Syntactic and lexical features of adolescent L2 students' academic writing

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1. Introduction

In the U.S. secondary education context, the significance of academic writing is underscored in Common Core State Standards (CCSS). The Common Core State Standards for English Language Arts & Literacy in History/Social Studies, and Technical Subjects (CCSS-ELA) for grades 6–12 have set a high bar for students, requiring them to be able to produce clear, coherent, and well-developed writing (National Governors Association Center for Best Practices and Council of Chief State School Officers, 2010). By the end of 6th grade, students are expected to develop a claim about a complex topic and substantiate it with relevant examples and evidence using credible sources while maintaining a formal style of writing. They must demonstrate "the ability to analyze and interpret challenging texts and to write about those texts using academic discourse in extended pieces of writing" (Olson, Scarcella, & Matuchniak, 2015, p. 5). In addition, students are expected to use precise language, domain-specific vocabulary, and nuanced transitional devices to show relations between ideas. In short, the CCSS-ELA's emphasis on academic writing demands high levels of analytical writing proficiency and academic language fluency. But are the students in middle and high schools in the United States performing at the level of proficiency set forth by CCSS?

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The results of the first computer-based writing assessment conducted by the National Assessment of Educational Progress (NAEP) indicate that only about 27% of students in 8th and 12th grades and only 1% of English Learners (ELs) in both grades perform at or above the proficient level (U.S. Department of Education. National Center for Education Statistics, 2012). The NAEP report shows that the majority of the students in middle and high school in the United States struggle as academic writers and in meeting the expectations set forth by CCSS. The alarming 1% proficiency level for ELs indicates that the challenge is much greater for adolescent L2 students. As of Fall 2017, ELs made up about 10% of students attending public schools in the United States (U.S. Department of Education. National Center for Education Statistics, 2020), and the number of ELs has been continuously increasing. Despite their growing rate in the U.S. secondary education context, adolescent L2 students are an underexplored population in L2 writing research. Much of the research in L2 writing, more specifically on the linguistic features of L2 texts, has focused on postsecondary students (Ortega & Carson, 2010).

While the gaps in research remain, the gaps in pedagogy to address adolescent L2 students' academic writing development continue to be prevalent. Applebee and Langer's (2011) study, which surveyed teachers across the United States and examined how writing is taught in 260 middle and high school classes in five different states, found that writing practice and instruction were minimal, with only 7.7% of class time spent on composing extended texts. Similarly, Graham, Capizzi, Harris, Heber, and Morphy (2014) reported that the amount of writing practice and the language instruction students receive are not sufficient in a typical middle school classroom. Graham et al.'s (2014) study highlighted the discrepancy between writing practices in secondary school and writing standards as defined by CCSS (Graham et al., 2014). Both of these studies suggest L2 students in secondary school are not receiving sufficient writing practice and are not exposed to high-quality writing and language instruction in general. These gaps in pedagogy and research warrant a need to investigate the linguistic features of adolescent L2 students' academic writing. Bunch, Kibler, and Pimentel (2012) emphasized the importance of understanding "the use of language and literacy relevant to the challenges facing ELs in light of the [Common Core] Standards" (p. 3). Such an understanding is vital in writing pedagogy that is geared towards helping adolescent L2 students learn the language conventions of academic written discourse.

2. Conceptual framework

We frame our study within the domain of academic writing and zero in on the language features of adolescent L2 students' text-based analytical essays with an intent to determine the extent to which these students are progressing towards acquiring the target language features of academic writing. Academic written register, which is characterized by its highly informational purpose, impersonal style and absence of narrative features, exhibits salient patterns of language use and grammatical complexity that need to be acquired by students when composing within an academic context (Biber, 2006; Biber, Gray, & Poonpon, 2011). Thus, standards-aligned classroom pedagogy geared towards facilitating L2 students' acquisition of language skills that are necessary to meet the demands of academic writing need to consider both the language features of academic writing and the linguistic needs of striving writers. The present study reviews the language features of academic writing and analyzes L2 students' text-based analytical essays to identify common linguistic patterns. While reviewing the language features of academic writing helps us understand the highly-specialized grammatical structures and lexical features of academic written discourse, a systematic examination of linguistic features of adolescent L2 writers' texts and identifying linguistic patterns observed in those texts can inform us about their linguistic needs. In what follows, we provide an overview of the linguistic features of academic writing, with an intent to identify common features shared within and across disciplines and to determine language demands necessary to build proficiency in academic writing.

2.1. Academic writing and its linguistic features

Writing in an academic context is guided by and aligned with communicative purposes and language conventions sanctioned by the members of particular discourse communities (Swales, 1990). Regardless of the discipline in which it is situated, academic writing is marked by a well-informed and focused topic/argument, evidence-based development, textual coherence based on logical order and relations between ideas, and formal tone. To accomplish these higher-order tasks, academic writers heavily rely on their linguistic resources; namely, syntax and vocabulary are two fundamental linguistic resources used to construct meaning and communicate ideas. The expression and the development of complex ideas in an academic context exhibit common register features because of the similarity in purposes of academic genres (Schleppegrell, 2001). Language features that are common in academic writing "create the qualities of precision, detachment, and density that fit the context of academic tasks" (Ranney, 2012, p. 565). Understanding "the linguistic elements that make up the [formal] registers of schooling" is crucial to students' academic writing development (Schleppegrell, 2001, p. 431).

2.1.1. Syntactic features of academic writing

The grammatical structures of academic writing tend to be highly specialized (Biber et al., 2011). One prominent syntactic and stylistic feature that is common across various academic written genres is the application of and dependence on hypotactic syntactic constructions that are more sophisticated and less common than those found in casual conversations. For example, Biber et al. (2011) found that nonfinite relative clauses, WH relative clauses (post-modifiers using *who, that, which, where, when*), noun complement clauses with *that* and *to*, and "dependent clauses functioning as constituents in a noun phrase" are much more prevalent in academic writing (p. 28). On the other hand, finite dependent clauses with *if* and *because* conjunctions and finite complement clauses (verb + *that* clause as in "I think that …") are more common in conversations than academic writing. Sophisticated forms of hypotaxis or subordination of clauses are common in academic writing for the dual purpose of achieving efficiency/economy and establishing a hierarchical order of ideas. Syntactic efficiency is achieved through embedding a subordinate idea within the main sentence rather than

expressing it in a separate, independent sentence. Hypotactic syntactic construction also makes the logical relations and interdependence of ideas explicit, showing arrangements of clauses and phrases that are subordinate to and dependent on main clauses and phrases.

Other specific syntactic features of academic writing include embedded phrases (participial and absolute phrases, and apposition embedded within sentences), complex phrasal structures (noun and prepositional phrases), and hierarchical structure (phrase and clause subordination). For instance, post-modifying prepositional phrases, pre-modifying nouns, and attributive adjectives in noun phrases are common in academic writing (Biber et al., 2011). The sentences below, which are extracted from the newspaper articles that students read and responded to for this study, exhibit clause embedding and other hierarchical syntactic features mentioned above.

Excerpt 1: From "The Man in the Water" by Roger Rosenblatt

> Lenny Skutnik, a 28-year old employee of the Congressional Budget Office, said: "It's something I never thought I would do" – referring to his jumping in the water to drag an injured woman to shore.

- *[a 28-year old employee of the Congressional Budget Office]* — apposition embedded in a subject-verb split position
- *[referring to his jumping in the water to drag an injured woman to shore]* — present participial phrase linked to the subject of the main clause

Excerpt 2: From "Sometimes the Earth is Cruel" by Leonard Pitts Jr.

> That is ultimately the fundamental lesson here, <u>as children wail, families sleep out of doors, and the dead lie unclaimed in the rubble that once was Port-au-Prince</u>.

- *[as children wail, families sleep out of doors, and the dead lie unclaimed in the rubble]* — subordinated adverbial clause with a connective *as*
- *[that once was Port-au-Prince]* — relative clause with relative pronoun *that*

In the sentences above, the subordinate clauses (underlined) make explicit the logical connections between ideas and show the hierarchical structure of clauses. In addition, the use of apposition and participial phrases (italicized) embedded in the sentences is a way to efficiently combine related ideas. In general, academic writing is characterized by complex grammatical structures, interdependent ideas expressed in hierarchical structures, embedding and nesting of clauses and phrases. These clause-combining strategies are used by academic writers to achieve efficiency and to build logico-semantic relationships.

2.1.2. Lexical features of academic writing

Academic writing across various genres and disciplines also share common lexical features. A linguistic feature that is conspicuous in academic writing is "the vocabulary of academic language, often described as comparatively large, precise, and formal" (Ranney, 2012, p. 563). Comparing the lexical features in spoken interactions and school-based texts, Schleppegrell (2001) notes that words used in academic writing tend to be specific and technical, and academic texts have higher lexical density. The density, precision, and technicality of academic lexicons are associated with informational density, technical concepts, and content-specific words that are required to convey complex ideas. Corpus-based research investigating the lexical features of academic writing has led to the development of vocabulary typologies. For example, Scarcella (2003) identified three major categories of academic vocabulary: (1) general words used across academic disciplines and in everyday situations, (2) academic words that are common across different disciplines, and (3) technical words found in specific academic fields. The words in the latter two categories tend to be highly specialized. Taken together, understanding these common linguistic features of academic writing is crucial in writing instruction that is geared towards developing L2 learners' academic language and writing proficiency.

2.2. Linguistic demands of academic writing

Academic writing requires the ability to analyze, interpret, synthesize, and explain complex ideas. Performing these higher-order analytical tasks successfully depends on linguistic resources and requires higher level of language proficiency. Kellogg (2008) asserts, "Without knowledge [of language] being accessible and creatively applied by the writer, it remains inert during composition and unable to yield the desired fluency and quality of writing" (p. 3). This is especially true at an advanced level of writing that is beyond what Bereiter and Scardamalia (1987) referred to as "knowledge telling," in which students rely upon summarizing what they have read. Thus, writing at the level of "knowledge transformation" that is characterized by a complex rhetorical problem-solving process and interpretation rather than summary demands advanced language skills and mastery of comprehensive language knowledge (Bereiter & Scardamalia, 1987).

To communicate well in an academic context, students need to have comprehensive knowledge of sentence structures, types, and functions. This includes the ability to coordinate and subordinate sentences, as well as the ability to make a variety of syntactic choices appropriate for the genre and audience. Further, syntactic knowledge is necessary to avoid sentence boundary errors. For example, the Analytic Writing Continuum (a rubric for literary analysis) developed by the National Writing Project (NWP) that connects U.S.

educators across different states requires proficient writers to (1) "demonstrate effective phrasing so that each sentence flows easily into the next," (2) "include sentences that vary in structure and length, creating an extremely effective text," and (3) construct sentences "that are consistently logical and clear so that the relationships among ideas are firmly and smoothly established" (National Writing Project, 2010, p. 2). Because academic writing demands complexity and variety in sentence structure, as well as conventionalized clause organization, developing writers need to learn formalized syntactic structures (Schleppegrell, 2001).

Academic writing also demands a large lexical capacity and in-depth knowledge of words, including their morphological, semantic, and pragmatic properties. While knowing more words is important, knowledge about the multi-dimensionality of vocabulary is vital in learning to write in an academic context (Kieffer & Lesaux, 2012). In addition, students need to learn to make appropriate lexical choices considering the academic audience and genre. Because adolescent L2 students are constrained by various factors affecting language development, writing pedagogy in secondary context needs to address ways of expanding students' linguistic resources and repertoire.

2.3. Syntactic and lexical features in L2 writing research

For L2 writers who are developing their academic language proficiency, expressing complex ideas in words and sentences to form coherent writing is a challenging task. Thus, understanding how linguistic features might relate to writing quality and proficiency has been an important step in L2 writing research. In several studies of L2 learner corpora, syntactic and lexical features have been used to predict writing quality and proficiency based on the notion that more complex, skilled syntax and sophisticated lexical production lead to better writing quality (Bulté & Housen, 2014; Crossley, Kyle, Varner, Gou, & McNamara, 2014; Crossley & McNamara, 2012; Ferris, 1994; Grant & Ginther, 2000; Guo, Crossley, & McNamara, 2013; MacArthur, Jennings, & Philippakos, 2019; McNamara, Crossley, & McCarthy, 2010).

L2 writing research indicates that "higher quality writing generally contains more complex syntactic features" (Crossley, 2020, p. 422). For example, Lu (2010, 2011) found that L2 texts that show higher writing proficiency exhibited longer and more varied sentences. Furthermore, high quality L2 texts have greater clausal subordination and complex syntactic structures (Friginal & Weigle, 2014; Grant & Ginther, 2000), greater production of dependent clauses (Crossley & McNamara, 2014), greater phrasal complexity (Kyle & Crossley, 2018; Taguchi, Crawford, & Wetzel, 2013). Kyle and Crossley (2017) found that both large-grained indices of syntactic complexity and fine-grained syntactic complexity features were predictors of writing quality. Like syntactic complexity, lexical features are predictive of L2 writing quality (Crossley, 2020). A variety of lexical features, including lexical diversity (Crossley, Salsbury, & McNamara, 2014; Engber, 1995) and lexical sophistication (Crossley & McNamara, 2012; Crossley, Cobb, & McNamara, 2013; Kyle & Crossley, 2016; Kyle, Crossley, & Berger, 2018; Laufer & Nation, 1995) have been found to have significant correlation with writing quality and proficiency.

Most of the extant studies, however, focus on independent writing tasks (as opposed to source- or text-based writing) performed by students in a postsecondary context. In research examining linguistic features of student writing, the type of writing task and genre is an important consideration since different tasks and genres may demand different linguistic skills (Crossley, 2020). In addition, linguistic features of adolescent L2 students' writing continues to be an underexplored area in corpus-based research. This study focuses on the linguistic features of text-based analytical writing (a task and genre different from both independent and typical source-based writing tasks) of adolescent L2 students in mainstream classrooms in a U.S. public education context. These students constitute a unique group with differing exposure to and experiences of navigating the complex landscape of US secondary education.

3. The study

The goal of the study is to systematically examine syntactic and lexical features and their relation to writing quality in adolescent L2 students' academic essays. This systematic examination is crucial in identifying the linguistic needs of this population within an academic context. Our study is guided by the following research questions:

1. What syntactic and lexical characteristics do students' text-based analytical essays exhibit?
2. To what extent do syntactic and lexical features predict writing quality?

Although this study focuses on adolescent L2 students in the U.S. public secondary education context, it has important implications for writing research that deals L2 students' texts and writing pedagogy that is geared towards developing L2 students' academic literacy. The findings of this study will inform us of the adolescent L2 students' linguistic needs and language skills that are necessary to meet the demands of academic writing.

The study's intent to inform the writing research and pedagogy in a secondary education context is particularly important since there is a dearth of research that focuses on the linguistic features of L2 students' text-based analytical writing. Crossley (2020) pointed out that "the majority of information available to the field about the interactions between writing quality/development and linguistic features is derived from a single task (independent writing), shedding some confidence on the generalizability of the findings to other tasks" (p. 432). To our knowledge, no study has examined linguistic features of text-based analytical writing that asked students to analyze a theme of a nonfiction article, make a claim about the author's message, use evidence to support the claim, analyze author's craft, and discuss the author's purpose. It is a writing task and genre that is distinct from a typical source-based, argumentative writing. Unlike typical source-based writing that often integrates multiple sources, this type of writing task draws on a single source and represents an argument of interpretive analysis or literary explication. It is aligned with the CCSS-ELA's emphasis on developing the

ability to analyze, argue, interpret, and use evidence to support ideas about the meaning and message of a literary work. It is also similar to Advanced Placement (AP) English Literature and Composition Assessment (an examination offered by the College Board's Advanced Placement Program) that many students striving for college entrance may take. Our study contributes to the extant literature by examining the linguistic features in lesser studied texts produced by underexplored L2 student population.

4. Methodology

4.1. Sample and setting

The unit of analysis in this study is 86 on-demand, text-based, analytical essays written by L2 students from 7th to 12th grade in a large urban school district in California. Close to 80% of the students in this school district are Latinx, and about 33% are classified either as English Learner (EL) or Reclassified Fluent English Proficient (RFEP) based on 2016–2017 enrollment data. The essays were selected from students who participated in a reading and writing intervention and professional development program called the Pathway Project developed by the University of California, Irvine (UCI) Writing Project. The essays were written at the beginning of the 2016–2017 academic year before the commencement of the intervention. All 86 essays are written by Spanish-speaking L2 students who are classified either as an EL (19%) or RFEP (81%). While 42% of the essays are written by students in middle school, the remaining 58% of the essays are written by high school students.

4.2. Writing task and holistic scoring

At the beginning of the school year before the intervention, the participating students completed reading and analytical writing tasks over two class periods. During the first period, the students read a short newspaper article and completed a post-reading packet focusing on summarizing, visualizing, analyzing a theme and author's craft, and evaluating and reflecting on the purpose and significance of the article. During the second period, they wrote analytical essays responding to a writing prompt that asked them to select a theme in the article, make a claim about the theme, and support their claim with evidence from the text. The writing task was designed to prompt students to write interpretive responses. The essays represent academic writing that requires students to analyze, interpret, argue, and integrate a source text.

All essays were scored holistically using a 6-point scale analytical writing assessment rubric developed by UCI Writing Project to assess the writing quality. The rubric for scoring the essays was based on those used to evaluate the essay portion of the CAHSEE (California Department of Education, 2008a), the California STAR 7 Direct Writing Assessment (California Department of Education, 2008b), and the NAEP (ACT, Inc., 2007). As indicated in the analytical writing assessment rubric, the writing quality was assessed based on the quality of interpretation, the clarity of thesis/claim, the organization of ideas, the integration of evidence, syntactic variety and sentence fluency, diction and word choice, and language conventions. Each essay was scored by two trained expert raters, scoring independently, and the two scores were added together for a final score between 2 and 12. If there was a discrepancy of two or more points between the raters, the essay was scored by a third rater. Readers for all but one paper were in exact agreement or differed by one point. The first- and second-reader scores were highly reliable with an alpha of 0.87. Raters agreed within a single score point or better for 99% of the papers; 56% of the papers had exact agreement between the two readers.

4.3. Corpus description and analysis

The essays in the corpus vary in length. The average word count of essays in the full sample is 198.7 (SD = 96.95), and the shortest essay is 42 words long while the longest essay has 443 words. Table 1 provides descriptive details, including average paragraph, sentence, and word counts and lengths by students' grade levels. The average length of essays increases as the grade levels advance, suggesting that students in higher grades write relatively longer essays compared to those in lower grades, with an exception that the average length of 10th grade students' essays is lower than that of 9th grade essays. Similar trends are observed for paragraph and sentence counts. In contrast, the average length of paragraphs, sentences, and words do not follow the similar upward trend. The average length of paragraphs written by 7th grade students is higher than that of 12th grade essays, suggesting that students in lower

Table 1
Descriptive Statistics: Paragraph, Sentence, and Word Counts.

	Full sample		7th Grade		8th Grade		9th Grade		10th Grade		11th Grade		12th Grade	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Paragraph count	2.4	1.4	1.4	0.8	2.3	1.6	2.9	1.6	2.9	1.3	2.3	1.1	3.6	1.4
Sentence count	11.4	6.0	8.6	4.9	11.1	6.3	10.9	6.1	12.3	5.5	13.0	5.4	14.8	7.7
Word count	198.7	96.9	144.8	71.1	191.2	90.9	212.3	115.6	194.2	111.9	225.9	80.6	255.4	91.8
Paragraph length (sentences)	5.8	3.9	7.1	4.0	5.9	2.8	4.3	1.8	5.6	5.2	7.0	5.3	3.9	0.9
Sentence length (words)	18.7	6.7	18.4	5.7	19.3	8.5	20.4	7.2	15.9	5.0	18.7	6.1	19.4	6.2
Word Length (letters)	4.3	0.3	4.3	0.3	4.3	0.3	4.2	0.3	4.3	0.2	4.2	0.3	4.2	0.3
	N = 86		n = 16		n = 19		n = 15		n = 13		n = 15		n = 8	

grades have longer paragraphs with fewer paragraph divisions, compared to essays in higher grades. Essays in lower-grades tend to have one paragraph. With respect to sentence length, the average number of words per sentence in the full sample is 18.7 (SD = 6.7); the essays in 9th grade have the highest mean score (M = 20.4; SD = 7.2) while essays in 10th grade have the lowest mean score (M = 15.9; SD = 5.0) in number of words per sentence.

While we used the full sample of 86 essays for our manual sentence coding to identify syntactic patterns, we excluded essays that are too short and used a selected sample for Coh-Metrix analysis. From the full sample of 86 essays, 16 essays were excluded for Coh-Metrix analysis for two reasons. First, essays that are too short (less than 100 words) were not included, considering the fact that the suggested text length for Coh-Metrix analysis is 100–1000 words, (McNamara, Graesser, McCarthy, & Cai, 2014). Second, essays predominantly comprised large chunks of quotes and sentences that are copied verbatim from the reading text were not included in Coh-Metrix analysis. The quoted and copied sentences have a confounding effect since the purpose of the study concerns how students construct sentences and use words in their own writing. Thus, the selected sample for quantitative analysis and Coh-Metrix measures consisted of 70 essays.

4.4. Procedures

To analyze the syntactic and lexical features of these essays, a combination of manual sentence coding and a computational tool Coh-Metrix were used. All sentences in uncorrected essays (N = 86) were coded by two human raters both of whom have extensive experience of teaching university-level writing and composition courses. The raters coded sentences based on 1) sentence structures — simple, compound/coordinated, and complex/subordinated, 2) types of clauses (i.e., adjective clause, adverbial clause, nominal clause, reduced clause) and phrases (i.e., participial phrase, absolute phrase, appositive), and 3) sentence boundary issues — fragment, run-on, and faulty sentence (incomprehensible and structurally-flawed sentences that do not conform to the rules of English grammar). We classified fragment, run-on, and faulty sentences unconventional as these syntactic structures are not conventional in an academic written discourse. Finite complement clauses (*I think…, I believe…*) were classified as a simple structure (Table 2). Inter-rater reliability (IRR) analysis was performed to assess the degree the coders consistently classified sentences into the suitable categories. The coders had substantial agreement (93.2%) in categorizing sentences, with a modest amount of variance mainly with discrepancy between faulty sentences and run-on sentences.

In addition, we used the computational tool Coh-Metrix that provides a wide variety of language and discourse measures (McNamara et al., 2014). We selected the indices that are pertinent to syntactic and lexical features (Table 3). Our selection was informed by the findings of previous studies that examined linguistic features of L2 writing. For syntactic features, we included sentence length, syntax similarity, left embeddedness (number of words before main verb), and number of modifiers per noun clause. Sentence length and variety were found to be important indicators of writing quality based on the findings that proficient L2 writers produced longer and more varied syntactic structures (Lu, 2011; Ortega, 2003). Phrase-level complexity was also found to be an important indicator of writing quality (Guo et al., 2013; Kyle & Crossley, 2018; Taguchi et al., 2013). Kyle and Crossley (2017) reported both large-grained and fine-grained syntactic measures were significant predictors of writing quality. Thus, we included sentence length and syntax similarity as large-grained, clause-level measures and left embeddedness and number of modifiers per noun clause as fine-grained, phrase-level measures.

For lexical features, we included a lexical diversity measure, specifically Measure of Textual Lexical Diversity (MTLD), and lexical sophistication measures, including word length, word frequency, and five psycholinguistic measures: age of acquisition, word familiarity, concreteness, imageability, and meaningfulness. Although Coh-Metrix provides several lexical diversity measures, including type-token ratio and *vocd*, we chose MTLD for two reasons. First, type-token ratio is confounded by text length as longer texts have more words that are repeated (Jarvis, 2013; McCarthy & Jarvis, 2007). MTLD attempts to overcome this issue by using estimation algorithms (McNamara et al., 2014). Second, McCarthy and Jarvis (2010), in their validation study, found that "MTLD performs well with respect to all four types of validity and is, in fact, the only index not found to vary as a function of text length" (p. 381). Similarly, Zenker and Kyle (2021) reported MTLD was stable in short L2 texts. When it comes to lexical sophistication, there is no agreed-upon method of operationalizing it; however, previous studies indicate that higher quality academic writing contains longer and less familiar words (Crossley, Salsbury, & McNamara, 2011), greater use of infrequent and advanced words (McNamara et al., 2010); less concrete, imageable, and meaningful words (Crossley & McNamara, 2012; Crossley, Kyle et al., 2014).

The initial phase of the study involved preparing the learner corpus for syntactic and lexical analysis. This included typing the essays since all of them were handwritten and coding sentences. For Coh-Metrix analysis, we corrected spelling errors and deleted sentences and large chunks of phrases (three or more consecutive words) that are either copied verbatim or quoted from the text to which students responded. We corrected the spelling errors in order to obtain accurate measures of syntactic and lexical features for Coh-Metrix output. Sentences and large phrases that were quoted and copied from the literary nonfiction article were deleted from the essays prior to the Coh-Metrix analysis because they reflected the syntactic and lexical features of the source material rather than students' language use. The data cleaning process underwent three rounds of reviewing each essay to make sure the texts are clean and satisfy Coh-Metrix criteria. This was important since "dirty" texts with spelling errors and odd symbols undermine Coh-Metrix's validity (Dowell, Graesser, & Cai, 2016). We used the version of Coh-Metrix designed for researchers to process a batch of texts, but we also randomly selected 10 essays to run through the publicly available version that processes individual texts to check if the measures of the individual essays were consistent with scores obtained using the researcher version. The scores of the 10 essays were consistent.

4.5. Analytic strategies

To analyze the syntactic and lexical features and their relation to writing quality, we conducted both descriptive and statistical analyses (Table 4). We used descriptive statistics of the syntactic and lexical features derived from manual sentence coding and quantitative measures from Coh-Metrix. Our manual sentence coding, which was conducted with uncorrected texts in the full sample (n = 86), was informed by the Systemic Functional Linguistic (SFL) approach (Halliday, 1994) that posits certain patterns of language use within a specific discursive context can be detected through a systemic approach and functional analysis of text construction. Since we intend to examine the language use and detect language patterns in students' written texts, Halliday's (1994) systemic approach and functional grammar that deals with structural features related to English phrases, clauses, and sentences served as an analytic strategy that guides our study.

To investigate the relation between the linguistic features and writing quality, we first ran Pearson Correlations between all syntactic and lexical variables and the holistic score of writing quality. We checked all predictor/independent variables for multi-collinearity. We then conducted multiple regression analyses to examine the relationship between the syntactic and lexical features and writing quality. Since multiple regression shows combined and independent contributions of predictors, this analytical strategy was used to determine the extent to which the selected syntactic and lexical features predict the human-rated holistic writing score.

5. Results

The goal of the study was (1) to investigate syntactic and lexical features in the adolescent L2 students' text-based analytical essays and (2) to analyze the extent to which syntactic and lexical features predict writing quality.

5.1. Syntactic and lexical features in students' text-based analytical essays

5.1.1. Syntactic features

The results of the systematic analysis based on manual coding of sentences revealed that 33% of all sentences in the full sample (N = 86) were categorized as unconventional sentences with boundary issues and other structural problems, making up the most frequent pattern. Unconventional sentences include run-ons and comma splices (14.76%), fragments or incomplete sentences (6.27%), and faulty sentences that do not conform to the rules of standard English grammar (11.93%). Simple structures that include both one-clause simple sentences and finite complement clauses (verb + *that* clause) were the next prominent pattern, accounting for 23.86% of the total number of sentences. Among subordinated sentences, which constituted 19.21% of all sentences, finite adverbial clauses (11.02%) and finite noun modifiers clauses (7.18%) were common patterns. Coordinated clauses made up about 11% of all sentences (Table 5).

We further investigated the complexity in syntax by examining the types of clauses and the connectives that were used to combine clauses (Fig. 1). The functional classification of clauses indicated the use of basic coordinating conjunctions and a limited variety of subordination. As exhibited in Fig. 1, coordinated sentences with *and* and *but* conjunctions were the most frequent patterns with 10.52% of all sentences. In addition, the three most frequently used subordinating clauses were finite noun modifier (FNM) clauses with a relative pronoun *that*, finite adverbial clauses (FAC) with a causal connective *because,* and FAC with a temporal connective *when.* These three structures alone constituted more than 50% of the subordinated clauses or complex sentences.

For the quantitative analysis, we used four Coh-Metrix measures of syntactic features: sentence length, sentence similarity across paragraphs, left embeddedness, number of modifiers per noun clause. The mean scores of left embeddedness (M = 3.86; SD = 1.64) and number of modifiers per noun clause (M = .69; SD = .16) were substantially lower than the grade-level estimates based on the Degrees of Reading Power (DRP) adjusted according to grade bands used within CCSS (see McNamara et al., 2014 for Coh-Metrix norms by grade level). On these two syntactic complexity measures, the mean score of the full sample was at around the fourth and fifth grade level. For example, the mean score of left embeddedness based on the norms of grade level estimate is 4.078 (SD = 1.7) for grades 6–8, and 4.644 (SD = 2.335) for grades 9–10, and 5.512 (SD = 2.430) for grades 11 and up (McNamara et al., 2014). In our sample,

Table 2
Sentence Coding Procedure.

Sentence Categories	Subcategories/Classifications	Examples
Simple structure	Simple sentence (1 clause)	The man in the Water has his own natural powers.
	Finite complement clause (verb + *that* clause)	I think that the theme is courage and bravery.
Compound sentence	Coordinated clauses (2 or more clauses)	This man lost the battle but he was able to save 5 other men in the process.
Complex sentence	Subordinate clause (2 or more clauses):	
	Finite adverbial clauses	When something tragic happened, they just move along with there business and forget the past.
	Finite noun modifier clauses (*that* and *which* relative clauses)*	We just sit and watch everything that is happening.
	Fragment (incomplete sentence)	To just ignore the cruelties of the earth's nature.
Unconventional sentence	Run-on (comma splices are classified as run-on)	Haiti people were poor they had to do what they need everyone will help people if they were injured or had been stuck.
	Faulty sentences (sentences that have semantic and structural problems)	While sinking a man risking his life to save other knowing his death will come soon.

Table 3
Coh-Metrix Indices Used in the Study.

Linguistics Features	Measures/Indices
Syntactic Features	
Large-grained length feature	Sentence length (number of words)
Syntactic variety	Sentence syntax similarity (across paragraphs)
Phrase-level complexity	Left embeddedness
Phrase-level complexity	Number of modifiers per noun phrase
Lexical Features	
Length feature	Word length (letters)
Lexical Diversity	Measure of Textual Lexical Diversity (MTLD)
Lexical Frequency	CELEX word frequency (content words)
Psycholinguistic properties	Age of acquisition (content words)
	Familiarity (content words)
	Concreteness (content words)
	Imageability (content words)
	Meaningfulness (content words)

however, the mean scores of left embeddedness were substantially lower in all grades (Table 6). In general, sentences in our sample had fewer words before the main verb, showing less syntactic complexity. A similar trend is observed in the number of modifiers per noun clause, suggesting the essays generally have simpler noun clause structures with fewer modifiers. On the other hand, sentence similarity across paragraphs were relatively stable across grade levels, as well as in comparison to grade-level estimates. This indicates that the essays have structurally diverse sentences. Sentence length varied by grade level, with 8th (M = 21.28; SD = 7.69) and 9th (M = 21.26; SD = 6.24) grade essays having larger mean scores of sentence length and 10th grade essays with the smallest mean score (M = 15.53; SD = 4.53). It is important to note that a lot of the long sentences that the students produced were run-on sentences or faulty sentences (common patterns based on our manual coding). For example, the sentence below is 46-word long, but because it is a run-on sentence, it may not be considered a sophisticated or complex sentence construction.

A sample sentence from a student text:

> In this essay I will talk about the Man in the water he is not just an ordinary person he was a hero why you may ask because he risk his life for other people's life not many people do that he saved 5 people's life.

Putting it all together, we summarize the key findings of syntactic features below. In general, the text-based analytical essays of adolescent L2 students in our sample exhibit the following:

- Unconventional sentences (run-ons, fragments, faulty sentences) and simple structures make up the most frequent patterns.
- Repeated use of basic and commonly-used coordinating (*but, and*) and subordinating (*that, because, when*) conjunctions.

Table 4
Data Matrix.

Research Questions	Measures	Analytical Approach
What syntactic and lexical characteristics do students' text-based analytical essays exhibit?	Syntactic measures derived from manual coding •Simple sentences (percentage) •Compound sentences (percentage) •Complex sentences (percentage) •Faulty sentences (percentage) Coh-Metrix syntactic indices •Sentence length •Sentence syntax similarity •Left embeddedness •Number of modifiers per noun phrase Coh-Metrix lexical indices •MTLD •Word frequency •5 psycholinguistic measures (Table 3)	•Human coding of sentences informed by Systemic Functional Approach (Halliday, 1994) •Descriptive statistics
To what extent do syntactic and lexical features predict writing quality?	•Holistic score of writing quality (dependent variable) •Syntactic features (predictors or independent variables) •Lexical features (predictors or independent variables)	•Correlation analysis •Multiple regression •Multicollinearity diagnostics (VIF computation)

- Underuse of varied and sophisticated subordination that are common in academic writing.
- Fewer words before the main verb showing less syntactic complexity (approximately two or more grades below the grade level norm).
- Simpler noun clause structures (two or more grades below the grade level norm).

5.1.2. Lexical features

Lexical characteristics are based on Coh-Metrix indices of lexical diversity (LD), lexical frequency, and five psycholinguistic measures of words — age of acquisition, content word familiarity, concreteness, imageability, and meaningfulness. On the LD measure, the essays typically have low scores. This indicates that the L2 students' text-based analytical essays have less lexical diversity and more repetition of content and function words. The mean LD score was lower than estimated grade-level norms. For example, the following excerpt from student writing shows a repetitive use of the phrase "*the man in the water*," leading to a repetition of content words (*man, water*) and function words (*the, in*) within a paragraph.

> I think the theme of "**The man in the water**" was about cruel and charity. **The man in the water** was more kind than nature. **The man in the water** was willing to give up his life for others and save any survivors from the plane crash. I think what the author was trying to show us two different acts of two different people like the act of the **man in the water** and nature. **Man in the water** put his life at risk to try to do something real good.

Repetitions of the bolded words such as this, which were pervasive in our L2 student texts, not only lead to less lexical diversity but signal the writers' lack of lexico-grammatical awareness.

The word frequency indices indicate that the essays containing more frequent words show less lexical sophistication. Word frequency measures have been used to analyze lexical sophistication based on the notion that less proficient learners use more frequent words, and thus the use of less frequent words show more sophistication. Word frequency for content words (M = 2.57; SD = .15) and all words (M = 3.20; SD = .10) had substantially higher frequency scores compared to grade level estimates, suggesting the use of more frequent words. This is consistent with the findings of previous studies that showed the use of more frequent words in low-proficient students' essays (Crossley et al., 2011; McNamara et al., 2010).

In addition to LD and word frequency measures, we examined five psycholinguistic measures of words. Age of acquisition for content words is a psycholinguistic measure of words that is based on the notion that "some words appear in children's language earlier than others" (McNamara et al., 2014, p. 74). Higher scores (600–700) of age of acquisition indicate academic and technical words that are not common in everyday speech. In our sample, the mean age-of-acquisition score was 308.71 (SD = 27.68), indicating that the students' vocabulary level, on average, is in the lower tiers of vocabulary (Beck, McKeown, & Kucan, 2013), progressing from tier 1, which includes 100–200 level words based on Bristol norms, to tier 2, which includes 300–400 level words (see Fig. 2 for comparison based on Bristol norms). This is consistent with the mean score of content word familiarity, which is based on "a rating of how familiar a word seems to an adult" (McNamara et al., 2014, p. 74). The scores of the essays on content word familiarity indicated a frequent use of familiar and basic words, on average. The three other psycholinguistic measures — concreteness (M = 376.40; SD = 26.76), imageability (M = 410.19; SD = 25.61), and meaningfulness (M = 446.07; SD = 20.19) — were comparable to grade level estimates.

Taken together, our analysis of lexical features based on quantitative measures of lexical diversity, lexical frequency, and psycholinguistic properties of words suggest the following:

- Unnecessary repetitions of content and function words, indicating less lexical diversity.
- Dependence on more frequent, familiar, and basic words that are common in spoken interactions and early stages of vocabulary acquisition.
- Low use of academic and sophisticated vocabulary.

Table 5
Syntactic Patterns Based on Manual Sentence Coding (Full Sample).

| Sentence categories	Subcategories	Percentage Breakdown
Unconventional sentences with boundary issues (33%)	Run-on sentences and comma splices	14.76%
	Faulty sentences	11.93%
	Fragments or incomplete sentence	6.27%
Simple structures (24%)	One-clause simple sentences	18.1%
	Finite complement clauses	5.76%
	Finite adverbial clauses	11.02%
Complex sentences with subordinated clauses (19%)	Finite noun modifier *(that, which, who* relative clauses)	7.18%
	Nonfinite noun modifier clauses (*-ing* and *-ed* clauses)	1.01%
Compound sentences with coordinated clauses (11%)	Coordinated sentences with *and* conjunction	5.46%
	Coordinated sentences with *but* conjunction	5.06%
	Coordinated sentences with *so, yet, or* conjunctions	0.81%
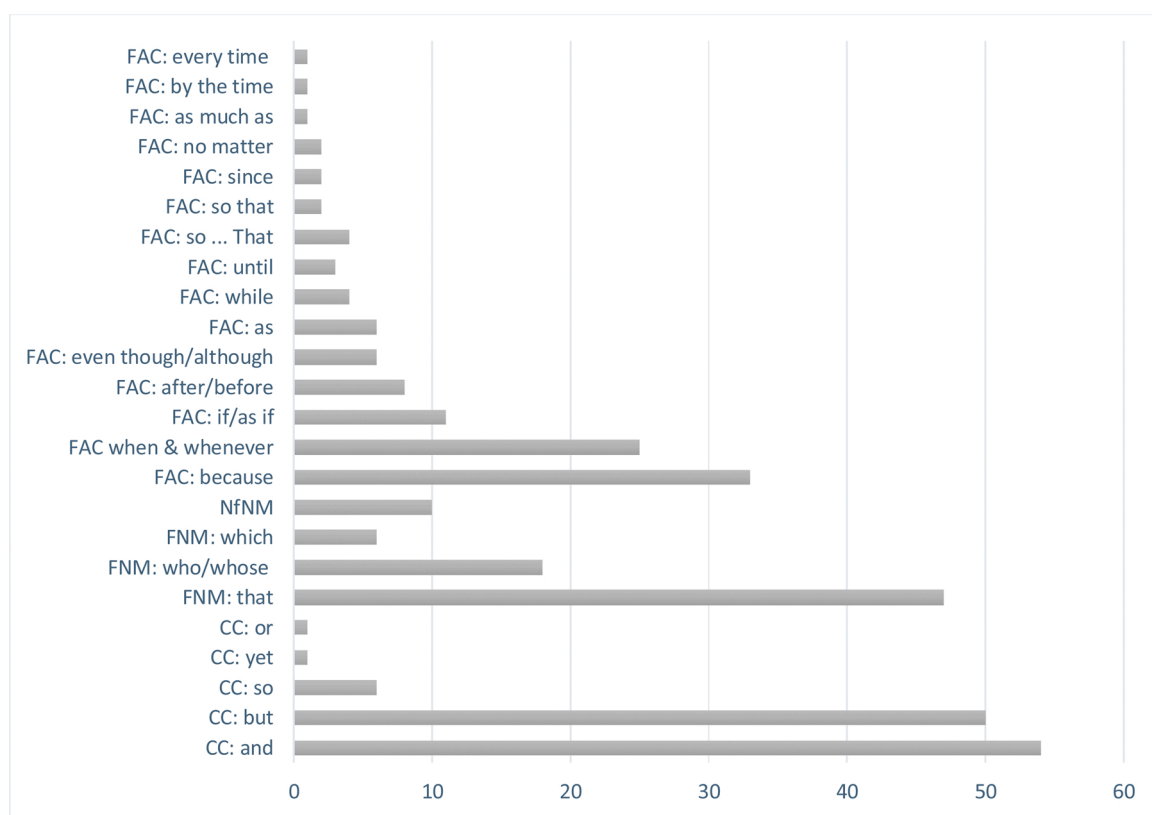
Fig. 1. Types of Clauses and Connectives Used (full sample).
Note. FAC — Finite Adverbial Clause, NfNM — Nonfinite Noun Modifier, FNM — Finite Noun Modifier, CC — Coordinated Clauses.

Table 6
Syntactic Features by Grade Level: Selected Sample for Coh-Metrix.

	Selected sample Mean (SD)	7th Grade Mean (SD)	8th Grade Mean (SD)	9th Grade Mean (SD)	10th Grade Mean (SD)	11th Grade Mean (SD)	12th Grade Mean (SD)
Syntactic Complexity							
Number of words	3.86	2.59	3.51	4.50	3.29	4.66	4.50
before the main verb	(1.64)	(0.97)	(1.69)	(2.17)	(0.94)	(1.48)	(0.97)
Number of Modifiers	0.69	0.65	0.66	0.65	0.66	0.82	0.69
per noun clause	(0.16)	(0.19)	(0.18)	(0.08)	(0.10)	(0.17)	(0.13)
Sentence similarity	0.09	0.09	0.09	0.08	0.09	0.09	0.08
across paragraphs	(0.03)	(0.04)	(0.04)	(0.03)	(0.02)	(0.02)	(0.03)
Sentence Length	19.15	18.20	21.28	21.26	15.53	19.20	18.47
	(6.24)	(6.63)	(7.69)	(6.24)	(4.53)	(5.98)	(4.20)
Observations	70	11	13	13	11	14	8

5.2. Relations between syntactic and lexical features and writing quality

In this section, we examine the relation between the linguistic features and writing quality. Correlations between the writing quality and six of the linguistic features were significant in the selected sample (n = 70): percentage of complex and compound sentences ($r = .61$, $p < .001$), percentage of faulty sentences ($r = −.49$, $p < .001$), age of acquisition for content words ($r = .34$, $p = .005$), word concreteness ($r = −.30$, $p = .011$), imageability ($r = −.37$, $p = .002$), and meaningfulness ($r = −.32$, $p = .006$). All other syntactic and lexical features were not significantly correlated with writing quality (Table 7). All syntactic and lexical variables were checked for multicollinearity to see whether any of the variables were highly correlated. This was important since highly correlated variables prevent the regression model from accurately estimating the relationship between the dependent variable and the independent variables. The results of Pearson correlations showed that complex and compound sentences were highly correlated with unconventional sentences ($r = .796$); word concreteness was highly correlated with imageability ($r = .957$) and meaningfulness ($r = .824$); and meaningfulness was highly correlated with imageability ($r = .869$). Thus, we excluded unconventional sentences, word

concreteness, and meaningfulness from the regression analysis. When we computed the variance inflation factors (VIF) on the remaining variables, the VIF values for all remaining variables were between 1.47 and 3.61 and all tolerance levels were beyond the .2 threshold, indicating that the multicollinearity was not an issue (Gordon, 2010).

In regression analyses, we included six measures of syntactic features in model 1, six measures of lexical features in model 2, and three syntactic and lexical measures that were significantly correlated with writing score in model 3 (Table 8). In regression model 1, only syntactic features were regressed against the writing quality score. The six syntactic features used in this regression model significantly predicted writing quality, $F(6, 63) = 8.23$, $p < .001$, $r^2 = .44$. The six syntactic features together account for 44% of the variance in the human-rated evaluation of writing quality. In regression model 2, six measures of lexical features were regressed against the writing quality score. These six lexical features together account for 23% of the variance in the human-rated evaluation of writing quality, $F(6, 63) = 3.07$, $p = .011$. Model 3 combined only the syntactic and lexical variables that had significant correlation with writing quality, excluding the three variables that were dropped due to multicollinearity. The three combined variables (percentage of complex and compound sentences, age of acquisition, and word imageability) account for 41% of the variance in the holistic score of writing quality, $F(3, 66) = 15.13$, $p < .001$. To sum up, both syntactic and lexical features are crucial indicators of writing quality.

6. Discussion

We systematically analyzed the linguistic features of adolescent L2 students' text-based analytical essays in order to identify the unique language features of their academic writing and to understand how these linguistic features predict their writing quality. Our study suggests that linguistic features substantially contribute to writing quality and that syntactic complexity and lexical sophistication play an important role in composing academic texts that require higher levels of analytical skills. Sentence boundary issues, lack of syntactic variety, the underuse of sophisticated subordination to show connections between ideas, and low use of advanced vocabulary are common features observed in adolescent L2 students' academic writing. These common patterns exhibited in students' writing are not in accord with the highly specialized linguistic features and language conventions of academic prose (see Biber, 2006; Biber et al., 2011 for grammatical features that are characteristic of academic writing). Rather, these patterns reflect language features that are common in informal conversations.

Our results are consistent with and correspond to what Shaughnessy (1977) contends in *Errors and Expectations;* developing writers' "unfamiliarity with certain features of the code that governs formal written English" may interfere with and impinge on their writing quality (p. 45). This, particularly, may be the case for L2 writers who have not fully acquired and internalized the language features of the formal code that govern academic writing. Syntactic and lexical constraints can inhibit fluency and thwart a writer's ability to express complex thoughts when engaging in academic writing that heavily depends on linguistic resources. Thus, L2 writers' ability to produce highly analytical academic texts may be undermined if they have not yet learned the specialized language features of academic writing. In this vein, Kellogg (2008) noted that students' linguistic choices are limited when their knowledge of syntax, discourse, and language in general is not available and easily accessible. Due to their unfamiliarity with the language conventions of academic writing, developing L2 writers are likely to draw on the linguistic resources that are readily available to them, especially in on-demand writing situations. Our findings demonstrate the need for adolescent L2 students to develop their language resources and expand their linguistic repertoire as they are required to engage in complex academic writing tasks.

Although the results of the present study contribute to our understanding of the linguistic needs of adolescent L2 students, there are several limitations that warrant discussion. First, the sample in our study consists of L2 students that represent only Spanish-speaking L2 students from one school district in California. We consider this an important limitation because adolescent L2 students constitute a diverse group with unique backgrounds and differing linguistic needs. In order to see whether the linguistic features we identified in this study pertain to other language-minority students, we need a much larger sample that represents diverse L1 language
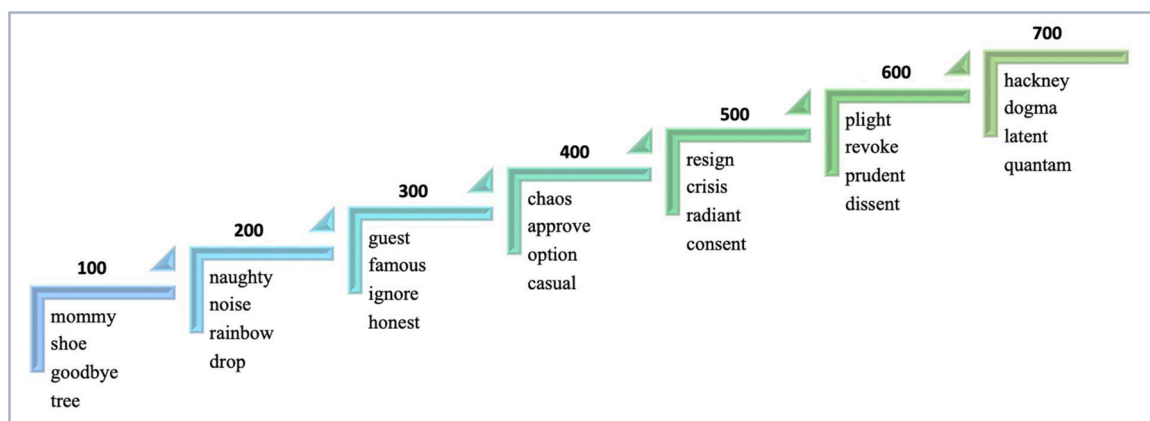
Fig. 2. Sample Words Representing Age of Acquisition Scores Based on Bristol Norms.

Table 7

Correlation Matrix: Syntactic and Lexical Features and Holistic Score of Writing Quality.

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Holistic score	5.74	1.80	—															
2. Simple sentences	20.61	16.92	−.09	—														
3. Complex & compound	34.64	24.41	.61***	−.14	—													
4. Unconventional sentences	44.74	27.65	−.49***	−.49***	−.80***	—												
5. Sentence length	19.15	6.23	.02	−.59***	−.16	.50***	—											
6. Sentence similarity	0.92	0.03	.18	.39***	.23	−.44***	−.51***	—										
7. Left embeddedness	3.88	1.62	−.13	−.17	−.06	.15	.25*	−.06	—									
8. Number of modifiers	0.69	0.16	−.10	.15	.07	−.15	.03	.15	.44***	—								
9. Word length (letters)	4.19	0.24	.12	.06	.15	−.16	−.16	.10	.04	.27*	—							
10. MTLD	62.55	18.36	.22	.01	.20	−.18	−.01	−.09	.10	−.02	.21	—						
11. Word Frequency	2.57	0.15	.01	−.12	.04	.04	−.03	−.04	−.32**	−.51***	−.51***	−.30*	—					
12. Age of acquisition	308.57	26.92	.34**	.14	.35**	−.40***	−.15	.11	−.03	.09	.18	.10	−.20	—				
13. Word Familiarity	583.42	6.02	−.13	−.08	−.03	.08	−.03	.04	−.27*	−.29*	−.30*	−.30*	.65***	−.45***	—			
14. Concreteness	376.40	26.76	−.30*	.16	−.29*	.16	.02	.03	.28*	.48***	.09	−.17	−.49***	−.28*	−.17	—		
15. Imageability	410.19	25.61	−.37**	.20	−.37**	.20	.00	.01	.30*	.45***	.12	−.12	−.53***	−.31**	−.24*	.96***	—	
16. Meaningfulness	446.07	20.19	−.32**	.22	−.34**	.17	−.03	.08	.21	.34**	.13	−.27*	−.41***	−.28*	−.16	.82***	.87***	—

n = 70. simple sentences, complex & compound sentences, and faulty sentences are in percentage.

* p < 0.05.
** p < 0.01.
*** p < 0.001.

backgrounds. Future research should address this limitation and use a more inclusive sample that represents a more linguistically heterogeneous mixture of L2 students.

Second, our manual analysis of syntactic features focused on sentence boundary issues and clause-level features. Biber et al. (2011) identified complex noun phrase structures in academic texts and suggested that phrasal complexity is an important feature of academic writing. For phrase-level features and lexical analysis, we used Coh-Metrix variables. While the quantitative analysis of phrasal complexity and lexical features provides us with an insight into general patterns of language use, qualitative measures of phrasal complexity and vocabulary use will provide a more comprehensive picture of syntactic and lexical features in students' academic writing.

Finally, in this study, we analyzed student texts that were produced in an on-demand writing situation. This, in fact, is a common trend among the previous studies that examined linguistic features of L2 writing. While it is important to examine what students can do during an on-demand situation because standardized, timed writing assessment is a large part of the public education system and oftentimes the basis for college admission, we recognize that writing at the level of knowledge transformation involves a complex rhetorical problem-solving process that requires a significant amount of time and multiple opportunities for revision. We also acknowledge that many of these adolescent L2 students have the potential to perform better when given the time and opportunity to write and revise their work.

7. Pedagogical implications

The complexity and academic nature of writing tasks that are emphasized in the Common Core State Standards for English Language Arts (CCSS-ELA) require students to analyze, interpret, and produce a variety of complex texts. While the CCSS-ELA place a premium on academic writing and set a high bar for students, how these ambitious goals may be achieved are not often clear. Importantly, CCSS-ELA explicitly states that defining the range of institutional and instructional supports that are available and appropriate for English language learners is "beyond the scope of the Standards," yet all students are held to and must meet the same high standards (California Common Core State Standards, 2013, p. 5). Thus, the responsibility is on the teachers to find ways to meet the differing and complex linguistic needs of adolescent L2 students for academic writing.

Since the findings of our study demonstrate the need for adolescent L2 students' development of linguistic resources and repertoire, an important pedagogical question is how teachers in a secondary education context can support L2 students in their effort to become proficient academic writers well versed in the specialized language of academic discourse. While there is no agreed upon instructional approach, language and literacy scholars have suggested ways to meet linguistic needs of L2 students and thereby the challenging demands of the CCSS-ELA. Seeing "transformational opportunities" afforded by the CCSS-ELA, Kibler, Walqui, and Bunch (2015), propose an instructional approach that is aimed "to socialize students into the language and literacy practices emphasized in the Common Core State Standards," that provides guidance, support, and scaffolding tailored to individual students and texts, and that engages students in materials and activities designed to offer multiple opportunities to learn the content and language (p. 29). Similarly, Walqui and Bunch (2019) argue for the amplification of the curriculum, rather than reduction and simplification, and

Table 8
Regression models where linguistic features and writing quality are examined.

	B	SE	t	p	R^2	$F_{(6, 63)}$
Model 1: Syntactic Features					.44	8.23***
Constant	2.99*	1.29	2.32	.024		
Simple sentences	0.01	0.01	1.04	.304		
Complex & compound sentences	0.05***	0.01	6.25	.000		
Sentence length	0.08*	0.04	2.18	.033		
Sentence similarity	8.13	6.43	1.26	.211		
Left embeddedness	−0.06	0.12	-.47	.641		
Number of Modifiers	−1.92	1.24	−1.55	.126		
	B	SE	t	p	R^2	$F_{(6, 63)}$
Model 2: Lexical Features					.23	3.07*
Constant	18.92	30.75	0.62	.541		
Word length	0.52	0.98	0.53	.599		
MTLD	0.01	0.01	0.93	.355		
Word frequency	−0.42	2.45	−0.17	.864		
Age of acquisition	0.01	0.01	1.20	.235		
Word familiarity	−0.01	0.05	0.76	.761		
Word imageability	−0.02*	0.01	0.04	.044		
	B	SE	t	p	R^2	$F_{(3, 66)}$
Model 3: Combined					.41	15.13***
Constant	6.48	4.06	1.60	.115		
Complex & compound sentences	0.04	0.01	4.90	.000		
Age of acquisition	0.01	0.01	1.03	.305		
Word imageability	−0.01	0.01	−1.42	.160		

*p < 0.05; p < 0.01; p < 0.001. n = 70.

emphasize the importance of enacting "stimulating, demanding, well-supported lessons to transform what is currently offered to many English learners" (p. 21). In general, recent research on L2 writing instruction suggests that literacy-rich curriculum that promotes meaningful and socially contextualized engagement in rigorous materials, as well as disciplinary practices, and that provides students multiple opportunities to productively engage with complex, challenging, and academic texts is essential in supporting L2 students to develop their academic language and literacy skills (Bunch, Schlaman, & Rutherford-Quach, 2019; Kibler et al., 2015; Olson, Matuchniak, Chung, Stumpf, & Farkas, 2017; Walqui & Bunch, 2019).

To be able to produce convincing and coherent academic texts, adolescent L2 students need to be conversant with the language conventions and the formal code of academic written discourse. Students need to know not just what linguistic choices they can make, but why they make these choices and when these choices are fitting. In order to expand L2 students' linguistic resources and repertoire, teachers may need a multifaceted pedagogical approach that provides 1) exposure to rich materials and activities that represent and align with the content and conventions of academic writing, 2) explicit instruction that draws learners' attention to syntactic structures and lexical use, 3) strategy instruction that shows how language is used to construct meaning, and 4) guided practice that promotes the application of their acquired linguistic knowledge in composing, revising, and editing processes (Maamuujav & Olson, 2019). This way, teachers can help students determine how writers create meaning from and with texts and how linguistic choices are shaped by socially-constructed genre-conventions.

8. Conclusion

Previous studies have provided insights into linguistic features of L2 writers' texts; however, much of the research on the language features of student texts has focused on the postsecondary context, exploring the language and writing development of undergraduate, graduate, ESL, and EFL students. This study, thus, adds to the extant literature by examining the linguistic features of adolescent L2 writers' text-based analytical essays in an effort to determine language attributes that these texts exhibit.

Our study informs us of the linguistic needs of adolescent L2 students who are often marginalized in their classrooms and schools. Kanno and Cromley (2015) assert that many language-minority students in secondary school are restricted in their access to rigorous curricula and become "long-term" English learners due to instructional and institutional barriers. For many language-minority students across different school districts and states, school may be the only place where they are exposed to academic language. Schleppegrell's (2004) remark is noteworthy here; she asserts, "In the absence of an explicit focus on language, students from certain social class backgrounds continue to be privileged and others to be disadvantaged in learning, assessment, and promotion, perpetuating the obvious inequalities that exist today" (p. 3). Thus, meeting the linguistic needs of adolescent L2 students at instructional and institutional levels is a way to promote equal access and level the playing field for this student population.

Developing proficiency in academic writing is a requisite for college and career success, and students who strive to pursue a path of higher education must learn to use academic language effectively. To become successful academic writers, adolescent L2 students need to develop their linguistic competence, syntactic fluency, and lexical capacity; they need knowledge of language, text, and discourse to be able to write confidently and competently, to be able to compose analytically and persuasively, to meet the standards set forth by CCSS, and to be ready for college and career success.

Acknowledgement

References

ACT, Inc. (2007). *Writing framework for the 2011 national assessment of educational progress*. Iowa City, IA: National Assessment Governing Board.

Applebee, A. N., & Langer, J. A. (2011). A snapshot of writing instruction in middle schools and high schools. *English Journal, 100*, 14–27.

Beck, I. L., McKeown, M. G., & Kucan, L. (2013). *Bringing words to life: Robust vocabulary instruction* (2nd ed.). New York, NY: The Guilford Press.

Bereiter, C., & Scardamalia, M. (1987). *The psychology of written composition*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Biber, D. (2006). *University language: A corpus-based study of spoken and written registers*. Amsterdam, Netherlands: John Benjamins.

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

Bulté, B., & Housen, A. (2014). Conceptualizing and measuring short-term changes in L2 writing complexity. *Journal of Second Language Writing, 26*, 42–65.

Bunch, G. C., Kibler, A. K., & Pimentel, S. (2012). Realizing opportunities for English learners in the common core English language arts and disciplinary literacy standards. In *Paper Presented at the Understanding Language Conference*. Retrieved from http://ell.stanford.edu/papers.

Bunch, G. C., Schlaman, H., & Rutherford-Quach, S. (2019). Where the rubber meets the road: What teachers and students report when implementing high-quality learning designs for English learners. In A. Walqui, & G. C. Bunch (Eds.), *Amplifying the curriculum: Designing quality learning opportunities for English learners* (pp. 21–41). New York, NY: Teachers College Press.

California Common Core State Standards. (2013). *English language arts & literacy in history/social studies, science, and technical subjects*. Retrieved from https://www.cde.ca.gov/be/st/ss/documents/finalelaccssstandards.pdf.

California Department of Education. (2008a). *English language arts teacher guide for California high school exit examination*. Sacramento, CA: Author.

California Department of Education. (2008b). *Teacher guide for the 2008 California writing standards test in grade 7*. Sacramento, CA: Author.

Crossley, S. A. (2020). Linguistic features in writing quality and development: An overview. *Journal of Writing Research, 11*(3), 415–443.

Crossley, S. A., & McNamara, D. S. (2012). Predicting second language writing proficiency: The roles of cohesion and linguistic sophistication. *Journal of Research in Reading, 35*(2), 115–135.

Crossley, S. A., & McNamara, D. S. (2014). Does writing development equal writing quality? A computational investigation of syntactic complexity in L2 learners. *Journal of Second Language Writing, 26*(4), 66–79.

Crossley, S. A., Salsbury, T., & McNamara, D. S. (2011). Predicting the proficiency level of language learners using lexical indices. *Language Testing, 29*, 243–263.

Crossley, S. A., Cobb, T., & McNamara, D. S. (2013). Comparing count-based and band-based indices of word frequency: Implications for active vocabulary research and pedagogical applications. *System, 41*, 965–981.

Crossley, S. A., Kyle, K., Varner, L., Gou, L., & McNamara, D. S. (2014). Linguistic microfeatures to predict L2 writing proficiency: A case study in automated writing evaluation. *Journal of Writing Assessment*, 7.

Crossley, S. A., Salsbury, T., & McNamara, D. S. (2014). Assessing lexical proficiency using analytic ratings: A case for collocation accuracy. *Applied Linguistics, 36*, 570–590.

Dowell, N. M., Graesser, A. C., & Cai, Z. (2016). Language and discourse analysis with coh-metrix: Applications from educational material to learning environments at scale. *Journal of Learning Analytics, 3*, 72–95.

Engber, C. A. (1995). The relationship of lexical proficiency to the quality of ESL compositions. *Journal of Second Language Writing, 4*, 139–155.

Ferris, D. R. (1994). Lexical and syntactic features of ESL writing by students at different levels of L2 proficiency. *TESOL Quarterly, 28*, 414–420.

Friginal, E., & Weigle, S. (2014). Exploring multiple profiles of L2 writing using multidimensional analysis. *Journal of Second Language Writing, 26*, 80–95.

Gordon, R. (2010). *Regression analysis for the social sciences*. New York: Routledge.

Graham, S., Capizzi, A., Harris, K. R., Heber, M., & Morphy, P. (2014). Teaching writing to middle school students: A national survey. *Reading and Writing, 27*, 1015–1042.

Grant, L., & Ginther, A. (2000). Using computer-tagged linguistic features to describe L2 writing differences. *Journal of Second Language Writing, 9*, 123–145.

Guo, L., Crossley, S. A., & McNamara, D. S. (2013). Predicting human judgments of essay quality in both integrated and independent second language writing samples: A comparison study. *Assessing Writing, 18*, 218–238.

Halliday, M. A. K. (1994). *Introduction to functional grammar* (2nd ed.). London: Edward Arnold.

Jarvis, S. (2013). Capturing the diversity in lexical diversity. *Language Learning, 63*, 87–106.

Kanno, Y., & Cromley, J. G. (2015). English language learners' pathways to four-year colleges. *Teachers College Record, 117*, 1–44.

Kellogg, R. T. (2008). Training writing skills: A cognitive developmental perspective. *Journal of Writing Research, 1*, 1–26.

Kibler, A. K., Walqui, A., & Bunch, G. C. (2015). Transformational opportunities: Language and literacy instruction for English language learners in the Common Core ear in the United States. *TESOL Journal, 6*, 9–35.

Kieffer, M. J., & Lesaux, N. K. (2012). Knowledge of words, knowledge about words: Dimensions of vocabulary in first and second language learners in sixth grade. *Reading and Writing, 25*, 347–373.

Kyle, K., & Crossley, S. A. (2016). The relationship between lexical sophistication and independent and source-based writing. *Journal of Second Language Writing, 34*, 12–24.

Kyle, K., & Crossley, S. A. (2017). Assessing syntactic sophistication in L2 writing: A usage-based approach. *Language Testing, 34*, 513–535.

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

Kyle, K., Crossley, S. A., & Berger, C. (2018). The tool for the automatic analysis of lexical sophistication version 2.0. *Behavior Research Methods, 50*, 1030–1046.

Laufer, N., & Nation, P. (1995). Vocabulary size and use: Lexical richness in L2 written production. *Applied Linguistics, 16*, 307–322.

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

Lu, X. (2011). A corpus-based evaluation of syntactic complexity measures as indices of college- level ESL writers' language development. *TESOL Quarterly, 45*, 36–62.

Maamuujav, U., & Olson, C. B. (2019). Meeting the linguistic needs of adolescent multilingual writers for academic writing. In J. I. Liontas (Ed.), *The TESOL encyclopedia of English language teaching*. Hoboken, NJ: John Wiley & Sons, Inc.

MacArthur, C. A., Jennings, A., & Philippakos, Z. A. (2019). Which linguistic features predict quality of argumentative writing for college basic writers, and how do those features change with instruction? *Reading and Writing, 32*, 1553–1574.

McCarthy, P. M., & Jarvis, S. (2007). *Vocd*: A theoretical and empirical evaluation. *Language Testing, 24*, 459–488.

McCarthy, P. M., & Jarvis, S. (2010). MTLD, vocd-D, and HD-D: A validation study of sophisticated approaches to lexical diversity assessment. *Behavior Research Methods, 42*, 381–392.

McNamara, D. S., Crossley, S. A., & McCarthy, P. M. (2010). Linguistic features of writing quality. *Written Communication, 27*, 57–86.

McNamara, D. S., Graesser, A. C., McCarthy, P. M., & Cai, Z. (2014). *Automated evaluation of text and discourse with Coh-Metrix*. New York, NY: Cambridge University Press.

National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards for English language arts and literacy in history/social studies, science, and technical subjects*. Washington, DC: Author.

National Writing Project. (2010). *Analytical writing continuum*. Available at https://archive.nwp.org/cs/public/download/nwp_file/21466/NWP_Analytic_Writing_Continuum.pdf?x-r=pcfile_d.

Olson, C. B., Scarcella, R., & Matuchniak, T. (2015). *Helping English learners to write: Meeting common core standard, grades 6-12*. New York, NY: Teachers College Press.

Olson, C. B., Matuchniak, T., Chung, H. Q., Stumpf, R., & Farkas, G. (2017). Reducing achievement gaps in academic writing for Latinos and English learners in Grades 7–12. *Journal of Educational Psychology, 109*, 1–21.

Ortega, L. (2003). Syntactic complexity measures and their relationship to L2 proficiency: A research synthesis of college-level L2 writing. *Applied Linguistics, 24*, 492–518.

Ortega, L., & Carson, J. (2010). Multicompetence, social context, and L2 writing research praxis. In T. Silva, & P. K. Matsuda (Eds.), *Practicing theory in second language writing* (pp. 48–71). West Lafayette, IN: Parlor Press.

Ranney, S. (2012). Defining and teaching academic language: Developments in K-12 ESL. *Language and Linguistics Compass, 9*, 560–574.

Scarcella, R. (2003). *Academic English: A conceptual framework*. The University of California Linguistic Minority Research Institute Technical Report 2003-1, Retrieved from https://escholarship.org/uc/item/6pd082d4.

Schleppegrell, M. J. (2001). Linguistic features of the language of schooling. *Linguistics and Education, 12*, 431–459.

Schleppegrell, M. J. (2004). *The language of schooling: A functional linguistics perspective*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Shaughnessy, M. P. (1977). *Errors and Expectations: A guide for the teacher of basic writing*. New York, NY: Oxford University Press.

Swales, J. (1990). *Genre analysis: English in academic and research settings*. New York: Cambridge University Press.

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

U.S. Department of Education. National Center for Education Statistics. (2012). *The nation's report card: Writing 2011 (NCES 2012-470)*. Washington, DC: Institute of Education Sciences, U.S. Department of Education.

U.S. Department of Education. National Center for Education Statistics. (2020). *English language learners in public schools*. Retrieved from https://nces.ed.gov/programs/coe/indicator_cgf.asp.

Walqui, A., & Bunch, G. C. (2019). What is quality learning for English learners? In A. Walqui, & G. C. Bunch (Eds.), *Amplifying the curriculum: Designing quality learning opportunities for English learners* (pp. 21–41). New York, NY: Teachers College Press.

Zenker, F., & Kyle, K. (2021). Investigating minimum text lengths for lexical diversity indices. *Assessing Writing, 47*. https://doi.org/10.1016/j.asw.2020.100505.

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