



Noun Phrase Complexity in ESL Academic Writing

Edwin Dartey*

*Department of Applied Linguistics, Pennsylvania State University, USA

Corresponding Email: *ead5744@psu.edu

Received: 02 February 2023

Accepted: 18 April 2023

Published: 25 May 2023

Abstract: *This study explores the relationship between second language proficiency and noun phrase complexity in the writing of students in an English for academic purposes (EAP) program. Based on a developmental progression index suggested by Biber et al. (2011), the project examined noun phrase complexity in the writing of intermediate and advanced students in an EAP program in Ghana. The study's data consists of a corpus of 50 successful argumentative essays written by intermediate and advanced-level students. Findings from a comparative analysis corroborate the hypothesized developmental index. The intermediate group used more attributive and predicative adjectives, modifiers that have been predicted to occur early in the developmental index while the advanced group used more abstract phrases with relative and noun clauses, modifiers that have been predicted to occur late in the developmental index. Also, the use of noun modifiers by the advanced group was closer to the published frequencies of advanced writers as reported by previous studies (e.g., Lan & Sun, 2019). The paper concludes with some pedagogical implications for L2 academic writing instruction.*

Keywords: *English for Academic Purposes, Second Language Writing, Noun Phrase Complexity, Syntactic Complexity, Corpus Linguistics.*

1. INTRODUCTION

Over the past several decades, research on noun phrase complexity has featured prominently in second language (L2) writing literature. While a few studies have investigated the influence of proficiency with reference to noun phrase complexity (e.g., Casal & Lee, 2019; Lu, 2011) and to a larger extent syntactic complexity, little is known of comparative studies that explore noun phrase complexity in students' writing within EAP programs. Adopting Biber, Gray, and Poonpon's (2011) developmental framework, this study explores noun phrase complexity in the writing of advanced and intermediate students. Parkinson & Musgrave (2014) indicate that an analysis of EAP writing might reveal significant patterns in the acquisition of noun modifiers by L2 learners and this together with the learning of academic writing skills which



is largely regarded as an important skill in university education (Lan & Sun, 2018) are the fundamental basis of this study.

Literature Review

Studies on L2 writing indicate that syntactic complexity is an important index of writing proficiency (e.g., Hunt, 1970; Lu, 2011; Ortega, 2003). Specifically, Norris and Ortega (2009) indicate that syntactic complexity can be considered as part of the foundational indices of second language (L2) development, with the other two indices being accuracy and fluency. Complexity has been measured in several ways since its emergence in the field of applied linguistics (Biber & Gray, 2011). Earlier studies in complexity research (Hunt, 1965, 1966) considered the minimal terminal unit (T-Unit) as an index for measuring complexity in academic texts. In these studies, T-Unit is defined as one independent clause and all its associated dependent clauses (Bardovi-Harlig, 1992).

The problem with this methodology as underscored by Biber et al. (2011) is that it places emphasis on clausal complexity, and it is unable to capture phrasal complexity in writing. In their study on phrasal modification in academic text and other genres, Biber and Gray (2011) reveal that noun modifications such as attributive adjectives, pre-modifying nouns, post-modifying prepositional phrases, appositive noun phrases and nominalizations are frequently employed in academic writing. Despite this finding, Biber and Gray (2011) indicate that previous measurements of syntactic complexity in academic writing had their focus on clauses as markers of complexity and proficiency and not phrases. Specifically, elaboration and grammatical complexity have been traditionally associated with embedded clauses (Huddleston, 1984). Along these lines, recent corpus-based studies (e.g., Biber et al., 2011; Parkinson & Musgrave, 2014; Staples, Egbert, Biber, & Gray, 2016) have criticized conventional notions of complexity. They argue for two different types of complexity, that is, phrasal and clausal complexity. These studies argue that whereas person to person communication predominantly employs many clausal grammatical devices that are regarded to be “complex” and “elaborated,” the clausal features are not frequently used in academic writing. They further argue that academic writing, especially, is produced in situations where the use of language is cautiously organized, revised, embedded, concise and peculiar. Therefore, the features of conciseness, embeddedness, and specificity are reflected at the phrasal and not the clausal levels of sentences (Staples et al., 2016).

The ongoing discussion points to the fact that complex noun phrases are frequently used in academic prose (Biber & Gray, 2011; Parkinson & Musgrave, 2014). The predominance of NPs in academic writing could be due to the fact that NPs perform the functions of modification and complementation, and this expands the meaning of headwords of some phrases and clauses. Additionally, the functions of modification and complementation are essential in academic writing, as academic writers are often encouraged to be concise and precise.

Empirical studies on NP complexity

Noun modifications are prevalent in academic writing (e.g., Biber & Conrad, 2009). In a study on grammatical change in noun phrases, Biber and Gray (2011) reveal that there has been an increase in the use of NPs in academic writing since the 1800s. The study also indicates that



nearly 60% of NPs in academic writing are constructed with pre-noun modifiers (e.g., lazy man) and/or post-noun modifiers (e.g., man in the room). Historically, modern research into the usage of noun phrases can be traced to the 1950s. In their study, Hunston and Francis (2000) identified five types of English NP constructions that were frequently used in the 20th century and these are nouns preceded by adjectives (e.g., trivial case), nouns followed by infinitives (e.g., schools to reduce illiteracy), nouns followed by prepositional phrases (e.g., a conflict in the hospital), nouns followed by that-clauses (e.g., materials that can be manufactured), and conjunctive structures (e.g., the man and the woman). Similarly, Biber and Gray (2011) have identified five linguistic devices related to NPs that have increased in academic writing over the last three centuries: attributive adjectives, nouns as modifiers, prepositional phrases, appositive NPs, and nominalizations. The structure of an NP can then be summarized as NP= Determiner + Pre-modifiers+ Head Noun+ Postmodifiers (Biber, Johansson, Leech, Conrad, & Finegan, 1999).

Theoretical claims and empirical evidence indicate that NP-centered structures are distinctive syntactic devices in academic discourse. Therefore, the commonly employed subordination-based complexity measures alone cannot adequately capture the use of noun phrases in academic writing. In terms of theoretical methods, the present study will adopt Biber et al.'s (2011) index of syntactic development to measure NP complexity in academic writing. The developmental sequence proposed by Biber et al. (2011) posits that novice academic writers begin their writing by using features of complexity that are frequently found in speech or person to person communication. After some time, they gradually gain proficiency in the use of phrasal complexity features associated with advanced academic writing. The developmental index covers 28 linguistic features, and these features have three different linguistic functions (adverbials, complements and noun modifiers). The developmental framework by Biber et al., (2011) can be summarized as an advancement through five stages that involve development along two syntactic parameters with the first being grammatical form (finite and non-finite dependent clause, dependent phrase) and the second being syntactic function (clause constituents; direct object or adverbial and noun phrase modifiers) and as writers rely more on discourse style that is dependent phrases instead of dependent clauses, writing becomes more compressed.

In terms of NP complexity research, several studies have examined noun phrase complexity in academic writing and most of these studies confirm the frequent use of noun phrases in college-level academic writing. In a study on academic writing development at the university level, Staples et al. (2016) reveal that student writers vary in their use of phrasal complexity features across different proficiency levels, but those differences cannot be fully understood without considering the influence of register and genre. Xu (2019) also investigated noun phrase complexity in integrated writing produced by advanced Chinese EFL learners. The results of the study indicate that writers establish syntactic complexity through phrasal elaboration instead of clausal coordination or subordination in the later stages of second language acquisition and this finding is a hypothesis of the present study. Similarly, after an investigation into noun phrase complexity in EFL postgraduate academic writing, Liu and Li (2016) confirm the hypothesized developmental index of NP development (Biber et al.,2011). Their study indicates that less proficient writers rely heavily on attributive adjectives, a modifier predicted to occur earlier in NP acquisition (Biber et al., 2011). Apart from Liu and Li (2016), other



studies (e.g., Parkinson & Musgrave, 2014; Lan & Sun, 2018; Bedmar & Paredes, 2020) have all employed Biber et al.'s (2011) developmental index in their studies. The usage of Biber et al.'s (2011) index has produced various confirmations of a sequential acquisition of noun modifiers in NPs. Some studies (e.g., Parkinson & Musgrave, 2014; Staples et al., 2016) have also indicated that phrasal complexity increases as writers become more academically advanced. Specifically, Parkinson and Musgrave (2014) compared the writing of English for Academic purposes students to that of MA TESOL students in their study. The results reveal that more than half of the modifiers (57.1%) used in English for Academic Purposes (EAP) writing were attributive adjectives, whereas only one third of the modifiers (35.1%) in the MA writing was attributive adjectives. Also, Parkinson and Musgrave (2014) indicate that a greater proportion of noun modifiers in their MA dataset were participial adjectives. This may imply that participial adjectives are acquired later than other adjectives in the acquisition of noun modifiers.

Research gap

To date, few studies have examined noun phrase complexity in L2 writing across different proficiency levels. To this end, while some research has explored the influence of proficiency in relation to noun phrase complexity (e.g., Casal & Lee, 2019; Lu, 2011) and to a larger extent syntactic complexity in some academic texts, little is known of comparative studies that explore noun phrase complexity in EAP writing. Specifically, a comparative analysis of argumentative writing by intermediate learners and advanced learners in an EAP program has not received much attention. Therefore, this study will offer empirical evidence that will reveal various aspects of the sequential progression that L2 writers in EAPs undergo in their NP development. Parkinson and Musgrave (2014) in their comparative analysis of EAP and MA student writing indicate that comparative studies of writing across different proficiency levels and genres in the academic register will help develop existing literature on noun phrase complexity. They indicate that a gradual consensus will be built on the common types of noun modifications used by writers across different proficiency levels. Hence, this study will be an addition to the growing body of research in NP complexity especially as consensus is being built on the types of noun modifications used in NPs. Also, the present study is a response to the suggestion by Biber et al. (2011) that their developmental stage hypothesis should be tested empirically by different studies. This study is also motivated by some primary research questions, and they are presented below:

1. Are there any differences between the frequencies of noun modifiers in advanced and intermediate students' writing?
2. What types of adjectives are used in advanced and intermediate students' writing?

2. CORPUS AND METHODOLOGY

2.1. Corpus description

The corpus used in this study is a collection of 50 essays from students at two levels (advanced and intermediate) in an EAP program at a university in Ghana. 24 essays are from the advanced group and 26 essays are from the intermediate group. The sampled essays are argumentative essays were written as a class exercise. Parkinson and Musgrave (2014) indicate that argumentative writing is common and important in college-level academic writing. This is



because, at the college level, the need to persuade a reader by stating reasoning and providing evidence to back it up is a good source of motivation for students to write freely and put up their best when writing. The total duration of this exercise was 30 minutes, and the essays were graded by an instructor in the EAP program who has a bachelor's and master's degree in teaching English as a second language.

In terms of students' backgrounds, most of the authors of these essays have completed their high school education in Ghana. Students at the post-high school level usually have at least 9 years of English instruction. Also, students in the EAP program take have to pass a high school English exam before they are admitted to the university. The proficiency of students is dependent on their previous high school exam scores.

2.2. Tagging and processing

All essays were converted from pdf formats to plain text files using an Ant File Converter created by Anthony (2020). The files were then tagged for part of speech using Tag Ant 1.2.0 created by Anthony (2020). After the part of speech tagging, a concordance tool kit, Anthony (2020) was used to find the frequency of noun modifiers in the corpus. The search output from the concordance was then saved into an excel spreadsheet and a manual analysis was conducted using Biber et al.'s (2011) development stages as the coding scheme.

2.3. Data sets

The data used in this study is a corpus of written student essays. There are twenty-four essays from students at the advanced level and twenty-six essays from students at the intermediate level. The dataset is presented in table 1.

Table 1. Datasets used in the study

Level	Number of texts	Average length of text	Total number of words	Total number of noun phrases
Advanced	24	204	4897	1269
Intermediate	26	184	4793	1179

2.4. Measure of complexity

Measure of complexity in this study refers to grammatical elements used to modify noun phrases. The present study adopts a subset of the developmental stages hypothesized by Biber et al. (2011, p.30). Specifically, the study will count and compare in the two data sets the use of attributive and predicative adjectives, relative clauses, possessive nouns as modifiers, relative clauses, prepositional phrases, non-finite relative clauses as post-modifiers, noun complement clauses and to-clauses. These modifiers are found in stages 2-5 of the (Biber et al., 2011, p. 30) developmental index and they are shown in Table 2.

Table 2 A subset of the hypothesized developmental stages (Biber et al., 2011)

Stages	Grammatical structure(s)	Example from the dataset
2	Simple phrasal embedding in the noun phrase: Attributive adjectives *Predicative adjectives	<u>diverse ways</u>



		each community was responsible
3	Relative clauses	belief that results in traditional practice, advice which helps the younger generation
	Simple phrasal embedding in the noun phrase: noun as premodifiers Prepositional phrases as postmodifiers: of phrases (concrete/locative meanings) Prepositional phrases other than of (concrete/locative meanings) Possessive nouns as modifiers	government body the exchange of goods and services insects on their crops people's gods
4	Non-finite relative clauses: ed ing-clauses Prepositional phrases as post modifiers of phrases (abstract meanings) Prepositions other than of (abstract meanings)	method used by traditional Africa someone sleeping with another man the influence of civilization knowledge on culture and traditions
5	Complement clauses controlled by nouns	understanding that egg is full of protein
	Appositive noun phrase	none found in the corpus
	To-clauses as postmodifiers	culture to acquire knowledge

*Not included in Biber et al. (2011)

3.5. Statistical analysis

A frequency analysis was conducted for the study. The frequencies of 12 noun modifiers were compared between advanced and intermediate students' writing. All frequencies were normalized per 1000 words.

3. RESULTS

3.1. Frequency analysis of noun modifiers and adjectives

Research question 1: Are there any differences between the frequencies of noun modifiers in advanced and intermediate students' writing?

The normalized total frequency for the 12 noun modifiers was slightly higher in the advanced student writing than in the intermediate student writing. The normalized total frequency for advanced writing is 362.67 per 1000 words and that of intermediate is 340.28 per 1000 words.



The biggest difference for the intermediate group was with prepositional phrases (of phrases with concrete/locative meanings) which was 54.04 per 1000 in contrast to 25 per 1000 words in the advanced group. The biggest difference for the advanced group was with nouns as pre-modifiers. The advanced group had 40 per 1000 words and the intermediate group had 17.53 per 1000 words. There is an observable pattern where advanced students use more noun modifiers than intermediate students, but with some few noun modifiers (e.g., nouns as pre-modifiers), intermediate students have higher numbers. The raw and normalized frequencies of the noun modifiers are presented in table 3.

Table 3			
Noun modifiers in students' writing			
Stage	Grammatical structure(s)	Advanced- raw and (normalized frequencies)	Intermediate-raw and (normalized frequencies)
2	Attributive Adjectives	288 (58.9)	249 (51.95)
	Predicative Adjectives	46 (9.4)	39 (8.14)
3	Relative clauses	98(20.01)	66 (13.4)
	Nouns as pre-modifiers	196(40)	84(17.53)
	Possessive nouns as pre-modifiers	14(2.86)	15 (3.13)
	Prepositional phrases as postmodifiers: of phrases (concrete/locative meanings)	124 (25)	259 (54.04)
	Prepositional phrases other than of (concrete/locative meanings)	423 (86.3)	408 (85.12)
4	Non-finite relative clauses: ed	12 (2.46)	2 (0.42)
	ing clauses	19(3.88)	13 (2.71)
	Prepositional phrases as post modifiers of phrases (abstract meanings)	45 (9.19)	29 (6.05)



	Prepositions other than of (abstract meanings)	92 (18.8)	76 (15.86)
5	Complement clauses controlled by nouns	65 (13.3)	66 (13.77)
	To-clauses as postmodifiers	354 (72.3)	325 (67.80)
Total noun modifiers		1776 (362.67)	1631 (340.28)

RQ2: What types of adjectives are used in advanced and intermediate students' writing? Normalized and raw frequencies for the types of adjectives in advanced and intermediate student writing is presented in table 4. As with noun modifiers, advanced writers use more adjectives than intermediate writers. An observable pattern is the slightly high numbers for descriptive and participial adjectives. This indicates that while some advanced writers use very simple adjectives, others use very complex adjectives in the form of participials. Also, in table 4, intermediate writers use more proper adjectives (3.39 per 1000 words) as compared to advanced writers (0.61 per 1000 words). The biggest difference for advanced writers is with descriptive adjectives (66.58 per 1000 words) in contrast to the 51.74 per 1000 words by intermediate writers. On the other hand, the biggest difference for intermediate writers is in the use of proper adjectives as indicated earlier. The raw and normalized frequencies are presented in table 4.

Type	Advanced- raw and (normalized frequencies)	Intermediate- raw and (normalized frequencies)
Descriptive	326 (66.58)	248 (51.74)
Quantitative	24 (4.9)	18 (3.76)
Proper	3 (0.61)	16 (3.39)
Indefinite	12 (2.45)	10 (2.09)
Possessive	8 (1.63)	6 (1.25)
Interrogative	3(0.61)	2 (0.42)
Participial	17(3.47)	0

4. DISCUSSION

Findings from the study reveal that both advanced and intermediate learners produce complex noun phrases with noun modifiers between stages 2 to 5 of the model (Biber et al., 2011). For noun modifiers, there was an inclination for students with higher proficiency to use more noun modifiers in their writing. Example 1(a) is a sentence from a student at the intermediate level. In this sentence, there are five modifiers and all of them are attributive adjectives.



Example 1

(a) Firstly, knowledge was acquired through our [social] systems such as [birth] rites, [funeral] rites, [marriage] rites, [puberty] rites and so on (NP-5).

(b) The situation [where [most] [traditional] Africans use [foreign] liquor for [libation] chants in the shrine has generated [heated] debate [which we should pay [close] attention to] (NP-25)

In contrast, example 1(b) is from an advanced writer with a similar length. This sentence contains eight noun modifiers: six attributive adjectives, one noun-complement clause and one relative clause. This example provides evidence for an observable pattern where students with higher proficiency tend to use more relative and noun clauses as noun modifiers. This finding is consistent with previous studies that indicate the influence that L2 writing proficiency has on the frequency of clauses (Ferris, 1994; Jarvis, Grant, Bikowski, & Ferris, 2003). Also, a manual analysis of the corpus revealed that advanced writers tend to use more relative clauses with diverse relative pronouns (e.g., which, who, whose, and that). In contrast, intermediate writers use fewer relative clauses and are quite limited in using relative pronouns. Therefore, for both data sets, relative clauses were a possible predictor of writing proficiency and noun phrase complexity.

Some studies (e.g., Biber, Gray, & Staples, 2014; Parkinson & Musgrave, 2014; Staples et al., 2016) claim that phrasal complexity increases as writers advance in proficiency. This claim is supported by the present study. For the phrasal noun modifiers investigated in the project, the frequencies of intermediate writers are generally less than that of advanced students, with the exception of possessive nouns as pre-modifiers and of prepositional phrases with concrete and locative meanings. The study also confirms the hypothesized model by (Biber et al., 2011). It could be inferred from table 3 that advanced writers produce quite a number of noun modifiers between stages 4 and 5 (abstract phrases and clauses). Therefore, it is expected that as intermediate learners develop in proficiency, their noun modifiers would move from the early stages to the latter stages of the developmental index. Nevertheless, the claim by studies (e.g., Biber et al., 2011; Parkinson & Musgrave, 2014) that advanced academic writers use few attributive adjectives and other noun modifiers in stage 1 is not fully substantiated by this study. Data from the corpus reveal that frequency levels for advanced writers in stage one and stage two are comparatively high as compared to intermediate writers.

The use of adjectives has been reported to be an indicator of syntactic complexity, especially at the level of noun phrases (e.g., Biber and Gray, 2011). This claim has been attributed to the observation that it requires more effort to learn and use adjectives especially complex ones in sentences. Therefore, the use of a wide variety of adjectives might predict higher proficiency and complexity, and this is the case for advanced writers in the study. The advanced writers used different kinds of adjectives (simple to complex). On the other hand, intermediate writers use comparatively fewer adjectives and if they use adjectives at all, it is usually simple adjectives. This finding is similar to what was observed by (Lan & Sun, 2018) in a corpus of Chinese EFL academic writing. The use of both simple and complex adjectives indicates that advanced writers do not only use complex modifiers, but they are able to recall and use simple ones they acquired earlier in their development. This finding also suggests that learners' syntactic development follows a sequence in acquisition where they move from simpler structures to more complex ones. This finding might also indicate that the more students understand how noun modifiers are used, the higher the probability that they will write better



sentences. It is anticipated that as students increase in proficiency, their vocabulary breadth and depth will increase and most likely their use of noun modifiers (e.g., adjectives) but the contrast situation could also happen where students' proficiency can increase but their use of adjectives do not.

4.1. Pedagogical implications

The study has implications for English for academic purpose instruction. The findings of the study reveal a noticeable gap in the use of noun modifiers between learners at the advanced and intermediate levels. Therefore, teachers can help students improve their writing proficiency by incorporating targeted and explicit instruction on noun modifiers. Specifically, the 11 noun modifiers in the hypothesis of Biber et al. (2011) can be considered in the teaching of writing for academic purposes. Also, studies (e.g., Biber et al., 2011; Lu, 2011) reveal that NPs are frequently used in academic writing. Therefore, it is important for teachers to familiarize EAP students with frequently used lexical items (noun modifiers) in academic writing to raise their consciousness of the modifiers. This would in turn enhance the academic literacy and students' ability to understand professional writing pieces.

5. CONCLUSION

This study explored NP complexity in advanced and intermediate student writing based on Biber et al.'s (2011) developmental index. Findings from the study revealed that advanced and intermediate writers differ in their use of noun modifiers. The former group produces more abstract phrases with relative and noun clauses, while the latter group produces concrete PPs, and attributive adjectives. The findings of this study support the Biber et al. (2011) developmental too. Limitations of the study include a small data set. Due to time constraints, the research could not explore large amounts of data, and this could have affected the generalizability of the study's findings. Also, data was collected in the form of a timed writing exercise and this factor might mean writers could not produce their best form of writing. Subsequent studies could consider a larger data set which might reveal a more nuanced understanding of between proficiency comparisons and the use of noun modifications. Also, an assignment or untimed writing could help learners produce possibly a better form of writing.

6. REFERENCES

1. Anthony, L. (2020). AntConc (Version 3.5.9) [Computer Software]. Tokyo, Japan: Waseda University. Available from <https://www.laurenceanthony.net/software>
2. Bardovi-Harlig, K. (1992). A second look at T-unit analysis: Reconsidering the sentence. *TESOL Quarterly*, 26(2), 390-395. <https://doi.org/10.2307/3587016>
3. Díez-Bedmar, M. B., & Pérez-Paredes, P. (2020). Noun phrase complexity in young Spanish EFL learners' writing: Complementing syntactic complexity indices with corpus-driven analyses. *International Journal of Corpus Linguistics*, 25(1), 4-35.
4. Biber, D., & Conrad, S. (2009). *Register, genre, and style*. Cambridge University Press.
5. Biber, D., & Gray, B. (2011). Grammatical change in the noun phrase: The influence of written language use. *English Language & Linguistics*, 15(2), 223-250



6. <https://doi.org/10.1017/S1360674311000025>
7. Biber, D., Gray, B., & Poonpon, K. (2011). Should we use characteristics of conversation to
8. measure grammatical complexity in L2 writing development? *TESOL Quarterly*, 45(1), 5-35. <https://doi.org/10.5054/tq.2011.244483>
9. Biber, D., Johansson, S., Leech, G., Conrad, S., & Finegan, E. (1999). *Longman grammar of written and spoken English*. Harlow: Longman.
10. Casal, J. E., & Lee, J. J. (2019). Syntactic complexity and writing quality in assessed first-year L2 writing. *Journal of Second Language Writing*, 44, 51-62 <https://doi.org/10.1016/j.jslw.2019.03.005>
11. Ferris, D. R. (1994). Lexical and syntactic features of ESL writing by students at different levels of L2 proficiency. *TESOL Quarterly*, 28(2), 414-420. <https://doi.org/10.2307/3587446>
12. Huddleston, R. (1984). *Introduction to the grammar of English*. Cambridge University Press.
13. Hunt, K. W. (1965). A synopsis of clause-to-sentence length factors. *The English Journal*, 54(4), 300-309. <https://doi.org/10.2307/811114>
14. Hunt, K. W. (1966). Recent measures in syntactic development. *Elementary English*, 43(7), 732-739. <https://www.jstor.org/stable/41386067>
15. Hunt, K. W. (1970). Do sentences in the second language grow like those in the first? *TESOL Quarterly*, 2(1) 195-202. <https://doi.org/10.2307/3585720>
16. Hunston, S., & Francis, G. (2000). *Pattern grammar: A corpus-driven approach to the lexical grammar of English (Vol. 4)*. John Benjamins Publishing.
17. Jarvis, S., Grant, L., Bikowski, D., & Ferris, D. (2003). Exploring multiple profiles of highly rated learner compositions. *Journal of Second Language Writing*, 12(4), 377-403.
18. Lan, G., & Sun, Y. (2019). A corpus-based investigation of noun phrase complexity in the L2 writings of a first-year composition course. *Journal of English for Academic Purposes*, 38, 14-24. <https://doi.org/10.1016/j.jeap.2018.12.001>
19. Liu, L., & Li, L. (2016). Noun phrase complexity in EFL academic writing: a corpus-based study of postgraduate academic writing. *Journal of Asia TEFL*, 13(1), 48. <http://dx.doi.org/10.18823/asiatefl.2016.13.1.4.48>
20. Lu, X. (2011). A corpus-based evaluation of syntactic complexity measures as indices of college-level ESL writers' language development. *TESOL Quarterly*, 45(1), 36-62. <https://doi.org/10.5054/tq.2011.240859>
21. Norris, J. M., & Ortega, L. (2009). Towards an organic approach to investigating CAF in instructed SLA: The case of complexity. *Applied Linguistics*, 30(4), 555-578. <https://doi.org/10.1093/applin/amp044>
22. Ortega, L. (2003). Syntactic complexity measures and their relationship to L2 proficiency: A research synthesis of college-level L2 writing. *Applied linguistics*, 24(4), 492-518. <https://doi.org/10.1093/applin/24.4.492>
23. Parkinson, J., & Musgrave, J. (2014). Development of noun phrase complexity in the writing of English for Academic Purposes students. *Journal of English for Academic Purposes*, 14, 48- 59. <https://doi.org/10.1016/j.jeap.2013.12.001>



23. Staples, S., Egbert, J., Biber, D., & Gray, B. (2016). Academic writing development at the university level: Phrasal and clausal complexity across level of study, discipline, and genre. *Written Communication*, 33(2), 149-183. DOI: 10.1177/0741088316631527