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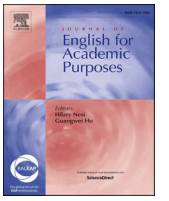

Effects of explicit instruction on noun phrase production in L2 undergraduate writing

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1. Introduction

The main goal of any second language (L2) composition course is to assist writers in developing the knowledge and skills necessary for effective written communication for academic purposes. From a linguistic perspective, this development is usually supported and assessed in terms of accuracy, fluency, and complexity (Wolfe-Quintero, Inagaki, & Kim, 1998). While writing curricula tend to focus on the first two components more often, complexity - and specifically syntactic complexity - may be often overlooked in writing instruction and pedagogy-oriented research. For example, an examination of the conference programs from five TESOL conventions (2015–2019) revealed that only five presentations focused on complexity in academic writing, with only two explicitly mentioning grammatical or syntactic complexity. This number is rather low considering that TESOL conventions feature more than a thousand presentations each year. At the same time, the focus on syntactic complexity can be reasonably expected at pedagogy-oriented conferences since this construct has recently been challenged and reconsidered in research (Biber, Gray, & Poonpon, 2011).

Traditionally, syntactic complexity has been operationalized in terms of large-grained measures (see reviews and meta-analyses by Lan, Liu, & Staples, 2019; Ortega, 2003; Wolfe-Quintero et al., 1998). This approach includes measures of average length of T-units (i.e., the main clause with attached dependent clauses), clauses, and sentences as well as the ratio of these units to one another and to other structures (e.g., coordination) (Hunt, 1965; as cited in Lan, Liu, & Staples, 2019). More recently, however, large-grained

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measures have received criticism, and instead, a different conceptualization has been proposed. Biber et al. (2011) argued that large-grained measures confound multiple grammatical features that have specific functional and distributional patterns in academic discourse. As a result, these measures fail to capture specific features that contribute to the length of certain units. Another limitation of large-grained measures is that they often reflect complexity in terms of dependent clause embedding, which is in fact common for spoken registers rather than academic prose (Biber et al., 2011). The latter, however, was found to rely more on complex noun phrases, which allow writers to compress information and produce concise discourse with dense meaning (see detailed discussion of limitations as well as distinction between spoken registers and academic prose in terms of clausal and phrasal complexity in Biber et al., 2011, and Biber, Gray, Staples, & Egbert, 2020). Therefore, relying on findings of previous large-scale corpus research on occurrence and co-occurrence of grammatical features in various registers (e.g., studies based on Biber's, 1988, multidimensional analysis; Biber, Johansson, Leech, Conrad, & Finegan, 1999), Biber et al. (2011) have proposed to consider normed frequencies of noun phrase features as a measure of syntactic complexity development in academic writing. This group of researchers also hypothesized that writers progress through specific developmental stages with a shift from reliance on dependent clause constituents to greater use of noun phrase modification.

The importance of noun phrases for academic writing development was confirmed in multiple descriptive studies that tested Biber et al.'s (2011) framework directly (Biber, Reppen, Staples, & Egbert, 2020; Lan & Sun, 2019; Lan, Lucas, & Sun, 2019; Parkinson & Musgrave, 2014; Staples, Egbert, Biber, & Gray, 2016) or followed other conceptualizations of syntactic complexity (e.g., Casal & Lee, 2019; Kyle & Crossley, 2018; Lu, 2011). As a result, many of these studies recommend that noun phrases be explicitly taught in L2 writing classrooms as a means of supporting students' syntactic complexity development. It is unclear, however, whether such teaching may indeed lead to more register-appropriate use of noun phrases, which would reflect conventions of academic writing register. The purpose of this study is to empirically test the validity of the recommendations to integrate noun phrase teaching into L2 writing curricula by investigating the effects of such instruction. Since most L2 writers' experience with academic writing within an ESL setting begins with a first-year writing (FYW) course, this study focuses on this student population and compares noun phrase use in their diagnostic and final writing. FYW courses may be properly positioned for noun phrase instruction since the goal of such courses is to prepare students for writing at the university level. Considering that university writers were found to use compressed noun phrase features more frequently as they progress through educational levels (e.g., Biber, Reppen, et al., 2020; Staples et al., 2016), it may be useful to raise students' awareness of complex noun phrases during introductory writing courses in order to assist them in developing syntactic complexity in writing.

2. Literature review

2.1. Role of phrasal features in syntactic complexity development

Biber et al. (2011) hypothesized stages of syntactic complexity development, which move from finite dependent clauses to non-finite clauses and then to phrases (in terms of grammatical structures) and from clause constituents to noun phrase modifiers (in terms of syntactic functions). This progression towards reliance on phrasal features as noun modifiers, or "compressed noun phrases", was confirmed by descriptive studies comparing writing at different academic levels. For example, in a cross-sectional study, Staples et al. (2016) examined writing by students who used English as their first language (L1) at four levels (first-, second-, final-undergraduate, and graduate) and found that students used compressed noun phrase features (e.g., attributive adjectives, nouns as premodifiers) more frequently and relied less on dependent clause features (e.g., verb + *that*-clauses, finite adverbial clauses) as their academic level increased. The use of these features was also mediated by discipline (e.g., humanities writing relied on clausal features to a greater extent than social or life sciences) and genre. Similar results were found in a longitudinal study by Biber, Reppen, et al. (2020), who examined writing by 22 L2 English students at two points of time with a two-year interval. They focused on two dependent clause features (i.e., adverbial clauses and relative clauses) and two phrasal noun modifiers (i.e., attributive adjectives and nouns as premodifiers) and found that the use of clausal features declined or remained unchanged while the use of phrasal features, especially nouns as premodifiers, increased. These findings confirm the hypothesized progression of students' moving from reliance on dependent clauses to phrasal features as noun modifiers.

While not testing the framework directly, other longitudinal studies on student writing revealed that a shift to greater use of noun phrase features may happen even within a short period of time. Bulté and Housen (2014) found an increase in the length of noun phrases when examining development that occurred over a semester-long EAP course. Even within one month, Mazgutova and Kormos (2015) found that the mean length of T-units and clausal embedding decreased, and the frequency of phrasal features increased in both lower and higher-level proficiency groups. The changes prompted by this short EAP course happened without any explicit instruction on syntactic features. Crossley and McNamara (2014) also identified that by the end of a semester-long EAP course, students used more modifiers in a noun phrase, more words before the main verb (both measures of phrasal complexity), and fewer clauses. These studies have demonstrated that an increase in noun phrase features was a part of linguistic development prompted by a month- or semester-long EAP course, even if no explicit instruction had been provided on these features.

The importance of noun phrases for complexity development was also confirmed by research examining the association between syntactic complexity features and writing quality or proficiency. A greater reliance on noun phrase modifiers was found to distinguish higher-rated writing present in placement tests for undergraduate international students in the U.S. (Taguchi, Crawford, & Wetzel, 2013) and source-based research essays in the FYW context (Casal & Lee, 2019). A complementary line of research that focuses on building statistical models that predict essay scores also found that select noun phrase features explained variation in higher- and lower-scoring essays in TOEFL iBT (Kyle & Crossley, 2018), undergraduate argumentative essays for a national contest (Xu, 2019), and

argumentative essays written for graduate matriculation in Thailand (Thongyoi & Poonpon, 2020). Only a few studies did not find an association between the greater reliance on noun phrase modifiers and scores, including the research on TOEFL iBT writing by Biber, Gray, and Staples (2014). This finding was explained by the nature of scoring rubrics that placed little emphasis on linguistic feature use. Overall, however, the majority of research investigating syntactic complexity in relation to writing quality and proficiency identified the important role of noun phrase features.

2.2. Noun phrases and the hypothesized development

Considering the established importance of noun phrases in academic writing development, several studies focused specifically on the subset of noun phrase modifiers from Biber et al.'s (2011) framework to test the proposed progression. Table 1 presents this framework that includes elements of noun phrase pre- and postmodification together with the developmental stages of syntactic complexity with which each modifier is associated.

The studies that tested this progression at the noun phrase level generally confirmed the hypothesized development. Examining this sequence in writing by international EAP and MA TESOL students, Parkinson and Musgrave (2014) found that EAP students relied more on attributive adjectives and less on other phrasal modifiers (e.g., nouns, prepositional phrases, appositives) in comparison to MA TESOL students. Since attributive adjectives correspond to Stage 2 of the developmental framework and other features to more advanced stages, this study confirmed the proposed developmental progression. Also, argumentative essays in FYW courses were found to contain noun phrases with more advanced modification if they were written by more proficient writers, as evidenced by student TOEFL scores (Lan & Sun, 2019; Lan, Lucas, & Sun, 2019). Given that the developmental progression proposed by Biber et al. (2011) received some validation in previous research, it is also adopted in the current study.

2.3. Pedagogy-oriented research on syntactic complexity development

Having determined the importance of noun phrase structures for writers' complexity development, multiple descriptive studies have pointed out in their pedagogical implications that teaching complex noun phrases should be introduced in L2 academic writing courses. For example, Lu (2011), who identified complex nominals per clause as a measure distinguishing writing at two adjacent undergraduate academic levels, suggested that "instructors may wish to help students improve the ability to engage complexity at the phrasal level as they progress to advanced proficiency levels" (p. 59). Larsson and Kaatari (2020), who found that select noun phrase features distinguished learner and expert writing, noted that "it would seem important for novice writers wishing to start an academic career to be made aware of these more or less explicit standards and expectations" (p. 10). While similar recommendations were provided by many other researchers (Casal & Lee, 2019; Lan & Sun, 2019; Lan, Liu, & Staples, 2019; Mazgutova & Kormos, 2015), it is unclear whether such explicit instruction has indeed become a common focus of L2 writing curricula (as evidenced by the survey of TESOL conference presentations). Only one recent qualitative study by Casal and Lu (2021) reported incorporating instruction on complex noun phrases - among other syntactic complexity features - in an L2 graduate EAP course. Apart from this study and Musgrave and Parkinson's (2014) pedagogy-oriented article, there seems to be little guidance for teachers on incorporating noun phrase instruction into writing classrooms.

At the same time, the effects of complex noun phrase instruction have not been empirically tested. Considering that composition teachers already need to cover multiple writing-related topics and that the development of noun phrase use occurs without explicit instruction (e.g., Bulté & Housen, 2014; Crossley & McNamara, 2014; Mazgutova & Kormos, 2015; Parkinson & Musgrave, 2014), it is crucial to understand whether providing such instruction is efficient or necessary. Casal and Lu (2021), who examined L2 graduate students' perspectives on engaging in complexity-focused activities, found that participants positively evaluated such activities,

Table 1
Complex noun phrase components (Biber et al., 2011).

Stage	Modification type	Examples from this study
2	Attributive adjectives (including *-ed* and *-ing* participles)	positive attitude; published research; flourishing commerce
3	*That* and *wh-* relative clauses	skills that can be utilized; news, which make them feel …
	Nouns as premodifiers	university life; host country
	Possessive nouns as premodifiers	students' publications; Brazilians' attitudes
	Of phrases as post-modifiers	process of research; authenticity of news
		a lot of time; a number of viewers
	• Quantifiers[a]	research by Gilbert; news on Facebook
	Prepositional phrases other than *of* as postmodifiers (concrete/locative meanings)	
4	Nonfinite relative clauses	papers based on their experiments; people working in the park
	Prepositional phrases other than *of* as postmodifiers (abstract meanings)	findings on the topic; judgment about news
5[b]	Preposition + nonfinite complement clause	importance of being a scholar; capability of making rational decisions
	That and *to* complement clauses controlled by nouns	opportunity to publish research; ability to make the right decision

[a] Not a part of the original framework.
[b] Stage 5 also included appositive noun phrases in the original framework.

reporting raised awareness of complexity features in academic writing. While these qualitative insights help us understand writers' perceptions of learning about complex noun phrases, it is unclear whether instruction may lead to quantitative changes of noun phrases in student writing. To address this gap, the present study investigates whether explicit noun phrase instruction embedded throughout a FYW course may lead to more register-appropriate production of these features in L2 writers' texts. In this study, "register-appropriate" use is operationalized as more frequent use of noun phrases in general, of modifiers associated with more advanced stages of Biber et al.'s (2011) developmental framework, and of compressed noun phrase features. This operationalization was based on findings from the previously discussed research on complexity development in academic writing (e.g., Bulté & Housen, 2014; Crossley & McNamara, 2014; Lan & Sun, 2019; Lan, Lucas, & Sun, 2019; Mazgutova & Kormos, 2015; Parkinson & Musgrave, 2014; Staples et al., 2016; Biber, Reppen, et al., 2020). While the functional aspect is clearly an important component of "register-appropriate" production, this dimension, which requires detailed qualitative analysis, is out of scope of this study and needs to be addressed in future research.

Register-appropriate use is examined in writing by students who received instruction on complex noun phrase features, and specifically in their diagnostic and final in-class essays. These essays were the first and last writing in the course and could thus provide insights into the instruction effects. To have a relative point of comparison, writing by a different group that received no noun phrase instruction is also examined. The described data are used to address the following research question: Does explicit instruction on complex noun phrases in an undergraduate L2 writing course lead to more register-appropriate use of these features?

3. Methodology

3.1. Research design

It is important to establish that this study did not adopt a true experimental design with an experimental and control group from the same student population. Instead, the main focus of this study was on the group that received explicit instruction on complex noun phrases, and specifically the comparison between this group's diagnostic and final writing. However, since previous research has demonstrated that the shift towards more register-appropriate use of noun phrases happens even without targeted instruction (as discussed in Literature Review), it was necessary to include a group that followed a curriculum not focusing on noun phrases and observe the degree of development occurring within this group. This group was included only as a relative benchmark: the participants, while being enrolled in a FYW course, were from a different university and had slightly different demographic background characteristics (see Section 3.2 for more details). The two groups were therefore not directly compared statistically.

3.2. Participants

The total of 60 undergraduate multilingual students enrolled in L2 FYW courses in the U.S. produced essays analyzed in this research. 30 participants comprised the group that received instruction on noun phrases as a part of a FYW curriculum at a large suburban university in the Mid-Atlantic region of the U.S. This group will be referred to as the Noun Phrase Instruction (NP-I) group. Minimum requirements for course enrollment included scoring 80 on TOEFL iBT with a minimum of 18 in each subsection. L1s of the participants included a variety of languages, including Arabic (13), Chinese (7), Vietnamese (2) as well as Bulgarian, Dutch, Finnish, Korean, Malayalam, Portuguese, Spanish, and Turkish (1 each). The second group, which will be called the Regular Instruction (Reg-I) group comprised 30 students enrolled in the first of the two courses in the sequence of FYW for multilingual and international students at a large rural university in the U.S. Midwest. Students were placed into this course if they scored a minimum of 68 on TOEFL iBT with the writing subsection score between 17 and 24. The students' L1s included Chinese (25) and Arabic (5). As can be seen, the Reg-I group had lower minimum TOEFL score requirements[1] and less varied L1s (mostly Chinese). Considering the impact of TOEFL scores on noun phrase feature use identified in previous research (e.g., Lan & Sun, 2019; Lan, Lucas, & Sun, 2019) and the specific nature of noun phrase structures in different languages (e.g., in Chinese, nouns can only take premodification, as mentioned in Ruan, 2018; or in Spanish, nouns cannot modify nouns, as was relevant in Parkinson, 2015), these variables should be considered when interpreting the results. To prevent the introduction of construct-irrelevant variance due to these variables, the two groups were not directly compared in the same statistical model. The focus was on the change within each group rather than the comparison between the groups.

Each group consisted of students who were taught by two instructors. In the NP-I group, 19 students were enrolled in courses taught by the researcher and 11 students in a course taught by a different instructor. In the Reg-I group, 14 students were taught by the researcher, and 16 students were instructed by a different teacher. At each institution, the researcher and the other instructor followed the pre-determined curricula (which are described in the next section); thus, students received similar instruction within one institution, although they took classes with different instructors.

3.3. Instruction

Both groups followed standardized curricula within their corresponding institutions. In general, apart from the focus on noun

[1] While there were differences in minimum enrollment scores, exact TOEFL scores for each student were not available at the time of data collection. Therefore, it cannot be assumed that one group was more proficient in writing than the other.

phrases within one institution, the curricula were similar since they were designed to develop students' rhetorical, process, and linguistic knowledge and skills. Major assignments in both groups went through revisions over three drafts based on peer and instructor comments. These assignments included two analytical summaries and a synthesis paper for the NP-I group, and a summary, summary-response, and argumentative source-based essay for the Reg-I group. The main difference in the instruction was that students from the NP-I group engaged in learning about complex noun phrases and applying this knowledge throughout the semester (the detailed description of this instruction is presented below).[2] While the Reg-I group received instruction on various grammatical features, the teaching of complex noun phrases was not integrated into the curriculum.

The noun phrase-related activities and assignments that the NP-I group completed throughout the semester are listed in Appendix A (other routine writing-related topics covered in the curriculum are not included in the appendix table). First, students were introduced to the notion of syntactic complexity and the role of noun phrases in syntactically complex writing. Students learned the grammatical structure of noun phrases represented by four slots (i.e., determiner, pre-modification, head noun, and post-modification) along with the grammatical features that can take each slot. It is important to emphasize that these features were not presented in relation to stages in Biber et al. (2011). This was done to prevent potential misinterpretation of the framework (e.g., students choosing to use Stage 5 modifiers only). Instead, students were simply introduced to the range of features that could be used as pre- or postmodifiers. After completing multiple controlled exercises aimed at practicing noun phrase component identification, students engaged in noticing noun phrases in course texts. These texts included published peer-reviewed research articles provided by instructors and were used as a basis for writing two analytical summaries, major course assignments. A part of the analytical summary assignment was the analysis of several noun phrases that referred to the main concepts of the article: Students had to determine what meaning was packaged into noun phrases and how this meaning helps writers add new information to or specify the main concept. After noticing and analyzing noun phrases in published texts, students proceeded to noticing use or lack of use of noun phrases in their own writing and transforming clauses into noun phrases where it was functionally appropriate. While students were encouraged to use noun phrases in their writing, they were not directly evaluated on the frequency of this feature use to avoid the perception that the quantity of noun phrases alone makes academic writing more effective. Focus on complex noun phrases was sustained throughout the course through activities, major assignments, and instructor feedback. As much as 250 minutes of class time during the 15-week semester were devoted to various activities related to noun phrase use in addition to homework tasks.

3.4. Essays

In order to determine the effect of explicit noun phrase instruction on the production of these features, this study examined diagnostic and final writing within the context of L2 FYW. These two types of texts were chosen because they were the first and the last writing that students produced in a course. A total of 120 timed in-class source-based essays were examined: 60 by the NP-I group and 60 by the Reg-I group. Within each group, half of the essays were diagnostic writing, and the other half were final writing that was produced by the same writers within an interval of 15 weeks. The information about the essays can be found in Table 2.

While data were collected from two institutions, the requirements for the diagnostic and final writing were similar. Both types of writing represent the register of timed in-class source-based writing. The diagnostic test required students to read a short excerpt and then respond to an open-ended question based on the source information. The same format was used for the final in-class writing, but this time students had to incorporate evidence from two provided sources and demonstrate the skills acquired in the course. The texts were written in response to three sets of prompts: one set of diagnostic and final writing for the NP-I group and two sets of prompts for the Reg-I group (see Appendix B). While having one set of prompts in each group would be methodologically preferred, it was not possible in the case of the Reg-I group due to low enrollments in L2 FYW courses at that university, which used new sets of prompts every semester. However, the statistical comparison (i.e., independent samples *t*-test) of the essays written on two prompts revealed no significant differences in the use of most target features, which suggested that little additional variance was introduced due to the prompt differences within the Reg-I group. In the course taken by the NP-I group, on the other hand, the same set of prompts was used over multiple semesters, which allowed for more consistent data collection.

3.5. Feature identification and analysis

To identify whether explicit instruction on complex noun phrases led to more register-appropriate use of these features, the developmental framework by Biber et al. (2011) was followed. Specifically, I focused on the subset of noun phrase features from Table 1 to identify frequencies of specific noun phrase modifiers. The framework, however, only partially accounted for instances when a head noun had more than one modifier; therefore, as will be discussed below, I introduce an additional classification to determine the frequency of complete noun phrases and their structural types. In sum, this study examined the frequency of specific noun phrase modifiers associated with a particular developmental stage as well as complete complex noun phrases. This analysis was conducted twice to also determine prompt effects.

3.5.1. Noun phrase modifiers

As Table 1 demonstrates, several changes were made to Biber et al.'s (2011) framework in this study. First, in the original

[2] The NP-I curriculum discussed in this study was created by George Mason University Composition and INTO Mason curriculum development team.

Table 2
Description of the essays used in the study.

	NP-I group		Reg-I group	
	Diagnostic writing	Final writing	Diagnostic writing	Final writing
Number of texts	30	30	30	30
Number of words	7332	7623	5461	6639
Ave. length	244 (*SD* = 69)	254 (*SD* = 67)	182 (*SD* = 55)	221 (*SD* = 34)
Range	104–403	126–434	91–302	163–334

Note: Ave. length = average essay length; *SD* = standard deviation; Range = minimum-maximum values.

framework, quantifiers containing *of* were a part the *of*-phrase category. However, considering their distinct grammatical function and the fact that they may be frequent in L2 writing (Bychkovska & Lee, 2017), quantifiers were separated into their own category in the present study. It is worth noting that if a quantifier was additionally modified, it was treated as a regular noun phrase. For example, *a number of* was classified as a quantifier, but *a considerable number of* was not considered a quantifier due to the additional modification. The second modification to the framework was the exclusion of appositive noun phrases, which belong to Stage 5 in the original classification. This feature was excluded because its use in the current study was institutional context dependent. Appositives were mostly used by the Reg-I group to introduce experts from the provided texts (in most cases verbatim), which was a course requirement for the Reg-I group, but not for the NP-I group. Therefore, inclusion of the appositive category would not accurately reflect student development. A total of 11 modification features were examined, and while instances of adverbs modifying attributive adjectives appeared in the data, they were excluded from the analysis since these features was not in Biber et al.'s (2011) framework, which this study focused on.

Before identifying the target features in the essays, these texts were manually pre-processed by removing headers, titles, references, and parenthetical elements of in-text citations (i.e., a year in integrated citations; both the author and year in non-integrated citations). Direct quotations were also removed from texts to ensure the focus on the language produced by student writers. In the cases when students used phrases from the provided text(s) but did not place quotation marks to identify citation boundaries, "direct quotations" were operationalized as text strings of five or more words identical to the provided source text. Also, instances with non-standard spelling (e.g., *back ground* or *team work*) were changed into standardized forms (i.e., *background* or *teamwork*) to ensure consistency. Consistency was also ensured through: removing first names if writing contained both a first and last name of a person (e.g., *Michael Jackson* was changed into *Jackson*); reducing names of institutions into an abbreviated form (e.g., *Ohio State University* was changed into *OSU*); and changing *the United States of America* into *the USA*.

After the pre-processing stage, the texts were tagged for part of speech using the Biber Tagger software (Biber, 1988), and AntConc (Anthony, 2019) was used to retrieve target features from Table 1. The retrieval was done through searching for a specific tag (for attributive adjectives, relative clauses, nonfinite relative clauses, and complement clauses) or regular expressions (for nouns and possessive nouns as premodifiers, prepositional phrases, and preposition + nonfinite complement clauses). Ungrammatical instances (e.g., *people on Sydney* instead of *people of/in Sydney*) were included in the analysis as long as the meaning was interpretable.

Since the modifiers were retrieved automatically, precision and recall are reported. 100% precision was ensured by manually checking concordance lines with automatically identified items and removing incorrectly identified features. For recall, a manual analysis of 10% of the texts revealed a 100% accuracy for most features with 93% for attributive adjectives and 95% for nouns as premodifiers; due to this high percentage, no further manual tag fixing was conducted. One feature, prepositional phrases other than *of,* required further manual coding: each instance was checked to ensure that it was indeed a noun postmodifier (e.g., ***Students*** *in particular majors need to* …) rather than an adverbial (e.g., *They* ***built*** *a stadium in a small town*). 10% of the instances were coded by a second rater, and after two rounds of coding and discussion, inter-rater reliability was over 90%.

Finally, according to the framework in Table 1, prepositional phrases as postmodifiers may have 'concrete/locative' or 'abstract' meaning. For this classification, the framework by Biber and Gray (2016, p. 193) was followed. 'Concrete/locative' meaning referred to several sub-categories: location inside a body part (e.g., *pain in his knee*), location inside/on the surface of an object or substance (e.g., *the oil in the thermometer*), geographic location (e.g., *our apothecaries in England*), and textual location (e.g., *his judgment and candor in his writings*). In the current study, given the prompt topics, two additional categories were added: online location (e.g., *fake news on Facebook*) and reference to human beings (e.g., *news about Clinton*). Other prepositional phrases were classified as 'abstract'.

3.5.2. Complete complex noun phrases

While conducting the analysis, it became apparent that several patterns that emerged in the data were not addressed in Biber et al.'s (2011) proposal. The original framework did not specify how to treat some of the instances when a noun phrase contains more than one modifier. The framework did account for two types of complex modification (i.e., "More phrasal embedding in the noun phrase: attributive adjective, nouns as premodifiers" at Stage 4 and "Extensive phrasal embedding in the NP: multiple prepositional phrases as postmodifiers, with levels of embedding" at Stage 5), but it was unclear how to treat instances when, for example, a head noun had both pre- and postmodification.

Therefore, in addition to counting the frequency of each modifier, this study also separately identified the frequency of complete complex noun phrases. This separate focus is necessary since it takes into account the complete structure of a complex noun phrase, which may contain more than one modifier. A complex noun phrase, thus, may belong to one of the eight possible structural types (see Table 3). Simple pre- or postmodification refers to structures containing a noun head with only one modifier, while complex pre- or

postmodification has two or more modifiers. The eight structural types were manually identified in this study by examining concordance lines of each individual modification and matching them with other modifiers for the same noun phrase.

3.5.3. Effects of prompts on complexity features

Another important aspect that stood out during the analysis of the participants' texts was the repetition of noun phrases from the prompts. This repetition was expected because prompt noun phrases were the key terms in the essays. Considering that the prompts for the diagnostic and final writing were slightly different within both groups, it was important to identify whether prompts had an effect on the observed differences.

To determine whether the prompt language had an effect on the noun phrase use, a second set of analysis was conducted. While the first analysis included all complex noun phrases, the second analysis excluded exact noun phrases from the prompt if they were used in the texts (see Appendix C for the list of noun phrases excluded from the second analysis). An example of the exact complex noun phrase is *undergraduate student(s)* from the prompt "Is it important for undergraduate students to view themselves as scholars? Why or why not?" Another example is *major international sporting event(s)* and *World Cup* from the prompt " …, what factors do you think a country needs to consider before deciding to host major international sporting events (e.g., World Cup, the Olympics)?" A noun phrase *the Olympic Games*, while not being the exact phrase from the prompt, was also excluded in the second analysis because it was a full version of *the Olympics*. The other exception was a phrase *Sydney Olympics in* 2000 that corresponds to the exact prompt phrase *2000 Sydney Olympics*. In the cases where an exact phrase from the prompt was additionally modified, the original noun phrase was treated as one unit (e.g., the phrase *wonderful major international sporting events* was analyzed as having only one premodification *wonderful*, and *major international sporting events* was considered a head of a noun phrase).

While it is clear that effects of prompts extend beyond the use of exact prompt language, as evidenced by previous research (Hinkel, 2002; Lan, Lucas, & Sun, 2019; Yang, Lu, & Weigle, 2015; Yoon, 2017), and the relation between a prompt and syntactic complexity is considerably more complex, the approach taken in this study is an attempt to minimize that effect and not completely eliminate it.

3.6. Statistical analysis

Frequencies of noun modification types and complex noun phrase structures in each text (rather than the whole corpus) were first normed per 1,000 words (ptw) to account for variation in text length and allow for dispersion identification. Most of the features followed a normal distribution, and since parametric and non-parametric tests run on all features produced identical results, the decision was made to present the results of the parametric tests to ensure consistency. A series of paired samples *t*-tests was conducted to compare noun phrase features in diagnostic and final writing for every student within the NP-I group and separately within the Reg-I group. Considering that multiple comparisons were performed for each analysis type (i.e., 12 for noun phrase modifiers and nine for noun phrase structures), Bonferroni correction was employed to control for Type I error. The alpha level was adjusted to .004 (.05/12) for modification types and to .006 (.05/9) for complex noun phrase structures. The same analysis was repeated after the exact noun phrases from the prompt were excluded to determine whether the effect of instruction would change with prompt effects minimized. Effect sizes, Cohen's *d* values, were examined to identify the magnitude of the difference in the noun phrase use between the diagnostic and final writing. Following Cohen's (1988) guidelines, *d* values were interpreted as small for ~.20, medium for ~.50, and large for ~.80. While both statistical significance and effect sizes were used to identify meaningful differences, ultimately, more focus was placed on *d* values since they 1) indicate the extent of change rather than if the change occurred, 2) are independent from sample size, which was relatively small in this study, and 3) can be used to make comparisons between different populations. Thus, use of standardized effect sizes allowed for the comparisons between the NP-I and Reg-I group despite their not being included in one statistical model.

4. Results

4.1. Effect of instruction on noun phrase modification

To determine the effects of explicit instruction on complex noun phrase production, I first examined frequencies of modifiers associated with specific developmental stages from Biber et al.'s (2011) framework. Table 4 demonstrates the descriptive statistics and results of paired samples *t*-tests that compared frequencies of noun phrase modifiers in diagnostic and final writing by the group that

Table 3
Complex noun phrase structures.

Noun phrase structure	Examples from this study
Simple premodification	positive impacts; Olympic days
Simple postmodification	benefit of research; views that are different from …
Complex premodification	intellectual and emotional energy; abysmal living conditions
Complex postmodification	process of publication of research articles; tendency to believe people, which is called …
Simple premodification and simple postmodification	ultimate opportunity to grow; firm belief that the Olympics can bring …
Complex premodification and simple postmodification	potential negative effects of encouraging …; growing public collection of local artifacts
Simple premodification and complex postmodification	possible assumptions by potential readers of journals; high cost of construction of facilities
Complex premodification and complex postmodification	indoor and outdoor area for different kinds of sports

received explicit instruction. As can be seen, the average frequency of almost all modifiers increased from diagnostic to final writing. The only modification type that was used less frequently is quantifiers, which may in fact indicate writer development since this change was mostly caused by a decrease in the colloquial phrase *a lot of*. In addition to the increase in the average frequency of most modifiers, statistically significant differences were found in the total use of modifiers and nouns as premodifiers.

The magnitude of difference between the NP-I group's diagnostic and final writing was medium to large for most modifiers. The highest effect size was identified for the difference in use of all modifiers combined (large), followed by nouns as premodifiers (medium to large) and by the features associated with more advanced stages of syntactic complexity development (i.e., prepositional phrases having abstract meanings and noun complement clauses) with medium effect sizes. These modifiers correspond to Stages 3, 4, and 5 of the developmental framework by Biber et al. (2011). The identified changes are illustrated in the following example from the same student's diagnostic and final writing (only the first three sentences from texts were included; modifiers are underlined):

Diagnostic writing: I think it is important for undergraduate students to view themselves as scholars. For example the article says: [quotation]. And I think feeling fake is not good for your self-trust and it may give a result in your grades and it can make you think that you don't belong here. However, you do belong here because you graduated high school, so students just have to think like that. (NP–I_F1906_pre).

Final writing: I think undergraduate students should publish research. According to Jungck, undergraduate students' lives are changing in a positive way, because the experience could be a dream coming true and the students may also have an opportunity to be a contributor to the creation of scientific knowledge. Although there is a chance that undergraduate journals might not have significant benefit to science, the publication of the article would also put pressure on the faculty members. (NP–I_F1906_post).

In this example, the frequency of modifiers noticeably increased, and features from later stages of complexity development were used (e.g., a nonfinite relative clause, two complement clauses, two prepositional phrases with abstract meaning).

It is also important to highlight that with the exception of noun complement clauses, all features that underwent change with small-to-medium or medium-to-large effect sizes (i.e., previously mentioned nouns as premodifiers and prepositional phrases with abstract meaning as well as attributive adjectives, possessive nouns, prepositions with nonfinite complement clauses) are considered "compressed" noun phrase features according to Staples et al. (2016).

In contrast to the NP-I group, changes in the use of noun phrase modifiers in the Reg-I group were less consistent (see Table 5; note that the groups were not directly compared statistically because they originated in different populations). There was a large effect size associated with the overall increase of total modifiers in the NP-I group in comparison to small in the Reg-I group. Average frequencies of some features in the Reg-I group increased (i.e., attributive adjectives, relative clauses, nonfinite relative clauses, prepositional phrases with abstract meaning, prepositions with nonfinite complement clauses, and noun complement clauses), while others decreased (e.g., nouns as premodifiers, possessive nouns, quantifiers, and prepositional phrases with concrete meaning) or remained the same (i.e., *of* phrases). No significant differences were found between Reg-I group's diagnostic and final writing, and effect sizes ranged from medium to small. Effect sizes for attributive adjectives and prepositional phrases (concrete meaning) were medium; for possessive nouns and nonfinite relative clauses between medium and small; for all other features small. Some of these trends, and specifically the increase in attributive adjectives and decrease in possessive nouns, are illustrated in the following example from the same student's diagnostic and final writing:

Diagnostic writing: According to Jennings, it states if or not a fake information will influence people, and how to handle with fake news in general. In this article, some sociologist think that people only open the article they interest in, so a fake information will not change a person's mind to many. I disagree with that, because I am easy to believe and change my mind from other people's views no matter the information is right or wrong. (Reg-I_F17549_pre).

Final writing: Nowadays, even though people actually know what are some differences between fake news and real news, people still believe fake news. According to article, motivated reasoning and naive realism are two constructs in psychological way. Firstly, motivated reasoning means that people are willing to believe what they already thought, and this belief is subjective wishes. (Reg-

Table 4
Noun phrase modification frequencies in diagnostic and final writing in the NP-I group.

Noun Phrase Modification	NP-I Group					
	Diagnostic ptw (*SD*)	Final ptw (*SD*)	p	95% CI Lower	Upper	*d*
Attributive adjectives	35.11 (11.57)	42.81 (20.08)	.051	-.05	15.45	.37
Relative clauses	7.76 (4.55)	9.15 (8.52)	.413	-2.04	4.83	.15
Nouns as premodifiers	6.72 (6.61)	13.88 (10.35)	.002*	2.98	11.34	.64
Possessive nouns	.41 (1.73)	1.76 (2.98)	.046	.03	2.68	.38
Of phrases	10.33 (7.05)	12.10 (7.64)	.300	-1.66	5.20	.19
Quantifiers	2.39 (5.63)	1.84 (3.19)	.535	-2.37	1.26	-.12
Prep. phrases (concrete)	1.40 (3.05)	2.51 (4.00)	.210	-.66	2.90	.23
Nonfinite rel. clauses	.79 (1.93)	1.29 (2.74)	.460	-.87	1.87	.14
Prep. phrases (abstract)	6.39 (5.27)	10.90 (8.71)	.012	1.09	7.94	.49
Prep.+ nonfin. compl. clause	1.84 (3.65)	4.37 (5.66)	.054	-.30	4.36	.37
Noun compl. clauses	1.39 (2.29)	4.35 (4.91)	.006	.93	4.98	.55
All modifiers	74.53 (18.99)	104.96 (35.98)	.000*	16.24	42.82	.87

Note: *statistical significance with Bonferroni correction $p < .004$; CI = confidence interval of difference; d = Cohen's d; polarity for CIs and d were switched for ease of interpretation.

Table 5
Noun phrase modification frequencies in diagnostic and final writing in the Reg-I group.

Noun phrase modification	Reg-I group					
	Diagnostic ptw (*SD*)	Final ptw (*SD*)	*p*	95% CI Lower	Upper	*d*
Attributive adjectives	64.32 (23.55)	77.35 (25.28)	.024	1.81	24.24	.43
Relative clauses	8.07 (7.32)	10.34 (9.00)	.224	-1.47	6.01	.23
Nouns as premodifiers	16.06 (12.95)	14.38 (15.09)	.570	-7.64	4.29	-.11
Possessive nouns	5.12 (7.28)	2.30 (4.61)	.041	-5.52	-.12	-.39
Of phrases	14.39 (16.11)	14.49 (9.55)	.970	-5.44	5.64	.01
Quantifiers	3.00 (3.80)	1.66 (4.09)	.154	-3.21	.53	-.27
Prep. phrases (concrete)	6.01 (6.87)	2.84 (2.98)	.025	-5.94	-.42	-.43
Nonfinite rel. clauses	.31 (1.21)	1.09 (2.02)	.095	-.15	1.72	.32
Prep. phrases (abstract)	4.55 (6.44)	5.38 (5.99)	.596	-2.34	4.00	.10
Prep.+ nonfin. compl. clause	0.65 (1.78)	1.12 (2.24)	.340	-.52	1.46	.19
Noun compl. clauses	1.23 (2.98)	2.23 (4.99)	.217	-.62	2.63	.23
All modifiers	123.71 (42.58)	133.19 (32.87)	.234	-6.47	25.42	.22

Note: statistical significance with Bonferroni correction $p < .004$; CI = confidence interval of difference; d = Cohen's d; polarity for CIs and d were switched for ease of interpretation.

I_F17549_post).

Interesting developmental trends emerged when both groups were examined descriptively side-by-side. As Fig. 1 demonstrates, the NP-I and Reg-I group started with different frequencies of modifier use in their diagnostic writing and then followed different trajectories. It should also be noted that all comparisons revealed a high degree of variation among individual learners, as evidenced by large standard deviations. The differences were likely due to a combination of different factors (e.g., instruction type, but also different minimum TOEFL requirements for enrollment, L1 backgrounds, topics). In the Reg-I group, most change seemed to have occurred in the use of attributive adjectives associated with Stage 2 of syntactic complexity development, while the increase in modifier use in the NP-I group was more consistently spread throughout all stages. The most notable increase in NP-I can be seen on the right side of Fig. 1, for features associated with Stage 4 and Stage 5.

Another noteworthy trend is that while the groups' use of some features was considerably different in diagnostic writing, by the end of the composition course, in their final writing, the average frequency of most features associated with Stage 3 (i.e., nouns as premodifiers, possessives, prepositional phrases with concrete meaning) became similar. While the decrease in the use of these features in the Reg-I group may initially be seen as a lack of development, after a closer examination it may be argued that slightly less frequent use of possessive nouns and prepositional phrases with concrete meaning may in fact be evidence of development in academic writing. It is suggested that "academic discourse privileges impersonal language that moves away from naming or describing the actors" (Liardét, 2016, p.27). Thus, since possessive nouns typically refer to human beings and concrete prepositional meaning in this study was operationalized as a reference to locations or human subjects, the decrease in the use of possessive nouns and concrete prepositional phrases suggests a shift from naming actors to the discussion of abstract entities, which academic prose tends to rely on.

Taken together, these findings demonstrate that despite the shift towards more register-appropriate noun phrase use occurring in both groups, the group that received explicit instruction on complex noun phrases underwent more advanced development. First, writers in the NP-I group increased their use of all modifiers (except quantifiers), while the Reg-I group displayed less consistency. There was a large effect size associated with the overall increase of total modifiers in the NP-I group in comparison to small in the Reg-I group. In terms of premodifier use, the NP-I group had a significant increase in the frequency of nouns, associated with Stage 3 of

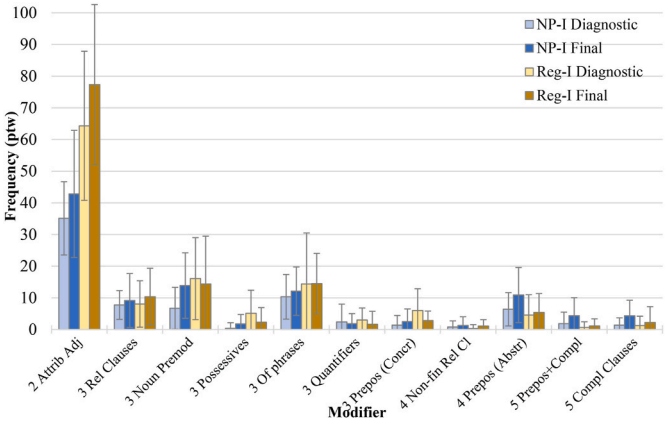

Fig. 1. Differences in the use of noun phrase modifiers by the NP-I group and Reg-I group.
Note: Error bars, included to demonstrate data dispersion, represent one standard deviation above and below the mean.

syntactic complexity development. The Reg-I group demonstrated a decrease in nouns as premodifiers, and instead, the highest increase occurred only at Stage 2 with attributive adjectives. Finally, in the NP-I group, the frequency of features significantly increased at Stage 4 and 5, while no such changes were observed in the Reg-I group. Thus, the findings suggest that explicit instruction on complex noun phrases led to more frequent use of modifiers related to more advanced stages of syntactic development.

4.1.1. Effect of instruction on noun phrase structure frequency

The second part of the analysis aimed to identify whether explicit noun phrase instruction leads to more frequent use of complete complex noun phrases. Table 6 demonstrates descriptive statistics and results of the paired samples *t*-tests for the differences in the noun phrase use between diagnostic and final writing in the NP-I group. It can be observed that just as noun phrase modifiers, all types of noun phrases were used more frequently in final writing. Significantly different were results for noun phrases that contained simple premodification and for the total frequency of noun phrases. Effect sizes were medium for four types of structures (i.e., simple premodification, simple postmodification, simple pre- and postmodification, and simple premodification with complex postmodification) and large for the total number of noun phrases. This demonstrates that in addition to using noun phrases with one modifier more frequently, the NP-I group started adding multiple modifiers before and after a head noun, thus packaging more meaning into noun phrases. It is important to acknowledge that despite medium effect sizes, some structures had quite low frequencies in the corpora (e.g., simple premodification with complex postmodification in Table 6); therefore, caution should be taken when interpreting the results.

In the Reg-I group, however, only half of the specific noun phrase structures were used more frequently in the final writing with no significant differences (Table 7). While the total frequency of noun phrases increased from diagnostic to final writing, this change had a medium effect size in comparison to the large effect size seen in the NP-I group.

Fig. 2 demonstrates that both groups mostly relied on noun phrases that contained only one modifier. Interestingly, however, the Reg-I group commonly used nouns with simple premodification, while the NP-I group relied both on simple premodification and on simple postmodification in a more balanced way. This greater reliance on premodification within the Reg-I group was observed for complex modification as well. The fourth most common category, noun phrases with simple pre- and simple postmodification, displays a trend observed previously with noun phrase modifiers: the groups' use of this type differed in the diagnostic writing but became similar by the end of the semester.

In summary, the results reveal that both groups increased their total use of complex noun phrases, but the effect sizes differed: large for the NP-I group and medium for the Reg-I group. For individual noun phrase structures, the magnitude of increase was also higher within the NP-I group. Considering the differences in effect sizes, it may be argued that explicit instruction on complex noun phrases led to more frequent use of these features.

4.2. Impact of prompts on the instruction effect

Considering that the two groups responded to different sets of prompts and previous research showed that prompts may impact complexity feature use, it was important to determine whether the effect of instruction differed from the initial findings when the influence of prompts was reduced. The statistical results of the differences between the diagnostic and final writing with reduced prompt effects can be found in Appendix D. In the NP-I group, virtually no changes occurred after noun phrases from a prompt were removed from student writing. This can be explained by the fact that both the diagnostic and final prompt contained only one complex noun phrase *undergraduate students*. As a result, the only difference was that the change in simple premodification lost its statistical significance, and the effect size slightly decreased (from $d = .55$ to $d = .42$). Also, a small increase was found in the effect sizes for the total number of noun phrases (from $d = .79$ to $d = .81$).

More noticeable effects of prompts were identified in the Reg-I group. First, the difference in attributive adjective use became significant with the considerably increased effect size (from $d = 0.43$ to $d = 0.68$). This change may be due to the exclusion of the phrase *major international sporting events* that was a part of a diagnostic writing prompt. This phrase contains two attributive adjectives, which contributed to greater use of this feature in the initial analysis and thus to smaller differences between the diagnostic and final

Table 6
Complex noun phrase frequencies in diagnostic and final writing in the NP-I group.

Noun phrase structure	NP-I group					
	Diagnostic ptw (*SD*)	Final ptw (*SD*)	*p*	95% CI Lower	Upper	*d*
Simple premodification	31.44 (11.63)	42.03 (18.70)	.005*	3.42	17.75	.55
Simple postmodification	22.54 (11.95)	30.79 (13.30)	.017	1.59	14.90	.46
Complex premodification	3.45 (5.13)	3.51 (5.03)	.965	-2.54	2.66	.01
Complex postmodification	.57 (1.85)	.85 (2.36)	.469	-.50	1.07	.13
Simple pre + simple post	6.16 (4.72)	9.49 (7.06)	.048	.04	6.62	.38
Complex pre + simple post	.17 (.65)	.28 (1.13)	.652	-.39	.61	.08
Simple pre + complex post	.29 (1.10)	1.80 (3.43)	.016	.30	2.71	.47
Complex pre + complex post	.00 (.00)	.00 (.00)	–	–	–	–
All noun phrases	64.97 (18.26)	88.07 (29.07)	.000*	12.24	33.97	.79

Note: *statistical significance with Bonferroni correction $p < .006$; CI = confidence interval of difference; d = Cohen's d; polarity for CIs and d were switched for ease of interpretation.

Table 7
Complex noun phrase frequencies in diagnostic and final writing in the Reg-I group.

Noun phrase structure	Reg-I group					
	Diagnostic ptw (*SD*)	Final ptw (*SD*)	*p*	95% CI Lower	Upper	*d*
Simple premodification	53.21 (17.94)	62.61 (17.13)	.073	-.94	19.73	.34
Simple postmodification	18.69 (11.07)	25.33 (14.00)	.039	.34	12.95	.39
Complex premodification	10.00 (11.77)	13.66 (12.17)	.095	-.68	8.01	.32
Complex postmodification	.52 (2.02)	.14 (.79)	.361	-1.20	.45	-.17
Simple pre + simple post	13.18 (10.59)	9.8 (6.90)	.114	-7.62	.87	-.30
Complex pre + simple post	.47 (1.45)	.94 (1.94)	.331	-.50	1.44	.18
Simple pre + complex post	.91 (2.17)	.63 (1.63)	.528	-1.19	.62	-.12
Complex pre + complex post	.00 (.00)	.15 (.81)	.326	-.15	.45	.18
All noun phrases	96.97 (28.99)	113.27 (24.25)	.016	3.31	29.29	.47

Note: statistical significance with Bonferroni correction $p < .006$; CI = confidence interval of difference; d = Cohen's d; polarity for CIs and d were switched for ease of interpretation.

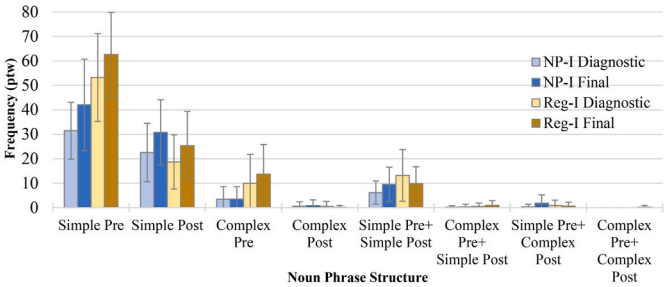

Fig. 2. Differences in the use of noun phrase structures by the NP-I group and Reg-I group.

writing before it was excluded. Second, changes in the effect sizes for prepositions with concrete meaning (from d = -.43 to d = -.21) occurred due to the exclusion of *fake news on Facebook/social media* from the diagnostics. In terms of complete noun phrase use, the overall difference became significant with an increased effect size (from d = .47 to d = .59). In specific structural categories, effect sizes for simple premodification with simple postmodification changed from d = -.30 to d = .04 and in complex premodification from d = .32 to d = .43. The changes were due to the reasons explained above.

Overall, these results demonstrate that prompts had an impact on the effect of noun phrase instruction. It is worth noting, however, that despite some changes in significance and effect sizes, all trends within groups remained unchanged: the increase in the features (i.e., modification types and noun phrase structures) from diagnostic to final writing was preserved when prompt noun phrases were excluded. A similar trend was observed for features that decreased or remained stable in the initial analysis. Therefore, it appears that while wording from the prompts influenced the instruction effect for some features, overall trends in differences of feature use from diagnostic to final writing remained the same.

5. Discussion

This study examined complex noun phrases in L2 writing within FYW courses and found that both groups, regardless of receiving explicit instruction, increased their use of these features from diagnostic to final writing. These results support findings from previous longitudinal and cross-sectional research that documented greater reliance on noun phrases as writers progress in their development (e.g., Biber, Reppen, et al., 2020; Crossley & McNamara, 2014; Parkinson & Musgrave, 2014; Staples et al., 2016) and that these changes may occur within a short period of time (Bulté & Housen, 2014; Mazgutova & Kormos, 2015). This study found, however, that the group that received explicit noun phrase instruction showed a greater shift towards register-appropriate use of these features.

First, while both groups increased the use of attributive adjectives associated with Stage 2 of syntactic complexity development, only the NP-I group had a significant increase in nouns as premodifiers (with a medium to large effect size), associated with Stage 3. A similar developmental trend was found by Parkinson and Musgrave (2014) who compared pre-matriculated graduate students and enrolled MA students: 57% of all modifiers for EAP students were attributive adjectives, while the MA group relied more on other features, including extensive use of nouns as premodifiers. Similarly, a significant increase in nouns as premodifiers (but not attributive adjectives) was found in a longitudinal study examining the same university students' writing with a two-year interval (Biber, Reppen, et al., 2020). As previous research found the development in noun as premodifier use at more advanced academic levels, the findings of this study (i.e., a significant increase of nouns as premodifiers in the NP-I group with a medium to large effect size) may support the claim that explicit instruction had a positive effect on writers' shift towards more register-appropriate use of noun phrases.

Another modifier at Stage 3, possessive nouns, was also used with increased frequency in the NP-I group. In previous research, more

frequent use of this modifier distinguished writing by MA writers from that of pre-matriculated students (Parkinson & Musgrave, 2014). This may indicate NP-I group's movement towards syntactically more advanced writing. While the Reg-I group's use of possessives decreased, it should be noted that this group's use was noticeably high in diagnostic writing. Thus, it could be argued that decreased use of possessives led to less frequent naming of human actors and relying more on abstract information, which could be evidence of register-appropriate use in the group that received no instruction. The use of possessives became similar in both groups in the final writing, suggesting that while the groups started at different points, explicit and implicit instruction led them to similar frequencies of use.

Another finding of this study is that the NP-I group increased their use of several modifiers at advanced Stages 4 and 5, while no such effect was found in the Reg-I group. One of these features, prepositional phrases with abstract meaning (Stage 4) was found to distinguish a more advanced group in previous research (Parkinson & Musgrave, 2014). Another observation was that almost all features in the NP-I group that increased with small-to-medium or medium-to-large effect sizes were compressed noun phrases (except for noun complement clauses), while in the Reg-I group no such consistency was identified. The change in the NP-I group goes in line with Staples et al. (2016) who found that compressed noun phrases increased as university writers progressed through educational levels. These findings together with the fact the average frequency of nearly all modifiers for the NP-I group increased from diagnostic to final writing (while no such consistency was found in the Reg-I group) and that increase for total modifier use had a large effect size in the NP-I group and small in Reg-I may be considered additional evidence for the effectiveness of explicit complex noun phrase instruction.

Apart from modification, complete noun phrases were also examined. The results indicate that the use of the majority of specific structural types increased in the NP-I group with medium effect sizes in comparison to inconsistent changes in the Reg-I group. The NP-group demonstrated a balanced increase in pre- and postmodification (used as a single modifier or together with other modifiers within one noun phrase), while the Reg-I group increased premodification use only. The total use of noun phrases in the NP-I group underwent a significant increase with large effect sizes in comparison to medium effect size in the other group. These differences again point to a greater shift towards register-appropriate use of noun phrases within the group that received explicit instruction.

When prompt effects were minimized through the exclusion of prompt noun phrases, some impact was revealed for both groups, with more noticeable differences in the Reg-I group. These findings align with previous research that found that topics impact complexity feature production (Lan, Lucas, & Sun, 2019; Yang et al., 2015; Yoon, 2017). However, despite differences in several modifiers or structural noun phrase types, overall trends in changes within each group remained unchanged. This suggests that while prompts had some effect on noun phrase complexity features (at least as it was operationalized in this study), other factors (e.g., minimum TOEFL scores, L1s, previous writing experiences) could have had a greater impact on the differences in developmental trajectories observed from diagnostic to final writing.

The findings overall point to the possibility that noticing noun phrase structures and functions in expert texts could have increased NP-I writers' awareness of the importance of these features and led students to incorporate more noun phrases into their writing. Controlled practice of clause-to-phrase transformations might have also encouraged deliberate experimentation with noun phrase structures that students rarely used before and as a result led to the expansion of writers' repertoires of linguistic choices. Overall, the instruction seemed to contribute to the shift in student writing from relying on elaborated discourse to producing more compressed and information-dense prose.

6. Pedagogical implications

When considered together, the results of this study suggest that complex noun phrase instruction embedded throughout a FYW course may lead to a greater increase in noun phrase frequency and complexity, and thus these findings support claims from previous research on the importance of integrating such instruction into L2 writing curricula. Therefore, the present study also recommends that L2 composition instructors consider including noun phrase-focused discussions and activities into their courses in order to support the syntactic complexity development of university-level writers. Introductory undergraduate writing courses may offer an appropriate venue for such instruction, but focus on noun phrases may be even more valuable for advanced undergraduate and especially graduate writers. Consulting the elements of instruction presented in this study (see Appendix A) and other articles (Casal & Lu, 2021; Musgrave & Parkinson, 2014) may be the first step for instructors or curriculum designers who wish to develop such activities. It seems important to inform writers about the role that noun phrases play in academic writing complexity, discuss noun phrase structures and functions, provide opportunities for noticing and analyzing these features in model texts and student own writing, offer controlled clause-to-phrase transformation exercises, and encourage integrating noun phrases into students' writing. While the curriculum discussed in this study did not focus on the relation of noun phrase modifiers to hypothesized developmental stages (Biber et al., 2011) and did not draw students' attention to the importance of compressed noun phrases (Staples et al., 2016), discussing these topics with writers might help foster a more nuanced understanding of phrasal complexity in academic writing. This focus on form and functions of complex noun phrases may help writers meet the conventions of academic writing register more effectively.

7. Conclusion

The effects of explicit noun phrase instruction as a means of assisting writers in using them in a register-appropriate way were examined in the context of FYW courses. The results indicate that while some developmental trends were observed in the group that received no explicit instruction on noun phrases, a more consistent increase in the use of noun phrase modifiers and complete noun phrases was identified in the group that was instructed on the role of noun phrases in academic discourse. This group also displayed an

increased use of noun phrase modifiers associated with more advanced stages of complexity development and compressed noun phrases. When the effects of prompts were minimized, the overall trends within groups remained unchanged. Having empirically tested the validity of recommendations from previous research to integrate noun phrase instruction into writing curricula, this study confirms that such instruction may indeed benefit academic writers' syntactic development at the phrasal level and lead to more register-appropriate use.

While this study was one of the first to test the validity of claims in previous research about the necessity of teaching complex noun phrases, it has several limitations. It is possible that differences in institutional contexts, other elements of instruction, minimum writing proficiency scores, L1 backgrounds, and topics might have had an effect on the results of the study. Future research should adopt a true experimental design in which the effect of these variables is minimized as well as include a delayed post-test to determine whether the impact of instruction has a long-term effect. It is also possible that a developmental level may have an impact on student receptiveness to the instruction. For example, writers with lower-level English or writing proficiency might be less receptive to complex noun phrase instruction or the opposite could be the case. More research is needed to determine how instruction on complex noun phrases impacts writing of students at other proficiency and educational levels and also with specific linguistic backgrounds. Another direction for future research is to test the effects of different types of complex noun phrase instruction. In this study, full-semester instruction was implemented; however, it is also important to determine if shorter-term interventions could have a similar effect. Finally, as mentioned earlier in the study, this research focused on the frequency aspect of register-appropriate use, but the functional dimension (i.e., whether noun phrases were used in a functionally appropriate manner) should be explored in more detail. Together these lines of research may advance our understanding of the viability and effectiveness of incorporating noun phrases instruction into L2 writing courses.

Author Statement

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Appendix A. Elements of the curriculum related to complex noun phrase instruction

Week	Relevant classwork	Relevant homework
1	**Diagnostic in-class writing**	
2	Review of independent clause components: Controlled practice of identifying a subject and a main verb	Additional practice of identifying independent clause components
3	Introduction to the role that noun phrases play in complexity in academic writing Introduction to the structure of noun phrases Controlled practice of identifying noun phrases in a paragraph and analyzing their grammatical structure	Additional practice of identifying noun phrases and analyzing their structure
4	Introduction to the idea of key concepts in academic texts and the role of noun phrases in referring to these concepts (noun phrases as key terms) Introduction to the functions of noun phrases as key terms Practice of identifying functions of noun phrases in Article 1 Written reflection on the relation between key concepts and noun phrases as key terms Review of key term annotations in Article 1	Annotation of key terms in Article 1 (a published research article): Students highlight noun phrases referring to a main concept and explain how the meaning is developed though noun phrases Self-grade annotations for Article 1: Students compare their annotations to the instructor's annotations and highlight all incorrectly identified noun phrases. They also create a comment with the analysis of one noun phrase they missed.
5	Noun phrase production practice: Students write a reflection related to the topic of Article 1. Then they revise the reflection by including more complex noun phrases and changing clauses into phrases where appropriate Introduction to the Analytical Summary assignment: A part of the assignment is to choose two noun phrases and explain how the meaning is developed through modifiers; students are also encouraged to incorporate complex noun phrases into their writing Review of noun phrases as key terms in Article 2	Draft and Peer review of Analytical Summary 1 Annotation of key terms in Article 2
6–7	Review of noun phrases as key terms in Article 3	Self-grade annotations of Article 2 Annotation of key terms in Article 3 Revision of Analytical Summary 1 Draft and peer review of Analytical Summary 2
8–9	Introduction to Synthesis Essay, including discussion of key terms (noun phrases) in the research question and driving sub-questions; in the thesis	Edits of Analytical Summary 1 Revision of Analytical Summary 2

(*continued on next page*)

(*continued*)

Week	Relevant classwork	Relevant homework
	statement; and as keywords for searching for sources. Students are also encouraged to rely on complex noun phrases in their writing	
10	Controlled practice of noun phrase production: Transformation of two clauses into one by incorporating noun phrases	
11–14	Discussion of the importance of noun phrases for cohesion within and between paragraphs Controlled practice of noticing this function in a provided passage and in student own writing	Edits of Analytical Summary 2 Draft and peer review of Synthesis Essay
15	Edits of Synthesis Essay, which included identification of one instance of a complex noun phrase used in the essay and explanation of the reasons this use was structurally and functionally effective **Final in-class writing**	Revision of Synthesis Essay

Appendix B. Assignment prompts

NP-I Group.

Diagnostic Writing Prompt: Skim the article below. Then, write a paragraph of response that uses at least two pieces of supporting evidence from the article. Using minimum 300 words, answer the question: Is it important for undergraduate students to view themselves as scholars? Why or why not?

Final Writing Prompt: Skim the three articles below. Then, write a paragraph that uses at least two pieces of supporting evidence from at least one of the articles. Using a minimum of 300 words, answer the question: Should undergraduate students publish research? Why or why not?

Reg-I Group.

Diagnostic Writing Prompt 1: Based on the information above, what factors do you think a country needs to consider before deciding to host major international sporting events (e.g., World Cup, the Olympics)? Write a paragraph and explain your ideas on this topic.

Final Writing Prompt 1: Write a paragraph about the impacts of the 2000 Sydney Olympics on the host city/country based on the two given sources. You are expected to use both sources as support/evidence in your body paragraph.

Diagnostic Writing Prompt 2: Based on the information above, do you think fake news on Facebook played a role in influencing its users' opinions about the election? Why or why not? What methods do you think would be effective in handling fake news on social media? Write a paragraph to explain your thoughts about this topic.

Final Writing Prompt 2: Write a body paragraph about the psychological reasons that may explain why people believe fake news based on the two given sources. You are expected to use both sources as support/evidence in your body paragraph.

Appendix C. List of exact noun phrases from prompts

The following noun phrases were excluded for the second analysis: *Undergraduate students, major international sporting events* (including *international sporting events, sporting events, major international events, international events*), *World Cup, Olympic Games, 2000 Sydney Olympics* or *Sydney Olympics in 2000, host city/country, fake news on Facebook/social media* (including *fake news* and *social media*), users' opinions about the election (including *users' opinions* and *opinions about the election*), and *psychological reasons that may explain …* (including *psychological reasons* and *reasons that may explain …*).

Appendix D. Statistical analysis results with prompt noun phrases excluded

Table D1
Noun phrase modification frequencies in diagnostic and final writing in the NP-I group (prompt nounphrases excluded).

Noun phrase modification	NP-I group					
	Diagnostic ptw (*SD*)	Final ptw (*SD*)	*p*	95% CI Lower	Upper	*d*
Attributive adjectives	28.26 (10.16)	33.56 (17.46)	.144	-1.93	12.52	.27
Relative clauses	7.76 (4.55)	9.15 (8.53)	.413	-2.04	4.83	.15
Nouns as premodifiers	6.72 (6.61)	13.88 (10.35)	.002*	2.98	11.34	.64
Possessive nouns	.41 (1.73)	1.76 (2.98)	.046	.03	2.68	.38
Of phrases	10.33 (7.05)	12.10 (7.64)	.300	-1.66	5.20	.19
Quantifiers	2.39 (5.63)	1.84 (3.19)	.535	-2.37	1.26	-.12

(*continued on next page*)

Table D1 (*continued*)

Noun phrase modification	NP-I group					
	Diagnostic ptw (*SD*)	Final ptw (*SD*)	*p*	95% CI Lower	Upper	*d*
Prep. phrases (concrete)	1.40 (3.05)	2.51 (4.01)	.210	-.66	2.90	.23
Nonfinite rel. clauses	.79 (1.93)	1.29 (2.74)	.460	-.87	1.87	.14
Prep. phrases (abstract)	6.39 (5.27)	10.90 (8.71)	.012	1.09	7.94	.49
Prep.+ nonfin. compl. clause	1.38 (3.14)	3.41 (5.14)	.086	-.30	4.36	.33
Noun compl. clauses	1.39 (2.29)	4.35 (4.91)	.006	0.93	4.98	.55
All modifiers	67.68 (18.83)	95.71 (31.07)	.000*	16.40	39.67	.90

Note: *statistical significance with Bonferroni correction $p < .004$.

Table D2
Noun phrase modification frequencies in diagnostic and final writing in the Reg-I group (prompt noun phrases excluded).

Noun phrase modification	Reg-I group					
	Diagnostic ptw (*SD*)	Final ptw (*SD*)	*p*	95% CI Lower	Upper	*d*
Attributive adjectives	40.12 (18.09)	59.43 (22.28)	.001*	8.71	29.92	.68
Relative clauses	8.07 (7.32)	10.34 (9.00)	.224	-1.47	6.01	.23
Nouns as premodifiers	12.56 (12.14)	10.00 (9.57)	.342	-8.00	2.87	-.18
Possessive nouns	4.50 (6.79)	2.30 (4.61)	.089	-4.78	.36	-.32
Of phrases	14.39 (16.11)	14.49 (9.55)	.970	-5.44	5.64	.01
Quantifiers	3.00 (3.80)	1.66 (4.09)	.154	-3.21	.53	-.27
Prep. phrases (concrete)	3.67 (6.01)	2.35 (2.77)	.265	-3.67	1.05	-.21
Nonfinite rel. clauses	.31 (1.21)	1.09 (2.02)	.095	-.15	1.72	.32
Prep. phrases (abstract)	3.93 (6.21)	5.38 (5.99)	.368	-1.79	4.68	.17
Prep.+ nonfin. compl. clause	0.65 (1.78)	1.12 (2.24)	.340	-.52	1.46	.19
Noun compl. clauses	1.23 (2.98)	2.23 (4.99)	.217	-.62	2.63	.23
All modifiers	92.44 (33.81)	110.40 (28.25)	.013	4.13	31.79	.49

Note: *statistical significance with Bonferroni correction $p < .004$.

Table D3
Complex noun phrase frequencies in diagnostic and final writing in the NP-I group (prompt noun phrases excluded).

Noun phrase structure	NP-I group					
	Diagnostic ptw (*SD*)	Final ptw (*SD*)	*p*	95% CI Lower	Upper	*d*
Simple premodification	24.22 (10.47)	32.41 (16.75)	.027	.99	15.40	.42
Simple postmodification	22.52 (12.11)	30.56 (13.85)	.023	1.19	14.87	.44
Complex premodification	3.45 (5.13)	3.51 (5.03)	.965	-2.54	2.66	.01
Complex postmodification	.57 (1.85)	.85 (2.36)	.469	-.50	1.07	.13
Simple pre + simple post	6.16 (4.72)	9.13 (7.10)	.077	-.34	6.28	.34
Complex pre + simple post	.17 (.65)	.28 (1.13)	.652	-.39	.61	.08
Simple pre + complex post	.29 (1.10)	1.80 (3.43)	.016	.30	2.71	.47
Complex pre + complex post	.00 (.00)	.00 (.00)	–	–	–	–
All noun phrases	57.38 (17.38)	78.54 (24.77)	.000*	11.39	30.92	.81

Note: *statistical significance with Bonferroni correction $p < .006$.

Table D4
Complex noun phrase frequencies in diagnostic and final writing in the Reg-I group (prompt noun phrases excluded).

Noun phrase structure	Reg-I group					
	Diagnostic ptw (*SD*)	Final ptw (*SD*)	*p*	95% CI Lower	Upper	*d*
Simple premodification	37.28 (15.17)	44.04 (15.38)	.071	-.61	14.13	.34
Simple postmodification	19.56 (11.75)	25.42 (14.00)	.071	-.53	12.26	.34
Complex premodification	5.55 (8.15)	10.81 (10.98)	.026	.67	9.85	.43
Complex postmodification	.67 (2.15)	.29 (1.11)	.352	-1.21	.44	-.17
Simple pre + simple post	9.41 (8.05)	9.81 (6.94)	.813	-3.00	3.79	.04
Complex pre + simple post	.32 (1.23)	.79 (1.81)	.277	-.39	1.33	.20
Simple pre + complex post	.76 (2.06)	.63 (1.63)	.784	-1.09	.83	-.05
Complex pre + complex post	.00 (.00)	.15 (.81)	.326	-.15	.45	.18
All noun phrases	73.55 (24.30)	91.94 (22.64)	.003*	6.73	30.04	.59

Note: *statistical significance with Bonferroni correction $p < .006$.

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