



2015-05-01

Grammatical Features of Structural Elaboration and Compression Common in Advanced ESL Academic Writing

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Grammatical Features of Structural Elaboration and Compression
Common in Advanced ESL Academic Writing

Gyusuk Yang

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of
Master of Arts

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May 2015

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ABSTRACT

Grammatical Features of Structural Elaboration and Compression Common in Advanced ESL Academic Writing

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The present study replicated the research framework of a previous study (Biber, Gray, & Poonpon, 2011) that identifies the grammatical complexity of L1 professional academic prose as strongly favoring a dense use of phrasal nominal modifiers such as prepositional phrases as postmodifiers, attributive adjectives, and nouns as premodifiers which characterize its unique structurally compressed discourse style. The main purpose of the present study was to explore syntactic similarities and differences between L1 professional and L2 student academic writing in terms of their reliance on phrasal/nominal compression features to determine characteristics of the grammatical complexity of advanced ESL academic writing. To this end, the distributional patterns of use for 25 specific grammatical complexity features of structural elaboration and compression were investigated in a corpus of 128 short academic essays collected from 16 advanced ESL learners and 16 L1 university students (as comparison data).

The results showed a heavier reliance of both the advanced ESL and L1 student academic writing on phrasal nominal modifiers (attributive adjectives and prepositional phrases as postmodifiers) of structural compression than on clausal elaboration features, which lent empirical support to Biber, Gray, and Poonpon's (2011) findings. In addition to the phrasal compression features, both the advanced ESL and L1 student academic writing were also characterized by a prominent use of specific colloquial grammatical devices such as adverbs as adverbials. Compared to the advanced ESL writing, the L1 student academic writing showed a significantly more preference for one particular colloquial feature: ZERO relative clauses where relative pronouns replacing relativized objects are omitted. This combined reliance on both phrasal compression devices and colloquial features in both the advanced ESL and L1 student academic writing distinguished their grammatical complexities from that of L1 professional academic prose and signaled a possibility for recognizing them as a transitional developmental stage from more casual to more academic writing.

Keywords: grammatical complexity, advanced ESL academic writing, phrasal structures, phrasal structural compression, clausal structural elaboration, colloquial features

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my committee members—my chair, Norman W. Evans and the other members Jesse A. Egbert and K. James Hartshorn. It is their sophisticated expertise and thoughtful guidance that have made the completion of this thesis possible. I appreciate their invaluable feedback and assistance that they provided with kindness, patience, and understanding at all steps of the research process, without which this thesis could not have been done.

I would like to acknowledge Judson Hart who gave me numerous pieces of inspiring and practical advice for choosing an appropriate topic and establishing the foundation for my research. I would also like to thank my fellow graduate students for their encouragement and positive feedback throughout the TESOL MA program. Finally, I must give my deepest appreciation to my family and friends whose unconditional support enabled me to stay motivated and move forward with confidence.

Table of Contents

ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
List of Tables.....	vi
List of Figures	vii
Chapter 1: Introduction	1
Organization of the Thesis.....	4
Chapter 2: Review of Literature.....	6
Complexity of the Complexity, Accuracy, and Fluency (CAF) Triad.....	7
Traditional Clausal Complexity Measures of L2 Writing Development	10
Limitations of Subordination- and T-unit-based Grammatical Complexity Measures	14
Register Variation across Speech and Academic Writing.....	17
The Compressed Nominal Discourse Style of Academic Writing.....	24
The Need for Characterizing the Discourse Style of L2 Writing.....	31
Research Questions.....	32
Chapter 3: Methods	34
Participants	34
Instrument.....	35
Data Analysis Methods and Procedures	36
Research design.	36
Grammatical features of interest.....	37
Analytical procedures.	44
Step 1 tagging.....	45
Step 2 grammatical error corrections.	46
Step 3 tag editing.....	48
Step 4 tag counting.....	50
Step 5 normalization and statistical analysis of the counts.	50
Chapter 4: Results	52
Statistical Analyses of the Features by Grammatical Type.....	52
Statistical Analyses of the Features by Statistical and Practical Significance	62
Chapter 5: Discussion and Conclusion.....	72
Summary Statement.....	72
Interpretations of the Findings in Light of the Research Questions.....	74
Research question 1.	75
Research question 2.	78
Research question 3.	85
Summary of Discussion.....	86
Limitations.....	88
Pedagogical Implications.....	89

Suggestions for Future Research	91
Conclusion	92
References	94

List of Tables

Table 1	35
Table 2	36
Table 3	38
Table 4	39
Table 5	40
Table 6	46
Table 7	47
Table 8	49
Table 9	54
Table 10	55
Table 11.....	56
Table 12	63
Table 13	66
Table 14	69
Table 15	80
Table 16	84

List of Figures

<i>Figure 1.</i> The mean scores for the most frequent dependent clauses and dependent phrases across the NNES and NES student academic writing based on the normalized rates of frequency counts per 1,000 words.	57
<i>Figure 2.</i> Sixteen features of statistical non-significance based on the distributional variations between the NNES and NES student academic writing.	64
<i>Figure 3.</i> Eight features of not statistical but practical significance based on the distributional variations between the NNES and NES student academic writing.	67
<i>Figure 4.</i> One feature of statistical significance based on the distributional variations between the NNES and NES student academic writing.	69

Chapter 1: Introduction

Many learners of English as a Second Language (ESL) often find it challenging to achieve a high level of writing proficiency in English. Developing the ability to communicate in English writing is demanding even for advanced ESL learners since written communication is more formal than spoken communication with fewer mistakes allowed in production. Many adult second language (L2) learners also display frustration when they are confronted with situations where they cannot fully express with their L2 writing skill what they want to convey (Norrby & Håkansson, 2007). The grammar of writing is not naturally acquired and more complicated than grammatical structures readily produced in speaking (Cleland & Pickering, 2006).

Challenges most ESL learners face in writing become greater especially when they have to compose academic written discourse in that academic writing, despite variance across disciplines, is universally claimed to be loaded with a substantial amount of information arranged in elaborated, complex and explicit representations (Wright, 2008). This quality is in general attributed to both student academic writing and professional academic research writing in English. In student academic writing, desired features of written discourse include a high degree of elaboration and specificity (Wright, 2008), just as professional academic research writing is claimed to manifest elaboration as an important rhetorical function (Hyland, 2007).

In this regard, a higher level of English writing proficiency is inevitably required of most ESL learners in pursuit of studying in the context of English for Academic Purposes (EAP) so that they can properly demonstrate their ability to fulfill the desired characteristics of student academic writing and a decent degree of academic performance capability in their academic coursework. Such a requirement of adequate writing proficiency can easily be identified in benchmark standards that many American universities have established for their

admissions decisions based on scores that international students earn on large-scale language proficiency tests such as the Test of English as a Foreign Language (TOEFL) and the International English Language Testing System (IELTS).

Specifically, the mean overall score on the TOEFL iBT test required of international students in pursuit of university education in the United States has been reported to be as high as 80 out of 120 based on responses from 108 American universities with high enrollment of international students (Andrade, Evans, & Hartshorn, 2014). This level of English proficiency, especially in writing, is likely equivalent to the Advanced Mid sublevel proficiency based on the American Council on the Teaching of Foreign Languages (ACTFL) Guidelines (Swender, Conrad, & Vicars, 2012), which identifies writers at this level in syntactic terms as being capable of appropriately controlling the most frequently used target-language syntactic structures and communicating thoughts expressed clearly and supported by some elaboration. That is, the benchmark standards set forth by many American universities already entail a demand on ESL learners for a writing proficiency level that exhibits a quality command of syntactic features in elaborated representations adequate for them to effectively complete their academic coursework in the EAP context.

Thus, in order for ESL learners to develop their writing proficiency properly in the desired syntactic terms in academic context, researchers in studies of L2 writing development and L2 teaching practitioners need to help inform them better of their performance of grammatical competence in writing. To do so, it is necessary to give profound consideration to the notion of grammatical complexity of written production. This notion is often characterized by some working definitions such as “using a wide range of structures and vocabulary” (Lennon, 1990, p. 390) and “revealing the scope of expanding and restructured second language knowledge” (Wolfe-Quintero, Inagaki, & Kim, 1998, p. 4) because it can

comprehensively capture the extent to which learners' written syntactic performance is demonstrated (Housen & Kuiken, 2009).

In the field of Second Language Acquisition (SLA) and English Language Teaching (ELT), grammatical complexity continues to yield theoretical and methodological problems because of its poor definition and varying interpretations depending on the context and interest of individual researchers (Pallotti, 2009). This phenomenon results in a lack of universal consensus on what syntactic features should serve as indices of grammatical complexity and how to measure them with a high degree of validity. Nevertheless, most researchers in L2 writing have developed, largely for the sake of practicality, a tendency to employ grammatical complexity measures based on frequency of clausal subordination and other clausal structural units such as the "T-unit" (Hunt, 1965, p. 21) meaning "one main clause with all the subordinate clauses attached to it" (Hunt, 1965, p. 20) (Givón, 1991; Wolfe-Quintero et al., 1998; Li, 2000; Ortega, 2003; Ellis & Yuan, 2004; Larsen-Freeman, 2006; Nelson & Van Meter, 2007). Such practice has been grounded on the assumption that increases in grammatical complexity of L2 writing result from syntactic elaboration based on more structural (mostly clausal) additions to simple clauses and phrases.

However, there have been other researchers who have questioned the validity of the measures of subordination and T-units as a reliable criterion representing the development of grammatical complexity in L2 writing (Bardovi-Harlig, 1992; Rimmer, 2006, 2008; Norris and Ortega, 2009; Ravid & Berman, 2010). In this context, Biber, Gray, and Poonpon (2011) have recently challenged the current universal reliance on subordination measures and T-unit measures (e.g., primarily mean T-unit length and the number of subordinate clauses per T-unit) in gauging grammatical complexity of academic written texts, by indicating their poor theoretical linguistic basis and lack of efficacy in testing applications. In their bottom-up attempt to identify characteristics of grammatical complexity of professional academic

written texts based on large-scale corpus analyses, they have found that phrasal (nonclausal) constituents in noun phrases, such as prepositional phrases as nominal postmodifiers (e.g., *an increase in demand for ethanol as an additive*), attributive adjectives (e.g., *functional differences*), and nouns as nominal premodifiers (e.g., *sales tax rates*), are exceptionally common in professional academic writing rather than embedded (dependent) clauses.

Biber et al.'s (2011) study confirming the predominant use of phrasal constituents in a noun phrase in academic writing poses the advantage of ensuring its internal validity by being grounded on the empirical corpus research to identify the grammatical complexity features characteristic of professional academic written texts rather than purely on intuitive or theoretical grounds. However, since the academic articles on which their study has based its corpus analyses are the production of highly professional native English writers, syntactic similarities and differences between L1 professional and L2 student academic writing in terms of their use of phrasal/nominal compression features (i.e., noun modifying adjectives, nouns, and prepositional phrases) still need further empirical verification. Thus, the present study replicated the research framework of the previous study by Biber et al. in the context of advanced ESL academic writing to inductively discover what grammatical complexity features of structural elaboration and compression were most frequently employed in L2 academic writing. The main focus of the present study also encompassed verifying if advanced ESL academic writers also displayed a syntactic tendency to pack information into noun phrases by constructing their academic text in a nominal/phrasal manner rather than in a clausal manner just as do professional academic writers.

Organization of the Thesis

In the following chapter, Chapter two, a body of relevant previous literature will be reviewed to contextualize the present study in discussing how grammatical complexity in writing has been viewed and measured by other researchers in studies of L2 writing

development and how the related discussions have led to the current focus on nominal/phrasal representations of academic writing, with the research questions of the present study subsequently presented. Chapter three will present detailed information of the corpus used for the present study in terms of how it was collected and analyzed which consisted of academic written texts (essays) gathered not only from non-native English speaking (NNES) advanced ESL learners but also from native English speaking (NES) university students for more valid comparisons to Biber et al.'s (2011) research findings where highly professional academic journal articles have been analyzed. Chapter four will report in detail the results of the data analysis which were the actual distributional variations of 25 specific grammatical complexity features of structural elaboration and compression, selected from 28 grammatical devices analyzed in Biber et al.'s research, across the NNES and NES student academic essays. Also the normalized rates of frequency of occurrence for these grammatical features will be reported in this chapter to offset the relatively small sample size of the present study. Finally, Chapter five will examine similarities and differences between the grammatical complexities of L1 professional and L2 student academic writing by answering each of the research questions based on interpretations of the results of the data analysis presented in the previous chapter and provide the limitations and pedagogical implications of the present study and suggestions for future research.

Chapter 2: Review of Literature

As pointed out in the previous chapter, the present study replicated the research framework of Biber et al.'s study (2011) to explore similarities and differences between the grammatical complexity of L2 student academic writing and that of L1 professional academic prose in terms of their reliance on phrasal/nominal compression features (i.e., noun modifying nouns, adjectives, and prepositional phrases). Their empirical corpus-based research has reported that as opposed to the widespread presumption among researchers in L2 writing development, it is not extensive subordination but phrasal constituents in a noun phrase that are strongly favored in professional academic writing. Drawing from the findings, they argue that any single complexity measure including the T-unit cannot adequately capture the underlying qualities of grammatical complexity of advanced academic writing. They also claim that phrasal structures as constituents in noun phrases heavily frequent in professional academic writing should serve as a basis for the assessment of L2 writing development since the writing proficiency realized in professional academic written discourse is the target standard of writing which most L2 learners aspire to approximate.

Their argument challenges the universal acceptance prevailing in studies of L2 writing development that grammatical complexity of advanced academic writing is characterized by its syntactic elaboration resulting from a substantial degree of subordination (e.g., Givón, 1991; Wolfe-Quintero et al., 1998; Li, 2000; Ortega, 2003; Ellis & Yuan, 2004; Larsen-Freeman, 2006; Nelson & Van Meter, 2007). Thus, this chapter explores, to contextualize the present study, how the perception and interpretation of grammatical complexity have projected themselves in studies of L2 writing development and how the relevant discussions focusing on the compressed nominal/phrasal discourse style of academic writing have been established.

Complexity of the Complexity, Accuracy, and Fluency (CAF) Triad

Before this chapter plunges into comprehensive discussions of grammatical complexity in L2 writing development of concern to the present study, it is reasonable to give proper consideration first to how the three concepts of complexity, accuracy, and fluency (CAF) in L2 writing development have traditionally been defined in different research contexts and have mutual influence on each of them in the L2 learner language system. A brief introduction to the three constructs can afford a better understanding of the specific concept of grammatical complexity on which the present study focused. Figuring as primary dependent variables of much research in applied linguistics and SLA, the three constructs have traditionally been described using working definitions though none has been indisputable to date and multiple working definitions still coexist (Housen & Kuiken, 2009).

Complexity has often been defined as “using a wide range of structures and vocabulary” (Lennon, 1990, p. 390), as “a willingness to take risks, to try out new forms even though they may not be completely correct” (Skehan, 1998, p. 5), as “[the availability of] a wide variety of both basic and sophisticated structures” (Wolfe-Quintero et al., 1998, p. 69), or as “the extent to which the language produced in performing a task is elaborate and varied” (Ellis, 2003, p. 340); accuracy as being “error-free” (Lennon, 1990, p. 390), as an emphasis on an orderly language learning progression toward a mastery of rules that come under control one by one (Hammerly, 1991), or as “the ability to be free from errors while using language to communicate in either writing or speech” (Wolfe-Quintero et al., 1998, p. 33); and fluency as the language processing ability with “native-like rapidity” (Lennon, 1990, p. 390), as “related to the production pressures that a language user faces while communicating a message in either writing or speech” (Wolfe-Quintero et al., 1998, p. 13), or as “the extent to which the language produced in performing a task manifests pausing, hesitation, or reformulation” (Ellis, 2003, p. 342).

In addition to the varied traditional definitions of CAF, Wolfe-Quintero, Inagaki, and Kim (1998), in their book-length review of construct validity and reliability of the various CAF measures indicative of L2 development in writing, have also illustrated the three constructs by grouping them in terms of language representation (competence) and language access (performance). Within such a conceptual framework, they have defined both complexity and accuracy as revealing “the second language learners’ current level of language knowledge” with the former in particular reflecting “the scope of expanding or restructured second language knowledge” and the latter specifically displaying “the conformity of second language knowledge to target language norms”; fluency has also been depicted in this view as “a function of the control in accessing that knowledge, with control improving” in the learners’ automatization of “the process of gaining access” (Wolfe-Quintero et al., 1998, p. 4).

Unlike the existing tendency to perceive the three constructs largely independently in their definitions as presented above, each trait of CAF is often characterized by their interrelationship observed by trade-offs in any potential pairs out of them and considered to develop not in a uniform manner but at the expense of another (Housen & Kuiken, 2009). As for the trade-off between complexity and accuracy, Tedick (1990) notes that L2 writers commit more errors when they take more risks to produce more syntactically complex utterances by lengthening their T-units in field-specific writing on more familiar subject matter. Between fluency and accuracy, MacKay (1982) illustrates in accounting for fluency in speech production the increase in speed as resulting in increased errors. Wendel (1997) has also proposed in the same context of the developmental trade-off between fluency and accuracy that different planning types contrarily contribute to the enhancement of each of the two constructs: *pretask planning* “giving learners the opportunity to plan a narrative before they speak it” (Ellis & Yuan, 2004, p. 60) enables fluency gains while *on-line planning* “that

occurs during a speech event” (Ellis & Yuan, 2004, p. 60) results in accuracy gains. In this regard, Yuan and Ellis (2003) also suggest that both pretask planning and on-line planning achieve the increase in complexity in L2 oral production whereas the former enhances fluency and the latter promotes accuracy. In sum, according to researchers with the theoretical background supporting the limitation of human attention mechanism and processing capacity (Skehan, 1998; Bygate, 1999; Skehan & Foster, 1999, 2001), L2 learners may focus on one of the three dimensions of L2 performance that competes with another for attention in the language processing and development (Housen & Kuiken, 2009).

Of the three constructs, central to the research purposes of the present study were complexity and how to operationalize and measure it with construct validity ensured in L2 writing development. The construct validity issue of complexity derives principally from its inherent multifaceted and multidimensional nature that entails both its underlying manifold connotations such as being “structurally multicomponential”, “cognitively demanding”, and “advanced” (Pallotti, 2009, p.593) and the existence of its internal hierarchical structures involving *task complexity* (properties of language task) and *L2 complexity* (properties of L2 performance and proficiency), the latter of which in turn has been interpreted in at least two different ways: as *cognitive complexity* (difficulty in L2 processing) and as *linguistic complexity* (linguistic property of L2 system) (Housen & Kuiken, 2009)

Since complexity is “the most complex, ambiguous, and least understood” construct of the CAF triad (Housen & Kuiken, 2009, p. 463), it is necessary to restrict its use to an operationalizable degree so that it can be discussed in a fruitful manner in the present study. Despite the variance in its definition from one researcher to another, within applied linguistics, complexity primarily refers to the more advanced grammatical structures that language learners demonstrate in their progress in proficiency, especially in their writing development (Biber, Gray, & Poonpon, 2011). This notional use of complexity as

grammatical complexity, which corresponds to *structural complexity* entailing the *formal* and the *functional complexity* of L2 syntactic features (Housen & Kuiken, 2009), out of varied facets of the construct served as the main focus of the research scope of the present study as in Biber et al.'s (2011) research so that this study could provide a stable discussion of linguistic properties of the L2 learner language system.

Traditional Clausal Complexity Measures of L2 Writing Development

When we restrict the use of complexity to grammatical complexity, in studies of L2 writing development, many researchers have accepted the traditional concept of grammatical complexity as structural elaboration that more clausal additions or modifications to simple clause structures lead to more complexification and elaboration. For instance, Hyland and Tse (2005) note the preferred use of “elaborated structures” in academic written discourse to “facilitate the readers’ understanding of the text” (p. 127). According to Foster and Skehan (1996), development in grammatical complexity refers to “progressively more elaborate language” and “a greater variety of syntactic patterning” (p. 303). Biber and Gray (2010) have also reported that it is possible by a simple database search of Education Resources Information Center (ERIC) to identify 114 published research articles in which *writing* and *elaborate/elaborated/elaboration* are used together. In addition, Huddleston (1984) and Purpura (2004) have specified that in the English morphosyntax, a simple sentence comprised of only one main clause develops into complex and compound sentences with two or more main or subordinate clauses, which reflects the widespread perception that more clausal additions lead to the increase in complexity. It has been fairly universal for these researchers to assume that grammatical complexity in writing evolves in clausal terms from simple clause structures to more complex and elaborated clause constructions that are speculatively accepted as typical of more complex, informational, and advanced writing.

The intuitive understanding of increased grammatical complexity in writing as a result of clausal structural elaboration has developed a strong tendency for L2 writing researchers to operationalize the construct as quantitative grammatical complexity measures that have to do mainly with dependent variables based on the T-unit, which Hunt (1965) proposed as referring to “a minimal terminable unit” (p. 21) consisting of a main clause and all dependent clauses embedded in it (Biber et al., 2011). Hunt originally argued that the T-unit would be a more promising index of written language maturity of first language (L1) English speaking students since it could preserve all the subordination and coordination achieved by the writer and capture syntactic tendencies showing strength in subordination index but weakness in clause length, and vice versa.

Of grammatical complexity ratios based on the T-unit Hunt (1965) examined, especially two specific measures such as mean length of T-units (MLTU, calculated by dividing the total number of words by the total number of T-units) and clauses per T-unit (C/TU, calculated by dividing the total number of clauses by the total number of T-units) have principally been favored to assess the syntactic development of L2 writing performance (Biber et al., 2011). Hunt found MLTU to be the best index for representing L1 writing development and distinguishing between grade levels as it displayed the greatest percentage growth. Yet, the efficacy of the measure as a complexity metric was later questioned by some subsequent researchers, such as Wolfe-Quintero et al. (1998) arguing that the lengthening of T-units could entail not only more subordinate clauses but longer clauses that refer to length, the subject matter of fluency, not complexity. Other recent researchers such as Norris and Ortega (2009), however, have vindicated the use of the ratio as a complexity measure in that length-based measures of complexity afford general or overall interpretations of complexity and can capture large-scale or long-term variation that would be missed by more specific metrics. Still, this support to length-based complexity measures still reflects the traditional

perception of grammatical complexity in writing that longer structural units result in increased complexity. In addition to MLTU, Hunt also found that C/TU would provide an index of the frequency and embeddedness of subordinate clauses within a main clause by direct inspection. This finding suggests the emphasis on extensive subordination, as well as the lengthening of structural units, as a significant measure of grammatical complexity in writing.

After Hunt's (1965) proposal of the T-unit as a more valid structural unit with which to measure grammatical complexity in writing, subsequent researchers in L2 writing development have long been attracted to relying on subordination- and T-unit-based measures of grammatical complexity despite their lack of proper theoretical background (Biber et al., 2011). For instance, researchers with theoretical approaches to complexity, such as Givón (1979, 1991), have theoretically posited that subordination and its embeddedness characterize syntactic complexity in writing. The argument is that L2 learners in earlier developmental stages utilize simple structures by conjoining clauses and shift to employing more subordination than coordination (Givón, 1979) and a higher proportion of subordinate clauses that are much more frequent in more grammaticalized written-formal discourse reveals more complexity and more cognitive demands for language processing as well (Givón, 1991).

Likewise, researchers with empirical approaches to the construct, such as Wolfe-Quintero et al. (1998), who conducted a comprehensive survey of CAF measures of L2 writing development, have also singled out two specific grammatical complexity measures—both C/TU representing “the clause depth of the T-unit” (p. 84) and dependent clauses per independent clause (DC/C) representing “the degree of embedding” (p. 88)—as most successful in fulfilling the criteria of demonstrating repeated sampling reliability across studies and concurrent validity for determining the best developmental measures. In other

words, the two grammatical complexity ratios have been reported to increase linearly to proficiency levels across studies regardless of how proficiency is defined and show high correlation to either program or school levels (Wolfe-Quintero et al., 1998). This recommendation of the measures reveals the emphasis on hypotactic constructions centering on clausal embedding as an important index of L2 writing development.

In the context of focusing on the extensive clausal elaboration in assessing grammatical complexity of L2 writing, other researchers (Li, 2000; Ortega, 2003; Ellis & Yuan, 2004; Larsen-Freeman, 2006; Nelson & Van Meter, 2007; Norrby & Håkansson, 2007) have also lent support to the utility of subordination- and T-unit-based measures of the construct under the assumption that more elaborated and longer clausal constructions achieve more complexity (Biber et al., 2011). Larsen-Freeman (2006) provides a perspective shift from a stage-like developmental view to an emergentist perspective on SLA that sees language development as contextualized products of individual learners' integrated learning activities in particular communicative contexts and change in language progress as fluctuating for different learners at different times. Yet, even from this sort of a distinctive perspective on SLA taking note of individual learner variability, the practice of measuring syntactic complexity in her study has still remained based on the extent of subordination (C/TU), with confirmation of it as part of the best complexity measures of L2 development in writing, in line with Wolfe-Quintero et al.'s (1998) recommendation.

Ortega (2003) has also documented that out of the 27 empirical studies analyzed to make possible comparison across them in terms of the use of grammatical complexity measures as proficiency indices of college-level L2 writing, 25 have shown reliance on MLTU to gauge grammatical complexity by employing no or a few other measures such as C/TU and DC/C, and of these studies, 16 are also reported to measure the construct only based on MLTU. As implied in these studies, researchers in studies of L2 writing

development have relied chiefly on subordination- and T-unit-based measures of grammatical complexity, and such a practice has been primarily for the sake of practicality: such grammatical complexity measures are relatively easier to calculate, even possible by hand-coding with smaller samples (Biber et al., 2011).

Limitations of Subordination- and T-unit-based Grammatical Complexity Measures

Despite the established reliance on grammatical complexity measures of L2 writing based on the T-unit and subordination metrics, there have been other researchers in applied linguistics and SLA that have questioned the utility of such complexity measures. As early as 1990s, Bardovi-Harlig (1992) cast doubt on the appropriateness of the T-unit as a structural unit for the description of syntactic complexity in writing of advanced adult L2 learners. The point was that T-unit analysis could not capture “accurately the knowledge of the learner” (p. 391) since it would not only miss out on the rhetorical sophistication, the syntactic function of a conditional, and possible specific semantic meanings that legitimate conjuncts would achieve and convey in coordinated sentences, but also dilute the original awkwardness produced by learners, giving them “too much credit by breaking up sentences” (p. 392). Norris and Ortega (2009) have also argued that a series of grammatical complexity metrics addressing subordination capture increase in the construct only under production of subordinate clauses since such measures equivalently “tap complexification as a phenomenon of subordination exclusively” (p. 560).

In addition, Biber and Gray (2010) and Biber et al. (2011) illustrate possible limitations of the traditional complexity measures via subordination, especially in academic contexts, by comparing short sentences from spoken and written English as follows: “*Well, since he got so upset, I just didn’t think we would want to wait for Tina to come back*” (Biber et al., 2011, p. 14) and “*From the system perspective, these stages are marked by the appearance of new systemic mechanisms and corresponding levels of complexity*” (Biber &

Gray, 2010, p. 7). If both sentences (the former from a conversation and the latter from a university textbook) are analyzed by employing MLTU, one of the most popular traditional complexity measures, the length is equivalently 20 in the number of words, which suggests the equal complexity in both sentences in contrast with a simple clause although the former does not feel complex or elaborated to average native English speakers (Biber et al., 2011). However, if the sentences are analyzed by reflecting the number of dependent clauses, one may conclude that the former is much more complex or elaborated than the latter since it involves four different dependent clauses (“*since he got so upset*,” “*we would want*”, “*to wait for*”, and “*Tina to come back*”) while the latter has none but just the main clause (Biber et al., 2011). Biber and Gray and Biber et al. point out this type of complexity analysis as misleading and revealing limitations posed by the traditional complexity measures based on the T-unit length and subordination. They argue that academic writing often presents its structural elaboration in terms not of embedded clauses but of embedded phrases in complex noun phrases, establishing a more compressed discourse style, and thus nonclausal (phrasal) embedding in complex noun phrases should be regarded as “represent[ing] higher orders of complexity than dependent clauses” (Biber et al., 2011, p. 15).

The reconsideration of the utility of T-unit-based measures of grammatical complexity in L2 writing has also arisen from some empirical surveys (Wolfe-Quintero et al., 1998; Ortega, 2003) that have failed in finding a significant relationship between proficiency and the T-unit-based measures (Biber et al., 2011). Wolfe-Quintero et al. (1998), despite their earlier recommendation for the T-unit complexity ratio (C/TU) and the dependent clause ratio (DC/C) for grammatical complexity analysis of L2 writing, still report that 11 of the 18 studies included in their survey fail to find “a significant relationship between proficiency and the T-unit complexity ratio (C/TU)” (p. 85). Likewise, Ortega (2003) has also found opposing evidence against the utility of MLTU in differentiating between proficiency levels

in her survey of studies employing MLTU for measuring complexity. Specifically, of the 68 comparisons across proficiency levels (including comparisons between adjacent proficiency levels, the lowest and highest levels, and an advanced level and a native speaking group) in the 19 studies analyzed, 43 comparisons turn out to show fairly small differences for MLTU (the mean differences clustered in a range from -1.5 words to 1.8 words per T-unit) although three of these observed between-proficiency differences have still been reported to be statistically significant in their original studies (Ortega, 2003).

Other scholars lending support to the standpoint that T-unit analysis is far from reflective of grammatical complexity also include Rimmer (2006), who notes that grammar testing and syllabi traditionally tend to be on the intuitional grounds and lack the principled sequencing of grammatical items, suggesting corpus-informed research as establishing better construct validation of grammatical complexity for testing purposes. Rimmer specifically presents a criticism of the traditional consideration of complexity unit length as a strong indicator of complexity, by indicating greater grammatical density achieved by shorter language production to pack much information into a narrower scope. Another of his criticisms concerns the tendency to concentrate on the clause as the basic unit for complexity analysis, such as C/TU and DC/C, for neither addressing given data below clausal level (at phrasal level) nor making distinction between different categories of subordination. Rimmer (2008) also conducted a corpus-based analysis of L1 secondary education student essays on nominal structures (noun phrases and clauses) in frequency and category terms to identify factors indicating the correlation between grammatical complexity and literacy. It is suggested that there is little correspondence between the usage of any single individual construction and overall grammatical complexity with complexity being rather a product of the interaction of grammar with the context of production (Rimmer, 2008).

In sum, while many researchers in L2 writing development have long been attracted to the practical virtue of simple subordination complexity measures and T-unit-based measures, there also have been other researchers who have raised concerns over the utility of such measures via theoretical and empirical methodologies as presented thus far. As well as critiquing the deficient construct validity revealed by the complexity measures addressing clausal elaboration in assessing L2 writing, most of these researchers have furthered the discussion to inviting consideration to the fundamental difference in grammatical complexity between English speech and written academic discourse, which will be discussed in the following section.

Register Variation across Speech and Academic Writing

Some early studies (e.g., Biber, 1988) in linguistics have argued that English academic writing is distinguished from speech in terms of difference in the discourse style; that is, spoken discourse derives its complexity from extensive clausal subordination while grammatical complexity of academic written discourse is characterized by a prominent use of complex noun phrases (noun phrases and pre- and post-modifiers) (Biber et al., 2011). For instance, as a notional discussion of the nominal and verbal discourse style of written English, Wells (1960) provides an argument defending the appropriateness of the nominal style, contrasted with verbal style, for academic writing in that the nominal fashion shows more concern with the content being expressed than with the manner of expressing it and help impersonality by means of the passive voice and nominalization.

Other scholars indicating the distinct properties of academic discourse from spoken registers include Halliday and Martin (1993) that argue from a systematic functional linguistic perspective that elaborated scientific language interprets the reality in a different manner from the way everyday language construes it, by re-construing it via the mode of noun phrase structures holding persistence of meaning through time rather than the grammar

of clauses where information fluctuates with time. Halliday (1979) has also found the association of subordination with the production constraints characteristic of speech. Halliday (2004) also specifies as a typical characteristic of scientific writing the use of noun phrases in preference to clauses despite the fact that such a substitution of a clause with noun phrases could form semantic ambiguity as well as high lexical density, with a single nominal phrasal construction corresponding to several different clausal replications and much semantic information concealed in the process.

In addition to the theoretical perspectives on discourse complexity, multidimensional corpus-based empirical studies of linguistic variation across speech and writing have shown that the grammatical complexity of spoken English reveals notable differences from that of academic written discourse. The multidimensional approach was developed to help linguists “analyze the linguistic co-occurrence patterns associated with register variation in empirical/quantitative terms” (Biber, 2006, p. 178). Studies with such an approach systematically provide “the linguistic characteristics of the range of [spoken and written] genres in English” (Biber, 1988, p. 55) by specifying textual dimensions of registers and textual relations among genres by means of corpus-based statistical techniques and computational tools (Biber, 1988). For example, Biber (1988) conducted an exploratory corpus-based study based on factor analyses to identify the co-occurring patterns of 67 linguistic features, to characterize six basic dimensions of register variation in English. The factor analyses were based on the assumption that markedly co-occurring linguistic features represent shared communicative functions (Biber, 1988). The justification for describing register differences in terms of the co-occurrence patterns of linguistic features across registers is situated in the fact that it does not help reliably determine the extent of register variation to merely consider the relative distribution of individual common linguistic features, due to their large numbers and occasional idiosyncratic distributions (Biber, 2006).

Biber's (1988) functional interpretation of the co-occurrence patterns of specific syntactic features with regard to a textual dimension of *Informational* and *Involved Production* shows a strong association of interactive real-time spoken production with subordination features such as sentence relatives, WH-complement clauses, causative adverbial clauses (e.g., *because*), and conditional adverbial clauses (e.g., *if*). These subordination features frequent in real-time spoken production occur in a complementary pattern to the use of nouns and phrasal nominal modifiers, such as attributive adjectives and prepositional phrases associated with a substantial density of information packed into texts, thus characterizing highly informational written texts (Biber, 1988). This analytical finding lends a degree of support to the fundamental linguistic distinction between spoken and written production characteristics and their different complexities and communicative intent. However, it is necessary in order to avoid any misunderstanding of linguistic variation between speech and writing, to note that Biber has specified no observed absolute difference but overlaps between the two registers along each of the six dimensions in the analysis. Nevertheless, there is still a definite difference particularly indicated between the two modes when the typical types of discourse in each mode are considered, face-to-face conversation and academic expository prose: the latter shows denser informational integration with more abstract conceptualization, a more careful choice of lexical items, and a more explicit specification of reference than the former (Biber, 1988).

Furthermore, other multidimensional approaches to register variation also provide a similar confirmation of the difference in complexity between spoken and written discourse (e.g., Biber, 1985, 1986). Biber (1992) has focused on 33 specific linguistic features associated with discourse complexity across spoken and written registers to examine its multidimensionality. Informational written registers (e.g., official documents, academic prose, press reportage, biographies, and professional letters) distinguish themselves from all other

spoken and written registers, including general fiction and personal letters, by showing a markedly frequent use of integrative features such as “nouns, often in noun-noun sequences [...], attributive adjectives, and prepositional phrases [as nominal postmodifiers]” (Biber, 1992, pp. 154-155) (Biber, 1992). The construct of discourse complexity is claimed to be multidimensional in that no single register included in the study shows consistency in complexity across each of the five analyzed dimensions defining “a unique set of relations among spoken and written registers” (Biber, 1992, p. 157) (Biber, 1992). That is, no single dimension represents an absolute distinction between the discourse complexities of spoken and written registers; yet, there is a fundamental internal distinction within each register: whereas written registers differ markedly among themselves with respect to both the kinds and the extent of discourse complexity, spoken registers differ only in extent, exhibiting a limited pattern with regard to their kinds of discourse complexity (Biber, 1992).

Biber (1995) also notes a similar pattern of register linguistic variation corresponding to his earlier findings that appears to hold not only in English but also across three other languages: Korean, Somali, and Tuvaluan. Different kinds of subordination features, such as adverbial clauses, relative clauses, and complement clauses, function independently and can be characteristic of either spoken or written register in the four languages (Biber, 1995). Still, there are “certain systematic generalizations regarding particular kinds of structural elaboration” (Biber, 1995, p. 263) resulting from these embedded clausal structures in each language (Biber, 1995). Adverbial subordinate clauses are used most frequently in spoken registers, co-occurring with “involved, reduced, or fragmented linguistic features” (Biber, 1995, p. 263) by which spoken registers are characterized, while relative clauses and nominal modifiers are mostly used for informational elaboration in written registers (Biber, 1995). Complement clauses show a frequent co-occurrence with linguistic features regarding personal stance or persuasion in both spoken and written registers (Biber, 1995). This pattern

in regard to register variation across the four languages supports a correlation of grammatical forms favored in different registers with their intended communicative functions observable cross-linguistically (Biber, 1995).

Large-scale corpus investigations such as Biber, Johansson, Leech, Conrad, and Finegan (1999) have also compared linguistic variation across a group of language use types including conversation, academic prose, fiction, and news reportage. The findings of Biber et al.'s research lend empirical support to the distinction between conversation and academic prose in terms of their different ways of achieving structural elaboration. The complexity of conversation results from a considerable use of dependent clauses and verbal features in contrast to phrasal constituents in noun phrases most frequently used in academic prose (Biber, Johansson, Leech, Conrad, & Finegan, 1999). For example, a distribution of particular lexical word classes across registers shows that nouns are "most common in news reportage (and to a lesser extent in academic prose)" (Biber et al., 1999, p. 65), while they are by far least frequent in conversation where verbs and adverbs are most common (Biber et al., 1999).

This distributional variation of simple lexical items such as nouns and verbs is informative of different types of structural complexity between conversation and academic written texts, in particular with regard to the density of informational integration and different communicative functions across registers. The fact that the more frequent use of verbs in conversation consequently entails more numerous clauses used in it characterizes the structural complexity of conversation as clausal elaboration (Biber et al., 1999). This claim is supported by the finding that many types of dependent clauses including complement clauses such as THAT-clauses and WH-clauses have the highest frequencies in conversation, the use of which are extremely restricted lexically to co-occurring controlling verbs such as *think*, *say*, and *know*, while they are least common in academic prose (Biber et al., 1999).

Furthermore, Biber et al. (1999) also identify conversation as lacking lexical elaboration, commonly found in expository written registers (e.g., academic prose), which can be achieved by “the detailing of semantic specification” (p. 1045) centering on “elaborated forms of noun phrase structures” (p. 1044) containing noun heads with pre- and post-modifiers (e.g., attributive adjectives, prepositional phrases as nominal postmodifiers, and relative clauses). In other words, conversation displays the absence of the need for lexical elaboration as is shown in its extreme reliance on the use of pronouns, instead of complex noun phrases with extensive modification (Biber et al., 1999). The dense use of pronouns in conversation, relying on shared contextual knowledge for understanding the intended referent between participants, thus leads to the avoidance of referential specificity and the lower lexical density and elaboration (Biber et al., 1999). In contrast, academic prose is characterized by a notably high frequency of complex noun phrases with extensive modification: “almost 60 percent of all noun phrases” (Biber et al., 1999, p. 578) in academic prose have been found to be accompanied with multiple pre- or postmodifiers (Biber et al., 1999). This considerable modification to noun phrases functions to integrate a great deal of the newly presented information in academic texts, resulting in high lexical density and syntactic elaboration reflecting more complex noun phrases embedded in longer clauses (Biber et al., 1999).

While the previous Multi-Dimensional (MD) analyses of register variation (Biber, 1985, 1986, 1988) have not claimed any observation of absolute distinctions but considerable overlaps between different complexities of spoken and written registers, a sharp opposition between the two production modes has been found in other subsequent MD studies such as Biber, Conrad, Reppen, Byrd, and Helt (2002) and Biber (2006) that provide the description of linguistic variation in more restricted discourse domains of university language use within the TOEFL 2000 Spoken and Written Academic Language Corpus (T2K-SWAL Corpus).

Biber et al. have applied to the analysis of university spoken and written register variation the six dimensions already identified in the previous study (Biber, 1988) based on a larger sample of more general texts and registers (e.g., conversation, interviews, news report, editorials, fiction, and academic prose). The university spoken and written registers reveal along most of the six dimensions a strong polarization regardless of their communicative purpose (Biber, Conrad, Reppen, Byrd, & Helt, 2002). Whereas the university written registers show the characteristics of a great density of information, a non-narrative focus, referential elaboration, less overt persuasion, and an impersonal discourse style, the university spoken registers are marked for involved and interactional production, situation-dependent reference, overt persuasion, and a less impersonal style (Biber et al., 2002). This strong distinction between the two university registers holds across an extensive range of communicative purposes (e.g., social and informational purposes) represented in the T2K-SWAL Corpus that reflects university-specific language use settings such as services encounters, textbooks, classroom teaching, and university catalogues (Biber et al., 2002).

Likewise, a sharp polarization between university spoken and written discourse has also been found in another MD study (Biber, 2006) that has taken a more specialized approach to enable descriptions of the dimensions virtually most significant in a particular domain of use and reflect specific functional properties of the domain. To this end, Biber (2006) has conducted a different MD analysis from the previous research (Biber, 1988) to identify the co-occurrence patterns particularly pervasive in the target corpus of university registers, with result of classifying 4 new dimensions: “oral versus literate discourse,” “procedural versus content-focused discourse,” “reconstructed account of events,” and “teacher-centered stance” (pp. 184-185). Along Dimension 1 (oral versus literate discourse), all university spoken registers show a close association with certain functional domains in which specific linguistic features indicate strong co-occurring patterns, such as personal

interaction and involvement (e.g., 1st and 2nd person pronouns and WH-questions), personal stance (e.g. mental verbs such as *think* and *like*), and reduced and formulaic language (e.g., contractions and THAT-deletion), whereas the written registers have to do with other functional domains to which the different types of features are strongly related, such as informational density (e.g., constituents in complex noun phrases including nouns, nominalizations, prepositional phrases, and adjectives) (Biber, 2006). These linguistic features falling on Dimension 1 sharply distinguish between the spoken and written registers “regardless of purpose, interactiveness, or other pre-planning considerations” (Biber, 2006, p. 186), which corresponds to a large extent to the previous functional interpretations of Dimension 1 (Biber, 1988; Biber et al., 2002).

The Compressed Nominal Discourse Style of Academic Writing

As discussed in an earlier section, previous MD studies have identified the syntactic complexity of academic written discourse as showing a significant dependence on noun phrase structures. This syntactic reliance on nominal phrasal construction has been considered to establish a unique, domain-specific nominal discourse style of academic writing. Fang, Schleppegrell, and Cox (2006) specify the use of nominalized elements as a necessary feature of scientific texts in contemporary schooling, given that they are useful for facilitating informational presentation and developing argument and accomplish “abstraction, technicality, and authoritativeness” (p. 259). Thus, a wide knowledge of constituents in nominal structures (e.g., noun heads and their pre- and post-modifiers) and nominalization can enable more comprehensive understanding of grammatical and semantic data expressed with increased clarity and economy in scientific texts and the way information is compacted into and expanded in them (Fang, Schleppegrell, & Cox, 2006) (see also Halliday, 1994; Guillén Galve, 1998).

In the discussion of the nominal textual representations of academic writing, some scholars such as Baratta (2010), however, have also called attention to a less significant use of nominalization in L1 student academic writing, which derives from verbs or adjectives to form the lexical class membership of noun (Biber et al., 1999) and is commonly recognized as maintaining impersonality and objectivity in academic writing. Baratta reports on a case study analysis of the developmental paths of six United Kingdom students' composition writing conventions throughout the undergraduate Language, Literacy and Communication (LLC) degree program. The argument is that the LLC student writing produces a more personal tone in writing resulting from more first person use, with less utilization of metalinguistic nominalizations which make more textual references to other theorists in literature, such as "*point, distinction, [and] expression*" (Charles, 2003, p. 316), due to its disciplinary characteristic that the expression of the presence of the personal syntactic agent is not much limited (Baratta, 2010). Thus, nominalizations are considered not as a syntactic choice featuring with a high frequency in academic writing in general but rather as "discipline-specific writing conventions" (Baratta, 2010, p. 1020) in certain fields of study such as hard sciences (Baratta, 2010) (see also Halliday, 1994, 2004; Swales, 1998).

However, despite the observed less frequent use of nominalizations within the LLC student writing overall, there is still a notable frequency increase of nominalizations in the students' essays between years 2 and 3 when they need to engage in their dissertation writing that requires them to demonstrate a higher standard of writing skills and encourages the avoidance of first person for a more impersonal (i.e., objective) tone in the discourse (Baratta, 2010). Moreover, Baratta also acknowledges the possibility that the noteworthy increase in the use of nominalizations during the period may also have stemmed from the students' subconscious efforts to approximate within their dissertations a highly refined writing style that they have experienced in reading their textbooks throughout their degree program. These

factors thus help to confirm the unique discourse style found in professional academia (including dissertations and textbooks) which displays extensive reliance on noun-based structures and nominalization in its language partly to maintain “an impersonal academic tone” (Baratta, 2010, p. 1020) and “[textual] cohesion” (Baratta, 2010, p. 1020). For instance, Charles (2003) provides compelling empirical evidence in this regard that in two specific academic disciplines, politics and materials science, not only textual cohesion but also writer stance revealed through it are realized to a significant extent by means of nouns used to encapsulate earlier propositions and organize discourse (i.e., “retrospective labels”, Francis, 1994, p. 83).

Within the broad framework of identifying linguistic characteristics of academic writing, recently other scholars (Biber & Gray 2010, 2011; Biber et al., 2011; Gray, 2011) have also focused on characteristics that distinguish academic prose from other kinds of written discourse and claimed its marked dependence on noun phrases and embedded phrasal modifiers, by offering empirical evidence to support the distinctive nominal discourse style of academic writing. Building on the previous MD studies of linguistic variation across spoken and written registers (Biber, 1988, 1992, 2006), Biber and Gray (2010) have documented the differing nature between the two registers in terms of structural elaboration and explicitness of meaning relations revealed at the grammatical level in a large-scale corpus-based analysis of structural complexities of conversation and academic writing (e.g., published professional research articles from a variety of disciplines such as science/medicine, education, psychology, and history). In this analysis, academic writing, contrasted with conversation, derives its structural elaboration considerably from multiple optional phrasal modifiers embedded in noun phrases, such as nominal premodifiers (e.g., attributive adjectives and nouns) and nominal postmodifiers (e.g., prepositional phrases), to condense extra information into texts (Biber & Gray, 2010).

This identified primarily nominal phrasal discourse style has been found to hold not only for professional research articles but also for “all written academic texts [...] in a university education, including textbooks, departmental web pages, and even course syllabi” (Biber & Gray, 2010, p. 9) (Biber & Gray, 2010). Some of the possible factors contributing to the nominal phrasal style across academic written discourse include the benefits of economy of expression and reading efficiency: the embedded phrasal modifiers can enable communicating nearly equivalent information that fuller clause syntax does, with the result of more compressed texts, thus producing high reading efficiency for target academic readers able to extract essential information of their concerns quickly (Biber & Gray, 2010). As a result of the observed marked use of phrasal structures, the nominal style of academic writing also entails implicit representations of meaning relations among grammatical elements in texts, even though academic prose, in which physical time and place is not shared between readers and the author, is generally more explicit in specifying referents of expressions than conversation that utilizes context-specific grammatical devices, such as pronouns and adverbs, which are based on shared knowledge between participants and convey implicit referential meaning only within a particular communicative situation (Biber & Gray, 2010).

The implicitness of structural meaning relations pervasive in the nominal style of academic writing is manifested by certain structural characteristics of some specific grammatical devices commonly used in academic writing (Biber & Gray, 2010). For example, a reduction in the explicitness of meaning relations occurs in omitting the agent in passives and the tense and aspect markers in nominalizations (Biber & Gray, 2010). Reliance on phrasal modifiers in academic writing also fosters the implicit meaning relations, such as a premodifier *heart* in “*heart disease*” (Biber & Gray, 2010, p. 12) paraphrasable as “*a disease [that is] located in the heart*” (Biber & Gray, 2010, p. 12), in that they have no grammatical devices marking the meaning relationship with head nouns as explicitly as fuller clausal

modifiers usually do (Biber & Gray, 2010). This inexplicit specification of structural meaning relations in academic writing thus prompts readers to elicit the intended meaning without offering overt grammatical clues to it (Biber & Gray, 2010). Halliday (2004) notes the possibility of semantic ambiguity arising from such implicit structural meaning relations in academic writing which tends to substitute clauses with noun phrases and have a degree of semantic information concealed in the replacement. In addition, despite the benefit that expert readers may enjoy from the implicit structural meaning representations by obtaining information they need efficiently, novice readers may face difficulty in performing this task because of their immaturity in inferring the expected meaning (Biber & Gray, 2010). This calls for some consideration for pedagogical efforts to help them develop proper reading strategies to extract the intended meaning from the compressed academic texts so that they can exploit available resources better for their academic success (Biber & Gray, 2010).

While the previous research (Biber & Gray, 2010) has focused on the investigation of the differing complexities between conversation and academic written registers, Gray (2011) has further examined syntactic features associated with structural complexity in terms of their academic disciplinary variation, including soft disciplines of philosophy and history, social science disciplines of political science and applied linguistics, and hard sciences of biology and physics. Clausal embedding (e.g., finite and nonfinite complement clauses) is considered as adding extra information to the meaning of the main clause and associated with structural elaboration in contrast to phrasal embedding (e.g., adjectives and nouns as nominal premodifiers) that incorporates optional information into noun phrases achieving structural compression (Gray, 2011). With regard to structural elaboration, nonfinite complement clauses (e.g., *to*-complement clauses) have been found to be the most frequent structure in all disciplines (Gray, 2011). However, this clausal elaborating structure shows a general declining frequency of use as the observation moves from the soft disciplines to the hard

sciences, and its use in softer disciplines has been observed to be controlled more highly by verbs than by adjectives or nouns, signifying a higher reliance on verbs than other lexical classes (Gray, 2011).

With regard to structural compression, adjectives as nominal premodifiers have been observed to be most frequent in all disciplines with little variation but a continuous high degree of frequency across disciplines (Gray, 2011). By contrast, nouns as nominal premodifiers are increasingly more frequent in the observation from soft disciplines to hard sciences, displaying the opposite trend of the use of the clausal elaborating structures, with an indication that such pre-modifying nouns should be most characteristic of the discourse in hard science disciplines (Gray, 2011). Despite the somewhat differing frequencies of use of phrasal structures associated with structural compression across academic disciplines, the results clearly suggest the substantial reliance of all academic disciplines involved in the analysis on extensive phrasal embedding as a primary means to communicate information (Gray, 2011).

Biber and Gray (2010), in addition to their discussion of the nominal/phrasal style of academic writing and its implicit meaning relations presented earlier, have also identified historical facts indicating changes in grammatical device use trends in academic prose, based on a corpus analysis of science/medical and astronomy texts. The point is that the change of academic writing in its preference for grammatical markers associated with the compressed phrasal discourse style is a relatively recent phenomenon and such a style became dominant in use with the start of the 20th century (Biber & Gray, 2010). Most phrasal modifiers in noun phrases showed a gradual and strong increase in use in transition from the 18th to 20th centuries (Biber & Gray, 2011). For instance, nouns as nominal premodifiers and prepositional phrases as nominal postmodifiers marked the most dramatic change in increase among others in the 20th century in comparison to the 18th century, with appositive noun

phrases slightly increasing, and with *of*-phrases as noun modifiers constantly highly frequent during the same period (Biber & Gray, 2010). These observed increases of noun structures lend strong credence to the reasoning of the historical trend of academic prose toward a more compressed nominal discourse style that structurally relies markedly on extensive nominal/phrasal embedding and thus entails less explicit representations of grammatical meaning relations (see also Biber & Clark, 2002; Biber & Gray, 2011, for more exhaustive descriptions of historical changes in usage patterns of phrasal grammatical devices achieving the condensed nominal discourse style of academic research writing).

More recently, Biber et al. (2011), the research framework of which the present study replicated, have also linked the discourse style of professional academic research writing to structurally favoring extensive noun phrase compression and modification rather than clausal elaboration, as well as adding their sharp criticism of the use of subordination to measure grammatical complexity of advanced writing. The distribution of 28 specific grammatical devices associated with structural elaboration and compression (e.g., *because* introducing a finite adverbial clause and *of* leading a prepositional phrase as a nominal postmodifier) has inductively been analyzed to identify grammatical complexities of academic research articles and conversation based on two large corpora of texts (Biber et al., 2011). The findings suggest that the construct of grammatical complexity of academic research writing is fundamentally different from that of conversation in that the former is characterized noticeably by a dominant use of “nonclausal features embedded in noun phrases” (Biber et al., 2011, p. 29) while the dense use of clausal embedding is more typical of the latter (Biber et al., 2011). The observed distributional differences of phrasal constituents in noun phrases that contribute to structural compression provide empirical verification of the nominal/phrasal discourse style of academic writing: prepositional phrases as nominal postmodifiers ($p < .0001$, $r^2 = .94$), attributive adjectives ($p < .0001$, $r^2 = .84$), and nouns as nominal

premodifiers ($p < .0001$, $r^2 = .52$) are exceptionally more frequent in academic research writing than in conversation (Biber et al., 2011).

The Need for Characterizing the Discourse Style of L2 Writing

Biber et al.'s (2011) study has had its internal validity secured by being grounded on the empirical corpus research rather than on sheer intuition for the bottom-up exploration of the distinctive discourse style of professional academic research writing with respect to grammatical complexity. However, despite its sufficient sample size in the analysis, the corpus of written texts used for the study consists simply of professional academic research articles from a range of disciplines (biology, medicine, education, history, and psychology). This exclusive focus of the study on professional academic research writing makes it sound implausible to apply the findings directly to L2 student writing production because of the obvious language proficiency gap existing between the two groups of writers.

Thus, in this regard, several subsequent researchers have attempted to examine if Biber et al.'s (2011) findings hold even for L2 student academic writing and provided meaningful research discoveries. For instance, Taguchi, Crawford, and Wetzel (2013) argue that attributive adjectives and prepositional phrases as nominal postmodifiers (at the phrase level) and subordinating conjunctions and *that*-relative clauses (at the clause level) have the potential for best distinguishing higher-rated from lower-rated L2 student essays (see also Lu, 2011). Parkinson and Musgrave (2014) have also investigated the use of noun modification features (attributive adjectives and noun-modifying nouns and prepositional phrases) in academic writing of two L2 student groups with different writing proficiency. The results suggest that the less proficient group relies heavily on attributive adjectives, at the lowest stage for noun modifications at the developmental stages for complexity features hypothesized by Biber et al., while the more proficient group favors noun-modifying nouns

and prepositional phrases, at higher stages in the developmental progression index (Parkinson & Musgrave, 2014).

These recent studies have lent additional empirical support to Biber et al.'s (2011) research findings by focusing on examining how specific clausal and/or phrasal complexity features help characterize the development of L2 writing. They have provided the potential for a complexity index based on a range of noun modification features for discriminating between different L2 writing proficiency levels. However, there still needs to be further investigation of the distribution of the entire set of grammatical features of clausal elaboration and phrasal compression, examined in the previous literature (Biber et al., 2011), in the L2 student writing context to better understand its actual discourse style in comparison to the compressed nominal/phrasal style of professional academic prose. Thus, the present study sought to fill this gap in the literature. This study replicated Biber et al.'s research framework by exploring the distributional variations of 25 specific grammatical complexity features in two sets of 64 student academic essays, one collected from advanced ESL learners and the other from L1 university students (for a comparison point), to reach its goal of characterizing the discourse style of advanced ESL academic writing. The following three research questions illustrate the primary concerns of the present study and will be answered in subsequent chapters.

Research Questions

1. What grammatical features of structural elaboration (dependent clauses) and compression (dependent phrases) are frequently used in advanced ESL and native English-speaking university student academic writing?
2. Is there any significant difference in the use of grammatical features of structural elaboration and compression between advanced ESL and native English-speaking university student academic writing?

3. Are the grammatical complexities of advanced ESL and native English-speaking university student academic writing characterized by a great use of phrasal structures functioning as constituents in noun phrases (prepositional phrases as nominal postmodifiers, attributive adjectives, and nouns as nominal premodifiers), as is observed in professional academic written discourse?

Chapter 3: Methods

This chapter provides descriptions of the research method employed to answer the research questions presented in the previous chapter. Detailed information of the participants, the instrument, and the data analysis methods and procedures for the present study will be given in the following separate subsections.

Participants

The present study included two groups of students as the participants: one consisting of 16 NNES students (advanced ESL learners) and the other of 16 NES university students. Although this study aimed at characterizing the discourse style of advanced ESL academic writing in comparison to that of professional academic prose, NES student academic writing was also involved in the analysis to provide an index for more convincing comparison, given the potential huge language proficiency gap in direct comparisons between NNES student and professional academic writing. The two groups of participants were selected via nonrandom sampling as a purposive sample based on their English language proficiency to be representative of advanced ESL learners and L1 speakers capable of adequately performing given academic writing tasks.

The NNES students were ESL learners preparing for college admission and enrolled in a writing class in an intensive English program at a large university in the United States. Their English proficiency was estimated to range from the Advanced Low to Mid sublevels of the ACTFL Proficiency Guidelines (Swender et al., 2012), based on their existing achievement test results for the program's assessment of the students' learning progress. Table 1 describes their demographic characteristics such as L1 background and gender. While the proportion of male to female NNES students ($n = 9$ to $n = 7$) was balanced to a certain extent within the group, their native languages were restricted to four languages (Japanese, Spanish, Portuguese, and Haitian Creole), primarily due to the coincidental

majority population of Spanish speakers in the writing class ($n = 11$) and the relatively small sample size of the group.

Table 1

NNES Participants by L1 and Gender

L1	Number of Participants		Totals
	Male	Female	
Japanese	1	0	1
Spanish	5	6	11
Portuguese	2	1	3
Haitian Creole	1	0	1
Totals	9	7	16

The NES students were those who had been L1 participants in a previous study (Evans, Hartshorn, Cox, & de Jel, 2014) to provide comparative data which has examined the validity of a weighted clause ratio proposed by Wigglesworth and Foster (2008) as a linguistic accuracy measure of L2 writing based on communicative adequacy. The preexisting academic essays that they had composed for the study were reutilized for the present study in that they met its research purposes as comparison data. According to Evans, Hartshorn, Cox, and de Jel (2014), the NES students were undergraduate students at a university in the United States and enrolled in the university's first-year writing course.

Instrument

The present study utilized writing samples gathered from each of the NNES and NES student groups as its research data. The writing samples consisted of four academic writing prompts: A Serious Social Problem, A Strong Economy, Too Much Freedom, and Effective Leadership, academic topics general enough to allow for impromptu writing without any field-specific background knowledge required. Each participant in both groups ($n = 16$ in each group) was equally asked to write a short argument paragraph on each prompt for 10 minutes, which resulted in 128 writing samples in total with an average text length of 591

words. This timed nature of the writing tasks could help the participants avoid fatigue and continue to concentrate on each prompt and this study ensure its practicality. The four writing prompts had been administered to the NES participants, according to Evans et al.'s (2014), on four separate occasions within a two-week period for the sake of research practicality.

Likewise, the NNES students were instructed in the writing class to take the writing task seriously and write on each of the four prompts at a class period as part of a normal class structure. Each of the writing samples from both the NNES and NES student groups was anonymized and decontextualized, with only minimal information about the participants identifiable, such as their gender and native languages. Table 2 summarizes the information of the corpus of the collected academic writing samples used for the present study.

Table 2

Corpus Used for the Analysis

Participants	NNES	NES
Number of Writing Samples	64	64
Number of Words	8,380	10,527
Mean Length of Writing Samples	524 words ($SD = 75$)	658 words ($SD = 168$)

Data Analysis Methods and Procedures

Research design. As a replication of the previous research (Biber et al., 2011), the present study also employed the same observational research design, in which frequencies of occurrences for 25 specific grammatical complexity features were calculated in an observation of each writing sample from both the NNES and NES student writing (i.e., 128 observations in total). The English language proficiency level served as the independent variable while the dependent variables were the rates of frequencies of occurrence for the target grammatical complexity features within the corpus of the present study, the distribution of which had already been investigated in larger corpora of professional academic journal

articles in the previous studies (Biber & Gray, 2010; Biber et al., 2011).

Grammatical features of interest. The main focus of the present study was to identify the discourse style of advanced ESL academic writing with emphasis on investigating whether or not advanced ESL writers compressed information into texts in a nominal/phrasal manner as do professional academic writers rather than communicating information in an elaborated clausal manner. As such, this study focused on discovering the distributional variation of 25 specific grammatical features of structural elaboration and compression (see Tables 3, 4, and 5) within its corpus. The grammatical devices of interest were obtained from the syntactic features already used for the analyses of grammatical complexity of L1 professional academic writing in the previous study (Biber et al., 2011). As shown in Tables 3, 4, and 5, the grammatical features can largely be categorized according to three major grammatical types: finite dependent clauses, nonfinite dependent clauses, and dependent phrases, which can serve three main grammatical functions such as adverbial, complement, and noun modifier (Biber et al., 2011).

Table 3

Finite Dependent Clauses (Biber et al., 2011)

Grammatical Function	Subcategory
1. Adverbial	<p>Causative: She won't narc on me, <u>because she prides herself on being a gangster</u>.</p> <p>Conditional: Well, <u>if I stay here</u>, I'll have to leave early in the morning.</p> <p>Concessive: If I don't put my name, she doesn't know who wrote it, <u>although she might guess</u>.</p>
2. Complement	<p>Controlled by a verb:</p> <p>THAT-clause: I would hope <u>that we can have more control over them</u>.</p> <p>ZERO THAT-clause^a: yeah, I think <u>I probably could</u>.</p> <p>WH-clause: I don't know <u>how they do it</u>.</p> <p>Controlled by an adjective:</p> <p>THAT-clause: It is evident <u>that the virus formation is related to the cytoplasmic inclusions</u>.</p> <p>Controlled by a noun:</p> <p>THAT-clause: The fact <u>that no tracer particles were found in or below the tight junction (zonula occludens)</u> indicates that these areas are not a pathway for particles of this size in the toad bladder.</p>
3. Noun modifier	<p>THAT relative clause: The results from a large number of cloze tests were used to estimate the amount of experimental error <u>that could be expected</u> to result from using cloze tests of various lengths.</p> <p>WH relative clause: Their nucleoid is formed by dense granules and rods composing a ring <u>which limits a central electrontransparent space</u>.</p> <p>ZERO relative clause^b: What they do not realize is the consequences <u>they will have to face</u>.</p>

^a Included in the counts for THAT-clause.

^b Not included in Biber et al. (2011).

Table 4

Nonfinite Dependent Clauses (Biber et al., 2011)

Grammatical Function	Subcategory
1. Adverbial	Purpose: <u>To verify our conclusion that the organic material is arranged as a coating around the silica shell components</u> , thin sections of fixed cells were also examined.
2. Complement	Controlled by a verb: <i>-ing</i> clause: I like <u>watching the traffic go by</u> . <i>to</i> clause: I really want <u>to fix this room up</u> . Controlled by an adjective: <i>-ing</i> clause: He's busy <u>convincing people he's not Leo</u> . <i>to</i> clause: It was important <u>to obtain customer feedback</u> . Controlled by a noun: <i>-ing</i> clause ^a : It was not just a matter of <u>looking in a dictionary to find the equivalent words</u> . <i>to</i> clause: The project is part of a massive plan <u>to complete the section of road...</u>
3. Noun modifier	<i>-ing</i> relative clauses: Transfer tests <u>following over-training</u> indicated individual variability. <i>-ed</i> relative clauses: The results <u>shown in Tables IV and V</u> add to the picture...

^a Operationalized as *-ing* clauses functioning as constituents in *of*-prepositional phrases as nominal postmodifiers.

Table 5

Dependent Phrases (Biber et al., 2011)

Grammatical Function	Subcategory
1. Adverb as adverbial	Adverb: I raved about it <u>afterward</u> .
2. Prepositional phrase as adverbial	Prepositional phrase: Alright, we'll talk to you <u>in the morning</u> .
3. Noun modifier	Attributive adjectives as premodifiers: <u>emotional</u> injury, <u>conventional</u> practices Nouns as premodifiers: the <u>trial transfer</u> sessions Prepositional phrases as postmodifiers: Class mean scores were computed by averaging the scores <u>for male and female target students in the class</u> . Appositive noun phrases as postmodifiers: Two Stuart monarchs (<u>Charles I and Charles II</u>) were strongly suspected of Romish sympathies.

A finite dependent clause commonly contains a subject and a verb phrase marked for tense, aspect, and/or modality and is regularly introduced by a subordinator (e.g., *because* or *if*) or a *wh*-word (e.g., *when* or *how*) (Biber et al., 1999). In contrast, a nonfinite dependent clause (e.g., *to*- and *-ing* clauses) is less explicit than a finite dependent clause in that it not only frequently lacks a subject and a clause link (a subordinator or a *wh*-word) but is also not marked for tense and modality (Biber et al., 1999). As opposed to finite and nonfinite dependent clauses, dependent phrases of interest, groups of words inherently without any clausal components including a subject and a verb phrase, involve both adverbial phrases (e.g., *in the morning*, *abroad*, and *afterward*) and noun modifying phrases such as attributive adjectives (e.g., *functional differences* and *gradual economic growth*), nouns as premodifiers (e.g., *scholarship applications* and *sales tax rates*), and prepositional phrases as postmodifiers (e.g., *the association of national culture with historical progress*).

Under each grammatical function (as adverbial, complement, and noun modifier) of the three major grammatical types (finite and nonfinite dependent clauses and dependent phrases), there are many subcategories encompassing 25 specific grammatical complexity devices therein whose distributional patterns of use within the corpus of the present study were central to its analytical procedures. For instance, there are three subcategories under finite dependent clauses in Table 3, according to the three identified grammatical functions, such as finite adverbial clauses including causative (e.g., *because*, *as*, and *since*), concessive (e.g., *although* and *though*), and conditional clauses (e.g., *if* and *unless*), finite complement clauses including THAT- and WH-clauses, and finite relative clauses including THAT and WH relative clauses (e.g., *who* and *which*). There are also three subcategories for nonfinite dependent clauses in Table 4 such as *to* adverbial clauses, *-ing* and *to* complement clauses, and *-ing* and *-ed* relative clauses. Dependent phrases in Table 5 contain two subtypes: phrasal adverbials (adverbs and prepositional phrases as adverbials) and noun modifiers including attributive adjectives, prepositional phrases as postmodifiers, nouns as premodifiers, and appositive noun phrases as postmodifiers.

Of the grammatical devices, both finite and nonfinite dependent clauses are closely associated with structural elaboration while dependent phrases are primarily linked to structural compression (Biber, 1988; Biber & Gray, 2010; Gray, 2011). Biber and Gray (2010) consider clausal embedding features, such as finite adverbial (e.g., *if* clauses), complement (e.g., THAT-clauses), and relative clauses (e.g., WH relative clauses) and nonfinite complement (e.g., *to* clauses) and relative clauses (e.g., *-ing* relative clauses), as resulting in structural elaboration in that they are “added on to the core structure of the main clause to elaborate the meaning of main verbs” (p. 6). For instance, finite adverbial clauses (1. in Table 3) always add optional information and modification into the main clause; and finite and nonfinite relative clauses (3. in Table 3 and 3. in Table 4 respectively) are also “optional,

identifying the reference of a head noun or providing elaborating information about that noun” (Biber & Gray, 2010, p. 6), as in the following example sentence where adverbial clauses are underlined and relative clauses are **bolded**:

*As I saw him go, picking his way among the nettles, and among the brambles **that bound the green mounds**, he looked in my young eyes as if he were eluding the hands of the dead people, **stretching up cautiously out of their graves**, to get a twist upon his ankle and pull him in. (Biber & Gray, 2011, p. 6)*

In addition, finite and nonfinite complement clauses (2. in Table 3 and 2. in Table 4 respectively) are also considered to contribute to the increase in structural elaboration, despite the fact that unlike adverbial clauses and relative clauses, they are not optional syntactic elements but normally function to fill the place of a required noun phrase (Biber & Gray, 2010). They can enable constructing manifold levels of elaborated structural embedding which convey a more extensive amount of information than a single noun phrase via the embedded clausal structures as in the following example sentence where each level of clausal embedding is bracketed: “*But I don’t think [we would want [to have it [sound like [it’s coming from us]]]]*” (Biber & Gray, 2010, p. 6) (Biber & Gray, 2010). As opposed to dependent clauses, dependent phrases are principally considered as achieving structural compression. Phrasal noun modifiers exemplifying dependent phrases, such as attributive adjectives (e.g., *emotional injury*), nouns as premodifiers (e.g., *the trial transfer sessions*), and prepositional phrases as postmodifiers (e.g., *an increase in demand for ethanol as an additive*), are “added on to noun phrases” (Biber & Gray, 2010, p. 7) to pack high amounts of supplemental information into texts by serving as “more condensed alternatives to fuller clausal structures” (Gray, 2011, p. 114). Biber (1988) cited Chafe (1982, 1985) and Chafe and Danielewicz (1986) to characterize prepositional phrases together with attributive

adjectives as important syntactic devices for both the integration of information into idea units and its expansion within an idea unit.

There is one point to notice about the recognized association between the dependent clauses and structural elaboration. The previous studies (Biber & Gray, 2010; Biber et al., 2011) categorize both finite and nonfinite relative clauses (e.g., WH and *-ing* relative clauses respectively) as grammatical devices for structural elaboration due to their inherent clausal nature in spite of their syntactic embeddedness within noun phrases at the phrasal level. They also identify them as “intermediate features” (Biber et al., 2011, p. 27) based on their less dramatic distributional difference between conversation and academic writing: they are relatively more common in academic writing than in conversation but not significantly frequent in absolute terms (Biber et al., 2011).

In this regard, however, Gray (2011) argues for recognizing nonfinite relative clauses (e.g., *-ing* relative clauses) as features of structural compression rather than elaboration given their syntactic characteristics of being reduced from fuller, finite relative clauses and their observed patterns of use across academic disciplines and registers which are similar to those for other compression features. That is, nonfinite relative clauses with no subjects and markers of tense, aspect, and modality are reduced forms from more elaborated, finite relative clauses and thus convey less information than the fuller alternatives communicating more detailed meaning and information (Gray, 2011). They also show generally increasing frequency trends similarly to other compression features in the observation from soft to hard disciplines, while the trends for finite relative clauses (e.g., WH relative clauses) are more similar to those for other clausal features of elaboration (Gray, 2011).

However, the present study adhered to the perspective presented in the previous studies (Biber & Gray, 2010; Biber et al., 2011) considering finite and nonfinite relative clauses to be features of elaboration for two specific reasons. First, Gray’s (2011) argument

for linking nonfinite relative clauses (e.g., *-ing* relative clauses) to structural compression appears to result in a potential false association between other clausal features with structural compression in that not only nonfinite relative clauses but also other finite and nonfinite dependent clauses functioning as constituents in noun phrases have also been found to be notably common in academic writing in other research (Biber et al., 2011), such as noun complement clauses (THAT- and *to* clauses) and WH relative clauses. Moreover, structural compression can only be best realized in substituting clausal structures with condensed phrasal structures concealing verbal elements as in a phrase “*lung cancer death rates*” (Halliday, 2004, p. 170) which allows for multiple possible paraphrases in re-construing its meaning via fuller clauses, such as the rates at which the number of people who die from lung cancer increases, the rates at which people die when they get lung cancer, or the rates at which people’s lungs die from cancer (Halliday, 2004). Thus, in this sense, the present study grouped under the features of structural elaboration nonfinite relative clauses (3. in Table 4) in which verbal constituents are still present at the reduced surface structure of the clauses, if not marked for tense, aspect, and modality.

Analytical procedures. The present study involved five-step analytical procedures to identify the distributional patterns of use for 25 specific grammatical features of structural elaboration and compression within the collected academic writing samples from both the NNES and NES students. The main purpose of the analysis included determining if the grammatical complexity of the NNES academic writing was characterized by a dense use of the structural compression features (phrasal nominal modifiers such as prepositional phrases as postmodifiers, attributive adjectives, and nouns as premodifiers in Table 5) as had been observed in L1 professional academic writing in the previous study (Biber et al., 2011). The analysis also aimed at discovering the potential distributional variations of the target features between the NNES and NES student academic writing. Each step of the procedures will

hereafter be illustrated in detail, including descriptions of computer programs used for grammatically annotating, editing, and counting the features, the process of correcting grammatical errors found in the NNES student writing samples, and a statistical analysis of the frequency counts for the features.

Step 1 tagging. To increase reliability and practicality of the identification of the target grammatical features, computer programs originally developed for the previous MD studies of register variation (Biber, 1988, 1995, 2006) were used for the analysis in the present study as were in Biber et al.'s (2011). The computer programs included an automatic grammatical tagger (a kind of computer software designed to grammatically annotate individual syntactic elements in given texts; Biber, 2006) and other additional programs such as a tag-editing program and a tag-counting program. The tagger associates each word in texts with a corresponding tag (code) and produces the tagged text in a vertical way that the running text is given on the left while the tags, with the delimiter (^) at the beginning, are presented to the right (Biber, 2006).

Table 6 illustrates an example sentence from the NES student writing and its tagged version. In the tagged text, a plus sign (+) separates five tag fields which identify linguistic details about the word, with the first field marking the major part of speech and the remaining fields marking specific grammatical functions or syntactic structures for the word (Biber, 2006). For instance, the single tag **jj** for the word *serious* in Table 6 identifies its part of speech as an adjective, and **atrb** in the second tag field marks its grammatical function as attributive (pre-modifying). The tag set **wrb+who+whcl++** for the word *how* indicates that it is a *wh*-word introducing a WH-clause. By using the automatic grammatical tagger, the NES samples, with their rare simple typing errors briefly fixed, were coded prior to the NNES texts that demanded a degree of correction to grammatical errors found in them in advance of being tagged.

Table 6

An Example Tagged Text

Original Sentence	Tagged Text
A serious social problem is how people are judged by their outer appearance before they are judged by their character and talents.	A ^at++++=A serious ^jj+atrb+++ =serious social ^jj+atrb+++ =social problem ^nn++++=problem is ^vbz+bez+vrb++=is how ^wrb+who+whcl++=how people ^nns++++=people are ^vb+ber+aux++=are judged ^vpsv++by+xvbnx+=judged by ^in++++=by their ^pp\$+pp3+++ =their outer ^jrb+atrb+++ =outer appearance ^nn+nom+++ =appearance before ^cs+sub+++ =before they ^pp3a+pp3+++ =they are ^vb+ber+aux++=are judged ^vpsv++by+xvbnx+=judged by ^in++++=by their ^pp\$+pp3+++ =their character ^nn++++=character and ^cc++++=and talents ^nns++++=talents. .^zz++++=EXTRAWORD

Step 2 grammatical error corrections. Compared to the NES student writing, the NNES samples in general contained some major and minor grammatical errors which needed some proper corrections so that individual grammatical elements in the texts could correctly be annotated by the automatic tagger. Yet, since the major focus of the present study was to investigate grammatical complexity of authentic written production of advanced ESL writers, excessive corrections to the errors were avoided in order not to mar the content validity of the collected data. This kind of concern called for a consistent error correction convention. Table 7 shows examples of the NNES students' original expressions with different types of grammatical errors and how the error correction convention worked on them.

Table 7

Grammatical Error Correction Convention for the NNES Samples

NNES Original Expressions	Corrections ^a
<i>nowdays</i>	<i>now<u>a</u>days</i>
<i>everithing</i>	<i>every<u>t</u>hing</i>
<i>begginig</i>	<i>begin<u>n</u>ing</i>
<i>comertial network</i>	<i>comm<u>e</u>rcial</i>
<i>movemnt</i>	<i>movem<u>e</u>nt</i>
<i>...if something is not <u>progesing</u>...</i>	<i>progr<u>e</u>ssing</i>
<i>This not only <u>afect</u> the economic situation of...</i>	<i>aff<u>e</u>ct</i>
<i>There are some, though, <u>that</u> don't know how to control themselves...</i>	uncorrected

^a Only simple spelling mistakes were corrected.

The error corrections were restrictedly made only to simple spelling mistakes occurring within one word in that the primary purpose was to enable the tagger to accurately locate correct tags at each word in the NNES texts. Other types of grammatical errors, such as those related to inflectional (e.g., number and tense markers such as *-s* and *-ed*) and derivational morphemes (e.g., affixes such as *-ness* and *-ful*), word order, lexical choice, or other larger syntactic structures, were kept uncorrected in accordance to the research purpose of the present study which concerned not linguistic accuracy but grammatical complexity, what the NNES students actually produced. For example, the error *afect* in Table 7 was only corrected to *affect* without adding an inflectional morpheme *-s* (third-person singular) to increase grammaticality, which should be an overcorrection than necessary since it was not actually produced by the writer. Likewise, the error *that* was also not corrected to *who* in that such a correction altering the lexical choice of relative pronouns should impact the counts of grammatical features of interest in the analysis. The tagger could correctly associate each word with a corresponding tag as long as it had no spelling error, and any potential tags inaccurately matched to any words were to be corrected in a subsequent step of tag editing. After the NNES samples were processed through the error correction, they were also tagged by the automatic grammatical tagger as were the NES texts.

Step 3 tag editing. With both the NNES and NES samples fully tagged, inaccurate tags were edited in this step. The incorrect tags resulted primarily from multifunctional characteristics of some specific words such as the functional word *that* which serves as a determiner, a demonstrative pronoun, a complementizer, or a relative pronoun. Prior to using an interactive computer program for the tag editing, two sample tagged texts were randomly selected, one from each of the NNES and NES texts, to manually conduct a pilot tag editing process. The purpose of this process was to identify mismatched tags which were related to 25 grammatical features of interest so as to apply them to the database for the interactive tag-editing computer program. Table 8 summarizes 11 types of the grammatical features found to be often annotated with inaccurate tags in the previous automatic tagging process.

After the pilot tag editing by hand, each of the mismatched tags was added to the database of an interactive tag-editing computer program which allowed for more efficient, if not completely automatic, tag checking. The program enabled spotting in the pool of the entire tagged texts of the NNES and NES samples the individual inaccurate tags detected beforehand (see Table 8) and suggested several appropriate alternatives for them at each instance of the spotting. For example, if the tag set **tht+rel+obj** in Table 8 inaccurately annotated with a THAT-clause was detected in the corpus of the tagged texts, the program suggested possible substitutions for that, such as **tht+vcmp**, **tht+jcmp**, **tht+ncmp**, **tht+rel+subj**, **dt+pdem**, and other related alternative tags. The most appropriate selection of a correct tag was made out of them based on contextual clues in the original running text visible together with the tags on the program. In this manner, all of the incorrect tags identified in the corpus were edited one by one to increase the accuracy for the results of the previous tagging process. Although this step required substantial amounts of time and labor, the relatively small corpus size of the present study made it practicable.

Table 8

The Incorrectly Tagged Grammatical Features of Interest

Features (Correct Tags)	Incorrect Tag Instances
1-1. Total finite adverbial clauses (cs)	wrb+who (WH-adverb)
1-2. <i>Because</i> (cs+cos)	in (preposition)
1-3. <i>If</i> (cs+cnd)	
1-4. <i>Although</i> (cs+con)	
2. THAT-clauses as verb, adjective, and noun complements, including ZERO (tht+vcmp , tht+jcmp , tht+ncmp , and tht0)	Omission of tht0 (ZERO THAT-clause) tht+rel+obj (THAT relative clause with object gap) tht+ncmp+obj (flawed tag)
3. WH-clauses (whcl)	Omission of whcl in wrb+who+whcl or wdt+who+whcl
4. THAT relative clauses (tht+rel)	dt+pdem (demonstrative pronoun) Confusion between tht+rel+subj and tht+rel+obj
5. <i>To</i> clauses as adverbials and verb, adjective, and noun complements (to , to+vcmp , to+jcmp , and to+ncmp)	in Confusion among vcmp , jcmp , and ncmp vb (verb), jj (adjective), and nn (noun) for vbi (base form of verb in infinitive clause)
6. <i>-ing</i> clauses (vbgnf++xvbg+)	jj or jj+atrb (attributive adjective) jj+atrb++xvbg (<i>-ing</i> form attributive adjective)
7. <i>-ed</i> relative clauses (vwbgn)	vbd (past tense verb) or vpsv (passive verb)
8. Adverbs as adverbials (rb)	jj , jjb (attributive-only adjective), or jjr (comparative adjective) in nn
9. Prepositional phrases (in)	rb or rp (adverbial particle) to cs+sub (other subordinating conjunction)
10. Attributive adjectives (jj+atrb)	Omission of atrb nn
11. Nouns as nominal premodifiers (nn or nns)	vb or vbz (3rd person singular verb)

Step 4 tag counting. An additional automatic computer program was employed to count the frequencies of occurrence for the target grammatical features in the final tagged corpus of the present study, which had previously been used for the analysis in Biber et al.'s (2011) research as well. While the frequencies of occurrence for most features were accurately counted by the program, several specific features inevitably needed to be manually identified in that there was a clear need for human judgment disambiguating their varied syntactic functions depending on given textual contexts. For example, it was determined by hand whether prepositional phrases (3. in Table 5), such as *of, in, on, with, and for*, functioned as nominal postmodifiers or as adverbials, which could only be done with contextual clues taken into account. Appositive noun phrases as nominal postmodifiers (3. in Table 5), located between proper punctuation marks such as commas and parentheses, were also identified by hand for the same specified reason. ZERO relative clauses (3. in Table 3), where a relative pronoun functioning as the object gap in the following relative clause is omitted, had not been included in the previous analysis (Biber et al., 2011). This caused the tagger not to be able to automatically annotate them with an appropriate tag while ZERO THAT-clauses (2. in Table 3) were automatically identified based on a given tag (**tht0**), which led to having them manually analyzed as were prepositional phrases as nominal postmodifiers and appositive noun phrases.

Step 5 normalization and statistical analysis of the counts. The frequency counts for all of the features were then converted to normalized rates of frequencies of occurrence (per 1,000 words) with the raw counts divided by the length of each text and multiplied by a normalized text length of 1,000 words (Biber 1988). The normalized rates enabled direct comparisons of the frequency counts across all of the texts unequal in length in the corpus, providing an accurate assessment of the frequency distribution in the texts (Biber, 1988). Based on the normalized frequency counts, a statistical analysis was conducted to examine

the distributional variation of the features between the NNES and NES samples, including the calculations of descriptive statistics such as means and standard deviations for the features.

Then, statistical significance (p -value) for each feature was also calculated via two-tailed independent samples t -tests of equal variances, to determine the significance of mean differences between the two samples. An *a priori*, Bonferroni corrected alpha level of .002 ($p < .002$) was calculated by dividing .05 (i.e., $p < .05$, a widely accepted benchmark for significance level) by 25 (the number of the dependent variables). In addition, calculations of effect size (Cohen's d) for the features were also taken into account in conjunction with statistical significance (p -value) to compensate for potential non-significance of mean differences for the features due to the relatively small sample size (128 writing samples in total) of the present study and provide practical significance assessing the strength of standardized mean differences between the two samples. Unlike p -values, effect sizes such as d values, computed based on the available data, are not affected by sample size, thus allowing for accurate judgments about their practical significance (Plonsky & Oswald, 2014).

Chapter 4: Results

This chapter presents the results of the statistical analysis of the normalized rates of frequency counts for 25 grammatical features of concern across the NNES and NES student academic writing samples. In the first half of the chapter, the normalized frequency counts for the features will be given in terms of the different grammatical types categorizing them (finite dependent clauses, nonfinite dependent clauses, and dependent phrases) to provide overall distributional patterns of use for the features across the NNES and NES student academic writing based on their mean scores. In the second half, the frequency counts will be described in more detail along three classifications (statistically non-significant, not statistically but practically significant, and statistically significant features) based on statistical significance (p -value) and practical significance (Cohen's d s) of mean differences for the features between the NNES and NES student academic writing. The findings presented in this chapter will then be further discussed in Chapter five to reach conclusions about both the exploration of syntactic similarities and differences between L1 professional and L2 student academic writing and the observed distinctive discourse characteristics of L1 and L2 student academic writing, by answering each of the research questions of the present study.

Statistical Analyses of the Features by Grammatical Type

Tables 9, 10, and 11 show descriptive statistics, two-tailed t -test (equal variances) results including statistical significance (p -value), and effect sizes (Cohen's d s) computed for the normalized frequency counts for the features across the NNES and NES student writing samples along three different grammatical types: finite dependent clauses (containing a subject and a verb phrase marked for tense, aspect, and/or modality; e.g., *because*, *that*, and *what*), nonfinite dependent clauses (lacking a subject and a clause link; e.g., *to*- and *-ing* clauses), and dependent phrases (adverbials and nominal modifiers; e.g., adverbs and adjectives). The analysis first concerned the distributional patterns of use for the features in

terms of these three grammatical types across the two student writing groups based on their normalized frequency counts indicated by the mean scores. The previous study (Biber et al., 2011) had already highlighted the prominent use of specific kinds of dependent phrases (prepositional phrases as postmodifiers, attributive adjectives, and nouns as premodifiers) in L1 professional academic prose as characterizing its grammatical complexity and achieving its unique compressed nominal/phrasal discourse style. Thus, the present study first focused on determining if these dependent phrases associated with structural compression were also markedly favored in L1 and L2 student academic writing, based on their mean scores identified in the analysis, compared to those for the other grammatical features. Figure 1 illustrates the most frequent finite and nonfinite dependent clauses and dependent phrases across the NNES and NES student academic writing samples based on the mean scores for the features.

Table 9

Statistical Analysis of Finite Dependent Clauses

Finite Dependent Clause Function	NNES		NES		<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Adverbials								
Total adverbial clauses	11.3	6.2	8.4	5.2	1.380	30	.178	.488
<i>Because</i> clauses	4.5	3.8	2.4	2.3	1.820	25 ^a	.081	.644
<i>If</i> clauses	4.6	5.4	4.8	3.8	-.102	30	.920	-.360
<i>Although</i> clauses	.4	.9	.5	.8	-.384	30	.703	-.136
Complements								
THAT-clauses as verb complements ^b	5.6	3.5	6.0	3.6	-.329	30	.744	-.116
WH-clauses as verb complements	3.8	3.4	3.9	2.9	-.091	30	.928	-.032
THAT-clauses as adjective complements	.4	1.0	.5	1.0	-.127	30	.900	-.045
THAT-clauses as noun complements	.4	.9	.7	1.1	-.723	30	.475	-.256
Noun modifiers								
THAT relative clauses	11.5	5.6	7.0	5.4	2.231	30	.033	.789
WH relative clauses	3.6	4.0	5.7	5.4	-1.240	30	.224	-.438
ZERO relative clauses ^c	1.0	.9	5.5	3.8	-4.475	17 ^a	.000	-1.582

^a *t*-test of unequal variances.

^b Including ZERO THAT-clauses.

^c Analyzed based on the normalized frequency counts by hand.

Table 10

Statistical Analysis of Nonfinite Dependent Clauses

Nonfinite Dependent Clause Function	NNES		NES		<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Adverbials								
<i>To</i> clauses	4.6	2.4	4.6	3.2	.005	30	.996	-.002
Complements								
<i>-ing</i> clauses as verb complements	.9	1.1	1.6	1.3	1.775	30	.086	-.628
<i>To</i> clauses as verb complements	2.1	2.1	3.4	2.2	1.591	30	.122	-.563
<i>-ing</i> clauses as adjective complements	.1	.5	.2	.7	.237	30	.814	-.084
<i>To</i> clauses as adjective complements	3.9	3.1	4.2	4.3	.180	30	.859	-.064
<i>-ing</i> clauses as noun complements ^b	.9	1.2	.3	.6	1.765	21 ^a	.092	.624
<i>To</i> clauses as noun Complements	2.5	3.4	2.6	2.6	.061	30	.952	-.022
Noun modifiers								
<i>-ing</i> and <i>-ed</i> relative clauses	2.3	3.1	3.0	1.7	.737	30	.467	-.261

^a *t*-test of unequal variances.

^b Operationalized as noun + *of* + *-ing* clauses.

Table 11

Statistical Analysis of Dependent Phrases

Dependent Phrase Function	NNES		NES		<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Adverbials								
Adverbs as adverbials	31.7	12.4	40.9	8.3	2.404	30	.023	-.850
Prepositional phrases as adverbials	58.2	11.6	59.7	9.0	.381	30	.706	-.135
Noun modifiers								
Prepositional phrases as nominal postmodifiers ^a	33.3	7.5	29.6	6.0	1.517	30	.140	.536
Attributive adjectives	52.1	10.4	43.7	7.7	2.511	30	.018	.888
Nouns as nominal premodifiers	9.1	6.4	11.5	8.1	.907	30	.372	-.321
Appositive noun phrases as postmodifiers ^a	.6	.9	.8	1.2	.594	30	.557	-.210

^a Analyzed based on the normalized frequency counts by hand.

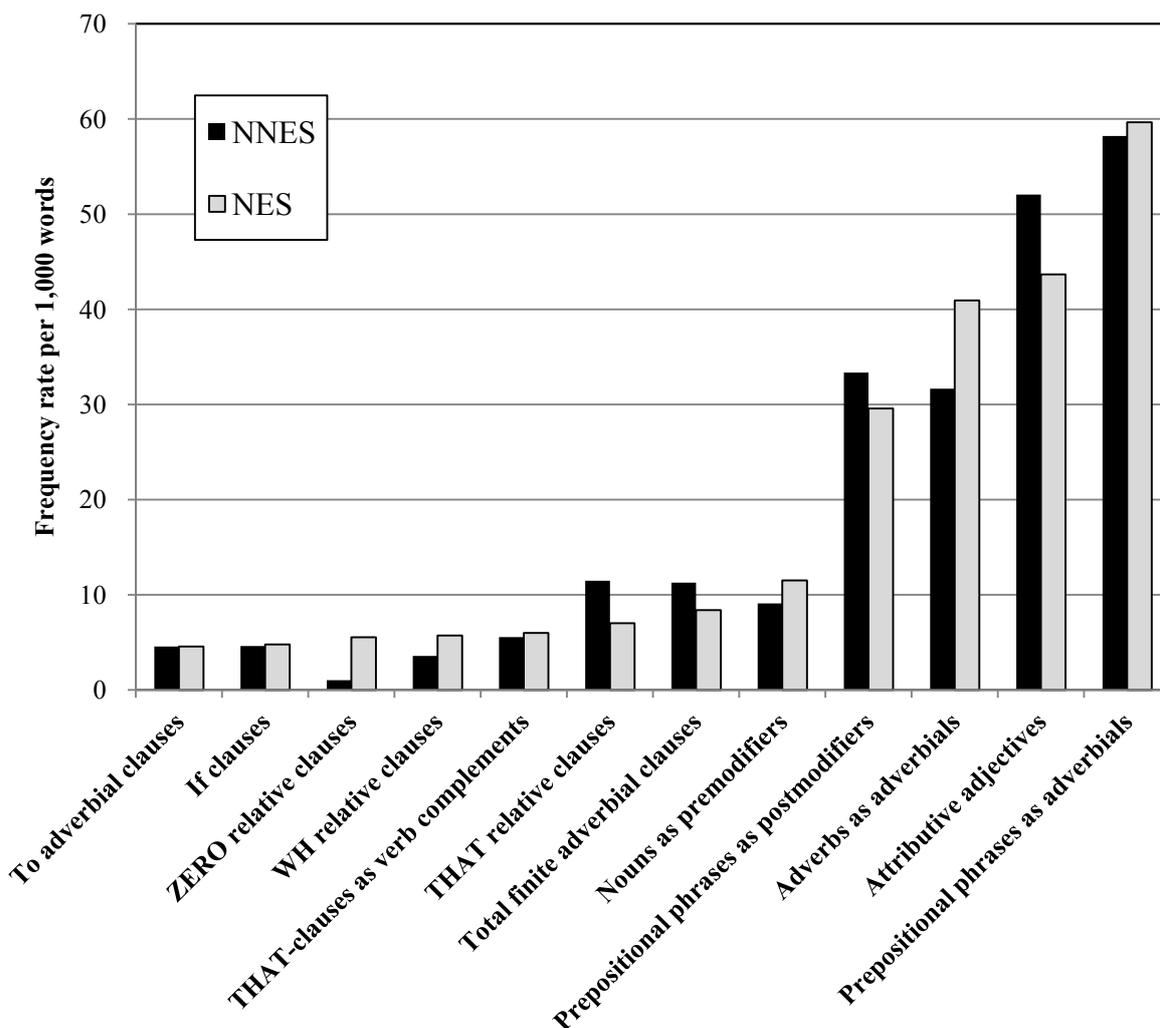


Figure 1. The mean scores for the most frequent dependent clauses and dependent phrases across the NNES and NES student academic writing based on the normalized rates of frequency counts per 1,000 words.

As for overall distributional variations of the target features across the NNES and NES samples, both finite and nonfinite dependent clauses associated with structural elaboration were less favored in general based on their mean scores as shown in Tables 9, 10, and 11 and Figure 1. For instance, the mean scores for even some of the most frequent finite dependent clauses shown in Figure 1 such as total finite adverbial clauses (NNES $M = 11.3$, NES $M = 8.4$), THAT relative clauses (NNES $M = 11.5$, NES $M = 7.0$), and THAT-clauses as verb complements (NNES $M = 5.6$, NES $M = 6.0$) were much lower than those for most kinds of dependent phrases. In contrast, phrasal noun modifiers closely associated with

structural compression under dependent phrases, including prepositional phrases as postmodifiers (NNES $M = 33.3$, NES $M = 29.6$) and attributive adjectives (NNES $M = 52.1$, NES $M = 43.7$), showed much greater frequency rates than all of the most frequent finite and nonfinite dependent clauses (see Figure 1). Excerpts 1 and 2 exemplify how the NNES and NES students utilized dependent phrasal noun modifiers such as prepositional phrases as postmodifiers (underlined) and attributive adjectives (**bolded**), markedly favored in both groups of student academic writing in the analysis and recognized as achieving structural compression of L1 professional academic writing in the previous study (Biber et al., 2011).

Excerpt 1

A **strong** economy is one of the most important assets a nation can have. The economy includes the products made in that nation and exchanged with others, opportunity for jobs, how citizens are spending their money, etc. A **strong** economy has many entrepreneurs, people vacationing and buying homes, cars and other **expensive** things. A **strong** economy is so important because it allows a nation to flourish. The economy is the back bone of the nation and it needs to be sturdy and consistent. The **economic** condition of a place is a **direct** impact on the number of unemployed. Clearly, unemployment is very harsh on the country itself and quickly has a snowball effect on the nation. If the economy is down, all other aspects of the nation seem to hurt as well. Even crime rates have been proven to rise and education decrease because of the economy. The **economic** position that a nation holds is its **most important** asset and therefore should be carefully studied and kept strong.

(NES student writing sample)

Excerpt 2

A **serious social** problem is world hunger that we are suffering nowadays. One of the causes of this problem is that the *developed* countries are wasting and investing their

income in situations that are not need it. One example of this, is New York. In downtown of NY you can find **fresh** food, clothes in good use, furniture, and so on. All of these things are in the garbage just because they get tired of it. In my opinion, this is unfair with the people that are really needing these **essential** elements to survive. And just because the society of those countries with high income, gets bored and preferred start looking for **new** things are letting other societies died and vanished. (NNES student writing sample)

However, nouns as premodifiers (NNES $M = 9.1$, NES $M = 11.5$), one of the grammatical complexity features found to contribute to the increase in structural compression of L1 professional academic prose together with prepositional phrases as postmodifiers and attributive adjectives (Biber et al., 2011), were not favored in the NNES and NES student writing as strongly as the other two phrasal nominal modifiers. Their frequency rates were relatively higher than other finite and nonfinite dependent clauses, such as THAT-clauses as verb complements (NNES $M = 5.6$, NES $M = 6.0$), *if* clauses (NNES $M = 4.6$, NES $M = 4.8$), and *to* adverbial clauses (NNES $M = 4.6$, NES $M = 4.6$); but their rates still resembled those for clausal elaboration features such as total finite adverbial clauses (e.g., *because*, *if*, and *although*) and finite noun modifiers (e.g., THAT relative clauses).

Instead of nouns as premodifiers, dependent phrases functioning as adverbials such as adverbs as adverbials (NNES $M = 31.7$, NES $M = 40.9$) and prepositional phrases as adverbials (NNES $M = 58.2$, NES $M = 59.7$) were much more frequently used in both student writing groups, which had not been particularly identified as associated with structural compression characterizing the nominal/phrasal discourse style of L1 professional academic writing (Biber & Gray, 2010; Biber et al., 2011). Adverbs as adverbials had rather previously been specified as much more significantly favored in conversation than in academic writing ($p < .0001$, $r^2 = .80$) despite their phrasal grammatical type in nature (Biber et al., 2011).

In addition to adverbs as adverbials, total finite adverbial clauses and THAT-clauses as verb complements, clausal elaboration features more common in conversation than in academic prose if not in absolute terms (Biber et al., 2011), were also observed to mark moderately higher frequency rates than other dependent clausal features in both student writing samples. These identified noticeable rates of occurrence for such grammatical features in the analysis, previously recognized as preferred in conversation, were worth noting in that they could help determine the discourse characteristics of the NNES and NES student academic writing rather different from those of L1 professional academic writing, which will be discussed in Chapter five. Excerpts 3 and 4 illustrate how the features favored in conversation such as adverbs as adverbials (**bolded**), finite adverbial clauses (underlined), and THAT-clauses as verb complements (*italicized*) were frequently employed in both the NNES and NES student academic writing.

Excerpt 3

Research has been conducted that says *that the average person influences and leads 250 people in his or her lifetime*. And that number could **just** be a starting point for you. Whether you are put in a leadership position or not, leadership affects everyone. One might ask what makes an effective leader. Although there are a lot of traits for this, I believe *that the two key ingredients for leadership are passion and vision*. Passion is **probably** the first and foremost attribute needed. Have you **ever** realized how **much** better a job you do when it is something you care about it? **Well** you do. Without passion, it is hard to motivate yourself, let alone motivate others, to get things done. **Right** behind passion needs to come a strong sense of vision. A lot of people feel **very passionately** about a lot of different things but the thing that stops the progression is lack of vision. Passion and vision **together** create a sturdy foundation for an effective leader. (NES student writing sample)

Excerpt 4

In the last years the world has changed **a lot** and one of the biggest changes is *that there is **too much freedom***. Young people are the ones taking more advantage of this situation; **nowadays** they have access to **almost** everything, beer, drugs, etc. For example: As soon as the internet became popular people started to use it for good and bad things, even when the objective of this was to be helpful a tool people have changed its use, **specially** young people use it for other bad things. **Finally**, parent's supervision should be a great help, even if their kids are young adults or adults they **always** need good advice from their parents or friends. **Besides** it is good to know *that **too much freedom could bring some non expected consequences***, it is good to have some control. (NNES student writing sample)

In sum, based on the mean scores for the target grammatical complexity features, phrasal nominal modifiers strongly associated with structural compression, such as prepositional phrases as postmodifiers (e.g., *difficulty in impulse control*) and attributive adjectives (e.g., *functional differences*), showed much greater rates of frequency counts than other clausal elaboration features in both the NNES and NES samples, which corresponded to the previous findings of L1 professional academic prose (Biber et al., 2011). In addition, the frequency rates for specific grammatical features commonly observed particularly in conversation in the previous study (Biber et al., 2011) were also relatively high in both the NNES and NES samples, such as adverbs as adverbials (e.g., *afterward*), finite adverbial clauses (e.g., *if*), and THAT-clauses as verb complements, with adverbs as adverbials extensively more frequent than the other two. Building on the identified frequency rates for the grammatical complexity features of interest, this chapter will move on to present in the following subsection the observed distributional variations of the features between the NNES and NES samples based on effect sizes (*d* values) as well as statistical significance (*p*-value).

Statistical Analyses of the Features by Statistical and Practical Significance

As for the distributional variations of the target features between the NNES and NES samples, the frequency rates for the features were distinguished along three levels of statistical significance: statistically non-significant, not statistically but practically significant, and statistically significant mean differences. These three classifications of the features were established based on both statistical significance of mean differences (p -value) and effect sizes (d values indicating the magnitude of standardized mean differences) for the features to compensate for possible statistical non-significance ($p > .002$) of their mean differences due to the relatively small sample size (128 writing samples in total) and the numerous dependent variables (25 specific grammatical complexity features) of the present study.

With p -values only serving as a sole benchmark for determining statistical significance of mean differences for the features and classifying them accordingly, no feature showed acceptable significance lower than the preset significance standard ($p < .002$) except for ZERO relative clauses ($p < .001$). This extremely limited number of the features fulfilling the preset statistical significance for the assessment of their distributional variations led to having d values (effect sizes) serve to be a complementary index enabling taking into account practical significance for the features in establishing the three classifications. Effect sizes for the features greater than .5 ($d > .5$) were determined to possess meaningful practical significance (Cohen, 1988). Tables 12, 13, and 14 summarize the three classifications of the features: of 25 grammatical complexity features, 16 were statistically non-significant (Table 12); 8 were not statistically but practically significant (Table 13); and one was statistically significant (Table 14).

Table 12

Statistically Non-Significant Features

Feature	NNES		NES		<i>t</i>	<i>df</i>	<i>p</i> *	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Finite dependent clauses								
Adverbials								
Total adverbial clauses	11.3	6.2	8.4	5.2	1.380	30	.178	.488
<i>If</i> clauses	4.6	5.4	4.8	3.8	-.102	30	.920	-.360
<i>Although</i> clauses	.4	.9	.5	.8	-.384	30	.703	-.136
Complements								
THAT-clauses as verb complements	5.6	3.5	6.0	3.6	-.329	30	.744	-.116
WH-clauses as verb complements	3.8	3.4	3.9	2.9	-.091	30	.928	-.032
THAT-clauses as adjective complements	.4	1.0	.5	1.0	-.127	30	.900	-.045
THAT-clauses as noun complements	.4	.9	.7	1.1	-.723	30	.475	-.256
Noun modifiers								
WH relative clauses	3.6	4.0	5.7	5.4	-1.240	30	.224	-.438
Nonfinite dependent clauses								
Adverbials								
<i>To</i> clauses	4.6	2.4	4.6	3.2	.005	30	.996	-.002
Complements								
<i>-ing</i> clauses as adjective complements	.1	.5	.2	.7	.237	30	.814	-.084
<i>To</i> clauses as adjective complements	3.9	3.1	4.2	4.3	.180	30	.859	-.064
<i>To</i> clauses as noun complements	2.5	3.4	2.6	2.6	.061	30	.952	-.022
Noun modifiers								
<i>-ing</i> and <i>-ed</i> relative clauses	2.3	3.1	3.0	1.7	.737	30	.467	-.261
Dependent phrases								
Adverbials								
Prepositional phrases as Adverbials	58.2	11.6	59.7	9.0	.381	30	.706	-.135
Noun modifiers								
Nouns as nominal premodifiers	9.1	6.4	11.5	8.1	.907	30	.372	-.321
Appositive noun phrases as postmodifiers	.6	.9	.8	1.2	.594	30	.557	-.210

* Statistically significant if lower than .002 ($p < .002$).

The mean differences for 16 features in Table 12 between the NNES and NES student academic writing groups were statistically non-significant according to the predetermined standard ($p < .002$). Figure 2 visually represents how most of the features marked approximately equivalent frequency rates across the NNES and NES samples regardless of the degree of frequency. There was one interesting point to notice about the mean differences for the features with statistical non-significance: except for one feature, total finite adverbial clauses, all of the features were more favored in the NES samples than in the NNES samples though their effect sizes (d values) were not large enough to show the meaningful strength of the differences (i.e. $d < .5$).

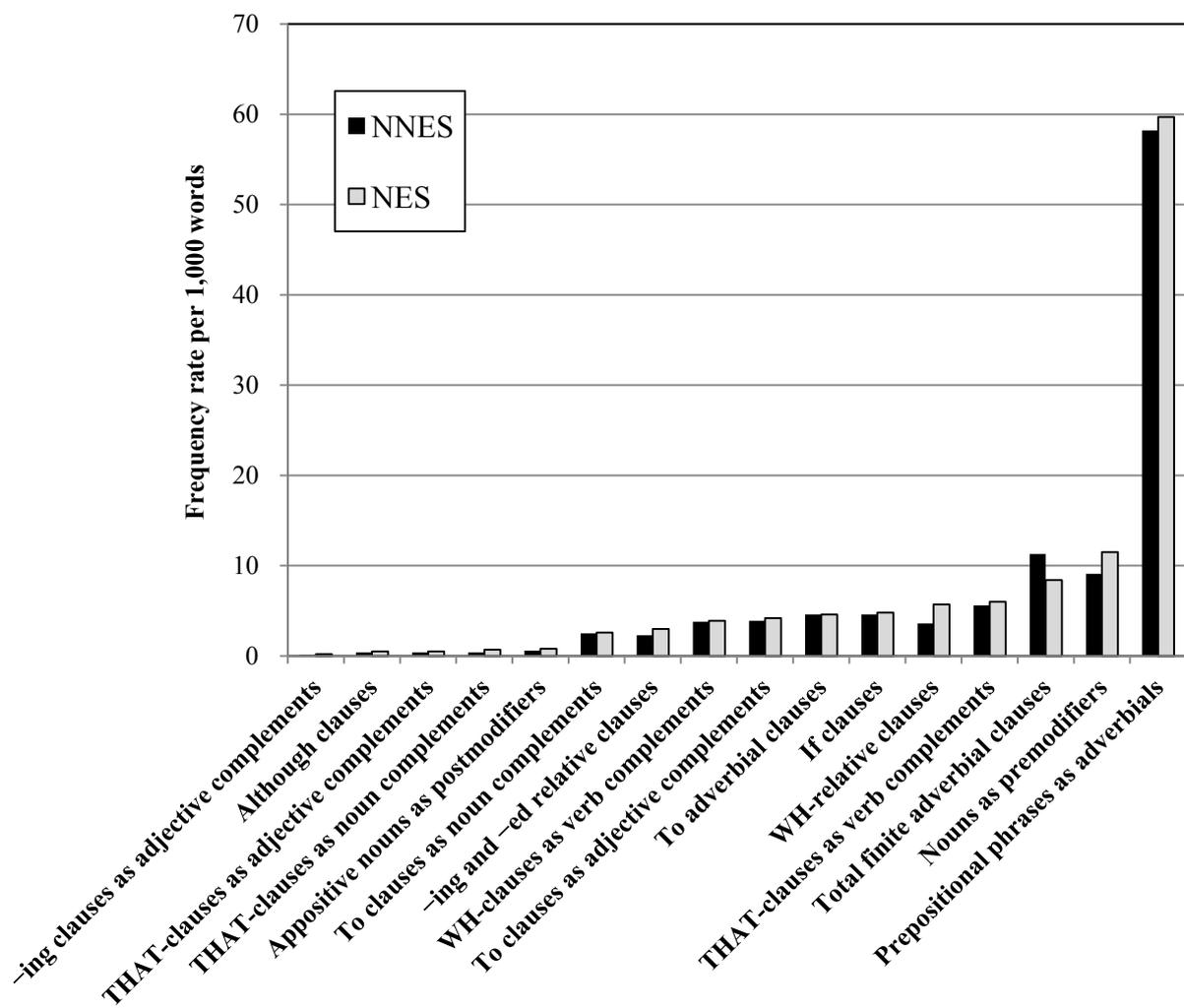


Figure 2. Sixteen features of statistical non-significance based on the distributional variations between the NNES and NES student academic writing. The frequency counts are based on the rates per 1,000 words.

Of the features more frequent in the NES group, WH relative clauses ($p = .224$, $d = .438$) and nouns as nominal premodifiers ($p = .372$, $d = .321$) showed relatively larger effect sizes than the other features, while total finite adverbial clauses ($p = .178$, $d = .488$) with the largest effect size of all in Table 12 were more favored in the NNES group. The two features favored in the NES group, WH relative clauses ($p < .0001$, $r^2 = .43$) and nouns as premodifiers ($p < .0001$, $r^2 = .52$), had previously been recognized as relatively more common in academic writing than in conversation, with nouns as premodifiers among the most favored features including prepositional phrases as postmodifiers ($p < .0001$, $r^2 = .94$) and attributive adjectives ($p < .0001$, $r^2 = .84$), whereas finite adverbial clauses ($p < .0001$, $r^2 = .35$) favored more in the NNES group had been identified as more frequent in conversation (Biber et al., 2011). This characteristic of these three features showing register variation between conversation and academic writing might contribute to identifying the different discourse attributes of the NNES and NES samples despite the relatively low magnitude of mean differences indicated by the small effect sizes for the features.

Table 13

Not Statistically but Practically Significant Features

Feature	NNES		NES		<i>t</i>	<i>df</i>	<i>p</i> *	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Finite dependent clauses								
Adverbial								
<i>Because</i> clauses	4.5	3.8	2.4	2.3	1.820	25 ^a	.081	.644
Noun modifier								
THAT relative clauses	11.5	5.6	7.0	5.4	2.231	30	.033	.789
Nonfinite dependent clauses								
Complement								
<i>-ing</i> clauses as verb complements	.9	1.1	1.6	1.3	1.775	30	.086	-.628
<i>To</i> clauses as verb complements	2.1	2.1	3.4	2.2	1.591	30	.122	-.563
<i>-ing</i> clauses as noun complements	.9	1.2	.3	.6	1.765	21 ^a	.092	.624
Dependent phrases								
Adverbs as adverbials	31.7	12.4	40.9	8.3	2.404	30	.023	-.850
Prepositional phrases as nominal postmodifiers	33.3	7.5	29.6	6.0	1.517	30	.140	.536
Attributive adjectives	52.1	10.4	43.7	7.7	2.511	30	.018	.888

* Statistically significant if lower than .002 ($p < .002$).

^a *t*-test of unequal variances.

As shown in Table 13, 8 features did not show statistically significant mean differences between the NNES and NES samples according to the preset statistical standard ($p < .002$), but their effect sizes (*d* values) still marked the meaningful strength ($d > .5$) calling attention to their practical significance. Figure 3 illustrates how mean differences for the features were observed between the NNES and NES samples. The classification of the features in terms of the practical significance revealed a contrasting preference of the NNES and NES groups for specific features reported to be separately favored either in conversation or in academic discourse (Biber et al., 2011). For example, the NES student academic writing was characterized by its preference for adverbs as adverbials ($p = .023$, $d = .850$) and *-ing*

clauses as verb complements ($p = .086$, $d = .628$), identified as notably frequent in conversation ($p < .0001$, $r^2 = .80$ and $p < .0001$, $r^2 = .42$ respectively; Biber et al., 2011), while attributive adjectives ($p = .018$, $d = .888$) and prepositional phrases as postmodifiers ($p = .140$, $d = .536$), recognized as exceptionally frequent in academic writing ($p < .0001$, $r^2 = .84$ and $p < .0001$, $r^2 = .94$ respectively) and strongly associated with structural compression (Biber et al., 2011), were more favored in the NNES samples.

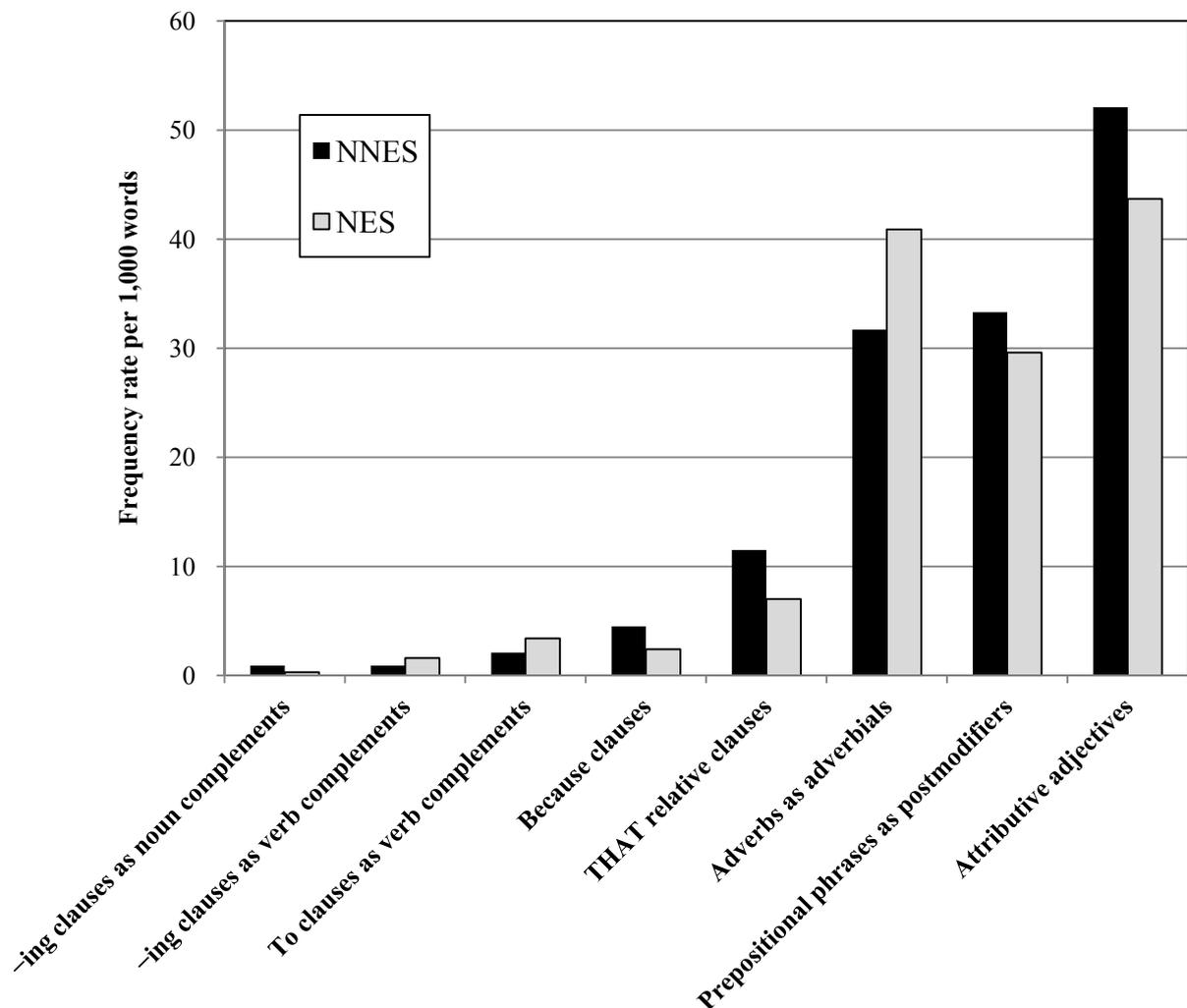


Figure 3. Eight features of not statistical but practical significance based on the distributional variations between the NNES and NES student academic writing. The frequency counts are based on the rates per 1,000 words.

However, a strong preference of the NNES student academic writing for THAT relative clauses ($p = .033$, $d = .789$) made less clear-cut the distinction between the NNES and NES groups in terms of the preference for the features favored either in conversation or in academic writing. Although the previous study (Biber et al., 2011) found no statistical significance of mean differences for the feature between conversation and academic writing, identifying its use tendencies as not linked to discourse genres, other scholars such as Celce-Murcia and Larsen-Freeman (1999) note the preferred use of THAT relative clauses over WH relative clauses in informal conversational discourse, especially to modify a nonhuman referent. Thus, the discussion of the dissimilarity between the two student academic writing groups with respect to favoring the features of different modality (conversation versus academic written texts) should also take into consideration the observed notable practical significance for THAT relative clauses ($p = .033$, $d = .789$) for more convincing assessment of the discourse qualities of the two groups, which will be provided in Chapter five.

Of the features with not statistical but practical significance, two specific features such as *because* clauses ($p = .081$, $d = .644$) and *-ing* clauses as noun complements ($p = .092$, $d = .624$) turned out to show significantly different variability in the means between the NNES and NES groups as a result of Levene's test for equality of variances ($p = .001$ and $p < .001$ respectively, with variances considered significant when p is lower than .05). The identified unequal variances of the means for the features between the NNES and NES groups led to having the obtained relatively large magnitude of the mean differences considered not as indicative of the distinction between the two student writing groups in general but as resulting from several specific NNES participants' individual preferred use of the features (i.e., as a result of outliers in the NNES mean scores for the features).

Table 14

Statistically Significant Feature

Feature	NNES		NES		<i>t</i>	<i>df</i>	<i>p</i> *	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Finite dependent clauses								
Noun modifiers								
ZERO relative clauses	1.0	.9	5.5	3.8	-4.475	17 ^a	.000	-1.582

* Statistically significant if lower than .002 ($p < .002$).

^a *t*-test of unequal variances.

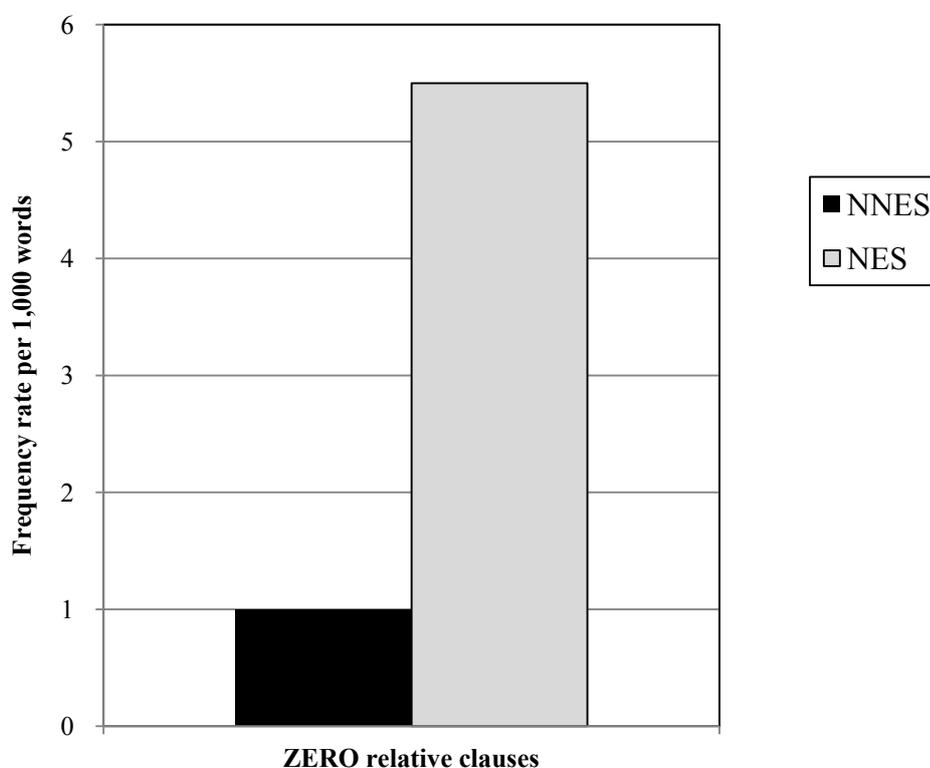


Figure 4. One feature of statistical significance based on the distributional variations between the NNES and NES student academic writing. The frequency counts are based on the rates per 1,000 words.

As shown in Table 14, there was only one feature that marked statistical significance of the mean differences between the NNES and NES samples according to the predetermined significance ($p < .002$): ZERO relative clauses ($p < .001$, $d = 1.582$) in which the relative pronouns (e.g., *that*, *which*, and *whom*) filling the object gaps in the following relative clauses

are deleted (e.g., *He found the old book I was looking for.*). Although the mean scores for the feature between the NNES and NES samples also showed unequal variances ($p = .033$) in Levene's test for equality of variances as were those for the two aforementioned features (*because* clauses and *-ing* clauses as noun complements), the mean differences for the feature still remained statistically significant ($p < .001$) in the *t*-test results of both equal and unequal variances and it was strongly favored in the NES student academic writing. Figure 4 displays the large magnitude of mean differences for the feature between the NNES and NES groups. This finding of the significant mean differences for ZERO relative clauses, characterized by their inherent clausal syntactic nature, reduced surface form, and high likelihood of occurrence in informal speech (Celce-Murcia & Larsen-Freeman, 1999), should be crucial for the assessment of the different discourse properties of the NNES and NES samples.

In sum, with regard to the distributional variations of 25 grammatical complexity features of interest between the NNES and NES groups based on both statistical and practical significance of the mean differences, 16 features (e.g., finite adverbial clauses and THAT-clauses as verb complements) were statistically non-significant; 8 features (e.g., adverbs as adverbials and attributive adjectives) were not statistically but practically significant; and one feature (ZERO relative clauses) was statistically significant. Specific phrasal noun modifiers achieving increased structural compression, such as attributive adjectives (e.g., *functional differences*) and prepositional phrases as postmodifiers (e.g., *an increase in demand*), were more favored in the NNES samples than in the NES samples based on their identified practical significance. In contrast, the NES student academic writing was largely characterized by its greater use of specific features recognized as more commonly employed in conversation than in academic writing (Biber et al., 2011), such as adverbs as adverbials (e.g., *afterward*) and ZERO relative clauses. Chapter five will provide further discussions of

these observed characteristics of the grammatical complexities of the NNES and NES student academic writing differing from that of L1 professional academic prose.

Chapter 5: Discussion and Conclusion

Building on the statistical findings presented in Chapter four of the distributional variations of 25 specific grammatical complexity features between the NNES and NES student academic writing, this chapter provides a discussion of the observed patterns of use for the target features across the NNES and NES groups in more detail. By answering each of the research questions of the present study, the discussion gives interpretations of the identified use patterns of the features in the NNES and NES samples and examines characteristics of the grammatical complexities of the L1 and L2 student academic writing in comparison with that of L1 professional academic prose recognized in the previous study (Biber et al., 2011). In addition to the discussion, the chapter offers several limitations and pedagogical implications of the present study and suggestions for future research.

Summary Statement

The present study replicated the research framework of a previous study (Biber et al., 2011) that had distinguished the grammatical complexity of L1 professional academic writing from that of conversation by identifying as most characteristic of its unique compressed nominal/phrasal discourse style the prominent use of dependent phrasal structures functioning as constituents in noun phrases (prepositional phrases as nominal postmodifiers, attributive adjectives, and nouns as nominal premodifiers). The main purpose of the present study involved an exploration of syntactic similarities and differences between L1 professional and L2 student academic writing in terms of their use of phrasal/nominal compression features. It also aimed at an identification of the distributional variations of 25 specific grammatical complexity features of structural elaboration and compression between the NNES and NES student academic writing groups.

The results of the analysis in this study indicated that in light of frequency rates of occurrence for the target features, the grammatical complexities of both the NNES and NES

student academic writing were primarily characterized by a dense use of a specific type of dependent phrase associated with structural compression: phrasal noun modifiers such as prepositional phrases as postmodifiers (e.g., *economy of expression*) and attributive adjectives (e.g., *functional differences*). In contrast, dependent clauses of structural elaboration such as finite adverbial clauses (e.g., *because, if, and although*), finite complement clauses (e.g., THAT- and WH-clauses), and nonfinite noun modifying clauses (e.g., *-ing* and *-ed* clauses) were much less favored than the phrasal structural compression features (phrasal noun modifiers) in both the NNES and NES samples. This finding of the prominent use of the phrasal compression features over the clausal elaboration devices in the L1 and L2 student academic writing corresponded to the previous findings of L1 professional academic writing (Biber et al., 2011).

However, the grammatical complexities of the NNES and NES student academic writing were distinguished from that of L1 professional academic prose in that nouns as nominal premodifiers (e.g., *scholarship applications*), one of the phrasal noun modifiers reported to achieve increased structural compression of L1 professional academic writing (Biber et al., 2011), were not favored in both groups of student academic writing. They were not preferred as strongly as attributive adjectives and prepositional phrases as postmodifiers, but their frequency rates rather resembled clausal structural elaboration devices. Moreover, adverbs as adverbials (e.g., *afterward*), a specific kind of dependent phrases previously found to be extremely more common in conversation than in L1 professional academic writing (Biber et al., 2011), marked substantially high frequency rates in both the NNES and NES groups. This observed preference for the particular conversational feature (adverbs as adverbials) rather than the phrasal noun modifier for structural compression (nouns as premodifiers) in the NNES and NES samples requires reflective discussions to determine

characteristics of the grammatical complexities of the L1 and L2 student academic writing distinguished from that of L1 professional academic prose.

In addition to the overall frequency rates for the target features in both the NNES and NES samples in general, their distributional variations between the NNES and NES groups were identified based on statistical and practical significance of their mean differences to draw distinctions in the grammatical complexities of the L1 and L2 student academic writing. The NES student academic writing was characterized by its preference for several specific features, such as adverbs as adverbials and *-ing* clauses as verb complements, which had been identified as more common in conversation than in academic writing (Biber et al., 2011). ZERO relative clauses (e.g., *That's another problem we face.*), recognized as highly likely to occur in informal speech due to their reduced surface form and clausal syntactic nature (Celce-Murcia & Larsen-Freeman, 1999), were also significantly more favored in the NES group than in the NNES group. By contrast, grammatical features contributing to the increase in structural compression of L1 professional academic writing were notably more favored in the NNES student academic writing than in the NES group, such as attributive adjectives (e.g., *scholarly articles*) and prepositional phrases as postmodifiers (e.g., *review of literature*). These identified distributional variations of specific grammatical features associated with the grammatical complexity of either conversation or L1 professional academic writing should serve as the basis for the determination of the difference in the grammatical complexities of the L1 and L2 student academic writing.

Interpretations of the Findings in Light of the Research Questions

The main focus of this section is to offer expository interpretations of the findings for determining the distinctive characteristics of the grammatical complexities of both the NNES and NES student academic writing, distinguished between themselves as well as from that of

L1 professional academic writing, by answering each of the research questions of the present study listed below as a reminder:

1. What grammatical features of structural elaboration (dependent clauses) and compression (dependent phrases) are frequently used in advanced ESL and native English-speaking university student academic writing?
2. Is there any significant difference in the use of grammatical features of structural elaboration and compression between advanced ESL and native English-speaking university student academic writing?
3. Are the grammatical complexities of advanced ESL and native English-speaking university student academic writing characterized by a great use of phrasal structures functioning as constituents in noun phrases (prepositional phrases as nominal postmodifiers, attributive adjectives, and nouns as nominal premodifiers), as is observed in professional academic written discourse?

Research question 1. As for the frequency trends for the target features of structural elaboration and compression in the L1 and L2 student academic writing, the results showed that phrasal nominal modifiers (attributive adjectives, prepositional phrases as postmodifiers, and nouns as premodifiers), closely associated with structural compression and classified as dependent phrases, were more strongly characteristic of both the NNES and NES groups than dependent clauses for structural elaboration (see Figure 1). This identified prominent use of the phrasal nominal modifiers over clausal elaboration features in the NNES and NES groups demonstrated similarities of the grammatical complexity of L2 student academic writing to that of L1 professional academic prose. In addition to the notable high frequency rates of the phrasal nominal modifiers, phrasal adverbials such as adverbs (e.g., *afterward*) and prepositional phrases (e.g., *in the world*), another type of dependent phrases, were also strongly favored in both the NNES and NES samples (see Figure 1). Despite their insufficient

linguistic association with structural elaboration and compression, their particularly high frequency rates provide noteworthy clues to a better understanding of the grammatical complexities of the L1 and L2 student academic writing differing from that of L1 professional academic prose.

One point to notice about the identified frequency patterns for the phrasal nominal modifiers was that nouns as premodifiers (e.g., *literature review*) were not favored as strongly as the other two phrasal noun modifiers (attributive adjectives and prepositional phrases as postmodifiers) in both the NNES and NES groups (see Figure 1). Additions of phrasal premodifiers (nouns and adjectives) or postmodifiers (prepositional phrases) to head nouns lead to heightened structural complexity of noun phrases, and as such noun phrases with either type of modifiers are highly characteristic of academic prose while they are relatively rare in conversation (Biber et al., 1999). In the premodifier category, adjectives are by far most common in expository written texts due to their explicit identification of manifold semantic classes such as extent, time, frequency, and affective evaluation (Biber et al., 1999). Nouns are the second most common premodifier in writing because of a wide range of inexplicit textual meaning relations between pre-modifying nouns and head nouns, such as purpose (e.g., *safety device*), identity (e.g., *grant aid*), content (e.g., *probability profile*), and source (e.g., *press release*), despite their high economy of expression in the premodification process (Biber et al., 1999).

This inexplicitness of meaning relations in noun phrases with noun premodifiers often results in semantic ambiguity as in a noun phrase presented in Chapter three, “*lung cancer death rates*” (Halliday, 2004, p. 170) which allows for multiple clausal paraphrases. Yet, noun premodification is still heavily favored in academic prose for its brevity of packing a high amount of referential meaning (Biber et al., 1999). The identified much lower frequency rates for nouns as premodifiers than those for attributive adjectives in both the

NNES and NES groups seemed to reflect the L1 and L2 student writers' tendency to recognize nouns more as mere content words than as effective tools for a high degree of abstract information integration and their preference for relatively less inexplicit meaning relations identifiable between attributive adjectives and head nouns.

Another point worth noting was the dense use of phrasal adverbials including adverbs and prepositional phrases in both the NNES and NES samples. Adverbs as adverbials (e.g., *afterward*) had previously been reported to be extremely common in conversation rather than in academic writing (Biber et al., 2011), even if without any adequate identification of its clear association with either structural elaboration or compression. In contrast, prepositional phrases as adverbials (e.g., *in the morning*), primarily conveying circumstantial information (e.g., time, place, process, and extent), are not particularly favored in a specific register but consistently common in conversation, fiction, news, and academic prose (Biber et al., 1999).

Thus, the observed high frequency rates for adverbs as adverbials signified colloquial aspects of the grammatical complexities of the NNES and NES student academic writing. For instance, several specific kinds of adverbs as adverbials that accounted for a major proportion of adverbs of interest to the analysis are identified as marking characteristics of interactive spoken discourse (involvement with addressees, situated textual content, and overt expressions of private attitudes, thoughts, and emotions), such as emphatics (e.g., *just* and *really*), amplifiers (e.g., *completely* and *greatly*), hedges (e.g., *kind of* and *maybe*), discourse particles (e.g., *well* and *anyway*), and time and place adverbs (e.g., *early*, *then*, *far*, and *there*) (Biber 1988). Given the observed extensive use of adverbs as adverbials as well as phrasal nominal modifiers (attributive adjectives and prepositional phrases as postmodifiers), a heavy reliance on complexity features of both structural compression and interactive, spoken

communication was most characteristic of the grammatical complexities of both the NNES and NES student academic writing in general.

Research question 2. As for the distributional variations of the target features between the NNES and NES student academic writing groups, it is necessary to consider the differences between them in the use of phrasal nominal modifiers enhancing structural compression (attributive adjectives and prepositional phrases as postmodifiers) and features typical of colloquial communication (e.g., adverbs as adverbials and ZERO relative clauses), based on their identified notable statistical and practical significance of mean differences. The NNES student academic writing was first distinguished from the NES group by the observed denser use of attributive adjectives ($p = .018$, $d = .888$) (e.g., *functional differences*) and prepositional phrases as postmodifiers ($p = .140$, $d = .536$) (e.g., *an increase in demand*) based on their relatively large practical significance. Yet, combinations of head nouns and prepositional phrases as postmodifiers were slightly more lexically restricted in the NNES writing than those in the NES group.

Four specific combinations of head referents and prepositional phrases accounted for 14 percent of all occurrences of noun modifying prepositional phrases in the NNES writing: *one of* (6.4%), *kind of* (2.9%), *some of* (2.5%), and *part of* (2.1%). The NNES samples showed a degree of reliance on a repetitive use of these particular phrasal chunks, as opposed to the NES writing diverse in terms of lexical choices for phrasal nominal postmodification, while *of*-phrases were equally most favored in both the NNES and NES groups. Thus, the structural compression achieved by phrasal nominal modifiers in the NNES writing could be considered partly due to the recurring use of several phrasal chunks with limited lexical variation with which the NNES participants displayed more familiarity in the postmodification.

In addition to the considerable use of phrasal nominal modifiers of structural compression, the NNES student academic writing was also characterized by its greater preference for THAT relative clauses ($p = .033$, $d = .789$) associated with structural elaboration than that of the NES group. Although THAT relative clauses are commonly favored across both spoken and written registers in general including conversation, fiction, news, and academic prose, their usage in comparison to WH relative clauses reflects distinctive grammatical stylistic conventions differing between colloquial discourse and academic prose (Biber et al., 1999). For instance, Biber et al. (1999) note more informal, colloquial associations with the relative pronoun *that* as opposed to more formal, academic associations with the relative pronoun *which*. *Which* is more commonly used for restrictive relative clauses (i.e., giving information that defines head nouns without using commas) than *that* in 70 percent of the academic texts within the Longman Spoken and Written English (LSWE) Corpus while *that* is more favored in conversation and contemporary fiction (Biber et al., 1999). Celce-Murcia and Larsen-freeman (1999) also cited Stauble (1978) to characterize a preference for *that* for inanimate head referents over either *which* or *who(m)* in informal spoken communication; and Biber (1988) specifies *that* relative pronoun replacing relativized objects as used for elaborating textual information under highly constrained real-time conditions characterizing prepared speeches, interviews, and spontaneous speeches.

Thus, based on the linguistic justifications for identifying THAT relative clauses as colloquial features, the observed greater preference for the feature in the NNES writing than the NES group signaled informal, spoken aspects of its grammatical complexity. This preferred use of the feature in the NNES writing seemed to result primarily from the multifunctional characteristics of *that* serving as a determiner, a demonstrative pronoun, a complementizer, and a relative pronoun. Its wider range of usage than that of *wh*-words (e.g., *which* and *who*) used for WH relative clauses possibly led to the NNES participants'

reinforced recognition of it as a more accessible grammatical device for relativization which does not even necessitate either a choice between subjective and objective cases or restriction on usage according to animateness of head referents. The claimed NNES students' preferred accessibility to THAT relative clauses than to WH relative clauses was supported by their strong tendency to use *wh*-relative pronouns only as the subject gap fills in the relative clauses as opposed to their common use trends for THAT relative clauses regardless of the cases (see Table 15). This phenomenon indicated the NNES students' limited lexical resource pool for relativization in preference for THAT relative clauses over WH relative clauses. Thus, the grammatical complexity of the NNES student academic writing was characterized by the colloquial aspects reflected in the favored use of THAT relative clauses and adverbs as adverbials (see Research question 1) as well as the structural compression achieved by the dense use of phrasal nominal modifiers (attributive adjectives and prepositional phrases as postmodifiers).

Table 15

Usage of WH- and THAT Relative Clauses in the NNES Student Academic Writing

Tagged Text of WH- and THAT Relative Clauses

... Yamamoto who	^whp+rel+subj	... money that	^tht+rel+subj
... people who	^whp+rel+subj	... opportunity that	^tht+rel+obj
... problem which	^whp+rel+subj	... nothing that	^tht+rel+subj
... communities which	^whp+rel+subj	... attribute that	^tht+rel+subj
... people who	^whp+rel+subj	... people that	^tht+rel+subj
... attributes which	^whp+rel+subj	... things that	^tht+rel+obj
... person who	^whp+rel+subj	... things that	^tht+rel+obj
... boss who	^whp+rel+subj	... characteristic that	^tht+rel+subj
... success, which	^whp+rel+subj	... line that	^tht+rel+subj
... Christ, who	^whp+rel+subj	... qualities that	^tht+rel+obj
... those who	^whp+rel+subj	... qualities that	^tht+rel+subj
... disciples who	^whp+rel+subj	... areas that	^tht+rel+obj
... parents who	^whp+rel+subj	... governments that	^tht+rel+subj
... country which	^whp+rel+subj	... characteristic that	^tht+rel+obj
⋮	⋮	⋮	⋮

Compared to the NNES group, in the NES samples, the trend for favoring colloquial features became stronger, despite its increased structural compression due to the dense use of phrasal nominal modifiers. In addition to the reported heavier use of adverbs as adverbials (e.g., *afterward*) than in the NNES writing (see Figure 3), other features characteristic of informal, interactive, and spoken discourse were also observed in a qualitative analysis of the NES texts. These colloquial features included those associated with interactiveness and involvedness (first and second person pronouns and direct questions) and those with a reduction in surface structure (contractions and *that*-deletion) whose grammatical functions Biber (1988) identifies as typical of verbal, interactional discourse. The use of both first and second person pronouns (e.g., *I*, *we*, and *you*) and direct questions (e.g., *What do you think about that?*) entails the overt presence of the addressor and addressee characteristic of highly interactive discourse as opposed to impersonality and objectivity favored in academic prose (Biber 1988; Biber et al., 1999). Contractions (e.g., *we've* and *don't*) and *that*-deletion (e.g., *I think he is honest.*) are highly efficient in real-time spoken production due to their reduced surface forms mostly marking fragmented and generalized presentation of information in informal, interactive discourse (Biber, 1988; Biber et al., 1999).

The linguistic background thus far supports the identification of the grammatical devices as colloquial features, by which the grammatical complexity of the NES academic writing was considerably affected. Excerpts 5 and 6 illustrate the use of the colloquial features in the NES writing, with the interactiveness features **bolded**, the reduction features underlined, and adverbs as adverbials *italicized*. Their frequent occurrences in the NES writing seemed to result possibly from the NES participants' relatively more casual recognition of the writing tasks conducted separately from their coursework in a writing lab than that of the NNES students to whom the writing tasks were administered as part of their normal class structure with the presence of an instructor in charge of their class management.

Excerpt 5

Freedom is something that **we** all enjoy *a lot here* in the US, but **do we have *too much freedom sometimes?*** Kids need rules and help along the road to becoming an adult and most do, but **what about us... do we need more regulations to make us better and more responsible members of society?** The freedom of speech is something that has *always* been *pretty* controversial. During slavery the freedom of speech was used and expressed *more* than **I** believe was acceptable, but because of the constitution no one could do anything about it. **Did the white persecutors have the right to say things about slaves and black people that would offend anyone, never be able to be erased, and end up defining our countries history in some respects?** Freedom is essential to successful society but needs to be controlled and *actively* censored. (NES student writing sample)

Excerpt 6

Effective leadership is *extremely* important in most situations. On the macro end of the scale **we** have the leaders of countries. If they don't have effective leadership then **who knows what could happen. I don't** know *very much* about government, but **I** can think of other things that may look small but could have a major effect depending on whether someone is an effective leader or not. For example, one position **I** can think of is teachers. If **our** teachers did not have good and effective leadership skills (and **I'm** sure we've all had teachers like that) *then* children are *highly* unlikely to learn anything from them. If **our** children aren't learning what they need to *then* when they grow up they might have to survive on things other than intellectual work such as pure physical work, and in **my** opinion that could destroy a nation *just as much* as an ineffective president. (NES student writing sample)

In addition to the identified colloquial features, the significant use of ZERO relative clauses ($p < .001$, $d = 1.582$) distinguished the NES student academic writing from the NNES group (see Figure 4). ZERO relative clauses (e.g., *That's another problem we face.*) entail the omission of relative pronouns replacing relativized objects which is the only grammatically permitted option for the deletion of relative pronouns (Celce-Murcia & Larsen-Freeman, 1999). Biber et al. (1999) note the colloquial associations with the use of ZERO relative clauses in that despite the nearly equivalently frequent use of ZERO relative clauses in both conversation and academic prose, the relativizer omission is proportionally by far most commonly favored in conversation (occurring in about half of the relative clauses tolerating the deletion), given the much more frequent use of relative clauses in academic prose in absolute terms. Celce-Murcia and Larsen-Freeman (1999) also specify the preference in writing for retention of relative pronouns over their deletion highly favored in informal conversation. Thus, the omission of relative pronouns in highly informational academic writing often results in decreased formality and an increased colloquial tone (Biber et al., 1999).

One interesting point to notice about the significant use of ZERO relative clauses in the NES academic writing was a specific use pattern for the feature in the NES writing corresponding to Biber et al.'s (1999) corpus findings. Biber et al. (1999) identify the deletion of relative pronouns as strongly accompanied by the presence of personal pronoun subjects in relative clauses due to their obvious subject cases explicitly signaling the beginning of a new clause. The use of ZERO relative clauses in the NES writing showed similar patterns of use: 63 percent of the relative pronoun omissions occurred with personal pronouns functioning as subjects in the relative clauses. This frequency rate was substantial given the overall low frequency rates for ZERO relative clauses in both the NNES and NES student academic writing in absolute terms (see Table 9).

The co-occurrence tendency of the relative pronoun omission and personal pronoun subjects in ZERO relative clauses in the NES writing is illustrated in Excerpts 7 and 8 where ZERO relative clauses are underlined and personal pronoun subjects are **bolded**. The observed frequent presence of personal pronoun subjects in ZERO relative clauses contrasted with frequent occurrences of common noun subjects in relative clauses with retained relativizers shown in Table 16. Thus, the more frequent use of personal pronouns in the NES writing, identified in an earlier discussion as one of the interactiveness features commonly characteristic of its colloquial aspects, seemed to result in the significantly more occurrences of ZERO relative clauses than in the NNES writing.

Table 16

Retention of Object Relativizers in the NES Student Academic Writing

Tagged Text of THAT Relative Clauses with Relativized Objects

... position that ^{^tht+rel+obj++=that} **a** ^
 ... luxury that ^{^tht+rel+obj++=that} we ^
 ... something that ^{^tht+rel+obj++=that} **Americans** ^
 ... freedom that ^{^tht+rel+obj++=that} **our** ^
 ... characteristics that ^{^tht+rel+obj++=that} **effective** ^
 ... feeling that ^{^tht+rel+obj++=that} **those** ^
 ... something that ^{^tht+rel+obj++=that} we ^
 ... mistakes that ^{^tht+rel+obj++=that} **people** ^
 ... right that ^{^tht+rel+obj++=that} **no** ^
 ... mistakes that ^{^tht+rel+obj++=that} you ^
 ... unit that ^{^tht+rel+obj++=that} **a** ^
 ... something that ^{^tht+rel+obj++=that} **every** ^
 ... something that ^{^tht+rel+obj++=that} we ^

In other words, the NES writers' tendency toward overt expression of their presence or involvement via personal grammatical agents led to the more occurrences of ZERO relative clauses and a more interactive, colloquial tone in their writing than in the NNES group. In addition to the colloquial features discussed earlier, such as adverbs as adverbials (see Research question 1) and the interactiveness and reduction features (e.g., first and second person pronouns and *that*-deletion), the significant use of ZERO relative clauses was most

characteristic of the grammatical complexity of the NES student academic writing in which heightened structural compression was also still achieved by the dense use of phrasal nominal modifiers (attributive adjectives and prepositional phrases as postmodifiers).

Excerpt 7

[...] In a sense we are freer than any other country in the world, and we have definitely proved our bravery through wartimes. But is this statement something we should be proud of? [...] If we want to show we can handle this great blessing we have been given we need to show it through our actions. [...] (NES student writing sample)

Excerpt 8

[...] Often we judge people that are overweight as a lazy. I knew a man that was well over 400 pounds that worked harder than anyone I had ever seen. [...] Many of the most beautiful women in the world are not happy at all because all people see is their outer beauty and they have neglected the things they need to do in order to become more beautiful on the inside. [...] (NES student writing sample)

Research question 3. According to the discussion thus far, the grammatical complexities of both the NNES and NES student academic writing were highly characterized by the denser use of phrasal structural compression features (phrasal nominal modifiers such as attributive adjectives and prepositional phrases as postmodifiers) than clausal elaboration features, based on their more extensive frequency rates of occurrences in absolute terms in both the NNES and NES samples. This grammatical characteristic indicates the L1 and L2 student academic writers' strong syntactic tendency to condense textual information into phrasal constituents in noun phrases rather than relying on fuller clausal constructions, despite their insufficient maturity in information integration implied by the observed much less preference for nouns as premodifiers (e.g., *literature review*) than the other two phrasal

compression features. The syntactic trend toward compressing information in nominal/phrasal structures in the NNES and NES student academic writing demonstrated their similarities in terms of grammatical complexity to L1 professional academic writing.

However, as opposed to L1 professional academic prose, both the NNES and NES student academic writing showed a substantial use of grammatical devices highly characteristic of colloquial communication, such as adverbs as adverbials (e.g., *afterward*). This reliance on phrasal adverbials indicated that the grammatical complexities of the NNES and NES student academic writing were characterized not only by structural compression enhanced by the dense use of the phrasal nominal modifiers but also by an informal, interactive tone established by colloquial grammatical features commonly used in their texts. Especially, the NES student academic writing showed a greater preference for colloquial grammatical devices than the NNES group, including adverbs as adverbials ($p = .023$, $d = .850$), ZERO relative clauses (e.g., *He found the old book I was looking for.*; $p < .001$, $d = 1.582$), and the features of interactiveness (first and second person pronouns and direct questions) and reduced surface structure (contractions and *that*-deletion). Thus, the NES student academic writing was distinguished from the NNES student academic writing as well as from L1 professional academic prose in terms of the more colloquial aspects of its grammatical complexity represented via the more frequent use of the features characteristic of informal speech.

Summary of Discussion

The results of the present study showed that the grammatical complexities of both advanced ESL and L1 student academic writing were highly characterized by substantially greater use of phrasal nominal modifiers of structural compression such as attributive adjectives (e.g., *functional differences*) and prepositional phrases as postmodifiers (e.g., *an increase in demand*) than clausal elaboration features such as finite dependent complement

clauses (e.g., THAT-clauses), based on their observed greater frequency rates in absolute terms. Furthermore, the identified much lower frequency rates for nouns as premodifiers (e.g., *scholarship applications*) in both L1 and L2 student academic writing seemed to indicate the existing maturity gap in information integration via complex noun phrases between professional academia and student academic writing. The findings of the preference for phrasal structural compression features in both L1 and L2 student academic writing established their similarities to L1 professional academic prose in terms of grammatical complexity.

An additional point worth noting about the findings was the observed colloquial aspects of the grammatical complexities of both L1 and L2 student academic writing. Specific grammatical devices whose functions mark conversational language use were considerably favored in both L1 and L2 student academic writing, such as adverbs as adverbials (e.g., *afterward*), the use of which had previously been recognized as more preferred in conversation than in academic writing (Biber et al., 2011). In this regard, the L1 student academic writing showed a greater preference for colloquial features such as ZERO relative clauses (e.g., *That's another problem we face.*), highly characteristic of informal, spoken communication (Biber et al., 1999), than the advanced ESL student academic writing. The extent of the use of colloquial features enabled a distinction between the grammatical complexities of the advanced ESL and L1 student academic writing as well as between those of L1 professional academic prose and student academic writing. Thus, the observed extensive combined use of both phrasal structural compression devices and conversational features in both the advanced ESL and L1 student academic writing signaled a potential for recognizing them as a transitional developmental stage from more casual to more academic writing with a unique compressed discourse style characterized by a heavy reliance on phrasal nominal modification in its writing convention (Biber et al., 2011).

Limitations

In conducting the present study, there were several limitations that should be taken into consideration in future research, including the sample size and the number of the grammatical complexity features analyzed. Above all, the sample size of this study was relatively small in comparison to other empirical research in the fields of English language teaching and applied linguistics: 128 short academic paragraphs in total were collected from both 16 advanced ESL students and 16 L1 university students. The small sample size of this study had the analysis of the distributional patterns of use for the grammatical features of interest be primarily based not on statistical significance (p -value) but on practical significance indicated by effect sizes (d values). The limited number of the samples might also restrict immediate generalization of the findings to a larger population. Thus, for the sake of more statistically compelling analyses and a wider scope of generalization, a larger recruitment of L2 learner participants should be considered in future research for a more convincing assessment of characteristics of the grammatical complexity of advanced ESL academic writing.

In addition, this study had a limitation of the number of grammatical features investigated in the analysis. This limitation was partly due to the characteristic of this study as a replication of the previous research (Biber, et al., 2011) that its establishment of the target grammatical devices of structural elaboration and compression was based on those analyzed in the previous study (Biber et al., 2011) and partly because of its limited sample size. For instance, more detailed categorizations under prepositional phrases as postmodifiers (e.g., *of*-, *in*-, *on*-, *with*-, and *for*-phrases) were avoided due to a potential for an increase in the number of dependent variables resulting in a decrease in the predetermined statistical significance which was less likely attainable given the small sample size of this study. Thus, an extended analysis range of grammatical complexity features with a larger sample size

should provide more specific descriptions of the discourse qualities of advanced ESL academic writing, such as detailed subcategorizations of adverbs as adverbials (e.g., downtoners, hedges, amplifiers, emphatics, and discourse particles).

Pedagogical Implications

The findings of the present study may enable practitioners to help their learners better approximate the writing standard of professional academic prose and researchers to make more informed decisions about learners' academic writing development. Despite the preliminary nature of this study and the need of further study of a wider range of L2 proficiency levels and writing contexts, these findings can still serve as informative resources for L2 teachers to help their learners raise consciousness of the specialized grammar of professional academic prose strongly favoring phrasal compression features. In a curriculum with potential for teaching the unique compressed discourse style of academic writing, L2 learners may acquire concrete awareness of information expansion and integration via interactional conversion between clausal constructions and phrasal structures in professional academic prose.

To this end, L2 teachers may formulate appropriate learning activities having their learners engage in practical exercises such as paraphrasing from fuller clausal structures to more compressed phrasal alternatives utilizing phrasal nominal modification. They may also consider integrating into their classes explicit teaching of detailed semantic meanings and grammatical functions of prepositional phrases as postmodifiers likely to substitute for fuller clauses. Furthermore, given the substantial use of not only phrasal compression devices (attributive adjectives and prepositional phrases as postmodifiers) but also colloquial features (adverbs as adverbials) observed in the advanced ESL student academic writing (see Figure 1), the encouragement of less reliance on phrasal adverbs may perhaps facilitate the

establishment of a relatively more academic tone in L2 student academic writing, considering their preferred dense use in conversation (Biber et al., 2011).

L2 researchers can also administer a more precise assessment of the grammatical complexity of L2 student academic writing by taking into account measures of the phrasal nominal modification practice as an additional index in conjunction with the use of traditional T-unit-based complexity measures. An earlier literature review in Chapter two indicates the limitations of the widespread reliance on the T-unit and subordination metrics as principal measures of the grammatical complexity of L2 student academic writing. These conventional complexity measures focusing primarily on clausal structures alone cannot fully capture the most important syntactic aspect of academic writing: structural compression for frequent textual information integration via the dense use of specific phrasal nominal modifiers such as prepositional phrases as postmodifiers, attributive adjectives, and nouns as premodifiers (Biber et al., 2011).

Thus, the extent to which phrasal nominal modification for structural compression is utilized should be central to measures of the grammatical complexity of L2 student academic writing in combination with other traditional complexity indices gauging clausal elaboration. The synthesized complexity measures may enable a more specific and accurate evaluation of the L2 student academic writing development, reflecting the register-specific compressed discourse characteristics of professional academic prose. Possible practicality issues arising as to measures of phrasal compression structures can be settled by the use of computational methods such as those employed in previous research (e.g., Biber & Gray, 2010; Biber et al., 2011) and this study in that they enable automatic and reliable identification of most kinds of phrasal nominal modifiers when correctly tagged.

Suggestions for Future Research

There are several areas for further research suggested by the findings of the present study. First, for a more profound investigation of the characteristics of the grammatical complexities of L2 student academic writing, it is necessary to conduct a MD analysis of overall co-occurrence patterns of use for a wider range of grammatical features in multiple levels of L2 student academic writing. The detection of the co-occurring trend for ZERO relative clauses and personal pronouns in a qualitative analysis of the NES student academic writing enabled the identification of their shared grammatical functions characterizing the colloquial aspects of its grammatical complexity in this study. Thus, a MD analysis of co-occurring patterns for an extensive array of grammatical devices particularly in L2 student academic writing of diverse proficiency levels can provide specialized descriptions of specific textual dimensions actually most characteristic in the L2 student academic writing domain.

Another area for further research is to carry out longitudinal studies of L2 learners' acquisition process of complex noun phrases with phrasal embeddings of prepositional phrases as postmodifiers, attributive adjectives, and nouns as premodifiers in their academic writing. Biber et al. (2011) identify these devices of structural compression as acquired later and representing a higher production complexity degree than conversational complexity features such as THAT- and WH-clauses and *to-* and *-ing* clauses in their hypothesized developmental stages for grammatical complexity features. In this regard, Taguchi et al. (2013) and Parkinson and Musgrave (2014) have recently lent empirical support to Biber et al.'s hypothesized developmental index by specifying such phrasal constituents in noun phrases as characterizing the grammatical complexity of higher-level L2 student writing. However, their analyses still lack an empirical investigation of potential factors underlying the observed frequent use of the features. Thus, longitudinal studies of L2 learner academic

writing are required to provide the appropriate rationale for the increased use of the phrasal compression features along progress in language proficiency: whether it is as a result of L2 learners' accumulated exposure to professional academic texts in the learning process, intensive explicit grammar teaching of the target features at a certain point, a strong personal motivation for approximating the writing standard of professional academia, or other environmental factors.

Conclusion

The present study replicated the research framework of the previous research (Biber et al., 2011) of the grammatical complexity of L1 professional academic prose in the context of L1 and L2 student academic writing. This study investigated the distributional patterns of use for 25 specific grammatical complexity devices of structural elaboration and compression in a corpus of 128 short academic essays collected from both 16 advanced ESL learners and 16 native English speaking university students. Its primary research purposes involved exploring syntactic similarities and differences between the grammatical complexities of L1 professional and L2 student academic writing in terms of structural elaboration and compression and determining characteristics of the grammatical complexity of advanced ESL student academic writing.

The advanced ESL and L1 student academic writing showed a substantial preference for specific phrasal nominal modifiers of structural compression (attributive adjectives and prepositional phrases as postmodifiers) over clausal elaboration features. This finding contributed to the establishment of the empirical validity of the previous findings of L1 professional academic prose (Biber et al., 2011) in the context of L1 and L2 student academic writing. In addition, while a great use of specific colloquial features such as adverbs as adverbials was characteristic of both the advanced ESL and L1 student academic writing in general, the grammatical complexity of the latter was distinguished from that of the former in

terms of a significantly more frequent use of other colloquial features such as ZERO relative clauses. The extensive combined reliance on both phrasal compression devices and colloquial features in both the advanced ESL and L1 student academic writing suggested a possibility for characterizing their grammatical complexities as a transitional developmental stage from more informal, casual to more formal, academic writing. Despite its preliminary nature, the findings of the present study should be valuable to second language teaching practitioners, researchers, and institutions and help them find better ways to develop more effective instructional approaches to L2 academic writing and analytical methods for measuring its grammatical complexity.

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