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Writing development in four genres from grades three to seven: syntactic complexity and genre differentiation

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Abstract Two measures of syntactic complexity, clauses per T-unit and words per clause, were used to examine differences among four genres of text—narrative, descriptive, compare/contrast, and persuasive—written by the same two cohorts (83 students in grades three and five and 96 students in grades five and seven) on two occasions 2 years apart as part of a larger longitudinal study. For clauses per T-unit, a measure of subordination, significant differences were found between persuasive essays, which had more subordinate clauses, and the other three genres. For words per clause, an indicator of the denser syntax of the academic register, significant differences were found between descriptive texts, which had more words per clause than the persuasive essays, which did not differ from the compare/contrast texts. Over the grade levels studied, the measures of syntactic complexity did not increase in their differentiation among the four genres. The two measures of syntactic complexity were negatively correlated, especially for the persuasive essays. For text length, which is thought to reflect compositional fluency, grade, genre, and grade × genre effects were significant for both cohorts. Post hoc analyses found few examples of the syntax-level structures characteristic of the academic register. These findings suggest that although students could produce each kind of genre, their ability to do so may have been compromised by their limited knowledge of the syntactic structures required to achieve text-level genre goals. Researchers and educators should consider the syntactic- and text-level requirements for different school-based genres in designing and evaluating writing instruction.

Keywords Syntax · Writing · Genre · Syntactic complexity · Writing development

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Introduction

To succeed in school, students must be able to read and write in a variety of genres. Written language itself, even in the simplest texts beginning readers encounter, differs substantially from spoken language in its structure; so at its outset, learning to write necessarily involves the acquisition of a new genre. However, written language does not consist of a single genre. Even in the elementary grades, students are at least implicitly required to distinguish among narratives, descriptions, and an increasing range of expository genres, including explanation, persuasion, and compare/contrast.

Of course, young children can recognize and produce a variety of genres in oral language (Hudson & Shapiro, 1991; Purcell-Gates, 1988). However, facility in understanding and producing written genres is acquired gradually, and for many students, only with difficulty (Snow & Uccelli, 2009). Part of the difficulty students face may stem from the relative paucity of exposure to informational texts, at least in the primary grades (Christie, 1987; Duke, 2000). However, exposure to informational texts alone is likely not sufficient for a student to become a skilled reader and writer of academic genres. Students must also learn the communicative purposes of different genres, along with their organizational structures. Additionally, students must acquire the linguistic resources to compose in academic genres, including the use of more sophisticated word forms and syntactic structures (Berman, 2009). Certain syntactic structures, such as subordinate clauses, relative clauses, and complex noun phrases allow writers to express more complex ideas.

Currently, explicit instruction in academic syntax is rare (if not altogether absent) in the elementary and secondary years. This was not always so, as textbooks from the late nineteenth and early to mid-twentieth century included a focus upon grammar and sentence-level exercises (Connors, 2000). Additionally, sentence-combining instruction was common in curricula from the 1960's; and despite evidence that it is effective in improving writing performance (Graham & Perin, 2007; Hillocks, 1986; O'Hare, 1973; Saddler & Graham, 2005), writing instruction has moved away from sentence-level exercises. Current process-focused writing instruction emphasizes planning, organizing, revising, and publishing texts in authentic contexts, and although many students benefit from this approach, syntax receives little attention (Connors, 2000).

Despite the relative lack of syntax-focused instruction in current writing curricula, students do seem to acquire the ability to compose more complex sentences and clauses. Research on syntactic complexity has shown that students use increasingly complex syntactic structures as they gain familiarity and skill with school-related writing (Reilly, Zamora, & McGivern, 2005; Schleppegrell, 2004). However, little research has focused on how this development occurs during early grade levels and in different text genres (Purcell-Gates, 1988; Tower, 2003), and when different genres are compared, they usually focus only on narratives and expository texts (Berman & Nir-Sagiv, 2007; Berman & Verhoeven, 2002; Crowhurst, 1980; Stewart & Grobe, 1979). Descriptive texts are rarely included (for an exception, see Crowhurst & Piche, 1979), and compare/contrast texts have not, to our knowledge, been included in studies comparing the development of

syntactic complexity. This study replicates and extends previous research by exploring the development of syntactic complexity in student writing from grades three, five, and seven in four common school-related genres: narrative, descriptive, compare/contrast, and persuasive essay.

Later syntactic development

Although most children acquire the basic syntactic structures of oral language before they reach age four (Bates & Goodman, 1999), acquiring the language of the academic register generally takes many years of schooling. This "later language development" (Nippold, 1988) of skilled writers occurs on two related axes: students need to develop both *linguistic literacy* (Ravid & Tolchinsky, 2002) and *discursive literacy* (Blum-Kulka, 2004). To acquire linguistic literacy, students must gain deeper understanding of their own spoken and written language systems, while "gaining increased control over a larger and more flexible linguistic repertoire" (Ravid & Tolchinsky, 2002, p. 420). Developing this "linguistic repertoire" involves acquiring and using increasingly rich vocabulary (Bar-Ilan & Berman, 2007), more advanced morphological forms (Anglin, 1993; Carlisle, 2000), and greater syntactic maturity (Faigley, 1979; Hunt, 1965, 1970), also described as syntactic complexity (Crowhurst, 1983; Nippold, Hesketh, & Duthie, 2005).

Discursive literacy develops along more pragmatic lines, as students learn to "interpret and construct extended discourse in genre-appropriate forms" (Blum-Kulka, 2004). Although academic genres exhibit many common register features (Schleppegrell, 2001), their overall structures can be quite different: compare/contrast texts, for example, have different structures than persuasive essays. Differences among genres are not restricted to macrostructural elements; they also can occur at the word level (Bar-Ilan & Berman, 2007) and at the level of syntax (Berman & Nir-Sagiv, 2007). In sum, children face two steep learning curves in their attempts to develop as writers: they must acquire academic vocabulary and the ability to use increasingly complex syntactic forms, and they also must learn to use these newly-acquired linguistic tools correctly in a variety of different genres.

This study focuses upon the syntactic level of linguistic and discursive literacy development, using two well-established measures of syntactic complexity to examine differences across four genres at three grade levels. These measures, words per clause and clauses per T-unit, serve as broader measures of syntactic complexity than other approaches, and using them offers several advantages. First, measures of syntactic complexity have proven to be sensitive to genre differences for adolescent writers (Beers & Nagy, 2009; Crowhurst & Piche, 1979) and elementary-age students (Scott & Windsor, 2000). As this study includes writers as young as eight, who are not likely to use sophisticated linguistic devices such as nominalizations, participles, and past perfect forms (which typically emerge in high school), broader syntax measures are more likely to detect emerging differences for younger writers. Second, using these measures situates this study within the long trajectory of research on syntactic complexity, allowing for replication, clarification, and expansion of previous findings. Third, these measures of syntactic complexity are still considered reliable indices of syntactic density (Berman, 2009).

Measures of syntactic complexity

Many attempts to quantify syntactic complexity have focused on a number of sentence-level text features, such as the number of words per sentence, the number of words per clause, the ratio of subordinate clauses to all clauses, and the number of words included in a "minimal terminable unit" (T-unit), which Hunt (1970) defined as "one main clause plus any subordinate clause or nonclausal structure that is attached to or embedded in it" (p. 4). Hunt (1965, 1970) determined that three measures of syntactic complexity were the most reliable indicators of increasing maturity in writing: clauses per T-unit, words per clause, and words per T-unit.

Importantly, clauses per T-unit and words per clause serve as indices of two qualitatively different aspects of text complexity. A higher number of clauses per T-unit is characteristic of more embedded text structures such as subordinate and relative clauses, which may make possible the expression of more complicated relationships among ideas (Coirier, 1996). Cause-and-effect relationships, for example, often require the use of subordinate clauses (*because X, Y*). Likewise, mental state and speech act verbs that characterize a person's attitude toward a proposition (e.g., *assert, assume, conclude, hypothesize, infer, suggest*) typically take subordinate clauses (Olson & Astington, 1990). To the extent that writers attempt to convey these kinds of relationships among ideas, the text they produce is likely to include a greater proportion of subordinate clauses, and hence more clauses per T-unit. The number of clauses per T-unit in students' speech and writing tends to increase with age, although the increase is gradual (Hunt, 1966).

A second measure of syntactic complexity, words per clause, is one indicator of the level of complexity within clauses. This measure reflects syntactic structures associated with linguistic literacy, such as nominalizations, attributive adjectives, nonfinite subordination (using infinitives, participles, or gerunds), passives, conjoining, and prepositional phrases, all of which allow a writer to compress several propositions into a single clause (Chafe & Danielewicz, 1987; Scott, 2004). With age, the number of words per clause in student writing tends to increase, with larger increases seen between high school and adult writing (Hunt, 1970).

Young writers, syntax, and genre

As explained earlier, beginning writers need to acquire a first strand of linguistic literacy, and developing writers, a second strand of discursive literacy, which involves using more advanced linguistic resources in genre-appropriate ways. Genres are viewed as socially constructed language practices serving specific social purposes (Halliday & Hasan, 1985), each of which may differ in their micro-level aspects (linguistic features) as well as their macro-level characteristics (overall organizational principles and text structures) to express different ways of making meaning. Children develop an initial sensitivity to genre differences at a young age. For example, primary grade children can distinguish between storytelling and pretend play (Benson, 1993), and between fictional narratives and descriptions (Tolchinsky & Sandbank, 1994). Additionally, several research studies have found that primary-age students can produce oral language samples that demonstrate basic

levels of genre differentiation (Duke & Kays, 1998; Pappas 1991, 1993; Purcell-Gates, 1988).

Student writers also appear to differentiate between genres in their compositions, especially when the linguistic features of narrative and non-narrative (expository) genres are compared. Compared to narratives, expository texts composed by student writers have been reported to have longer clauses (Malvern, Richards, Chipere, & Duran, 2004), more complex noun phrases (Ravid & Berman, 2010), more nominalized forms (Schleppegrell, 2004), more relative and adverbial clauses (Scott & Windsor, 2000; Scott, 2004), and more passive voice constructions (Reilly et al., 2005). Few of these marked syntactic structures are used by younger school-aged students; many are only mastered in high school or later (Berman & Nir-Sagiv, 2007). At younger ages, students appear to differentiate between narrative and expository genres on the syntactic level, with differences in clauses per T-unit emerging as early as age nine and in words per clause by age twelve (Crowhurst & Piche, 1979; Scott & Windsor, 2000).

Comparing narratives with expository texts, however, may mask important differences in the linguistic tools used by students when writing in specific school-based genres. The category of "expository" may refer to a number of non-narrative genres, such as persuasive essays, descriptions, procedural texts, or compare/contrast texts. For example, in their influential series of cross-linguistic developmental studies comparing the linguistic features of student writing in two genres, Berman and her colleagues (see Berman & Nir-Sagiv, 2007; Berman & Verhoeven, 2002; Jisa, Reilly, Verhoeven, Baurch, & Rosado, 2002; Tolchinsky & Rosado, 2005), used a "deliberately broad definition of expository discourse" for their writing tasks that led them to conclude that "the expository discussions we analyzed also differed markedly from other non-narrative discourse such as descriptions and persuasion" (Berman & Katzenberger, 2004, p. 59). In these studies, students at four grade levels (fourth grade, seventh grade, eleventh grade, and graduate school) watched a short video depicting a variety of conflicts in a school setting, after which they were asked to write a story about a personal experience with conflict (narrative) and to write a composition discussing problems between people (expository). Given this type of prompt, students may have composed in a wide variety of "expository" genres, precluding the possibility of analyzing any specific non-narrative genre.

In addition to conflating non-narrative genres, researchers comparing student writing across genres may have elicited different types of narrative or expository texts. In a widely-cited study (Scott & Windsor, 2000), students with language learning disabilities and their age- and language-matched peers composed narrative and expository texts (along with spoken responses). To obtain these written samples students were asked to summarize a narrative video (19 min long) and an expository video (15 min long), with the expectation that the summaries would conform to narrative and expository genre forms. In contrast, Crowhurst and Piche (1979) showed students at grades six and ten three different pictures, and asked them (in counterbalanced fashion) to: (a) make a decision about the picture and try to convince the teacher to agree (persuasive); (b) write an exciting story about the picture (narrative); (c) describe the picture as fully as possible (descriptive). Without examining the texts from these two studies, it is impossible to determine

whether the summaries of the narrative video were similar to the "exciting stories" based upon the pictures, but it is quite possible that they were not. Moreover, it seems likely that the summaries of the expository video would differ from the descriptions and persuasive texts elicited in the Crowhurst and Piche (1979) study.

Given the differences between the ways genres have been conceptualized in these studies, it is perhaps not surprising that on some measures the literature comparing the syntactic complexity of non-narrative texts is inconsistent. For example, Scott and Windsor (2000) found that student narratives (for students nine and eleven years old) had *more* clauses per T-unit than the expository summaries, while Crowhurst and Piche (1979) found that student narratives (for students 12 years old) had *fewer* clauses per T-unit than persuasive essays (argument) and were not significantly different from the descriptive texts. These results suggest that students may use different syntactic constructions when writing different expository genres, and that conflating non-narrative genres can overlook these differences.

When student-written samples of non-narrative genres are more clearly specified and compared with narratives, syntax-level differences emerge most clearly for persuasive essays. In two studies using similar methodologies, Crowhurst and Piche (1979) and Crowhurst (1980) found that student essays at grades six, ten, and twelve had more words per T-unit than the narratives, and at grades six and ten essays had more clauses per T-unit. Differences for words per clause were found only at grade ten. A more recent study (Beers & Nagy, 2009) found that essays of seventh-grade writers had more clauses per T-unit and more words per T-unit, but there were no differences across genres for words per clause. These results support Crowhurst and Piche's (1979) conclusion that "narration places fewest demands and argument greatest demands on writers to make use of their syntactic resources" (p. 107). This syntactic challenge is at least partly explained by the impersonal, authoritative stance expected in this genre as writers attempt to depict "the logical interrelationship of propositions" (Crowhurst, 1980, p. 229) in support of a position. Introducing generalized statements that are supported and elaborated upon requires subordination and the condensation of linguistic elements into clause-internal structures, which could lead to both more clauses per T-unit and more words per clause.

The syntactic complexity of other non-narrative genres, such as description and compare/contrast, has been less thoroughly explored. Furthermore, it is not well known whether (or how) student writers use different syntactic constructions in descriptive or compare/contrast texts when compared with persuasive essays or narratives. Crowhurst and Piche (1979) found that the descriptive texts written by students at grades six and ten had fewer clauses per T-unit than the persuasive essays, but were not different from the narrative texts. For words per clause, differences only emerged at grade ten, with descriptive texts having more words per clause than narratives. There were no differences for words per clause between descriptive texts and the persuasive essays at grade ten.

To our knowledge, the syntactic complexity of student-written compare/contrast texts has not been examined. Much of the research on compare/contrast texts focuses upon the overall structure of the genre (e.g. Dickson, 1999; Englert, Stewart, & Hiebert, 1988), which has been found to be more difficult for students than

writing descriptive texts or texts that describe a sequence of events (Englert & Thomas, 1987). Given the communicative purposes of compare/contrast texts, some of the syntactic features characteristic of persuasive essays and/or descriptive texts may pertain to this genre as well. For example, more skilled writers of compare/contrast texts may make use of timeless verbs and expanded nominal groups (Martin, 1989), which could affect clause length.

In sum, syntax-level distinctions between non-narrative genres in children's writing have been underexplored. Consequently, little is known about how students develop the syntactic resources required to write in these school-based genres effectively. The present study, by comparing the syntactic complexity of student texts in four common school-based genres, contributes to the existing literature in two ways. First, by examining how students write in three expository subgenres specifically (persuasive, descriptive, and compare/contrast) along with narratives, it both replicates and expands upon existing studies of genre and syntax. Second, this study examines student texts written in grades three, five, and seven, contributing to the knowledge of how syntactic complexity develops across genres from the mid-elementary years to early adolescence.

Based on previous research, we hypothesized that the persuasive essays, with the subordinating devices required for argumentation, would have more clauses per T-unit than the other three genres being examined at each grade, although we expected that these differences would become more pronounced with each grade as students acquire more syntactic resources. For words per clause, we expected that the clause-lengthening devices such as attributive adjectives and prepositional phrases would be more apparent in the descriptive and compare/contrast texts, at least at grades five and seven, than in the persuasive essays and narratives. Since clause-lengthening structures used in essays tend to develop in later grades, we hypothesized that the persuasive essays would be similar to the narratives at each grade level, but that the descriptive and compare/contrast texts would have more words per clause than persuasive essays at grades five and seven.

Method

This analysis was part of a five-year longitudinal study of writing and its connections with reading and oral language development. Phase one included studies of early writing (by hand and by keyboard), reading development and its connections with phonological, orthographic, and morphological awareness, and spelling, with typically developing students and students with disabilities. Phase two (in progress) has focused upon linguistic analyses of experimenter-designed writing tasks to assess different genres of writing at different levels of language and transcription modes.

Participants

A volunteer sample was recruited from a large urban school district in the Pacific Northwest. Parents of students entering first or third grade were contacted by letter,

asking if they would agree to enroll their children in a five-year longitudinal study that involved bringing their children to a university location once a year. After obtaining informed consent from parents and assent from their children, 128 first graders and 113 third graders completed a comprehensive assessment of reading, writing, and related processes. Two cohorts were created, with participants in Cohort 1 assessed annually from first through fifth grade, whereas participants in Cohort 2 were assessed annually from third through seventh grade. The attrition rate across the five-year period was low, with 122 (68 girls and 54 boys) participants in Cohort 1 completing the study and 106 (54 girls and 52 boys) participants in Cohort 2 completing the study. However, a few students were not present every time data were collected, and not all students completed each task. The analyses reported here are based on data collected in years three and five of this study, from 83 students from Cohort 1, collected in grades three and five, and 96 students from Cohort 2, collected in grades five and seven.

Children of a variety of ethnic backgrounds participated: Asian American (23.4%, Cohort 1; 21.2%, Cohort 2), African American (6.3%, Cohort 1; 9.7%, Cohort 2), European American (64.8%, Cohort 1; 65.5%, Cohort 2), Hispanic (1.6%, Cohort 1; .9%, Cohort 2), Native American (1.6%, Cohort 1 only), and other (2.3%, Cohort 1; 2.7%, Cohort 2). Approximately 7% of the parents had less than a high school education or graduated from high school in each cohort, and about 11% of the parents had more than a high school education but less than a college education. About 40% of the parents had an undergraduate education, and around 33% of the parents had completed graduate degrees. Information on parental level of education was missing for 2.4% of the mothers and 7.9% of the fathers in Cohort 1, and .9% of the mothers and 7.2% of the fathers in Cohort 2.

Procedures

The study was conducted at a university laboratory in the Pacific Northwest. Each year, participants were brought to the university to complete a variety of reading, writing, and other language-related assessments. This paper examines a subset of this larger project database, focusing upon one set of text writing tasks composed in years three and five of the project. Accordingly, student texts written at grades three and five (Cohort 1) and grades five and seven (Cohort 2) were obtained.

Writing tasks

Students composed texts in four school-related genres (narrative, descriptive, compare/contrast, and persuasive essay). For the narrative task, students were asked to write a story about "The Day Mt. St. Helens Blew its Top!" For the descriptive task students reviewed postcards depicting the changing seasons on the mountains, and then were asked to write about "The Changing/Changeless Mt. Rainier." The compare and contrast essay prompt asked students to tell how the mountains are alike and how they are different ("Compare/Contrast Mt. St. Helens and Mt. Rainier"), whereas the persuasive essay prompted students to give their opinion and

defend it in order to convince the reader about one of the controversies presented to the student previously ("Defending My Opinions on Some Controversies about Mt. St. Helens and Mt. Rainier"). All student texts were handwritten upon a sheet of paper with the title of the text (indicating the genre) at the top.

To help control for potential differences in background knowledge, the topic for each genre was related to well-known geographical icons of the Pacific Northwest: Mt. Rainier and Mt. St. Helens, each of which is an active, glacier covered volcano, but only the latter has erupted in the recent past. So that children could understand the task requirements and the content about which they were to write, all pre-writing instructions and resource material for specific genres were read orally by the testers while the children viewed (and read) the written versions silently. For example, before writing the compare/contrast text, participants listened to and read silently a passage describing many facts about Mt. Rainier and Mt. St. Helens. Across years three and five of the study, all topics, prompts, and passages read aloud were held constant.

In sum, each student composed four pairs of texts, with each text in a given pair written two years apart in the same genre using the same prompts. For each text, students were given five minutes to write. Although this is a relatively short time period for composing, prior research has shown that most children in the elementary grades (ages six to twelve) can sustain independent composing for this period of time without needing additional prompts to continue. To keep the composing times consistent from grades three to seven, and to encourage independent composing without additional prompting, five-minute composing times were selected.

Coding and scoring

The primary data sources for this study were the texts from Cohort 1 (grades three and five) and Cohort 2 (grades five and seven). Each text was coded for three linguistic variables; overall text length in words, T-unit boundaries, and clause boundaries. Clauses and T-units were defined using the criteria set by Hunt (1965). Non-finite constructions (such as gerunds and participles) were not coded as separate clauses.

Two coders, the first author and a trained graduate assistant, coded an initial set of 40 texts to determine interrater reliability. Based on Pearson correlation coefficients, the correlations between the two coders were $r = .92$ for clauses per T-unit, and $r = .95$ for words per clause. After discussing and resolving all differences in coding among these 40 texts, the remaining texts were split evenly and coded separately. Overall words per text, words per clause, and the ratio of clauses per T-unit were calculated for each text.

Analysis

We examined three text properties—two measures of syntactic complexity: clauses per T-unit and words per clause—and text length in words. For each of these three measures, a 2 × 4 (grade × genre) ANOVA was performed, with both grade and

genre being within-subject variables. Given the number of ANOVAs performed, a conservative alpha level was selected (.008).

To follow up on significant main effects of genre that were found for both cohorts, within-subject ANOVAs were performed separately for each grade level within each cohort for the two measures of syntactic complexity (words per clause and clauses per T-unit) and for text length. Simple contrasts were used to compare persuasive essays with each of the other three genres (narrative, descriptive, and compare/contrast). Because twelve such analyses were conducted, a Bonferroni correction was used and alpha was set at .004.

Additionally, correlations were calculated to examine potential relationships between the two indices of syntactic complexity across genres and grades. We also examined the correlations between text length in words and the two measures of syntactic complexity, clauses per T-unit and words per clause, to see if some of the differences in syntactic complexity might be associated with differences in text length.

Results

Means and standard deviations for clauses per T-unit, words per clause, and text length are reported for each genre and for each grade (for both cohorts) in Tables 1, 2, 3. The main effect of genre was significant for both measures of syntactic complexity, and for each grade level (all Fs > 11.00, all ps $< .001$).

Table 1 Means (standard deviations) for clauses per T-unit

Cohort	Grade	Genre			
		Narrative	Descriptive	Compare/contrast	Persuasive
1	3	1.15 (.27)	1.11 (.27)	1.25 (.46)	1.96 (1.00)
1	5	1.26 (.42)	1.15 (.22)	1.30 (.43)	2.13 (.67)
2	5	1.21 (.22)	1.16 (.20)	1.24 (.30)	2.12 (.71)
2	7	1.22 (.23)	1.21 (.20)	1.32 (.34)	2.08 (.67)

Table 2 Means (standard deviations) for words per clause

Cohort	Grade	Genre			
		Narrative	Descriptive	Compare/contrast	Persuasive
1	3	7.13 (2.20)	7.90 (2.06)	7.13 (2.48)	6.93 (2.11)
1	5	7.46 (2.13)	8.88 (2.85)	6.67 (2.37)	6.71 (1.60)
2	5	7.54 (1.84)	8.34 (2.00)	6.77 (2.03)	6.86 (1.66)
2	7	8.65 (1.71)	9.00 (2.08)	7.68 (1.56)	7.20 (1.77)

Table 3 Means (standard deviations) for text length in words

Cohort	Grade	Genre			
		Narrative	Descriptive	Compare/contrast	Persuasive
1	3	29.93 (15.61)	32.76 (15.87)	27.06 (14.14)	31.27 (15.82)
1	5	47.94 (21.23)	50.63 (20.57)	39.67 (16.47)	55.22 (22.60)
2	5	51.25 (22.09)	57.90 (23.64)	42.71 (20.98)	59.31 (24.80)
2	7	67.07 (23.06)	70.22 (21.90)	58.05 (19.72)	82.49 (25.08)

Clauses per T-unit

For Cohort 1 (grades three and five), the main effect of grade did not reach significance, $F(1,82) = 5.350$, $p = .023$, but there was a main effect of genre, $F(3,80) = 58.244$, $p < .001$. The interaction of grade and genre was not significant, $F(3,80) = .571$, $p = .636$. For Cohort 2 (grades five and seven), there was no main effect of grade, $F(1,95) = 1.047$, $p = .309$, but a main effect of genre, $F(3,93) = 92.930$, $p < .001$. The interaction of grade and genre was not significant, $F(3,93) = .730$, $p = .537$.

The simple contrasts between genres showed that persuasive essays had more clauses per T-unit than the narratives at each grade level (all p values $< .001$), the descriptive texts at each grade level (all p values $< .001$), and the compare/contrast texts at each grade level (all p values $< .001$) (Table 4).

Words per clause

For Cohort 1 (grades three and five), there was no main effect of grade, $F(1,82) = .251$, $p = .618$, but there was a main effect of genre, $F(3,80) = 13.347$, $p < .001$. The interaction of grade and genre approached significance, $F(3,80) = 3.758$, $p = .014$. For Cohort 2 (grades five and seven), the main effect of grade was significant, $F(1,95) = 22.832$, $p < .001$, and a main effect of genre, $F(3,93) = 27.363$, $p < .001$. The interaction of grade and genre was not significant, $F(3,93) = 2.086$, $p = .107$.

The simple contrasts showed that the persuasive texts had fewer words per clause than the narratives at grade seven ($p < .001$), with the differences approaching

Table 4 Tests of simple contrasts for clauses per T-unit: persuasive versus other genres

Cohort	Grade	Genre contrast					
		Persuasive/narrative		Persuasive/descriptive		Persuasive/comp/con	
		F	*p*	*F*	*p*	*F*	*p*
1	3	57.85	.000	58.82	.000	40.77	.000
1	5	116.00	.000	215.47	.000	110.28	.000
2	5	138.43	.000	169.52	.000	125.97	.000
2	7	143.28	.000	141.53	.000	95.01	.000

Table 5 Tests of simple contrasts for words per clause: persuasive versus other genres

Cohort	Grade	Genre contrast					
		Persuasive/narrative		Persuasive/descriptive		Persuasive/comp/con	
		F	*p*	*F*	*p*	*F*	*p*
1	3	.13	.722	8.88	.004	.19	.667
1	5	7.68	.007	45.92	.000	.01	.937
2	5	9.22	.003	34.22	.000	.18	.674
2	7	34.24	.000	41.59	.000	4.67	.033

significance at grade five ($p = .007$ for cohort one, and $p = .003$ for cohort two). The persuasive texts also had fewer words per clause than the descriptive texts at all grade levels ($p = .004$ for grade three, for grades five and seven all p values $< .001$). There were no differences found between the persuasive texts and the compare/contrast texts for words per clause (Table 5).

Text length in words

For Cohort 1 (grades three and five) there was a main effect of grade, $F(1,84) = 138.4$, $p < .001$, a main effect of genre, $F(3,82) = 39.696$, $p < .001$, and a grade by genre interaction, $F(3,82) = 11.643$, $p < .001$. Likewise, for Cohort 2 (grades five and seven) there was a main effect of grade, $F(1,92) = 115.7$, $p < .001$, a main effect of genre, $F(3,94) = 77.248$, $p < .001$, and a grade by genre interaction, $F(3,94) = 5.938$, $p = .001$.

For the simple contrasts, the difference between the persuasive essays and narratives was not significant at third grade, but was significant at fifth grade for both cohorts ($p = .001$ for cohort one, $p < .001$ for cohort two), and at seventh grade ($p < .001$). The difference between persuasive essays and descriptive texts was significant only for seventh grade ($p < .001$). The difference between persuasive essays and compare/contrast texts was significant for both cohorts at all grade levels ($p = .001$ for grade three, all ps $< .001$ for grades five and seven) (Table 6).

Table 6 Tests of simple contrasts for text length in words: persuasive versus other genres

Cohort	Grade	Genre contrast					
		Persuasive/narrative		Persuasive/descriptive		Persuasive/comp/con	
		F	*p*	*F*	*p*	*F*	*p*
1	3	1.836	.179	1.920	.169	11.902	.001
1	5	12.386	.001	8.139	.005	33.420	.000
2	5	16.627	.000	.661	.418	76.220	.000
2	7	55.276	.000	44.024	.000	54.891	.000

Correlations

We examined correlations between words per clause and clauses per T-unit to compare relationships between these two indices of syntactic complexity, across genres and grades. For three of the four genres (narrative, descriptive, persuasive essay), there were low to moderate negative correlations between these measures at almost every grade level. For Cohort 1 grade three, words per clause and clauses per T-unit were negatively correlated, $r = -.35$, $p < .001$, and for Cohort 1, grade five the relationship was similar ($r = -.31$, $p < .001$). Similar relationships were found for persuasive essays in Cohort 2, grade five ($r = -40$, $p < .001$) and grade seven ($r = -.33$, $p < .001$). For compare/contrast, however, significant correlations were found for these measures only for Cohort 2, grade seven ($r = -.25$, $p < .05$).

For text length and the measures of syntactic complexity only a few correlations were significant at the .01 level, and these were relatively low. For Cohort 1, grade three, text length in words was significantly related to clauses per T-unit for persuasive essays, $r = .284$, $p = .005$. For Cohort 1, grade five, none of the correlations were significant. For Cohort 2, grade five, text length in words was significantly related to clauses per T-unit for narratives, $r = .261$, $p = .010$, and for compare/contrast, $r = .354$, $p < .001$. For Cohort 2, grade seven, text length in words was also significantly related to clauses per T-unit for compare/contrast, $r = .327$, $p = .001$ (Table 7).

Qualitative analyses

To gain more insight into the main effects of genre for these measures, and to identify cases to illustrate these findings, we re-examined selected subsets of the data, identifying students who had typical values for each variable—within a standard deviation and a half of the mean—but who also showed a large difference in syntactic complexity between the non-narrative genres. In the case of clauses per T-unit, we were interested in finding out how and why students used greater subordination in persuasive essays than in the other genres. In the case of words per clause, we paid special attention to identifying what clause-lengthening constructions were used by students. Because we were most interested in differences across the non-narrative genres, we focused on the persuasive essays, descriptive texts, and compare/contrast texts only. We then selected the following series of texts from one

Table 7 Correlations between clauses per T-unit and words per clause

Cohort	Grade	Genre			
		Narrative	Descriptive	Compare/contrast	Persuasive
1	3	−.24*	−.22*	−.16	−.35***
1	5	−.28**	−.25**	−.06	−.31***
2	5	−.11	−.32***	.07	−.40***
2	7	−.38***	−.33***	−.25*	−.33***

* $p < .05$, ** $p < .01$, *** $p < .001$

student (in seventh grade) which are representative of the texts we reviewed. Spelling errors have been corrected for clarity, but no other changes have been made.

Persuasive essay (3.5 Clauses per T-unit, 7.14 Words per clause)
I believe that we should name Mt. St. Helens and Mt. Rainier after the Native American names because they were here long before any of the Europeans were. I also think that humans should not mess with the ecosystem around these mountains because what right do we have to destroy the ecosystem there.
Descriptive text (1.20 Clauses per T-unit, 10.17 Words per clause)
Mt. Rainier is a beautiful place. During the winter it's a great place to ski, while during spring and summer beautiful flowers grow.
Mt. Rainier is 14,411 feet above sea level making a towering mountain in the United States. During the winter the top of Mt. Rainier is hidden from view 8 out of every 10 days.
Winter lasts about half of the year.
Compare/contrast text (1.40 Clauses per T-unit, 6.29 Words per clause)
Mt. St. Helens and Mt. Rainier are alike in some ways and very different in others. Both mountains are active but only Mt. St. Helens has erupted lately.
Mt. Rainier is taller than Mt. St. Helens.
Mt. St. Helens has a visitors center even though it is not a national park like Mt. Rainier is.

In this example, the persuasive essay has substantially more subordination (leading to a higher ratio of clauses per T-unit) than the other two expository genres. The high level of subordination in the persuasive essay largely reflects a pattern very common for student writers in this genre: "I think that X because Y." This pattern, seen in many of the essays in this study, reflects a straightforward interpretation of the purpose of a persuasive essay: State your opinion and provide a justification for it. This pattern can lead to many short clauses, and also may explain the negative correlations between words per clause and clauses per T-unit at every grade level (Cohort 1, grades 3 and 5, $r = -.35$, $r = -.31$ respectively, Cohort 2, grades 5 and 7, $r = -.40$, $r = -.33$ respectively).

If the "I think" types of phrases were removed, this persuasive essay would have 9.20 words per clause, a value just above the seventh-grade mean for the descriptive texts. However, the persuasive essay by this writer also uses proportionally fewer clause-lengthening devices such as prepositional phrases and attributive adjectives than are used in the descriptive text. Consistent with the clause constructions in this example, the essays as a whole tended to exhibit high levels of subordination using very short clauses

The descriptive text in this example has substantially more words per clause than the other two expository genres. This higher level of words per clause comes in part from the more frequent use of linguistic structures also used (though less frequently) in the other genres: Attributive adjectives (*a beautiful place, a great place, beautiful flowers, a towering mountain*) and prepositional phrases (*during the winter, during spring and summer, in the United States, above sea level*). Although greater use of these constructions is associated with more formal or academic registers

(Chafe & Danielewicz, 1987; Purcell-Gates, 1988), these constructions are well within the oral language capability of young children. In contrast, this example includes one structure not seen in the other two genres: a non-finite clause using a participle (*making a towering mountain*). This type of clause-lengthening tool, which is more characteristic of later-developing syntactic resources (Ravid & Tolchinsky, 2002), was used infrequently in the student texts.

The compare/contrast text has a relatively low score for both measures of syntactic complexity—less subordination than the persuasive essay, and fewer words per clause than the descriptive text. Any explanation for the syntactic simplicity of the compare/contrast text must be tentative at this point, but it appears to be a consequence of the way that the student has attempted to deal with the writing task for this genre. Although comparisons can be expressed using subordination (*Mt. St. Helens… is not a national park like Mt. Rainier is*), the writer also uses simple juxtaposition of facts (*Both mountains are active but only Mt. St. Helens has erupted lately*), and comparisons not requiring subordination or any other syntactic complexity (*Mt. Rainier is taller than Mt. St. Helens*).

The approach used by this student to construct a compare/contrast text is an example of the "part by part" text structure (Raphael & Kirschner, 1985) where the writer compares features of the given topics individually throughout the text (as opposed to the "whole-whole" structure, where groups of features are compared against other groups of features). Overall, students used shorter, less syntactically complex clauses in their compare/contrast texts, which, unlike the persuasive essays, did not seem to result from a high ratio of clauses per T-unit. Rather, there were no significant correlations between these measures of syntactic complexity for compare/contrast texts.

Discussion

In this study, we used two measures of syntactic complexity, clauses per T-unit and words per clause, to examine the extent to which students at grades three, five, and seven may vary in the syntactic structures used in their writing across the four genres. We found clear and consistent evidence of differentiation in syntactic complexity as a function of genre. Main effects of genre were significant for both measures of syntactic complexity, and for both cohorts. The most consistent differences were that (a) persuasive essays at each grade level had more clauses per T-unit than the other three genres, and (b) descriptive texts at each grade level had more words per clause than the persuasive essays. In terms of text length, an indicator of text level fluency, the compare/contrast texts were shorter than the persuasive essays at each grade level, as were the narratives at grades five and seven.

These findings partially supported our hypotheses. We expected that the persuasive essays would have more clauses per T-unit than the other genres, which was largely supported, although we saw little change (and no significant differences) with age. For words per clause, we expected to find that the descriptive and compare/contrast texts would have more words per clause than the essays at grades five and seven. This was only partially supported. The descriptive texts, as

hypothesized, had more words per clause than the persuasive essays (even at third grade), but the compare/contrast texts did not. We were also surprised that the narrative texts had more words per clause than the essays, although this was found at grade seven only. In terms of text length, the compare/contrast texts were shorter than the persuasive essays at all grade levels, and somewhat surprisingly, the narratives were also shorter than the persuasive essays at grades five and seven. Although the data only partially supported our hypotheses, it is clear that students as young as third grade were using different syntactic constructions when writing in different school based genres.

Although the differences among genres were substantial, there was very limited evidence for any increase in differentiation of genres across the grade levels examined. The interaction of Grade × Genre was significant for text length in words, but not for either of the measures of syntactic complexity. The lack of grade effects was inconsistent with previous research. However, this inconsistency can be explained in part by the fact that our study examined differences across two-year intervals, whereas other studies examined longer time periods. Hunt (1965, 1970), for example, found that clause length increases from approximately five words per clause to eight words per clause from grades four to twelve in writing, although genre was not specified. Loban (1976) found increases from 1.22 clauses per T-unit in third grade to 1.35 clauses per T-unit in seventh grade. Crowhurst and Piche (1979) found differences in syntactic complexity from grades six to ten for descriptive and persuasive texts (although they did not find differences for narratives). We speculate that the relatively short texts may have influenced these results.

Limitations

The within-subject design in two large cohorts of student writers allowed for a robust analysis of differences in syntactic complexity by grade across four genres. However, the brevity of the texts (almost all were well under 100 words) and the relatively short composing times (5 min) warrant some caution in interpreting these results. Despite these short texts, clear differences emerged across genres, especially for the persuasive essays. With more authentic writing tasks, longer composing times, and longer texts, it is possible that the results would have been even more robust—students (especially in grades seven) might have constructed more complex clauses, adding other clause-lengthening constructions such as more complex noun phrases (Ravid, van Hell, Rosado, & Zamora, 2002), infinitives, participles, and gerunds (Berman & Nir-Sagiv, 2007), or past-perfect and syntactic passives (Reilly et al., 2005). These constructions, however, become much more common at high school age (Berman, 2009), and it seems unlikely that largely different patterns would emerge.

Another limitation of this study is that it focuses exclusively upon microstructural elements of the texts, while ignoring macrostructural elements such as the overall content, organizational structure, and text quality. Although measures of syntactic complexity have been shown to correlate with text quality, this relationship is dependent upon the specific measures being used and the genres being examined (Beers & Nagy, 2009), and it may not be consistent for genres such as compare/contrast or descriptive. Studies in progress are exploring student writers' developing

use of "genre-specific principles of organization" across these school genres, using more sophisticated approaches to linguistic coding (Berman & Nir-Sagiv, 2007, p. 91).

Conclusion

We found that the third-, fifth-, and seventh-grade students in our study did, for the most part, make distinctions among the four genres examined, in ways that showed up clearly for two measures of syntactic complexity. These broad measures of syntactic complexity provided a lens through which differences in student writing across genres could be viewed, and helped us identify examples of these differences in syntax use. Clearly, there is more research to be done, to identify more specifically the genre-specific syntactic constructions required by school-based writing and how students acquire them.

Consistent with previous research, students at these grade levels used relatively few clause-lengthening constructions characteristic of *linguistic literacy*, many of which appear to be acquired in high school or later. Notably, these students appeared to recognize the different communicative purposes associated with each genre, which indicates some development of *discursive literacy*. However, their ability to write effectively in them (especially compare/contrast and persuasive texts) was likely compromised by their limited knowledge of the syntactic structures needed to carry out these communicative purposes effectively.

If so, these findings raise several compelling questions. First, what accounts for the relatively slow acquisition of genre-appropriate syntactic constructions? There are at least three possibilities, all of which may influence students' developmental trajectories. One possibility may be that there are cognitive limitations upon students at younger ages, such that students are not fully capable of creating adequate mental representations of the discourse types they are asked to write (Berman & Nir-Sagiv, 2007). If so, students may have sufficient linguistic resources to compose academic texts, but lack the ability to marshal these resources to meet the organizational and communicative demands of the specific genre. A second possibility may be that most students' linguistic capacities simply develop along a relatively slow trajectory that, with few exceptions, prevents them from using more complex syntactic structures until high school, even if they understand clearly the structure and purpose of the genres assigned. A third possibility, however, may involve the instructional approaches used to teach writing in different genres. Should syntax be taught as a school subject? Would genre-specific writing instruction that included a focus upon the syntactic tools required perhaps accelerate the acquisition of these syntactic structures? If so, how might this be instruction be combined with authentic literacy practices?

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