*rEFLections*
Vol 27, No 1, January – June 2020

# Phrasal Complexity Measures as Predictors of EFL University Students' English Academic Writing Proficiency

**KRITTAYA THONGYOI**
*Faculty of Humanities and Social Sciences, Khon Kaen University, Khon Kaen, Thailand*
**KORNWIPA POONPON***
*Faculty of Humanities and Social Sciences, Khon Kaen University, Khon Kaen, Thailand*
***Corresponding author email: korpul@kku.ac.th**

***Article information***

***Article History:***
*Received: December 16, 2019*
*Accepted: April 23, 2020*
*Available online: April 24, 2020*

***Keywords:***
*Academic writing*
*L2 writing proficiency*
*Phrasal complexity measures*
*EFL university students*

***Abstract***

*The study aims to investigate phrasal complexity measures that can predict EFL students' academic writing proficiency. Academic English written test responses were derived from written responses from the Khon Kaen University Academic English Language Test (KKU-AELT). Five hundred and thirty written responses were separated into groups based on their writing scores. Sixty-six phrasal complexity measures (Kyle, 2016) were analyzed for this study. The Tool for the Automatic Analysis of Syntactic Sophistication and Complexity (TAASSC), a computational tool for phrasal complexity analysis, was used to calculate the average numbers of occurring measures in written responses. Phrasal complexity measures occurring in written responses were analyzed with the independent t-test. Then, 11 significant phrasal complexity measures, derived from the independent t-test, were entered into Binary logistic regression in order to examine potential phrasal complexity measures that can predict proficiency levels. The results revealed three phrasal complexity measures that can predict academic writing for higher proficiency level students.*

## INTRODUCTION

English academic writing skills are a mandate for students in higher education. Especially, EFL students are required to show their proficient academic writing skills to ensure their potential in studying at either the undergraduate or graduate level. They have to take a standardized test (e.g., IELTS or TOEFL) or an institutional test and use the score to be officially admitted to a study program at a university. For this reason, improving English academic writing skills is vital for university students.

Being able to write academically refers to an ability to demonstrate a good use of paragraph organization, topic development, cohesion, coherence, a range of vocabulary and grammar (Weigle, 2002). Among these important qualities, one key ability of academic writing is grammatical ability, which refers to grammatical accuracy and grammatical complexity (Neumann, 2014). Grammatical complexity is, especially, regarded as an important

characteristic of academic writing because academic writing has been found to be grammatically complex (Biber & Gray, 2010; Biber, Gray & Poonpon, 2011).

Grammatical complexity, or widely called syntactic complexity, refers to a variety of grammatical forms that appear in language production (Ortega, 2003). Syntactic complexity is measured by linguistic features that rely on the complexity at sentential, clausal and phrasal levels (e.g., Lu, 2010, 2011; Norris & Ortega, 2009). Previous studies have revealed that syntactic complexity has a relationship to academic writing proficiency as it can differentiate writing proficiency levels (Biber, Gray & Poonpon, 2011; Lu, 2011). Especially, the complexity at phrasal level, phrasal complexity, was reported that it typically occurs in second language (L2) writing produced by high proficiency writers (e.g., Liu & Li, 2016; Kyle, 2016; Kyle & Crossley, 2018). To illustrate, Parkinson and Musgrave (2014) investigated noun modifiers from Biber et al. (2011) in academic writings produced by two groups of graduate L2 writers. The results indicated that MA writers' academic writings (high proficiency) contain more noun modifiers than English for Academic Purposes (EAP) students' academic writings (less proficiency). In other words, academic writing rated as low and high proficiency levels can be distinguished by phrasal complexity which considers linguistic features that mainly rely on noun or noun phrase modifiers. Phrasal complexity increases when academic level increases (Staples, Biber & Gray, 2016).

In Thailand, there are very few studies investigating phrasal complexity in the academic writing of Thai students. Jitpraneechai (2019) examined whether noun phrase modifiers produced by Thai university students (low proficiency) is different from noun phrase complexity produced by Native English Speakers (NES) students (high proficiency). The results found that NES students produced more noun modifiers than Thai students. These findings also support previous studies that L2 writing by high proficient writers contains more phrasal complexity measures than less proficient writers. Despite evidence of the relationship between phrasal complexity and L2 writing proficiency, there are no studies examining the use of phrasal complexity to predict proficiency levels of academic English writing, particularly for Thai university students. Thus, the present study aims to fill this gap by investigating phrasal complexity measures that can be predictors of Thai university students' academic writing proficiency. The findings of this study might be useful for raters to initially judge test takers' writing quality and for Thai university students in terms of using particular grammatical structures in their writing tests to reach high proficiency of academic writing.

## LITERATURE REVIEW

L2 writing skill is one of the English language skills that Thai EFL students often have problems with, especially academic writing skill that university students need to acquire in order to complete tasks in their academic disciplines (Padgate, 2008). To measure whether students reach sufficient academic proficiency, grammatical complexity has been used as an indicator of L2 writing development (Wolfe-Quintero, Inagaki & Kim, 1998). When students develop their

academic language, they tend to produce grammatical complexity at phrasal level (Biber, Gray & Staples, 2016). It was found that phrasal complexity is particularly produced by high proficiency writers (Biber, Gray & Staples, 2016). Thus, it is one of indicators of high writing proficiency.

Academic writing is commonly complex at phrasal level; thus, the texts are structurally compressed (Biber & Gray, 2010). L2 learners seem to acquire this complex structure at different stages. Based on grammatical features that L2 learners progressively acquire, Biber, Gray and Poonpon (2011) introduced five different developmental stages of L2 learners' grammatical complexity. In the first stage, as L2 learners early acquired conversational features even they were mainly taught written features; the stage mainly relied on conversational features, e.g., *that*-clauses controlled by common verbs. The second stage relied on attributive adjectives. Stages 3 and 4 contained more features functioning as noun modifications e.g., *that*-relative clauses, nouns as premodifiers, possessive nouns as premodifiers, *-ed* and *-ing* clauses as postmodifiers. The last stage showed the dense use of noun modifications e.g., attributive adjectives with nouns as premodifiers, prepositions as postmodifiers with abstract meanings.

A number of studies have supported the developmental stages that proficient writers tended to produce more features in the later stages than less proficient writers (Table 1). To illustrate, Parkinson and Musgrave (2014) examined noun modifiers from Biber et al. (2011) in EAP students' essays (low proficiency) and MA students' essays (high proficiency). The findings indicated that MA essays contained more noun modifiers including the later stage features than EAP essays (e.g., relative clauses, nouns as premodifiers, prepositional phrases with abstract meanings, appositive noun phrases as postmodifiers). On the other hand, EAP writers considered as less proficient writers relatively used more attributive adjectives which are the features in early developmental stage of complexity (Stage 2) than high proficiency writers. Likewise, Ansarifar, Shahriari and Pishghadam (2018) also compared noun modifiers in abstracts written by three groups of writers—MA writers (L1 Persian), PhD writers (L1 Persian) and published writers—in the applied linguistic discipline. In contrast to Parkinson and Musgrave's study, the study found four modifiers, i.e., nouns as premodifiers, *-ed* participle as postmodifiers, attributive adjectives with nouns as premodifiers and multiple prepositional phrases as postmodifiers, that had statistically significant differences among the three groups. The overall results show that highly proficient writer (PhD and published writers) tended to use a higher number of these four noun modifiers than less proficient writers (MA writers). Ansarifar et al.'s study supports the developmental stages of Biber et al. that high proficient writers are likely to use phrasal complexity features in later developmental stages (e.g., multiple prepositional phrases as postmodifiers). Jitpraneechai (2019)'s study is consistent to Ansarifar et al.'s study in terms of the use of phrasal complexity measures in later developmental stages by highly proficient writers. Native English writers produced more phrasal complexity measures than Thai writers e.g., relative clauses, nouns as premodifiers, *of* phrases as postmodifiers. There is no significant difference of using attributive adjectives between Thai and native English writers; however, native English writers tended to use more attributive adjectives than Thai writers. This finding contrasts to Parkinson et al. (2014).

Besides, phrasal complexity measures have been reported to correlate with holistic essay scores. Taguchi, Crawford and Wetzel (2013) found that high scoring essays relied on more attributive adjectives and prepositional phrases as postmodifiers. Similarly, Biber, Gray and Staples (2014) found that attributive adjectives are correlated to high scoring essays of TOEFL integrated writing task at score level 4. Lan, Lucas and Sun (2019) also revealed that attributive adjectives and relative clauses positively correlated to scores rated for argumentative writing produced by high proficiency writers. In L2 writing studies, the complexity analysis has been broadly focused on the number of occurring measures correlating to holistic scores; however, there were some studies concerned the complexity variation. That is, Kyle (2016), the study not only concerned noun phrase modifiers but also the place that noun phrase modifiers occur e.g., nominal subject (noun or noun phrases that function as a subject of sentence), passive nominal subject (noun or noun phrases that function as a subject of sentence in passive form). Thus, the phrasal complexity measures are relatively detailed. Kyle and Crossley (2018) revealed that high scoring TOEFL independent essays tended to include 1) objects of the preposition with more modifiers (especially more adjectives and prepositional phrase modifiers), 2) direct objects with more modifiers and a wide range of modifiers, and 3) nominal subjects with a wide range of modifiers. Additionally, Kyle et al.'s results also supported Biber et al. (2011) in terms of noun phrase modifiers as indicators of academic writing.

In conclusion, the previous studies on phrasal complexity have revealed specific characteristics of academic writing and their relationship with L2 learners' proficiency level. The notable results similarly show that high proficiency writers are likely to produce more phrasal complexity measures than less proficient writers. Furthermore, in writing assessment, high scoring essays are characterized by some noun phrase modifiers or phrasal complexity measures. These previous evidence highlights the importance of investigations of phrasal complexity measures in academic writing. Particularly, the investigations of the phrasal complexity measures in writing produced by learners whose proficiency is in need to be improved. In Thai contexts, for example, this kind of studies can be helpful for Thai university students in terms of raising awareness of academic writing features and avoiding grammatical errors. In so doing, the employment of such reliable measures as Kyle (2016)'s phrasal complexity measures maximizes the validity and reliability of the studies as they were based on second language acquisition and second language writing research (e.g., Norris & Ortega, 2009). Kyle's framework, moreover, treats positions of noun phrases which seem to be rarely mentioned in other frameworks of phrasal complexity in academic discourse.

The present study, therefore, investigated phrasal complexity measures in academic writing produced by Thai university students. The study was guided by the research question: what are the phrasal complexity measures that can be predictors proficiency levels of KKU-AELT written responses?

**Table 1**
**A summary of previous studies on phrasal complexity in academic writing**

| Authors | Purposes | Phrasal complexity features | Results |
|---|---|---|---|
| Biber, Gray & Poonpon (2011) | To investigate whether characteristics of conversation can measure grammatical complexity in L2 academic writing. | 2nd Stage: Attributive adjectives<br>3rd Stage:<br>o Relative clauses<br>o Nouns as premodifiers<br>o Possessive nouns as premodifiers<br>o *Of* phrases as postmodifiers (concrete/locative meanings)<br>o Prepositions other than *of* (concrete/locative meanings)<br>4th Stage:<br>o Nonfinite relative clauses: -ed/ -ing<br>o Attributive adjectives with nouns as premodifiers<br>o Prepositional phrases as postmodifiers:<br>o *Of* phrases (abstract meanings)<br>o Prepositions other than *of* (abstract meanings)<br>5th Stage:<br>o Preposition + nonfinite complement clause (*Of* + -ing)<br>o Complement clauses controlled by nouns (*that* + noun complement clauses)<br>o Appositive noun phrases<br>o Multiple prepositional phrases as postmodifiers, with levels of embedding | o Conversation relies on clausal subordination measures.<br>o Academic writing relies on complex noun phrase constituents (rather than clause constituents) and complex phrases (rather than clauses).<br>o The study introduced the developmental stage of complexity features. |
| Parkinson & Musgrave (2014) | To compare noun phrase complexity in L2 writing of EAP students and international students who enrolled in an MA program (in TESOL). | o Followed features from Biber et al. (2011)<br>o Added 'Participial premodifiers' in 2nd stage<br>o Added 'To-clauses as postmodifiers' in 5th stage | o EAP students' writing relied heavily on attributive adjectives (both common/ less common).<br>o MA students' writing consisted of various noun phrase modifiers including features in later stages e.g., participial premodifiers, relative clauses, nouns as premodifiers, appositive noun phrases as postmodifiers. |
| Biber, Gray & Staples (2014) | To investigate pattern of grammatical complexity across mode (spoken/ written), task types (independent/ integrated writing) | o Grammatical complexity features that are commonly found in writing. i.e., word length, passive voice verbs, nouns, nominalizations, prepositions, noun + *of*-phrase, attributive adjectives, premodifying nouns, | o Word length/ attributive adjectives/ verb + *that*-clauses are associated with written integrated task with high score (score level 4). |

| Authors | Purposes | Phrasal complexity features | Results |
|---|---|---|---|
| | and proficiency level (score levels) in TOEFL iBT responses | verb + *that*-clause, noun + *that*-clause, passive *-ed* relative clauses, noun + *to*-clause, and finite relative clauses | |
| Taguchi, Crawford & Wetzel (2013) | To investigate whether linguistic features are indicative of writing quality of nonnative English-speaking students | o Clause-level complexity measures and phrasal-level complexity measures based on Biber et al. | o For clause-level measures, high-rated essays tend to include t*hat*-clause verb complement.<br>o For phrasal-level measures, high-rated essays tend to include attributive adjectives and prepositional phrase as postmodifiers. |
| Kyle & Crossley (2018) | To examine whether traditional indices of syntactic complexity, fine-grained indices of clausal complexity, and fine-grained indices of phrasal complexity can predict holistic scores of independent essays of TOEFL iBT | o Phrasal complexity indices concerning with noun phrase variety: dependents (noun phrase modifiers) and phrase types (the place that noun phrases occur).<br>o 132 phrasal complexity measures: 66 with pronoun and 66 no pronoun version. | o Phrasal complexity are the best predictors of writing quality scores with medium effect.<br>o High-scoring essays tend to include:<br>*Dependents per object of the preposition* (especially adjective modifiers and prepositional phrase modifiers) accounted for 13.6% on holistic scores.<br>*Dependents per direct object* accounted for 3.5% on holistic scores.<br>*Dependents per nominal subject* accounted for 2.0% on holistic scores. |
| Lan, Lucas & Sun (2019) | To investigate noun phrase complexity in argumentative essays written by first-year Chinese students (high/ low- proficiency students). | o Followed features from Biber et al. (2011)<br>o Added 'To-infinitive clauses' in 5$^{th}$ stage | o High-proficiency students used more attributive adjectives and relative clauses than low-proficiency students.<br>o Low-proficiency students used more nouns as premodifiers and *Of* phrases as postmodifiers (abstract meanings) |
| Jitpraneechai (2019) | To compare noun phrase complexity in argumentative essays of Thai and native English university students. | o Followed features from Biber et al. (2011)<br>o Added 'Participial premodifiers' in 3$^{rd}$ Stage | o Native English university students used more noun phrase modifiers than Thai students e.g., attributive adjectives, relative clauses, participle as postmodifiers, appositive noun phrases. |

## METHODOLOGY

### KKU-AELT written corpus

This study focuses on an academic writing test (Khon Kaen University Academic English Language Test, KKU-AELT) offered by the Center for English Language Excellence (CELEx) at a university in Thailand. KKU-AELT is available for anyone who would like to test their English proficiency and use test scores for an application in a graduate program at KKU. There are two parts in this three-hour test: reading (two hours) and writing (one hour). This study focuses only on the writing test. In the test, test takers have to write an argumentative essay based on a provided prompt. Each response was scored by at least two raters with the inter-rater reliability level at at least .80 (see rating scales in Appendix A). The scores were divided into five proficiency levels based on score bands: Band 1 (0-20), Band 2 (21-40), Band 3 (41-60), Band 4 (61-80) and Band 5 (81-100). Test takers who aim to enroll in a Master's degree program at KKU are required to reach at least Band 3, while those who are to enroll in a Doctoral degree program are required to reach at least Band 4.

The KKU-AELT written corpus consists of 2,979 written responses produced by KKU-AELT test takers from January to December 2018. These responses were grouped on a basis of the score bands. Due to the limited number of the written responses in Band 5 (only 9 responses), these were excluded from the study. The written responses at Bands 1 and 2 were limited, for grammatical feature analysis, in text length that should be longer than 100 words (Biber, 1990, 1993 cited in Biber & Gray, 2013), they were also excluded from the study. This study, therefore, had to use only 530 written responses at Band 3 (265 responses) and Band 4 (265 responses). The total number of words are 147,451 words (68,465 from Band 3 responses, 78,986 from Band 4 responses).

### Instrument

The computational analyzer, Tool for the Automatic Analysis of Syntactic Sophistication and Complexity (TAASSC), was used to identify and compute phrasal complexity measures in the KKU-AELT written responses. TAASSC relies on Stanford neural-network dependency parser used to identify syntactic structures, and it was reported to achieve an accuracy of around 90% (Kyle, 2016). The TAASSC contains various and reliable syntactic complexity measures, including phrasal complexity measures, derived from second language acquisition and second language writing research (e.g., Lu, 2011; Norris & Ortega, 2009). So, this study used TAASSC since its phrasal complexity measures cover all measures found in academic writing. The overall phrasal complexity measures are 132 measures divided into two versions: pronoun (66 measures) and no-pronoun version (66 measures) (see Appendix B). However, this study used the no-pronoun version as pronouns are not commonly mentioned in academic writing. In addition, TAASSC considers standard deviation in order to measure syntactic variation. The analyzer is freely available for educational purposes, and it can analyze phrasal complexity measures in a short time.

**Phrasal complexity measures**

Sixty-six phrasal complexity measures were analyzed in the study. TAASSC focuses on noun modifiers (dependent types) and the place that noun modifiers occur (phrase types) (see the description of dependents and phrase types in Appendix C.). In addition, there are 3 steps that TAASSC calculates phrasal complexity measures. In Step 1, it calculates the average number of all dependents per each phrase type and all phrase types. In Step 2, it calculates the occurrence of particular dependent types per the overall number of noun phrase types they occur in. Finally, it calculates the average number of particular dependent types per particular types of noun phrase types they occur in.

**Data collection**

Before collecting the data, a permission to access the data was granted by CELEx, KKU. This study used 530 written responses which were scored as Band 3 and Band 4. Due to ethical concerns, these responses were copies of original responses, provided by CELEx officers, without test takers' names. All responses were transferred from handwriting to typed texts by manually retyping the texts and saving them in a .txt file format which is the format required by the TAASSC program. The author created one text file for each response. Errors in responses (e.g., misspelling) were kept unaltered in order to keep original test takers' texts. In addition, those errors had no effect on phrasal complexity analysis. The outcomes from TAASSC were the average numbers of phrasal complexity measure occurrences and the results were generated in Excel files.

**Data analysis**

The average numbers of occurrence from TAASSC were analyzed by Independent Samples *t*-test in order to identify the phrasal complexity measures which had statistically significant differences between the two response groups. Then, occurring phrasal complexity measures were analyzed using binary logistic regression. Binary logistic regression was used to find the probability that the complexity measures which had statistically significant differences can predict written responses at the two different proficiency levels of Band 3 and Band 4.

**RESULTS AND DISCUSSION**

The results from the Independent Samples *t*-test analysis showed that there are 11 phrasal complexity measures that had statistically significant differences between Band 3 and Band 4 responses. In the binary logistic regression model (Table 3), the classification table showed that 11 phrasal complexity measures can correctly predict 176 of 265 responses for Band 3 (66.4 %), and it can correctly predict 159 of 265 responses for Band 4 (60 %). The overall correct prediction of logistic regression model is 63.2 %.

**Table 3**
**The classification table**

| | | | Predicted | | |
|---|---|---|---|---|---|
| | | | Proficiency level | | |
| | Observed | | Band3 | Band4 | Percentage Correct |
| **Step 1** | Proficiency level | Band3 | 176 | 89 | 66.4 |
| | | Band4 | 106 | 159 | 60.0 |
| | Overall Percentage | | | | 63.2 |

According to Table 4, the model also reveals that 3 of 11 phrasal complexity measures tend to predict responses for Band 4 level at significance level ($p < 0.05$). These include 1) dependents per passive nominal subject ($p = 0.014$), which refers to the use of a wide range of dependents modifying noun or noun phrase that functions as subject of passive structures, 2) adjective modifiers per nominal subject ($p = 0.030$), which refers to adjective modifiers that function as noun modifiers of subject of non-passive structures, and 3) relative clause modifiers per nominal subject ($p = 0.006$) which refers to relative clauses that function as noun modifiers of subject of non-passive structures.

**Table 4**
**Phrasal complexity measures that can predict proficiency levels**

| | | B | S.E. | Wald | df | Sig. | Exp(B) | 95% C.I. for EXP(B) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Lower | Upper |
| 1. | Dependents per passive nominal subject | .300 | .122 | 6.014 | 1 | .014* | 1.350 | 1.062 | 1.716 |
| 2. | Dependents per agent | .385 | .198 | 3.762 | 1 | .052 | 1.469 | .996 | 2.167 |
| 3. | Dependents per nominal complement | .147 | .093 | 2.523 | 1 | .112 | 1.158 | .966 | 1.389 |
| 4. | Adjectival modifiers per nominal | -.304 | 1.341 | .051 | 1 | .821 | .738 | .053 | 10.225 |
| 5. | Relative clause modifiers per nominal | 1.597 | 3.367 | .225 | 1 | .635 | 4.936 | .007 | 3623.377 |
| 6. | Adjectival modifiers per nominal subject | 1.714 | .788 | 4.733 | 1 | .030* | 5.553 | 1.185 | 26.018 |
| 7. | Relative clause modifiers per nominal subject | 6.934 | 2.538 | 7.465 | 1 | .006* | 1026.573 | 7.098 | 148480.847 |
| 8. | (Non-clausal) adverbial | -4.010 | 2.250 | 3.176 | 1 | .075 | .018 | .000 | 1.493 |

| | | B | S.E. | Wald | df | Sig. | Exp(B) | 95% C.I. for EXP(B) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Lower | Upper |
| | modifiers per nominal subject | | | | | | | | |
| 9. | Conjunction "or" as a dependent per nominal subject | -3.896 | 2.427 | 2.576 | 1 | .109 | .020 | .000 | 2.367 |
| 10. | Conjunction "or" as a dependent per direct object | -2.862 | 2.155 | 1.765 | 1 | .184 | .057 | .001 | 3.899 |
| 11. | Determiners per object of the preposition | 1.016 | .802 | 1.605 | 1 | .205 | 2.762 | .574 | 13.298 |
| | Constant | -1.003 | .367 | 7.463 | 1 | .006 | .367 | | |

*Significance level at $p < 0.05$

Example texts showing these three features are as follows:

1) dependents per passive nominal subject
   *"A balance is required to ensure that watching this is still personal while doing other activities also necessary."* [D-2-128-B4]
   [Prompt: Is watching too many TV soap operas harmful to your mind? What is your opinion?]

   A is to an article (dependent)
   A balance is a passive nominal subject.

2) Adjective modifiers per nominal subject
   "*Previous study suggested that people that learn history…"* [D-3-5-B4]
   [Prompt: Should we learn history through movies or films? What is your opinion?]

   *Previous* is an adjective (adjectival modifier)
   *Previous study* is a nominal subject.

3) Relative clause modifiers per nominal subject
   *"Nowadays, there are many equipment that could improve the ability of studying…"*
   [ D-1.2-32-B4]
   [Prompt: Can video games be a useful learning tool? What is your opinion?]

   *Many equipment* is a nominal subject
   *That could improve the ability of studying*… is relative clause modifiers.

According to Vanichbuncha (2003), binary logistic regression analysis considers the odd ratio which indicates the probability of occurring event. The odd ratio which is higher than 1 indicates the probability that responses were rated for Band 4 higher than Band 3. In addition, the odd ratio which is less than 1 indicates the probability that responses were rated for Band 3 higher than Band 4. If the odd ratio is 1, it means the chance that responses were rated for Band 3 and Band 4 is equal.

The complexity measure "dependents per passive nominal subject" showed the odd ratio (Exp(B)) is at 1.350 which is higher than 1. It means that dependents per passive nominal subject are 1.350 times to predict responses for Band 4. In addition, the odd ratio also indicated the positive correlation between dependents per passive nominal subject and proficiency levels of the KKU-AELT written responses (B = .300). In other words, if writers produce more dependents per passive nominal subject, responses had a chance to be rated as Band 4. The second phrasal complexity measure is adjective modifiers per nominal subject which showed the odd ratio at 5.553 which is higher than 1. The odd ratio revealed that adjectival modifiers per nominal subject are 5.553 times to predict responses for Band 4. The correlation between adjectival modifiers per nominal subject and proficiency levels of responses are positive (B = 1.714). Thus, if adjectival modifiers per nominal subject is higher, responses are more likely to be rated as Band 4. The last phrasal complexity measure is relative clause modifiers per nominal subject which showed the odd ratio at 1026.573 which is higher than 1. Thus, relative clause modifiers per nominal subject are 1026.573 times to predict responses for Band 4. The correlation between relative clause modifiers per nominal subject and proficiency levels of responses are positive (B = 6.934). If responses include more relative clause modifiers per nominal subject, those responses tend to be rated as Band 4.

As revealed by logistic regression model, written responses rated for high proficiency level (Band 4) can be predicted by the use of phrasal complexity measures, particularly adjective modifiers and relative clauses. The model explained the correctly prediction for Band 4 at 66.4% which is a medium proportion. These results were supported by previous evidence. To illustrate, Lan et al. (2019) found that attributive adjectives and relative clauses positively correlated to holistic scores. In the same way, Biber et al. (2014) and Kyle et al. (2018) shared the same findings that attributive adjectives correlated to high scoring essays and adjective modifiers have been commonly found in academic writing (Biber & Gray, 2010; Biber et al., 2011). However, in the developmental stages of Biber et al (2011), adjective modifiers occur in Stage 2 and relative clauses are found in Stage 3 which are the early stage that writers acquire for develop their writing complexity. As can be seen, Band 4 responses are considered as academic writing due to the use of phrasal complexity measures occurring in responses. Moreover, test takers who include these measures in their writing gain the opportunity to reach academic standard requirement.

In sum, the results revealed that 3 of 11 phrasal complexity measures had probability to predict KKU-AELT responses for Band 4. The measures were: dependents per passive nominal subject, adjectival modifiers per nominal subject and relative clause modifiers per nominal subject. Also,

the results indicated that the test takers tended to use noun phrase modifiers, especially adjectives and relative clauses, to modify noun or noun phrase functioning as a subject of a sentence of active voice structures. It seems that if the test takers included these measures in their responses, they were likely to be rated as Band 4 level.

## CONCLUSION

This study aims to investigate what phrasal complexity measures can predict KKU-AELT written responses at different proficiency levels. A total of 530 written test responses at two different proficiency levels were analyzed to find phrasal complexity measures. The Independent *t*-test analysis was used to examine the significant measures and Binary logistic regression was used to examine the measures that can potentially be predictors of writing proficiency. The results indicated that dependents per passive nominal subject, adjective modifiers per nominal subject and relative clause modifiers per nominal subject can potentially be predictors of Band 4 responses. It was found that Band 4 responses were more complex and academic than Band 3 responses by the dense use of noun modifiers that are characteristics of academic writing.

According to the developmental stages of phrasal complexity (Biber et al., 2011), adjective modifiers and relative clauses are in the early stages 2 and 3. This indicates that Band 4 responses are complex in some extent. Moreover, if students need to develop their academic writing to be more complex, instructors can help them by teaching how to appropriately use these phrasal complexity measures to create academic texts. These findings also shed light on language use in terms of language complexity which test takers need to be concerned when they have to produce their academic writing in order to meet standard English language proficiency that the university requires. As the use of phrasal complexity was mostly found in the high proficiency level, it is possible that test takers are likely to receive high scores for their responses if they use these measures.

Regarding the KKU-AELT scoring, although “syntactic variety” is stated in the rating scales, this may not be insufficient at the higher score levels. Based on the evidence found in the present study, the dense use of phrasal complexity measures in the highly-scored responses definitely reflected academic written discourse (Weigle, 2002) as the KKU-AELT intends to measure. Also as Yang, Lu & Weigle (2015) concluded, the use of syntactic complexity (including phrasal complexity) seems to be salient in academic writing produced by test takers with higher proficiency levels. For these reasons, “phrasal complexity” is possible to be explicitly included in the description to supplement the “syntactic variety,” at high score rating scales, especially at score levels 4 and 5. This may help raters score writing quality of test takers’ responses, in terms of language use, more rapidly and accurately.

However, the present study has some limitations. Due to the fact that the results reported the prediction rate of occurring measures to predict Band 4 at 60%, it seems a relatively low rate. However, the results show evidence to initially predict writing quality of KKU-AELT responses.

Only phrasal complexity analysis cannot be used to judge writing quality of KKU-AELT responses effectively. Thus, for further studies, other aspects in rating scales need to be examined along with phrasal complexity aspect, e.g., academic vocabulary, writing organization and topic development. Another limitation is about the phrasal complexity analyzer. TAASSC processes the outcomes as average numbers of occurrences, the places or sentences that phrasal complexity measures occur cannot be identified. It would be more accurate if the coders are included in order to find the reliability between the coders and the analyzer.

**THE AUTHORS**

***Krittaya Thongyoi*** is a master's degree student in English program, the faculty of Humanities and Social Sciences, Khon Kaen University. Her research interests include academic English writing and corpus linguistics.
*krittaya.t@kkumail.com*

***Kornwipa Poonpon*** is an assistant professor and currently a lecturer in English at the Faculty of Humanities and Social Sciences, Khon Kaen University, Thailand. She is the head of MA in English Program, Department of English, and the director of Center for English Language Excellence at Khon Kaen University. Her research interests include corpus linguistics, language testing and assessment, discourse analysis and speaking pedagogy and strategies.
*korpul.kku@ac.th*

**REFERENCES**

Ansarifar, A., Shahriari, H., & Pishghadam, R. (2018). Phrasal complexity in academic writing: A comparison of abstracts written by graduate students and expert writers in applied linguistics. *Journal of English for Academic Purposes, 31*, 58-71.

Biber, D. (1990). Methodological issues regarding corpus-based analyses of linguistic variation. *Literary and Linguistic Computing, 5*, 257–269.

Biber, D. (1993). Representativeness in corpus design. *Literary and Linguistic Computing, 8*, 243–257.

Biber, D., & Gray, B. (2010). Challenging stereotypes about academic writing: Complexity, elaboration, explicitness. *Journal of English for Academic Purposes, 9*(1), 2-20.

Biber, D., Gray, B., & Poonpon, K. (2011). Should we use characteristics of conversation to measure grammatical complexity in L2 writing development? *TESOL Quarterly, 45*(1), 5-35.

Biber, D., Gray, B., & Staples, S. (2014). Predicting patterns of grammatical complexity across language exam task types and proficiency levels. *Applied Linguistics, 37*(5), 1-31.

Biber, D., Gray, B., & Staples, S. (2016). Contrasting the grammatical complexities of conversation and academic writing: Implications for EAP writing development and teaching. *Language in Focus, 2*(1), 1-18.

Jitpraneechai, N**. (**2019**).** Noun phrase complexity in academic writing**:** A comparison of argumentative English essays written by Thai and native English university students**.** *LEARN Journal: Language Education and Acquisition Research Network. 12***(**1**)**, 71-88**.**

Kyle, K. (2016). *Measuring syntactic development in l2 writing: Fine grained indices of syntactic complexity and usage-based indices of syntactic sophistication (Doctoral Dissertation).* Retrieved September 30, 2018, from http://scholarworks.gsu.edu/alesl_diss/35

Kyle, K., & Crossley, S. A. (2018). Measuring syntactic complexity in L2 writing using fine-grained clausal and phrasal indices. *The Modern Language Journal, 102*(2), 333-349.

Lan, G., Lucas, K., & Sun, Y. (2019). Does L2 writing proficiency influence noun phrase complexity? A case analysis of argumentative essays written by Chinese students in a first-year composition course. *System, 85*, 1-13.

Liu, L., & Li, L. (2016). Noun phrase complexity in EFL academic writing: A corpus-based study of postgraduate academic writing. *The Journal of AsiaTEFL*, *13*(1), 48–65.

Lu, X. (2010). Automatic analysis of syntactic complexity in second language writing. *International Journal of Corpus Linguistics, 15*(4), 474-496.

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.

Neumann, H. (2014). Teacher assessment of grammatical ability in second language academic writing: A case study. *Journal of Second Language Writing, 24***,** 83-107.

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.

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.

Padgate, W. (2008). Beliefs and opinions about English writing of students at a Thai university. *PASAA, 42,* 31-53.

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.

Staples, S., Egbert, J., Biber, D., & Gray, B. (2016). Academic writing development at the university level. *Written Communication, 33*(2), 1-35.

Taguchi, N., Crawford, W., & Wetzel, D. Z. (2013). What linguistic features are indicative of writing quality? A case of argumentative essays in a college composition program. *TESOL Quarterly, 47*(2), 420-430.

Vanichbuncha, K. (2003). *Advance statistics with SPSS for windows* (3th ed). Bangkok, Thailand: Thammasan.

Weigle, S. C. (2002). *Assessing writing*. Cambridge, UK: Cambridge University Press.

Wolfe-Quintero, K., Inagaki, S., & Kim, H-Y. (1998). *Second language development in writing: Measures of fluency, accuracy, and complexity (Technical Report No. 17***)**. Honolulu, HI: Second Language Teaching & Curriculum Center, University of Hawaii.

Yang, W., Lu, X., & Weigle, S. C. (2015). Different topics, different discourse: Relationships among writing topic, measures of syntactic complexity, and judgments of writing quality. *Journal of Second Language Writing, 28*, 53-67.

## KKU-AELT rating scales

| Score | Topic development | Organization | Language use |
|---|---|---|---|
| 5 | • effective addresses the topic and task<br>• is well organized and well developed, using clearly appropriate explanations, exemplifications and/or details | displays unity, progression, and coherence | • displays consistent facility in the use of language<br>• demonstrates syntactic variety, appropriate word choice, and idiomaticity, though it may have minor lexical or grammatical errors |
| 4 | • addresses the topic and task well, though some points may not be fully elaborated<br>• is generally well organized and well developed, using appropriate and sufficient explanations, exemplifications, and/or details | displays unity, progression, and coherence, though it may contain occasional redundancy, digression, or unclear connections | • displays facility in the use of language<br>• demonstrates syntactic variety and range of vocabulary, though it will probably have occasional noticeable minor errors in structure, word form or use of idiomatic language that do not interfere with meaning |
| 3 | • addresses the topic and task<br>• uses somewhat developed explanations, exemplifications, and/or details | displays unity, progression, and coherence, though connection of ideas may be occasionally obscured | • may demonstrate inconsistent facility in sentence formation and word choice that may result in lack of clarity and occasionally obscure meaning<br>• may display accurate but limited range of syntactic structures and vocabulary |
| 2 | • limited development in response to the topic and task<br>• inappropriate or insufficient explanations, exemplifications, or details to support or illustrate generalizations in response to the task | inadequate organization or connection of ideas | • a noticeably inappropriate choice of words and word forms<br>• an accumulation of errors in sentence structure and/or usage |
| 1 | • little or no detail, or irrelevant specifics, or questionable responsiveness to the task<br>• serious disorganization or underdevelopment | serious disorganization or underdevelopment | • serious and frequent errors in structure or usage |
| 0 | merely copies words from the topic, rejects the topic, or is otherwise not connected to the topic, is written in a foreign language, consists of keystroke characters, or is blank | | |

**Appendix B**
**Sixty-six phrasal complexity measures in TAASSC (Kyle, 2016)**

| No. | Phrasal complexity measures | Index types |
|---|---|---|
| 1 | dependents per nominal | Noun phrase complexity |
| 2 | dependents per nominal subject | Noun phrase complexity |
| 3 | dependents per passive nominal subject | Noun phrase complexity |
| 4 | dependents per agent | Noun phrase complexity |
| 5 | dependents per direct object | Noun phrase complexity |
| 6 | dependents per object of the | Noun phrase complexity |
| 7 | dependents per indirect object | Noun phrase complexity |
| 8 | dependents per nominal complement | Noun phrase complexity |
| 9 | dependents per nominal (standard deviation) | Noun phrase variety |
| 10 | dependents per nominal subject (standard deviation) | Noun phrase variety |
| 11 | dependents per passive nominal subject (standard deviation) | Noun phrase variety |
| 12 | dependents per agent (standard deviation) | Noun phrase variety |
| 13 | dependents per direct object (standard deviation) | Noun phrase variety |
| 14 | dependents per object of the preposition (standard deviation) | Noun phrase variety |
| 15 | dependents per indirect object (standard deviation) | Noun phrase variety |
| 16 | dependents per nominal complement (standard deviation) | Noun phrase variety |
| 17 | determiners per nominal | Noun phrase complexity |
| 18 | adjectival modifiers per nominal | Noun phrase complexity |
| 19 | prepositions per nominal | Noun phrase complexity |
| 20 | possessives per nominal | Noun phrase complexity |
| 21 | verbal modifiers per nominal | Noun phrase complexity |
| 22 | nouns as a nominal dependent per nominal | Noun phrase complexity |
| 23 | relative clause modifiers per nominal | Noun phrase complexity |
| 24 | (non-clausal) adverbial modifiers per nominal | Noun phrase complexity |
| 25 | conjunction "and" as a nominal dependent per nominal | Noun phrase complexity |
| 26 | conjunction "or" as a nominal dependent per nominal | Noun phrase complexity |
| 27 | determiners per nominal subject | Noun phrase complexity |
| 28 | adjectival modifiers per nominal subject | Noun phrase complexity |
| 29 | prepositions per nominal subject | Noun phrase complexity |
| 30 | possessives per nominal subject | Noun phrase complexity |
| 31 | verbal modifiers per nominal subject | Noun phrase complexity |
| 32 | nouns as a nominal subject dependent per nominal subject | Noun phrase complexity |
| 33 | relative clause modifiers per nominal subject | Noun phrase complexity |
| 34 | (non-clausal) adverbial modifiers per nominal subject | Noun phrase complexity |
| 35 | conjunction "and" as a dependent per nominal subject | Noun phrase complexity |
| 36 | conjunction "or" as a dependent per nominal subject | Noun phrase complexity |
| 37 | determiners per direct object | Noun phrase complexity |
| 38 | adjectival modifiers per direct object | Noun phrase complexity |
| 39 | prepositions per direct object | Noun phrase complexity |
| 40 | possessives per direct object | Noun phrase complexity |
| 41 | verbal modifiers per direct object | Noun phrase complexity |
| 42 | nouns as a direct object dependent per direct object | Noun phrase complexity |

| No. | Phrasal complexity measures | Index types |
|---|---|---|
| 43 | relative clause modifiers per direct object | Noun phrase complexity |
| 44 | (non-clausal) adverbial modifiers per direct object | Noun phrase complexity |
| 45 | conjunction "and" as a dependent per direct object | Noun phrase complexity |
| 46 | conjunction "or" as a dependent per direct object | Noun phrase complexity |
| 47 | determiners per object of the preposition | Noun phrase complexity |
| 48 | adjectival modifiers per object of the preposition | Noun phrase complexity |
| 49 | prepositions per object of the preposition | Noun phrase complexity |
| 50 | possessives per object of the preposition | Noun phrase complexity |
| 51 | verbal modifiers per object of the preposition | Noun phrase complexity |
| 52 | nouns as an object of the preposition dependent per object of the preposition | Noun phrase complexity |
| 53 | relative clause modifiers per object of the preposition | Noun phrase complexity |
| 54 | (non-clausal) adverbial modifiers per object of the preposition | Noun phrase complexity |
| 55 | conjunction "and" as a dependent per object of the preposition | Noun phrase complexity |
| 56 | conjunction "or" as a dependent per object of the preposition | Noun phrase complexity |
| 57 | determiners per indirect object | Noun phrase complexity |
| 58 | adjectival modifiers per indirect object | Noun phrase complexity |
| 59 | prepositions per indirect object | Noun phrase complexity |
| 60 | possessives per indirect object | Noun phrase complexity |
| 61 | verbal modifiers per indirect object | Noun phrase complexity |
| 62 | nouns as an indirect object dependent per indirect object | Noun phrase complexity |
| 63 | relative clause modifiers per indirect object | Noun phrase complexity |
| 64 | (non-clausal) adverbial modifiers per indirect object | Noun phrase complexity |
| 65 | conjunction "and" as a dependent per indirect object | Noun phrase complexity |
| 66 | conjunction "or" as a dependent per indirect object | Noun phrase complexity |

**Appendix C**
**Description of phrasal complexity measures in TAASSC (Kyle, 2016)**

| Phrase types | Description |
|---|---|
| Nominal subject | A subject of a (nonpassive) clause that is a noun phrase |
| Passive nominal subject | A noun phrase that serves as the syntactic subject of a passive clause |
| Agent | The conceptual subject in a passive clause, which is introduced by the word "by" |
| Nominal complement | A noun or noun phrase that functions as a complement in a copular clause |
| Direct object | A predicative noun phrase that is the recipient of the action of a transitive verb |
| Indirect object | A noun phrase that functions as the dative object of the verb |
| Prepositional object | A noun or noun phrase that functions as the object of a prepositional phrase |
| **Dependent types** | |
| Determiners | Articles, demonstratives, and quantifiers |
| Adjective modifiers | An adjective that modifies a noun or noun phrase |
| Prepositional phrases | A prepositional phrase that modifies a noun or noun phrase |
| Possessives | A possessive pronoun or noun with a possessive "s" that modifies a noun or noun phrase |
| Verbal modifiers | A nonfinite verb or verb phrase that modifies a noun or noun phrase |
| Nouns as modifiers | A noun that modifiers a noun or noun phrase |
| Relative clause modifiers | A relative clause is a clause that modifies a noun or noun phrase, and is often (but not always) marked by a "wh" word |
| Adverbial modifiers | An adverb that modifies a noun or noun phrase |
| Conjunction "and" | The conjunction "and" when used to join two nouns or noun phrases |
| Conjunction "or" | The conjunction "or" when used to join two nouns or noun phrases |