
| RESEARCH ARTICLE

EFL Academic Writing Development Beyond the University Essay Genre: Functional Syntactic Complexity in Scholarly Research Writing

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| ABSTRACT

Effectively realizing meaning in the lexis and grammar of a foreign language is naturally challenging. The compounded challenges EFL learners experience in academic written communication result in a deficiency that has been studied extensively in the context of Morocco. Different aspects of this deficiency have been identified. Yet, we know little about whether the lack of writing genre proficiency contributes to this academic writing underdevelopment. The present study investigates functional syntactic complexity as a characteristic feature in complex meaning-making in the applied linguistics scholarly research writing genre. Towards this end, the deployment of syntactic complexity features in 120 Discussion sections in research articles written by Moroccan doctoral candidates was compared to the use of the same features in 120 Discussion sections in research articles authored by expert international researchers. Theoretically underpinned by the cognitive-functional outlook and guided by the corpus linguistics approach, this study was carried out using computational linguistics tools. The statistical analyses of the data indicate significant differences between the two groups regarding the use of syntactic complexity to realize rhetorical functions; namely, the degree of coordination, the degree of subordination, the degree of phrasal sophistication, nominal modification, apposition, prepositional phrases, and nominalization. These findings provide actionable insights with respect to functional grammar instruction and teaching grammar for and in the context of writing. Furthermore, the empirical evidence here signals the imperativeness of foregrounding the conceptualization of academic writing proficiency as genre-based, rather than the transfer of a uniform writing skill to different meaning-making situations. These insights thus afford deriving practical applications for academic writing development, scholarly research writing instruction, and syllabus and assessment framework design.

| KEYWORDS

Syntactic complexity; academic writing development; research writing; genre-based pedagogy; systemic functional linguistics; cognitive linguistics; corpus linguistics

| ARTICLE INFORMATION

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1. Introduction

Writing development is intervention beyond the restraining product-process fallacious dichotomy and the mere equation of writing with word combinatory skills according to morphological, lexical, and syntactic knowledge. Writing is, rather, a complex phenomenon, which involves an interplay of writer, reader, text, and reality, based on which a written discourse is constructed (Matsuda & Silva, 2010). Matsuda and Silva convincingly invoke the fluid and evolving writer-reader-text-reality relational aspect and the strategic aspect involving assessing a rhetorical situation and effectively responding to it with a constructed text.

At the macro level, the development of EFL learners' writing skills is expected to progress along Bloom's taxonomy stages, as gradual higher-order thinking skills application is sought. Basic arrangement of words into sentences and paragraph writing, along with mechanics of writing, are some targeted competencies at lower proficiency levels (remembering, understanding, and

applying). At higher levels, though, writing multiple-paragraph essays, argumentation, analysis, and synthesis are targeted (analyzing and evaluating). Yet, it is at the highest level—creating—where the challenges in academic writing are compounded.

At the specialized writing level, even more challenging is deploying higher-order thinking skills within genre and discipline-specific norms and expectations and using normalized devices to achieve communicative functions within recurring rhetorical situations. *Genre knowledge*, “the knowledge that helps shape possible responses to particular rhetorical situations, functions as a scaffolding that assists writers in managing the complexity of writing and readers in interpreting the text” (Matsuda & Silva, 2010, p. 233). Genre is defined here as recurring rhetorical situations that result in typified rhetorical actions that are developed and shared within a community of practice (Miller, 1984; Bakhtin, 1986). Successful academic writing is, therefore, successful integration of a community of practice—a discourse community.

In the context of Morocco, there has been a paucity of research on the factors that hinder EFL learners’ academic writing development from the standpoint of specific genres and linguistic devices in realizing rhetorical actions in these genres. An instance of such devices and genres is syntactic complexity in scholarly research writing. *Complexity* is “a property or quality of a phenomenon or entity in terms of (1) the number and the nature of the discrete components that the entity consists of, and (2) the number and the nature of the relationships between the constituent components” (Bulté and Housen, 2012, p. 22). Lu (2014) defines syntactic complexity as “the range and degree of sophistication of syntactic structures” (p. 130). This study will use this definition and the definition proposed by Ortega (2015): “the range and the sophistication of grammatical resources exhibited in language production ... the variety, diversity and elaborateness of deployed grammatical features” (p. 82). This structural complexity serves the function of economy of expression, a prime characteristic of academic writing stemming from the need to convey more information in fewer words (Biber et al., 2011). Although extensive research has been carried out on the academic writing in the context of Morocco, previous studies appear to not have adequately addressed the form-function dimension of linguistic complexity in genres.

This study aims to provide an additional perspective on the academic writing deficiency among EFL learners in Morocco and, ultimately, contribute to the ongoing scholarly conversation around this problem. In more tangible terms, the purpose is to gather evidence to contribute to advancing our collective knowledge in the field of academic writing and inform action. In an attempt to identify additional factors that hamper academic writing development, this research seeks to assess the use of functional syntactic complexity by Moroccan doctoral candidates in scholarly research writing within the field of applied linguistics by comparing this use to that salient in their field of specialty. This study attempts to answer the following question:

Are there any significant differences in the use of functional syntactic complexity in Moroccan applied linguistics doctoral candidates’ scholarly research writing and that in effective and successful research writing in this genre?

2. Literature review

An extensive body of research has explored the writing deficiency among Moroccan EFL learners. Some studies investigated high school students’ writing, while other studies targeted academic writing at the undergraduate and graduate levels. Writing at the doctoral level—a more specialized academic writing genre—seems to have been limited to doctoral theses. We realize that, since theses are not published, this research fails to explore scholarly writing aiming to contribute to conversations engaging other scholars and attempting to advance knowledge on problems at a global level. Nonetheless, these studies fall, on the whole, into one of two categories.

Non-linguistic factors contributing to this deficiency have been studied under the first category. Chibi (2018) and Khartite et al. (2021) explored the effect of culture (C1), Kadmiri (2022) investigated anxiety, Ouahidi (2022) studied the effect of classroom size, Ghaicha and Ait Taleb (2016) assessed the effect of peer reviewing, and Said and El Mouzrati (2018) explored corrective feedback. The second type of studies explored linguistic factors as independent variables. These factors include spelling errors (Aknouch & Bouthiche, 2022), first language (L1) negative transfer (El Mansouri, 2019; Trimasse, 2016), cohesion and coherence problems (El Khayma, 2020; Sahlane, 2019; Hellalet, 2013), and the lack of lexical proficiency (Ait Hammou et al., 2021).

However, we note that the forenamed published studies appear to have overlooked the positive correlation between syntactic complexity and L2 academic writing proficiency and development established in the literature at the international level. Ortega (2003), Biber et al. (2011), Lu (2011), Ai and Lu (2013), Kim (2014), Cushing Weigle et. al (2015), and Lu and Ai (2015) have found that the more advanced non-native English speakers university students’ writing, the more syntactically complex it is. While these studies have focused on structural syntactic complexity, a different line of research has explored functional syntactic complexity, specifically in meaning-making in academic writing genres.

Previous studies have reported a variability in the deployment of syntactic complexity devices to realize particular communicative goals in written academic discourse. Ryshina-Pantkova (2015) demonstrated that syntactic complexity serves specific communicative demands of tasks in specific contexts through analysis of the different functions the use of nominalization (the process of turning verbs or adjectives into nouns or noun phrases) accomplishes in academic writing. In the same vein, Biber and Gray (2016) analyzed the discourse functions of nominal premodifiers and postmodifiers in academic writing. Parviz et al. (2020) explored phrasal complexity features and indicated how adjectives and nouns as noun premodifiers, nominalization, appositives, and prepositional phrases are used for specific functions while discussing the findings in a research paper. These studies indicate that varied syntactic complexity features are used to respond to the complex demands of meaning-making in scholarly research writing.

Theoretical framework

The theoretical framework within which this study was pursued encompasses a set of concepts and assumptions drawn from two functional theories: Systemic Functional Linguistics (SFL) and Cognitive Linguistics (CL). The general principle underlying this theoretical framework is that language, a part of human cognition, offers an overall choice potential among systems networks for meaning-making in specific situations and contexts. The core principle of SFL is that language is a network of interrelated systems and that it serves functions. Form and meaning are not disassociated, and grammar is a meaning-making resource for coding experience into meaning (Webster, 2009). Language, according to this functional outlook, is seen as providing *meaning potential* and offering grammatical resources for meaning-making by allowing what Eggins (2004) calls *linguistic choices* while considering their appropriateness in relation to the context of use.

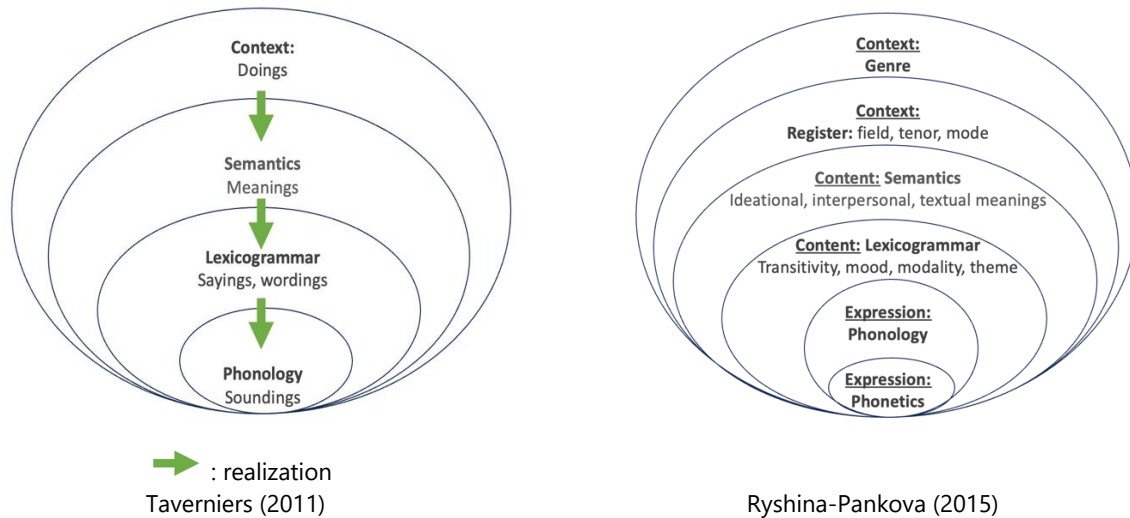
Language in SFL is theorized to entail relations between elements of a system—paradigmatic relations—and relations among constituents of a syntactic configuration or a structure—syntagmatic relations. These are, respectively, the *axis of choice* and the *axis of chain* (Eggins, 2004). The levels (strata) of language in this theory are context, semantics (meaning), lexicogrammar (wording), and phonology (or graphology); The context is realized in meaning, meaning is encoded in lexicogrammar, and lexicogrammar is realized in phonology or graphology, depending on the medium of communication (Figure 1). Lexis and grammar are viewed as forming a continuum where meaning is fashioned and organized (Halliday, 2009).

In addition, three types of meaning—meta-functions—are involved in the organization of language in SFL. The ideational meta-function concerns the content aspect, the interpersonal meta-function pertains to how social relationships are enacted through language, and the textual meta-function is integrating and presenting the ideational and interpersonal meta-functions as text (Traverniers, 2011). Language use in this theory is referred to as *Language as text*, an instance of *language as system* (Halliday, 2009). Instantiation, according to Hood (2016), is “the relation between the generalized meaning potential of the system of the language and the meanings instantiated in text” (p. 200).

The integration of context is a major characteristic of SFL. The context of language use triggers a deployment of a language variety: register, or variety of language according to use. The context of use is defined according to three parameters of discourse. *Field* is “the nature of social action, apropos of which language is being used,” and *tenor* pertains to “the nature of social relationship amongst those involved with the action—not which specific individual, but how the individuals are socially positioned vis-a-vis each other, since this is what will impinge on the production and reception of the messages.” *Mode*, on the other hand, is “the mode of contact for the actors in the discourse event, since clearly the nature of the message will be different for a co-actor in absentia compared with that for the co-present interactant” (Hasan, 2009, p. 172).

From the register standpoint, variation in these contextual parameters, consequently, engenders semantic variation, which, in turn, triggers variation in lexicogrammar (Figure 1). This is summarized in Halliday’s (1978) definition of register as “the configuration of semantic resources that the member of a culture typically associates with a situation type. It is a meaning potential that is accessible in a given social context” (p. 111). At a higher level, genre is the recurrence of typical configurations of the contextual parameters of language use within a community. That is, “a genre comes about as particular values for *field*, *tenor* and *mode* regularly co-occur and eventually become stabilized in the culture as *typical situations*” (Eggins, 2004, p. 58).

Figure 1. Stratified Model of Language and Genre in Systemic Functional Linguistics



Cognitive linguistics (CL) overlaps with SFL and complement it by emphasizing the active role of the language user. CL is a functional theory that sees language as shaped by its communicative uses. CL treats language as a human behavior mediated by cognition, emphasizing the role of the language user in the choices made for meaning-making. The foregrounding of the cognitive underpinnings of language in CL is accounted for by the cognitive processes involved in language use. Here, meaning is considered, rather than compositional, as activation of higher-order meaning construction cognitive processes by sequences of linguistic units (conceptualization or construal). Syntax and semantics are indissociable in CL and are seen as “a structured inventory of conventional symbolic units” (Langacker, 1987a, p. 57). The symbolic units here are conventions of form-meaning pairings that make up the mental grammar.

Another tenet of CL is the usage-based perspective. Langacker (1987a) refers to language use as “a problem-solving activity that demands a constructive effort and occurs when a linguistic convention is put to use in specific circumstances” (p. 65). From the usage-based perspective, lexical-syntactic schemas are abstracted from language usage events and associated with specific instances (abstraction and schematization). These two psychological abilities are used along with categorization: Language users make categorizing judgments to produce linguistic expressions to code conceptualizations that are detailed and context-dependent (Langacker, 1987a). Categorization means a language user “assesses whether a specific expression can be categorized as a member of the category defined by a conventional linguistic unit or a unit that is widely shared by the language users of a speech community” (Heyvaert, 2003, p.12).

Abstraction, schematization, and categorization recurrence result in entrenchment. Entrenchment is “the continuous routinization and re-organization of associations, depending on exposure to and frequency of identical or similar processing events, subject to the exigencies of the social environment” (Schmid, 2015, p. 10). Schmid defines conventionalization as “the continuous mutual coordination and matching of communicative knowledge and practices, subject to the exigencies of the entrenchment processes taking place in the individual minds” (p. 10). Schmid further notes that *co-adaptation*, a speaker’s accommodation and taking over and repeating of linguistic material perceived in usage events, and *diffusion* (the cumulated effect of co-adaptation on a speech community) prompt *usualization* (a community’s implicit agreement on a co-adapted and subsequently diffused linguistic material), which becomes a norm—*normation*. Such is, therefore, how registers and genres are established from the CL standpoint. These theoretical insights seem to not have been adequately leveraged in investigating academic writing in the context of Morocco.

On the basis of the reviewed literature and the SFL and CL theoretical lens, there appears to be a gap in our collective knowledge regarding the academic writing deficit in Morocco. We still know little about whether the lack of the strategic use of linguistic features associated with specific genres contributes to this deficiency; namely, functional syntactic complexity in scholarly research writing.

3. Methodology

3.1. Research design

To compare functional syntactic complexity in the scholarly research writing of Moroccan applied linguistics doctoral candidates and that of expert researchers in this genre, a quantitative approach was used with a causal-comparative design. A causal-comparative design is a type of ex-post facto design, which is well-suited for the purpose of this study and the research question it seeks to answer. Ex-post facto (after the fact or retrospectively) research, as an alternative to experimental research where independent variables are manipulated, allows for comparison of two groups from two distinct populations with respect to independent variables that have already occurred (Lunenburg & Irby, 2008). In Kerlinger's (1970) definition of this type of research design, the independent variable or variables have already occurred, and the investigation starts with the observation of a dependent variable or variables. The independent variable or variables are then studied in retrospect for their possible relationship to, and effects on, the dependent variable or variables.

Two types of ex-post facto designs can be identified: the *co-relational study* (also called *causal research*) and the *criterion-group study* (also referred to as *causal-comparative research*) (Cohen et al., 2007). The aim of a co-relational study is to identify the precedents of a present condition. On the other hand, adopting the criterion-group (causal-comparative) approach means that "the investigator sets out to discover possible causes for a phenomenon being studied by comparing the subjects in which the variable is present with similar subjects in whom it is absent" (Cohen et al., 2007, p. 266). Cohen et al. also note that "causal-comparative studies may be seen as bridging the gap between descriptive research methods on the one hand and true experimental research on the other" (p. 266). The causal-comparative design is adopted in the present investigation of possible relationships between syntactic complexity (the independent variable) and scholarly research writing proficiency (the dependent variable). This is accomplished through a comparison of the scholarly research writing of the two groups previously identified. Research articles authored by the researchers in the two groups were compared.

3.2. Selection of participants and sampling procedure

To carry out the aim of this investigation, two corpora of Discussion sections of applied linguistics open-access journal articles published from 2012 through 2023 were compiled. The first (Target Corpus: TC) consists of 120 Discussion sections from research articles authored by Moroccan doctoral candidates (randomly selected 5 male and 5 female doctoral candidates affiliated with each of the 12 public universities in Morocco). The second (Reference Corpus: RC) consists of 120 Discussion sections from articles written by successful international researchers (randomly selected 60 male and 60 female authors). These are highly cited articles used in this study as genre *exemplars*.

3.3. Instrumentation

When addressing research questions regarding participants' language knowledge and ability, Language Production Tasks (LPTs) are the data collection techniques usually utilized. LPTs certainly allow for the collection of naturally occurring data and maximum control a researcher exerts over which specific language productions to seek and permit simultaneous data elicitation from a large number of respondents in a relatively short period of time. However, as Rose et al. (2020) note, respondents may avoid the target linguistic features or, due to culture, personality, and foreign language anxiety reasons, not respond to the task as predicted by the researcher. Corpus-based data collection permits circumventing some of the shortcomings of LPTs, such as participants altering their behavior based on an understanding of the distribution of the stimuli in a task or when they know they are being observed (Hawthorne effect). This alternative data collection method also yields more contextualized data in the sense that there is no control over the production task, which renders it more relevant to the real world and, therefore, more authentic.

This study adopts corpus linguistics as a language and language use investigation methodology. Corpus linguistics is the quantitative study of textual instances with the aim of obtaining evidence through naturally occurring texts (Wu, 2009). Bennett (2010) sums up the aim of corpus linguistics methods of language study in determining patterns of lexical and grammatical features and these patterns differences within varieties and registers. In other words, this methodology aims to determine whether the occurrence or co-occurrence of linguistic elements is attested in corpora, if such occurrences and co-occurrences are attested more than others, and if they are observed more often than would be expected by chance (Gries, 2009). The quantitative corpus-derived frequencies of lexico-grammatical items are complemented with the researcher's qualitative judgements about meaning and communicative functions (Nesi, 2016). The rationale for choosing research articles Discussion section texts as files to include in the corpora is discussed next.

3.4. The Discussion section of research articles

The generic structure of a research article (RA) allows for the organization of data and ideas, with each section serving a specific purpose. Yet, it is the Discussion section—a functionally meaningful section—that ties all the sections together. This section of a research article was chosen as text for analysis with respect to functional syntactic complexity due to its centrality in an RA. It is

the section in which an author aims to achieve crucial and complex communicative purposes to convince readers of the validity of the claims and arguments made in the RA. The complexity of this task requires a strategic deployment of a repertoire of linguistic complexity.

In more specific terms, the Discussion section of an RA has centrality in a research article, for it is the section in which the findings are described, analyzed, and interpreted. This is also the section where the results are related to the research questions and put in the general context of the research. Moreover, in this section, authors demonstrate the significance and importance of the results and how and where they fit within the current literature. Given the number and variety of communicative functions to be achieved in the Discussion section, research has shown that it may be a problematic part of research article writing for many researchers who are non-native English speakers (Amirian et al. (2008); Basturkmen (2012); Cotos et al. (2016); Peacock (2002); Swales (2004)). In addition, Perez-Llantada et al. (2012) note that an effective Discussion section involves “mastery of rhetorical strategies for conveying interestingness, motivation and promotion-related elements and, above all, foregrounding the significance of the research while being aware of the provisional nature of the scientific claims” (p. 124).

While research articles are often structurally segmented into sections, Moreno and Swales (2017), in accordance with the functional framework adopted for this research, present the Discussion section as a stage and propose an analytical scheme of *steps* and *moves* that serve communicative functions. Moves are “discoursal or rhetorical units performing coherent communicative functions in texts” (Swales, 2004, pp. 228-229). Steps are sub-components of moves. That is, “steps of a move primarily function to achieve the purpose of the move to which they belong” (Biber et al., 2007, p. 24). The usefulness of the move analytical scheme lies in highlighting the lexico-grammatical features characterizing the richly functional research article part that the Discussion stage is. Moreno and Swales hold that the Discussion stage encompasses the functions: announcing, providing background information, summarizing or restating key results, commenting on key results or other key features, evaluating the current study or other research, drawing implications, and elaborating.

3.5. Corpora design

To answer the question posed in this investigation, two corpora of applied linguistics articles Discussion sections were constructed. The first corpus is a compilation of the Discussion sections in 120 articles published in international journals from 2012 through 2023 by Moroccan researchers affiliated with the twelve public universities in Morocco (Target Corpus: TC). The second corpus includes 120 international journal articles’ discussion sections written by expert and successful researchers (Reference Corpus: RC). Only data from research articles was utilized for the purposes of this research. Literature review and methodology articles were, for example, systematically excluded. Moreover, the texts used were single-author articles of similar length. This ensured avoiding the length of texts—potentially comprising a higher number of the target lexico-grammatical features—affecting the results obtained. After the corpus files were collected, they were processed to be formatted into the corpora. This included preparation of the data, coding, and annotation.

3.6. Preparation of the data

Since the data collection aimed to gather only texts originally produced by the authors, all non-textual elements and non-author-produced text, referred to as *noise*, were removed. These *noise* elements included in-text citations, quoted texts and quotation marks, tables, characters, symbols, numbers, formulas, graphs, and charts. Metadata was added to each text file included in the corpora. Metadata is information that identifies the data files in the corpora. To this end, a coding framework was adopted to add information to each text to help analyze the corpus. This entailed assigning to each text an identifying alphanumeric code comprising the initial letters of the words in the name of the university the author is affiliated with, male (M) or female (F), and a number (1-5). As to the reference corpus, a simpler coding framework was adopted. Each text included in the corpus was assigned an alphanumeric code including the letters RC (reference corpus), M or F, and a number (1 through 60). With respect to annotation, additional elements were added to each file in both corpora in the back-up copies. Annotation included information such as when the data were collected, the source of the data, and other information that would help the researcher easily retrieve any file included in the corpora and recall any procedures performed during data collection. Syntactic complexity indices were then extracted from the corpora files.

3.7. Syntactic complexity operationalization

Research has shown that argumentative texts are syntactically complex and, in particular, that academic writing is structurally compressed and characterized by more features of nominalization and phrasal modification. Research has also indicated that a high degree of phrasal complexity is associated with high quality and advanced proficiency in different disciplines’ scholarly research writing and that the rhetorical goals in meaning-making within research articles’ sections are realized through salient complex lexicogrammar features. For instance, phrasal complexity was demonstrated by Biber et al. (2004) to be a distinctive feature of academic writing. This and subsequent research (Biber et al., 2014; Parkinson & Musgrave, 2014; Taguchi et al., 2013)

have also indicated that developed L2 writing reflects moving away from clausal complexity that characterizes informal conversations to phrasal complexity.

The syntactic complexity indices used in this study were eclectically selected for a comprehensive coverage and enhanced syntactic complexity operationalization, in accordance with what Biber et al. (2022) term *the multi-faceted construct of complexity*. The aim of this study is to attempt to ascertain whether doctoral candidates employ the features of structurally compressed style that characterize specialized written academic prose, with rare use of dependent clauses (Biber et al., 2022). These measures have proven to correlate with advanced academic writing and effective scholarly research writing in applied linguistics. Accordingly, a set of syntactic complexity measures was selected to compare the academic writing of the two groups in an attempt to infer answers to the research question posed in this study. These measures are shown in Table 1.

A T-unit (Minimal Terminable Unit) consists of a main clause and all of its modifiers, including any embedded or attached clauses (elements) (Hunt, 1964). Nominalization is the process of turning verbs, adjectives, or adverbs into nouns. It is a syntactic complexity device that affords realizing complex communicative purposes of academic writing (Boukhris & Sakale, 2025). Nominalization realizes lexical density and the packing of meaning through morphological complexity (the number of morphological formatives of words—morphemes) (Stump, 2016). Nominalization is achieved through derivational morphology (affixation: incorporating prefixes or suffixes to verbs, adjectives, or adverbs). The nominalization suffixes used in this study are *-tion*, *-ty*, *-ment*, *-cy*, *-sion*, *-ance*, and *-ness*.

Table 1. Syntactic Complexity Indices Used in this Study

Index name	Code	Description
Amount of subordination		
Clauses per T-unit	C/T	Number of clauses per T-unit
Complex T-units per T-unit	CT/T	Number of complex T-units per T-unit
Dependent Clauses per Clause	DC/C	Number of finite (nominal, adjective, or adverbial) or nonfinite (with gerund, infinitive, or past participles) dependent clauses per clause
Dependent Clauses per T-unit	DC/T	Number of dependent finite and non-finite clauses per T-unit
Amount of coordination		
Coordinate phrases per Clause	CP/C	Number of coordinate phrases per clause
Coordinate Phrases per T-unit	CP/T	Number of coordinate phrases per T-unit
T-units per sentence	T/S	Number of T-units per sentence
Degree of phrasal sophistication		
Complex Nominals per Clause	CN/C	Number of complex nominals per clause
Complex Nominals per T-unit	CN/T	Number of complex nominals per T-unit
Verb Phrase per T-unit (VP/T)	VP/T	Number of verb phrases per T-unit
Nominal modification	NN	Number of nouns that modify another noun
Apposition	APPO	Number of appositive noun phrases
Prepositional phrase	PREP	Number of prepositional phrases
Nominalization	NOMZ	Number of nominalizations

3.8. Data analysis

Analysis of the data in the two corpora consisted of processing the text files through natural language processing and computational linguistics programs to extract syntactic complexity features. These are the L2 Syntactic Complexity Analyzer (L2SCA) (Lu, 2010), the Tool for the Automatic Analysis of Syntactic Sophistication and Complexity (TAASSC) (Kyle, 2016), and the concordance tool AntConc. L2SCA and TAASSC display the occurrences of pre-selected syntactic complexity indices in the corpus files. AntConc was used to identify nouns containing nominalization suffixes such as *-tion* in *manipulation* to identify the occurrences of nominalizations. If, for instance, the suffix *-tion* is selected in the user interface, a list and count of all the *-ion*-suffixed words contained in the input file would be generated. Manual procedures were also used to complement the automatic analysis of the data. For instance, words containing *-ion* but that are not formed through nominalization were removed from the

lists displayed in the AntConc results. After the extraction of syntactic complexity indices, between-groups analyses of variance (ANOVA) were performed using the statistics software JASP (version 0.19.3) to display and compare the data obtained.

4. Results

Results of the statistical analyses are displayed in Table 2. The data in this table comprises the mean (M) and standard deviation (SD) values for the indices in each corpus. The p-value indicates whether there is a significant difference between the two groups. A $p < .05$ allows for rejecting the null hypothesis that there is no significant statistical difference between the groups, pointing to the existence of a difference. Yet, the p-value does not indicate the magnitude of the difference. The effect size (ω^2) provides the magnitude of the difference between groups. An Omega Squared $\omega^2 < .01$ is considered trivial, .01 small, .06 medium, and .14 large (Gross-Sampson, 2022).

Table 2. Results of Statistical Analyses of Syntactic Complexity Indices in TC and RC

		Corpus				ANOVA		
		TC		RC		F	p	ω^2
		Mean	SD	Mean	SD			
Amount of subordination	C/T	1.568	0.054	1.678	0.036	325.495	< .001	0.576
	CT/T	0.411	0.024	0.469	0.043	161.858	< .001	0.401
	DC/C	0.364	0.029	0.397	0.036	60.864	< .001	0.200
	DC/T	0.561	0.032	0.687	0.036	750.209	< .001	0.757
Amount of coordination	CP/C	0.484	0.032	0.581	0.025	632.506	< .001	0.725
	CP/T	0.732	0.055	0.941	0.023	1311.890	< .001	0.845
	T/S	1.027	0.036	1.083	0.021	204.710	< .001	0.459
Phrasal sophistication	CN/C	2.292	0.028	2.600	0.021	5309.020	< .001	0.957
	CN/T	3.341	0.025	4.240	0.021	12002.787	< .001	0.980
	VP/T	2.390	0.033	2.580	0.023	2726.991	< .001	0.919
	NN	18.017	3.737	20.233	2.631	28.231	< .001	0.202
	APPO	9.950	2.855	23.008	2.148	1603.371	< .001	0.870
	PREP	43.758	3.462	38.208	2.053	228.169	< .001	0.486

As can be seen from the data in Table 2, the international expert applied linguistics authors of the texts in RC used significantly more syntactic complexity than the Moroccan authors of the texts in TC. There is a significant difference regarding the four amount-of-subordination measures between the two groups. In more technical terms, the three p-values are below .05, with $p < .001$ for the number of clauses per T-unit (C/T) (TC: M = 1.568, SD = 0.054 - RC: M = 1.678, SD = 0.036), the number of complex T-units per T-units (CT/T) (TC: M = 0.411, SD = 0.024 - RC: M = 0.469, SD = 0.043), the number of dependent clauses per clause (DC/C) (TC: M = 0.364, SD = 0.029 - RC: M = 0.397, SD = 0.036), and the number of dependent clauses per T-units (DC/T) (TC: M = 0.561, SD = 0.032 - RC: M = 0.687, SD = 0.036). The effect size is large for all four measures—a ω^2 value at 0.576, 0.401, 0.200, and 0.757, respectively.

With respect to the amount of coordination indices, there are significant differences between the two groups. The p-value is below .001 for the number of coordinate phrases per clause (CP/C) (TC: M = 0.484, SD = 0.032 - RC: M = 0.581, SD = 0.025). The same value ($p < .001$) is observed regarding both the number of coordinate phrases per T-unit (CP/T) (TC: M = 0.732, SD = 0.055 - RC: M = 0.941, SD = 0.023) and the number of T-units per sentence (T/S) (TC: M = 1.027, SD = 0.036 - RC: M = 1.083, SD = 0.021). The effect size for the amount of coordination indices is large: $\omega^2 = 0.725$ for CP/C, $\omega^2 = 0.845$ for CP/T, and $\omega^2 = 0.459$ for T/S.

In like manner, the phrasal sophistication measures—complex nominals per clause (CN/C) [(TC: M = 2.292, SD = 0.028 - RC: M = 2.600, SD = 0.021), $p < .001$], complex nominals per T-unit (CN/T) [(TC: M = 3.341, SD = 0.025 - RC: M = 4.240, SD = 0.021), $p < .001$], and verb phrases per T-unit (VP/T) [(TC: M = 2.390, SD = 0.033 - RC: M = 2.580, SD = 0.023), $p < .001$])—exhibit significant

statistical differences, each. The ω^2 values 0.957 (CN/C), 0.980 (CN/T), and 0.919 (VP/T) indicate a large effect size for the phrasal sophistication indices.

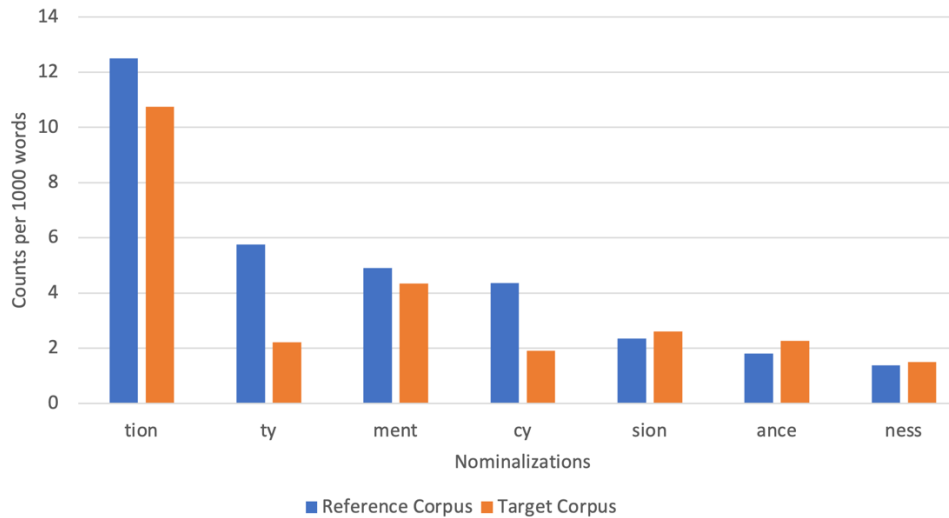
The data in Table 2 also reveals significant differences between the two groups regarding the noun modification, apposition, and prepositional phrases measures. The ANOVA test yielded p-values inferior to .05 regarding NN [(TC: M = 18.017, SD = 3.737 - RC: M = 20.233, SD = 2.631), $p < .001$], APPO [(TC: M = 9.950, SD = 2.855 - RC: M = 23.008, SD = 2.148), $p < .001$], and PREP [(TC: M = 43.758, SD = 3.462 - RC: M = 38.208, SD = 2.053), $p < .001$]. A high difference magnitude—NN ($\omega^2 = 0.202$), APPO ($\omega^2 = 0.870$), and PREP ($\omega^2 = 0.486$)—is observed for all the three measures.

Results regarding the comparison of the two corpora in terms of nominalization show a difference in nominalization use by the authors of TC texts and the authors of RC texts. On the whole, more nominalizations are used in RC than TC: 32.66 nominalizations per 1000 words in RC (total 3728 in the corpus) and 25.58 nominalizations per 1000 words in TC (total 2622 in the corpus), as reported in Table 3. More specifically, *-tion* nominalizations are the most frequent in both corpora (Figure 2). Nominalizations with *-ment*, *-cy*, and *-ion* are the next most frequent, followed by *-sion*, *-ance*, and *-ness* in RC. In contrast, the order of nominalization frequency in TC is *-ment*, *-sion*, *-ance*, *-ty*, *-cy*, then *-ness*. Moreover, the authors of RC texts used more *-tion* (12.50/1000 w), *-ty* (5.37/1000 w), *-ment* (4.90/1000 w), and *-cy* (4.36/1000 w) than the authors of TC texts (*-tion*: 10.75/1000 w, *-ty*: 2.21/1000 w, *-ment*: 4.34/1000 w, *-cy*: 1.91/1000 w). The *-sion* (RC: 2.35/1000 w – TC 2.61/1000 w) and *-ness* (RC: 1.38/1000 w – TC 1.50/1000 w) nominalizations use frequency is similar in the corpora. Yet, there are more *-ance* nominalizations in TC (2.26/1000 w) than in RC (1.80/1000 w).

Table 3. Comparison of the Occurrences of Nominalization in TC and RC

Nominalizations	Corpus			
	TC		RC	
	Occurrences in the corpus	Occurrences per 1000 words	Occurrences in the corpus	Occurrences per 1000 words
-tion	1100	10.75	1394	12.50
-ty	227	2.21	621	5.37
-ment	445	4.34	567	4.90
-cy	196	1.91	505	4.36
-sion	268	2.61	272	2.35
-ance	232	2.26	209	1.80
-ness	154	1.50	160	1.38
Total	2622	25.58	3728	32.66

Figure 2. Comparison of Nominalization Occurrences per 1000 Words in TC and RC



5. Discussion

The overall results indicate that the two corpora differ significantly in terms of the deployment of syntactic complexity features while seeking to make meaning and accomplish the communicative tasks in the Discussion section of a research article. Writing a Discussion section of a research paper involves complex meaning-making, cognitive complexity, and concisely supporting an argument before a knowledgeable community of practice, where linguistic norms for scholarly conversations have been established. The significant difference between TC and RC reflects varying degrees with respect to subordination, coordination, phrasal sophistication, nominal modification, apposition, prepositional phrases, and nominalization.

The higher amount of subordination and coordination in the RC texts than the TC texts indicates that the international expert researchers use more clauses and phrases per information unit than the emerging Moroccan researchers. This was observed concerning all four subordination indices (Clauses per T-unit (C/T); complex T-unit per T-unit (CT/T); dependent clauses per clause (DC/C); dependent clauses per T-unit (DC/T)) and all three coordination indices (coordinate phrases per clause (CP/C); coordinate phrases per T-unit (CP/T); T-units per sentence (T/S)). This means information that can be put together more effectively is spread out over different sentences. Other research findings reported similar subpar subordination and coordination in EFL scholarly research writing. Ebrahimi and Imandar (2021) found that research articles authored by Iranian emerging researchers published in journals in Iran had significantly fewer clauses and phrases per sentence than articles published in the USA.

Results of the present study also point to a higher use of phrasal sophistication in the reference corpus texts than in the target corpus texts. This higher use was noted across the three indices: complex nominals per clause (CN/C), complex nominals per T-unit (CN/T), and verb phrases per T-unit (VP/T). An inferior deployment of these three syntactic complexity features than that characteristic of this genre was also reported in a study in the Iranian EFL context. Ansarifard et al. (2018) found less phrasal sophistication in Iranian PhD dissertations than in international research articles. This could be explained as under-exploitation of genre means through which effective conveying of complex meaning is accomplished in scholarly research writing. Juxtaposition of related components of information certainly aids the reader to follow and, ultimately, have a clear representation of the writer's argument.

In like manner, a superior use of syntactic complexity was observed in the RC texts than in the TC texts with regard to nominal modification (NN), apposition (APPO), and preposition phrases (PREP). The integration of nominal modification (NN) among the indices selected for the purposes of this study might be criticized and invoked as redundant, as this syntactic structure is a type of complex nominals we have already quantified under phrasal sophistication. In fact, nominal modification, more than attributive adjectives and noun post-modifiers, is one of the defining characteristics of scholarly research writing (Biber et al., 2011). Besides, it is noticeable in many EFL written texts that the writers may not have moved beyond the basic and restrictive notion of adjectives modifying nouns. Noun modification, apposition, and prepositional phrases serve the crucial function of clarifying or providing additional information that the reader would need immediately before or after a noun, not elsewhere in a text. Xue and Ge (2021) reported similar below-genre-standard incorporation of phrasal sophistication features in EFL research

writing. Their research findings reflect significant differences between Chinese graduate students' and international researchers' articles.

Nominalization, a key asset among the functional syntactic complexity repertoire—as Ryshina-Pantkova (2015) demonstrates—is deployed significantly more in RC than in TC. This reveals yet another Moroccan doctoral candidates' scholarly research writing deficiency in terms of abiding by the norms of this genre. An important function of nominalization in research writing is abstraction. At the core of advancing the collective knowledge about a topic is conducting research on a particular group (properly selected to represent a target population) in a particular context and inferring conclusions that may be generalized beyond the specific setting of the study. Consider the example: *Classroom interaction improves EFL learners' speaking skills*. This inference was reached after many experiments had been conducted by different researchers on different groups of EFL learners. *Interaction* in this example moves improving EFL learners' speaking skills to a general concept and elevates it beyond the specific studies.

Moreover, the results indicate a slightly superior use of *-ance* and *-ness* nominalizations in TC, although the frequency of these two types of nominalizations is very low in both corpora. This could be attributed to the overuse of generic words and phrases by TC text authors (significance, importance, performance, dominance, and relevance, for example). The insignificance of the higher frequency of *-ness* nominalizations in TC could be explained by its more frequent use in literary writing. On the other hand, the frequency order of suffix nominalizations this study identified in the RC texts supports the order Nishina (2007) advances. Yet, the obtained data calls into question Nishina's assertion that *-tion* nominalization represents 55% of academic writing nominalizations. Nominalizations with *-tion* in the present study's data represent only 38%. The results also confirm the under-use of suffix-based nominalization found in Chinese EFL learners' research writing (Xue & Ge, 2021).

6. Conclusion

The main aim of the current study was to determine whether Moroccan doctoral candidates' scholarly research writing may be underdeveloped because it lacks the genre standard use of functional syntactic complexity for meaning-making. The results indicate that these emerging researchers' articles exhibit a significant substandard use of functional syntactic complexity across all the previously cited indices.

This suggests that these doctoral candidates may not have successfully made the transition from the university academic writing genre to the more specialized scholarly research writing. Genre, thus, emerges as a crucial guiding component in EFL academic writing development. This supports and confirms previous research advocating for exploiting genre knowledge for successful communication within a discourse community. Primary in genre knowledge is the functional use of linguistic features for complex meaning-making in a context that involves interpersonal relationships with the readers who belong to a community of practice with established, valued, and expected norms. Syntactic complexity also emerges as a reliable predictor of academic writing proficiency and a useful and effective tool among the repertoire of means through which EFL learners may effectively communicate within an academic writing genre. These findings may have implications for academic writing instruction and scholarly research writing development.

The evidence from this study suggests that academic writing development would benefit from linking grammar and writing and from incorporating and raising the students' awareness of the role of linguistic complexity and genre characteristics in academic writing. This entails grammar being seen and taught as a network of systems with affordances for effective context-bound choices during the planned and carefully thought process of writing. The positive impact adopting this view may have on writing development is evidenced by the varied functions this study shows syntactic complexity features serve in research writing. Equally instrumental in our understanding of academic writing development is viewing attainment not only as achieving university-level benchmarks in terms of accuracy and fluency but also in terms of complexity. Academic writing, as we have seen, is characterized by a compressed style. This density of information is manifested as more information per unit of text. The semantic density triggers syntactic complexity.

In seeking to aid students increase their academic writing level, instructors ought to be aware and make use of the correlation between syntactic complexity and academic writing proficiency. Also essential in academic writing proficiency development is conceiving of attainment as a successful transition from one of its subgenres to another. This transition should be guided by these subgenres' knowledge, including shared norms of devising and interpreting texts. The transition ought not to be a mere mechanical transfer of essay writing features and techniques into scholarly research writing, which is a more specialized genre that is knowledge-making demands informed. Taken together, these implications may contribute to addressing the academic writing challenges among university students in Morocco, despite some limitations in this study that need to be considered.

Firstly, only research articles written by participants within the applied linguistics discipline affiliated with public universities were included. Yet, including participants from other disciplines and affiliated with private higher education institutions would have taken the scope of this study to an unmanageable level. Secondly, the study did not evaluate the use of other components of linguistic complexity, namely, lexical and morphological complexity. On the other hand, although the texts explored were limited to the Discussion sections, this section is one of the most important sections in a research article and the one that involves the most complex communicative tasks. Despite these limitations, the current study may springboard future research.

The research problem and outcomes of this study may serve as a base for future studies and open research avenues. Linguistic complexity may be used as a variable in experimental and longitudinal academic writing research. Experimental investigations using linguistic complexity instruction as treatment would complement the present study and confirm its conclusions. Another possible area for future research would be to investigate linguistic complexity in scholarly research writing in different academic disciplines. This would be a natural progression of the present research that focused on applied linguistics. Further cross-disciplinary comparison in this regard, such as the one undertaken by Green (2019) in a different context, is also recommended. Furthermore, research that foregrounds genre analysis and pedagogy that is premised on genre knowledge are welcomed. Future work on examining characteristic linguistic patterns of texts within different writing genres would expand our collective knowledge on how to optimally teach academic writing.

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