1-1-2011

Systemic Functional Analysis of Elementary School Language Arts Textbooks

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SYSTEMIC FUNCTIONAL ANALYSIS

OF ELEMENTARY SCHOOL LANGUAGE ARTS TEXTBOOKS

A Thesis submitted to
the Graduate College of
Marshall University

In partial fulfillment of
the requirements for the degree of
Master of Arts in English

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Marshall University
May 2011

Table of Contents

List of Tables

List of Figures

ABSTRACT

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by Irina Presnyakova

The purpose of this study is to investigate lexico-grammatical changes in the language of instruction in the Language Arts textbooks from four consecutive grades. The nature and rate of such changes are addressed within the framework of Systemic Functional Linguistics. The study focuses on analyzing lexical density and variation, grammatical intricacy, process types, and clause complexes in the sample texts obtained from four elementary school textbooks for 2nd, 3rd, 4th, and 5th grades. The analysis shows that there are gradual changes in the lexico-grammatical features of the language of instruction across the grade levels; however, these gradual changes are not proportional to the increase of the grade levels. The lower grade texts employ lexico-grammatical and logico-semantic patterns different from those of the higher grade texts. Furthermore, it is suggested that the lexico-grammatical disparity revealed in the data may be partially responsible for the "4th grade slump" commonly discussed among elementary school educators.

Introduction

Formal and Functional Linguistics

Generally speaking, linguistics can be approached from a formal perspective that focuses on the formal, technical aspects of language, and a functional perspective that studies language in use.

One of the most widely recognized formal approaches is Chomskyan formal linguistics. Its main theoretical framework is based on the conception of language as a universal system inherent to the speaker; hence language is cognitively motivated. Language acquisition, according to Chomsky, is possible because children are born with innate language faculty called Universal Grammar (UG) that contains sets of syntactic rules organizing language, and a Language Acquisition Device (LAD), an "organ" in the brain that allows them to select their L1 specific parameters based on input. Competence and performance are the other key concepts of Chomskyan linguistics. Competence is the underlying set of linguistic rules, and performance is the actual use of language that usually reflects competence rather poorly due to numerous errors in performance. Competence is the focus of study for formal linguistics whereas performance is treated as irrelevant because it deals with a social function of language and cannot explain how the brain generates language. Chomskyan generative-transformational grammar draws on these concepts and is devoted to the study of syntax of language through exploring deep and surface structures of a phrase in order to predict which combination of words will produce a grammatical sentence.

Although Chomsky's approach has heavily influenced modern formal linguistics, many of its concepts have been questioned by a number of scholars (see, e.g. *The Anti-Chomsky Reader*). To begin with, the hypothesis about the existence of UG is "not available

for perusal, and its form must be deduced from the actual languages we can observe" (Bauer, 2007, p. 55). Neurolinguistically, it has not been proven yet that there is an area in the brain that controls and develops language; rather, there are several areas in both hemispheres that are involved in first and second language acquisition (Everett, 2006). Data for analysis in the formal approach is generalized and idealized (Bauer, 2007, p. 49). The maximal unit of analysis for formal linguistics is a clause, and what analysis concentrates on is the syntactic structure of the clause. Such approach to the analysis can be seen as limiting the understanding of language because all multiple meanings created within clause complexes and texts as well as the semantics of language are left unaccounted for. Dr. Minsky, Chomsky's colleague from MIT, in his interview for the on-line journal *Brain and Mind* says, "Prof. Noam Chomsky is to be faulted why we don't have good machine translation programs. He is so brilliant and his theory of generational grammar is so good, that for 40 years it has been used by everyone in the field, shifting the focus from semantics to syntax" ("The mind, artificial intelligence and emotions," n.d.). Finally, and most importantly, formal approach to linguistics does not pay enough attention to the social nature of language, analyzing language in its ideal, probably non-existent in reality, form.

Functional approaches, on the other hand, account for the syntax of the language, concentrating at the same time more on social and interpersonal aspects of the language. In regard to social and interpersonal functions of the language, Schleppegrell states: "Rather than seeing language as a set of rules, the functional perspective sees the language system as a set of options available for construing different kinds of meanings" (2004, p. 7).

The roots of functional linguistics can be traced back to the 1920s when the Prague Linguistic Circle was founded in Europe by a Czech scholar, Vilem Mathesius. The Circle

included many prominent linguists of the time, and later the Prague school of linguistics became a major influence in functionalism together with the Copenhagen school started by Louis Hjelmslev and the so-called "London school" of linguistics based on the work of J. R. Firth. Neo-Firthian linguists continued Firth's studies of phonology, prosody, and context of situation. In particular, Michael Halliday, influenced also by Malinowski's studies of anthropology, set out to develop a social semiotic functional theory of language that deals with both syntagmatic and paradigmatic issues. Halliday's work on social semiotics (1978) explains the orientation of this theory, known as Systemic Functional Linguistics (SFL), towards sociology. Its main concern is the function of language in the society. Language from the SFL perspective is represented as resource with numerous system networks (hence "systemic") that allow language users to choose from paradigmatic options in order to make meaning on multiple strata of the language system. Meaning making is the general function of the language in context (hence "functional"). The choice from meaning-making options is influenced by the cultural, social, and cotextual context of the situation. Eggins (2004) defines SFL as a "functional-semantic approach to language which explores both how people use language in different contexts, and how language is structured for use as a semiotic system" (p. 20-21).

Two of the fundamental concepts for SFL are the notions of syntagmatic and paradigmatic relations. Eggins (2004) accounts for syntagmatic relations as "the relations by which signs can go together in sequences or structures," and paradigmatic relations as "the relations by which signs stand in opposition to other signs" (p.190). Halliday explains that syntagmatic order is the 'compositional aspect of the language': "a word consists of a whole number of letters, a sub-sentence of a whole number of words, a sentence of a whole number

of sub-sentences" (2004, p. 20-21). Paradigmatic relations, on the other hand, is "what could go instead of what" (Halliday, 2004, p. 22). Paradigmatic ordering represents language as a set of meaningful choices graphically outlined in system networks such as in Figure 1. All grammatical categories of language can be organized in similar systems.
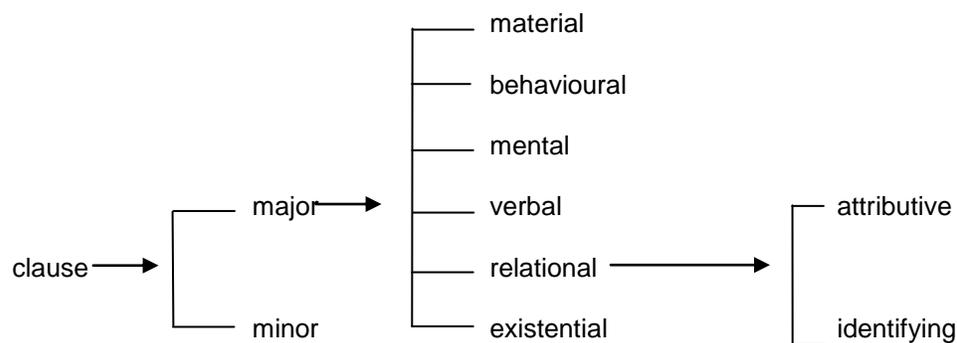
Figure 1. An example of system network (adapted from Halliday, 2004, p. 173)

Another central notion in SFL is stratification. Language, according to Halliday, is a "complex semiotic system, having various levels, or strata" (2004, p. 24). Phonology, lexicogrammar, semantics, and context are such strata that form the multi-layered and metaredundantly related language system. Paradigmatic and syntagmatic relations define linguistic signs at each stratum. Stratification is visually represented as shown in Figure 2.
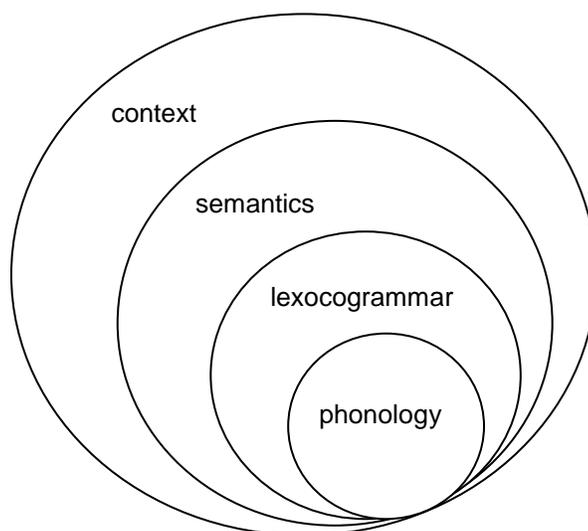
Figure 2. Stratification (from Halliday, 2004, p. 25)

The relationship among the strata is metaredundant; that is, lexicogrammar is interpreted as "an emergently complex pattern of phonological patterns, and discourse semantics as an emergently complex pattern of lexicogrammatical patterns" (Martin, 2010, p. 5). The linguistic system is "embedded in context" (Halliday, 2004, p. 26).

Context of situation is responsible for variations in register understood as "a functional variety of language" (Halliday, 2004, p. 27). Differences in context are described in SFL in terms of field, tenor, and mode. Schleppegrell provides the following description: "field (what is talked about), tenor (the relationship between speaker/hearer or writer/reader), and mode (expectations for how particular text types should be organized)" (2004, p. 46). Each stratum of language, then, can be explored from these three different perspectives. Lexicogrammar construes three corresponding kinds of meaning: the ideational (experiential and logical), interpersonal, and textual (see Figure 3). Thus, when we talk, "we simultaneously construe some kind of experience, enact the role relationship between speaker and hearer or reader and writer, and structure texts so that they make coherent wholes" (Schleppegrell, 2004, p. 46).
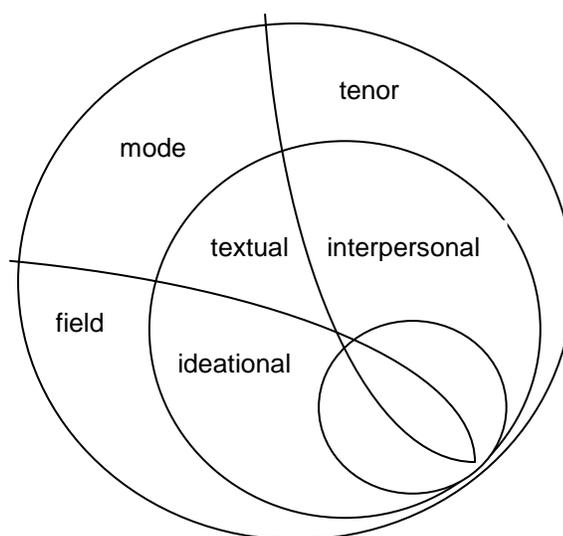
*Figure 3.*The metafunctional organization of language (from Martin, 2010, p. 14)

Every text and every sentence within the text are perceived by a systemic linguist as multifunctional. Castello (2008) explains that:

> the experiential metafunction has to do with the fact that any text involves some
> doings or happenings and some participants; the ideational metafunction with the fact
> that doings and happenings appear in a logical sequence; the interpersonal
> metafunction concerns the text producer's belief as to the role of the text in the
> interaction and his/her relation with the interlocutor; finally, the textual metafunction
> concerns the organization of the text. (pp. 150-51)

An important distinction of functional approach is that it studies "actual instances of language that have been used (or are being used) by speakers or writers" (Bloor & Bloor, 2004, p. 5). Such linguistic analysis of real language has many practical applications. Halliday in the preface to the 1994 edition of his *Introduction to Functional Grammar* mentions 21 of them, among others "to understand the quality of texts: why a text means what it does, and why it is valued as it is; to understand many aspects of the role of language in the community and the individual: multilingualism, socialization, ideology, propaganda, etc.; to help people learn their mother tongue, reading and writing, language in school subjects, etc." (xxix).

Systemic Functional Linguistics is successfully applied for analysis of texts of different genres and with different purposes. It provides some universal tools for analyzing texts in order to identify what makes a text the kind of text it is. Schleppegrell (2004) mentions in this regard:

> … teachers also need a better understanding of the features of the language they aim
> for students to develop, and so focus here is on the forms that language takes in

academic contexts. Academic texts make meanings in ways that are informationally

dense and authoritatively presented. At the same time, these texts embed ideologies

and position readers in ways that can seem natural and unchallengeable. Students and

teachers need tools for unpacking the meanings and recognizing the positions and

ideologies. (p. 44)

Thus, studies of the language of schooling can help reveal the "hidden curriculum" and

ideology of texts in order to create better curricula.

Rationale

This thesis concentrates on applying Systemic Functional Linguistics tools to the

analysis of four English Language Arts textbooks designed to be used in 2nd to 5th grade

classrooms. The rationale for this choice is as follows.

For decades, researchers and educators have agreed that textbooks play a key role in

the process of school education, determining what and how teachers teach (see, e.g., Watts-

Taffe, Gwinn, Johnson, & Horn, 2003; Dole & Osborn, 2003; Reys, Reys, & Chavez, 2004;

Tyson, 1997; Apple, 1991; Elliot & Woodwart, 1990). Palinscar and Duke (2004) argue that

even "when teachers elect not to teach 'from the text', texts play a significant role in

determining the curriculum" (p. 184). Authors cite the 1995 study by Radencich who found

out that "95% of teachers' decisions are governed by the textbook they use" (p. 184). Thus,

students' success in school depends to a great extent on their understanding of the texts, and

this understanding is influenced "by a variety of features that characterize the nature of text"

(Beck, McKeown, & Worthy, 1995, p. 220). Without close analysis of the texts, it is hard to

make conclusions about the efficiency of textbooks in the school instruction. As

Schleppegrell puts it, "… a careful analysis of the linguistic challenges of learning is

important for understanding the difficulties students face and the limitations they demonstrate in talking and writing about topics they have studied" (2004, p. 2).

The necessity to explore the language of textbooks is becoming more and more recognized. However, Nathan, Long & Alibali argue that though textbooks are the main learning tool, "analyses of their composition and organization are often neglected in research on learning from text" (2002, pp. 1-2).

As teachers do not normally possess the linguistic knowledge necessary to realize the challenges the language can pose, they "need help to become aware of the language difficulties present in school textbooks" (Moss, 2006, p. 889).

Previous linguistic research of English Language Arts textbooks was influenced by Chomskyan formal linguistics, behaviorist theories of learning, theories of cognitive development (Piaget, 1970), and sociolinguistic theories (see *Linguistics and Teaching the Language Arts* (2003) for overview). Since the 1980s, Systemic Functional Linguistics was "brought" to schools first in Australia, then in other countries by Martin, Rose, Eggins, Schleppegrell, Coffin, Christie, and many others. Their research on the language of schooling concentrated mainly on the language of math (Nathan, Long, & Alibali, 2002; Abel & Exley, 2007), history (Moss, 2006; Martin, 2002; Schleppegrell & Achugar, 2003; Coffin, 1997), and social sciences and natural sciences (Ninnes, 2001; Halliday & Martin, 1993; Rose, 2000; Veer, 2000; Macken-Horarik, 2002). To my knowledge, the language of Language Arts has not been the main focus of attention so far.

Four elementary school textbooks in Language Arts were chosen for a close analysis. The sequence is important for this research. Schleppegrell states that "learning involves linguistic challenges that increase as students move from primary to secondary schooling and

on to higher education" (2004, p. 1). Chall and Squire (1991) mention that sequencing of textbooks has been practiced for more than hundred years "with each book designed to be suitable in content, appeal, and difficulty for children within each grade" (p. 126). Thus, I seek in this research to look closely at the sequenced texts to see how the linguistic challenges of text complexity progress in terms of structure of the texts.

As for the complexity of texts, there have been numerous studies concerning vocabulary difficulty (lexical density and lexical variation of texts) (Gibson, 1993; Ventola, 1995) and readability (the comprehension difficulty of texts) (Bruce & Rubin, 1988; Johnson, 1998). Chall and Dale (1948; 1995) developed a formula to measure the readability of school texts and rated texts used in U.S. schools to determine the reading level. Though this formula supposedly measures both lexical and syntactic complexity, its credibility was critiqued by some scholars on the assumption that there are many other factors that contribute to text difficulty (see, e.g., Bruce and Rubin, 1988; Gibson, 1993; Alderson, 2000).

Indeed, the complexity of the text depends not only on the number of unfamiliar words, or the sentence length, or the lexical density and variation. Systemic Functional Linguistics offers a new perspective on studying the text complexity.

Research Questions and Thesis Overview

The main research question posed in this study is:

Granted that the language of instruction in English Language Arts textbooks in grades 2, 3, 4, and 5 gradually becomes more complex, what are some of the lexicogrammatical features involved in this increasing complexity?

To answer this question, the following issues were addressed:

1. What are the lexical density, lexical variation, and grammatical intricacy of the texts across levels?

2. What process types are predominant in texts at different levels?

3. What features characterize clause complexes of texts of different levels?

This thesis is structured in the following way. Literature review section reviews research on the language of schooling and the application of SFL to investigate the language of schooling. Study section describes the methodology of the study, presents the data, and provides the analysis. In Conclusion and Discussion section, results of the study are discussed, limitations and implications are addressed.

Review of the Relevant Literature

Language of Schooling

In the 1970s, a group of authors attracted attention to the necessity of investigating the classroom language with the publication of the volume *Functions of Language in the Classroom* (Eds. Cazden, John, & Hymes, 1972). This book started a new wave of research that explored classroom language in social and cultural context. The following review will concentrate on the important issues of the trend and describe some relevant studies.

Schleppegrell (2004) stresses the importance of studying the language of education. Children encounter academic language at quite an early age, from the first grades of elementary school, having sometimes no previous experience with such register. Schleppegrell argues that in many cases the problems children have with learning are caused by their lack of familiarity with academic register rather than "the intrinsic cognitive challenges of the content or subject matter" (2004, p. 7). It is actually a social problem: children from a lower social class are disadvantaged in that they don't have an opportunity to encounter academic register prior to coming to school. Schleppegrell further states that "all children enter school with language resources that have served them well in learning at home and that have enabled them to be interactive and successful members of their families and local communities. But many children lack experience in making the kinds of meanings that are expected at school" (Schleppegrell, 2004, pp. 21-22). As soon as children enter school, they are expected to use academic language. Schleppegrell points out that often no explanation about the structure or organization of a particular text accompanies the task students receive, and the only feedback they get is requests to use clear language and be precise (2004, p. 2). It is not surprising that many students are taken completely by surprise

by such tasks and perform inadequately, which leads to their further exclusion from classroom practices as teachers prefer to call on students who can communicate in the desired register. Thus, it is important to study how language is used in school so that it does not become "a hidden curriculum through which some students are denied access to full participation in the institutions and practices of society" (Schleppegrell, 2004, p. 41).

Another issue with the language of schooling that deserves attention is that it is easy to underestimate the complexity of the academic language a child encounters at school. Addressing this issue, Moss (2006) argues that because subject teachers often have profound knowledge in their field but little understanding of language, they "may assume that the texts they use are transparent and therefore attribute students' lack of understanding to inattention in reading, laziness or stupidity" (p. 882). Moss reports on several studies carried out in the Colombian Institute for the Development of Science and Technology that aim at identifying the sources of difficulties in the textbook language as well as the ideology of the textbook discourse (Moss, 2006; 2010).

Rose (2006) argues as well that educators sometimes underestimate the "bewildering complexity" of language. While reading, writing, speaking, and listening, children have to process at the same time many structural layers of language, "including patterns within the word that we call spelling, patterns within the sentence known as grammar, and patterns within the text which I call discourse" (p. 51). Text also exists in a particular context of situation (register) and context of culture (genre), carrying as well some ideological message. To function successfully in school, children need to learn to process this extremely complex structure automatically, so that the actual goal of school activities – acquiring new

knowledge – is reached. Rose, in his study, offers to base teaching on reading and proves the usefulness of such an approach.

A new view of literacy is another reason why studying the language of schooling is so important. Wyatt-Smith and Cummings (2003) state that today literacy is categorized as "being more dynamic, contextualized and complex" (p. 49). Authors even claim that it is not "a literacy", but rather "literacies": "to be successful, students need to be able to identify and engage with these curriculum literacies within each subject, not just for learning, but also for successful negotiation of assessment within each subject. These are what we term "*curriculum literacies*" (pp. 49-50).

Abel and Exley (2007) also state that "specific school subject areas have their own distinctive grammatical features and language structures that students must exchange between and across in order to be successful learners" (p. 5). Their study uses SFL tools to examine math texts designed for primary school. They conclude that it is absolutely necessary for teachers to understand and respond to "the specific literacy demands of discrete subject areas" (p. 1).

Growing interest to the language of schooling can be explained by a new view of language. Halliday, in his significant work *Towards a Language-Based Theory of Learning,* states that it is incorrect "to isolate learning language from all other aspects of learning" (1993, pp. 112-13). He describes the stages of child language development from infancy to secondary school, demonstrating that learning is not separate from acquiring language. In fact, learning is happening *through* language, that is why it is important to study the language of schooling, both the language of classroom and textbook instruction.

Functional approach has been applied to numerous studies of the language of schooling, classroom discourse, and literacies. The research presented here also employs Halliday's functional grammar as a framework for analysis. The next section briefly introduces the notions necessary for analysis.

The Functional Grammar Framework

This analysis concentrates on measuring lexical density and variation together with grammatical intricacy of texts as well as on studying the system of transitivity and clause complexes. The choice of objects for this analysis is determined by the fact that, from the discourse semantics perspective, lexis and the transitivity system fall under experiential metafunction, which is also a part of ideational metafunction that explores clause complexes. Halliday explains that "language provides a theory of human experience, and certain of the resources of the lexicogrammar of any language are dedicated to that function. We call it the ideational metafunction, and distinguish it into two components, the experiential and the logical" (2004, p. 29). Thus, this research explores how the authors of the textbooks construct the experience through the language choices they make.

Lexis

Analysis of the lexical density has been used in research on differences between modes of speech (written vs. spoken) and on register differentiation (Castello, 2008, p. 49). There are several types of measurement of lexical density, each applied to different corpora by different researchers. It is widely acknowledged that "measures of richness of vocabulary, such as lexical density, provide a robust method of distinguishing genres"

(Stubbs, 1996, as cited in Castello, 2008, p. 52), as well as help to identify the level of text complexity. Though current study is not concerned with the text complexity per se, measuring lexical density of the texts at different grades allows the researcher to compare these texts in order to trace the change of complexity across levels.

According to Halliday, "Lexical density is the proportion of lexical items (content words) to the total discourse. It can be measured in various ways: the ratio of the lexical items either to the total running words or to some higher grammatical unit, most obviously the clause" (1987, p. 60). Castello (2008) refers to the former way as Ure's method of calculating the lexical density (LDU) represented in the following formula (p. 59):

$$LDU\ (\%) = \frac{Number\ of\ lexical\ words}{Total\ number\ of\ words\ (tokens)}\ x100$$

The main difficulty with calculating the lexical density is distinguishing lexical and grammatical items because, according to Halliday (2004), lexis and grammar form one system – lexicogrammar – and the moving between them is a matter of delicacy (p. 43). For the current research, the classification of grammatical and lexical items created by Castello (2008, pp. 56-58) was used.

However, the density of the text depends not only on the proportion of lexical and grammatical items in it. Another important measurement is lexical variation because, as Halliday (1989) points out, "repetition reduces the effect of density" (p. 64). If there is an approximately equal number of grammatical and lexical items in two hypothetical texts, but in one text some lexical items are repeated five or eight times, whereas in the other most such items are used only once, then the second text is likely to be perceived as more difficult.

The formula to calculate lexical variation (LV) is as follows (Castello, 2008, p. 64):

$$\text{LV (index)} = \frac{\text{Number of different lexical words}}{\text{Total number of lexical words}}$$

To apply this formula, the words belonging to the same lemma or word family are considered to be the same lexical item (e.g., write, wrote, written, writing, writer). If a text scores low on lexical variation, it means the same lexical items are repeated many times.

Halliday (1989) offers another approach to calculating lexical density stating that "words are not packed inside other words; they are packaged in larger grammatical units – sentences, and their component parts. It is this packaging into larger grammatical structures that really determines the informational density of a passage of text" (p.66). Instead of calculating the proportion of lexical and running items, he suggests that the number of lexical items per clause should be considered. The formula for Halliday's lexical density (LDH) calculation is as follows (Castello, 2008, p. 97):

$$\text{LDH (index)} = \frac{\text{Total number of lexical words}}{\text{Total number of ranking clauses}}$$

Finally, in addition to the lexical complexity of a text, there is a grammatical complexity. Halliday (2004) states:

typically, written language becomes complex by being lexically dense: it packs a large number of lexical items into each clause; whereas spoken language becomes complex by being grammatically intricate: it builds up elaborate clause complexes out of parataxis and hypotaxis. (p. 654)

Halliday's method of measuring grammatical intricacy complements measuring lexical density, contributing to a more objective description of the text. Grammatical intricacy (GI) is calculated by the following formula (Castello, 2008, p. 97):

$$GI \ (index) = \frac{\text{Total number of ranking clauses}}{\text{Total number of clause complexes}}$$

The resulting index demonstrates how many clauses are combined in each clause complex; the higher the index, the more intricate the text.

The system of Transitivity

Transitivity system belongs to the experiential metafunction of the language. Hallidays states that "experientially, the clause construes a quantum of change as a figure, or configuration of a process, participants involved in it and any attendant circumstances" (2004, p. 169).

Three main types of processes are material, mental, and relational. In between different pairs, sharing features of both, are three additional process types – behavioural, verbal, and existential (Martin, Matthiessen, & Painter, 1997, pp. 102-110).

Material processes are doings and happenings, both concrete and abstract. An inherent participant of a material clause is an Actor – the one who is performing the action; there can also be a Goal – something impacted by the action, and a Range that defines the scope of happening:

(1) She	brought	her crutches	to school.
Actor	Process: material	Goal	Range

Mental processes are those of perception, cognition and affection. The inherent participant is the Senser; there can be also the Phenomenon – something being sensed, as Example 2 illustrates:

(2) She   remembered   the time [[she broke her leg.]
     Senser   Process: mental   Phenomenon

Relational processes construe being in one of two ways: attributive (show class membership, Example 3) and identifying (show symbolization, Example 4):

(3) Here   are   some suggestions [[for publishing your work.]]
     Carrier   Process: rel.:   Attribute
                 attributive

(4) Revising   is   the first step in the editing process.
     Token   Process: rel.:   Value
                 identifying

Verbal processes are processes of saying, as well as showing or indicating something. The Sayer is the central participant; there can be also a Receiver (addressee) and the Veribage (something being said) (Example 5):

(5) A writer   answers   questions   in each part of the story map.
     Sayer   Process: verbal   Verbiage   Range

Behavioural processes construe human behavior realized through material or verbal actions. The main participant is called the Behaver (Example 6):

(6) Let   your partner   read   it silently.
                 Behaver   Process: behavioral

Existential processes have just one participant – Existent, which is introduced by the process (Example 7):

(7) There   are   many different purposes for writing
                    Process: existential   Existent

Analyzing a text for process types presents several difficulties. First of all, clause complexes usually contain more than one different process type that need to be treated separately (see Example 8). Sometimes, however, one of the processes does not contribute to the transitive meaning of the clause representing just a stage in the process (see Example 9).

(8) Remember ||as you are writing || to be creative || and have fun with your topic.
     Pr.: mental   Pr.: material   Pr.: relational   Pr.: behavioral

(9) A Venn diagram helps you   compare two things.
                                  P:mental

Next, there is no clear border between process types; rather, they shade into one another. Halliday (2004) explains: "The world of our experience is highly indeterminate; and this is precisely how the grammar construes it in the system of process type" (p. 173). Example 10 is such a case: reading is impossible without some mental activity, but at the same time it is realized through a material act of producing sounds; thus 'read' can be defined as a behavioural process:

(10) Read   your first draft aloud.
         Pr.: behavioral

Another difficulty arising during the analysis is the changeable nature of the process types. Depending on the context, 'write' can be a verbal process (Example 11) or a material one (Example 12).

(11) Write about your favorite activity. (i.e. communicate some message to your interlocutor)

(12) Write freely for several minutes. (i.e. produce some text as an artifact)

The distinguishing criterion here is "whether the act of creation is aimed at the resultant text as artifact or at the process of communication in which artifact is involved" (M. Lewis, personal communication, February 9, 2010).

Analyzing a text for process types contributes to our understanding of different genres. As Halliday states, "Part of the flavor of a particular text, and also of the register it belongs to, lies in its mixture of process types" (2004, p. 174). Though any text usually contains different process types, it is possible to talk about, for example, predominant use of verbs of material process type in recipes and relational processes in science textbooks. Schleppegrell (2004) mentions that "the more frequent use of relational processes … characterizes school-based registers" (p. 53). Such a situation is important to note given findings that children are not as familiar and comfortable with relational processes as with other process types (Abel & Exley, 2007, p. 11).

In this research, the number of verbs belonging to different process types was calculated and compared to examine whether there is a change in the ratio of different process types across levels.

Clause complexes

Clause complexes show "how the flow of events is construed in the development of text at the level of semantics" (Halliday, 2004, p. 363). Writers choose to combine clauses into complexes in order to pack more meanings into shorter sequences: "the sequences that are realized grammatically in a clause complex are construed as being sub-sequences within the total sequence of events that make up a whole episode in a narrative. … But the integrated and choreographing effect achieved by clause complexes is not, of course, restricted to narratives; it is a feature of texts of all kinds" (Halliday, 2004, p. 365).

Eggins (2004) defines clause complex as a "grammatical and semantic unit formed when two or more clauses are linked together in certain systematic and meaningful way" (p. 255). If there is just one clause in a sentence, it is called a clause simplex.

The way clauses are combined in a clause complex is described through two systems, taxis and logico-semantics. Taxis shows the type of relations between clauses; the relationship of equality and independence is called parataxis (Example 13), and the relationship of dependency is called hypotaxis (Example 14).

| (13) Choose your topic, | ‖ | and organize your information. |
| 1 | | 2 |

| (14) Look at your listeners ‖ | when you speak. |
| α | β |

The logico-semantic system shows how clauses are related to each other: through projection or expansion. When what is projected is a thought, it is called idea (example 15). When what is projected is speech, it is called locution (Example 16).

(15) Decide || what your purpose and audience will be.
      α   'β

(16) They might ask themselves || why an event made them feel in a certain way.
      α   "β

Expansion can be of three different types: elaboration (when one clause restates or exemplifies another one, Example 17), extension (when one clause adds some new information to another clause, Example 18), and enhancement (when one clause develops another clause in some way, Example 19).

(17) A synonym,   <<or word that has the same   may come after the
                      meaning,>>   example sentence.
      1   << =2 >>

(18) Then choose a topic || and organize your information.
      1   +2

(19) Look at your listeners|| when you speak.

      α   xβ

System of clause complex can be represented graphically (Figure 4):
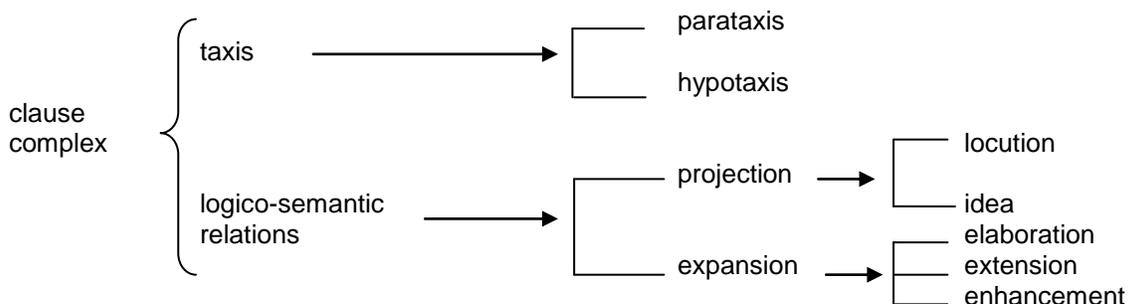

Figure 4. System of clause complex (from Eggins, 2004, p. 259)

Any clause chooses both for taxis and logico-semantic relations. The choice is "either or": a type of relations between clauses can be either paratactic, or hypotactic. The same is

true for logico-semantic relations: a clause either projects (or is being projected), or expands (or is being expanded).

The difficulties in the analysis arose here mainly when the text was divided into clauses because in addition to ranking clauses, dependent or independent, each text contained a large number of embedded clauses. Embedding is defined by Halliday (2004) as "a semogenic mechanism whereby a clause or phrase comes to function as a constituent within the structure of a group, which itself is a constituent of a clause … Hence there is no direct relationship between an embedded clause and the clause within which it is embedded" (p. 426). Embedded clauses are also called rankshifted; they are excluded from the analysis because they do not carry any separate experiential meaning and serve as Postmodifier in a nominal group or Head in a nominal group (Examples 20, 21).

(20)   Choose a way [[to share your writing]].

(21)   [[Using different kinds of type and different colors]] makes writing [[fun to read.]]

It is, however, difficult in many cases to define whether the clause is ranking or rankshifted. Martin, Matthiessen, and Painter (1997) in their manual for systemic functional analysis give a number of probes that can help to distinguish ranking and rankshifted clauses: presence or absence of punctuation, ability to serve as a subject of an agnate passive clause, ability to become the focus of Theme predication, etc. (p. 183).

Now that the research context for the analysis is established, the study will be described.

Study

The methodological approach of this study draws on a systemic functional analysis of the texts mentioned above. The SFL analysis of the corpus comprised the following aspects: lexical density, lexical variation and grammatical intricacy of the texts, clause complexes, transitivity system (process types).

Data

This research involved the analysis of four sequential elementary school texts used in U.S. schools. The textbooks selected for the study have been adopted by the South Point Local School District (Ohio). The schools currently using them are South Point Elementary School and Burlington Elementary School (Ohio). It's a series of textbooks by the same team of authors (I.L.Beck, R.C.Farr, D.S.Strickland, A.F.Ada, M.Brechtel, M.McKeown, N.Roser, & H.K.Yopp; consultants: A.G.Hilliard III, F.I.Campoy, & D.A.Monti) published in 2005 by Harcourt Publishing House as part of the Harcourt Reading / Language Arts program.[1]

The section of the textbooks analyzed for this research is the *Writer's Handbook* placed at the end of each textbook before the Glossary. The number of pages devoted to the Handbook is the same in all grades (21 pages); however, because of the font size change from 2nd to 5th grade texts, higher grades comprise much more content. The sections under discussion contain pictures, graphs, and tables that were excluded from the analysis as they bear little to no textual information relevant to the current analysis. The corpus analyzed consisted of 1,897 words for 2nd grade, 3,392 for 3rd grade, 3,288 for 4th grade, and 3,108 for 5th grade.

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[1] Information is available on the official cite of the program www.harcourtschool.com/menus/reading.html

The aim of the Writer's Handbooks is to give children basic knowledge on the concept of the audience, purpose of writing, writing process, as well as features of good writing, and to offer tips on presenting students' work and conducting peer conferences. The Handbook for all the four grades has exactly the same organization: there are 5 sections titled "Planning Your Writing," "Using References and Resources," "Organizing Information," "Polishing Your Writing," and "Presenting Your Writing." The smaller subsections within each section are followed by "Try This" written tasks.

Methods of Analysis

Lexical density and lexical variation analysis

For the analysis of lexical density, functional words were manually tagged using Castello's system in the texts; the number of lexical and functional words was calculated using MSWord. For the analysis of lexical variation, AntConc 3.2.1w, a concordance program developed by Laurence Anthony, was used to calculate lemmas (word families).[2] After all the data were logged into the data set, the formulas described in the previous sections were applied to calculate the percentage and indices of lexical density and variation. The results were represented in tables and charts.

Process types analysis

An analysis of the transitivity types was performed in order to reveal the distribution of process types in the texts across levels and the frequency of their occurrences. Processes

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[2] The free software can be accessed at www.antlab.sci.waseda.ac.jp/software.html

were labeled and counted according to their types; the percentages of different process types'

occurrence were calculated. The data for all grades were represented in a table and a chart.

Clause complexes analysis

In order to investigate the logico-semantic complexity of the clause complexes within

the texts, the following steps were performed. Each of the four texts was divided into clauses

and saved as an MSWord table. After this, each clause was analyzed in the following

manner: embedded clauses were marked by double square brackets, clause simplexes were

labeled as such, and clause complexes were further distinguished on the basis of their tactic

relations. Clause simplexes and complexes were numbered with Arabic numerals, and

ranking clauses within clause complexes were additionally numbered with Roman numerals

(see Figure 5 for a sample of the data). The frequency of clause simplexes and complexes

was calculated. Next, tactic and logico-semantic relations were analyzed and labeled, and the

occurrence of clauses with different types of tactic and logico-semantic relations was

counted. Data on clause frequency were combined with those on the occurrence of the lexical

words in the texts in order to calculate the grammatical intricacy. The results of the analysis

were represented as graphs, charts, and tables.

α		74i	You may want P:ment.
'β	α	74ii	to carry P:mat. a small notebook
	xβ	74iii	to write down P:mat. interesting things [[you see or hear,]] unusual or meaningful things [[people say,]] and descriptions of people or places.
Clause simplex		75	You can refer P:mat. to your notebook [[for writing topics]] later.
xβ		76i	If the topic [[you must write about]] is P:rel. unfamiliar to you,
α		76ii	search P:beh. first on the Internet or in an encyclopedia.
Clause simplex		77	Newspapers and magazines may also have P:rel. information on your topic.

Figure 5. Sample of the data

Analysis and Results

Lexical density, lexical variation, and grammatical intricacy

    Lexical density.

The number of lexical items in all the texts slightly exceeds 50% of the total number of words. Ure's method of calculation produced the following results: the lexical density is 52.3% for the 2nd grade data, 50.2% for the 3rd, 51.4% for the 4th, and 52.5% for the 5th (see Table 1). Such lexical density is normal for texts of written genre, as written texts normally have a lexical density over 40%, and spoken texts under 40% (Castello, 2008, p. 49). With the exception of the 2nd grade data, there is a slight increase in the lexical density across the grades; in other words, more lexical and less functional items are used in the texts of higher grades. Lexical density calculation by Halliday's method produced similar results: the index is 4 for the 2nd and 3rd grades data, 4.1 for the 4th, and 4.2 for the 5th (Table 1).

Table 1

Lexical Density

Grade	2	3	4	5
Total words	1897	3392	3288	3108
Grammatical words	904	1688	1599	1477
Lexical words	993	1704	1689	1631
Lexical density, Ure's method, %	52.3 %	50.2%	51.4%	52.5%
Lexical density, Halliday's method, index	4	4	4.1	4.2

The results demonstrate that the lexical density calculated by different methods increases from 3rd to 5th grade (see Figure 6).
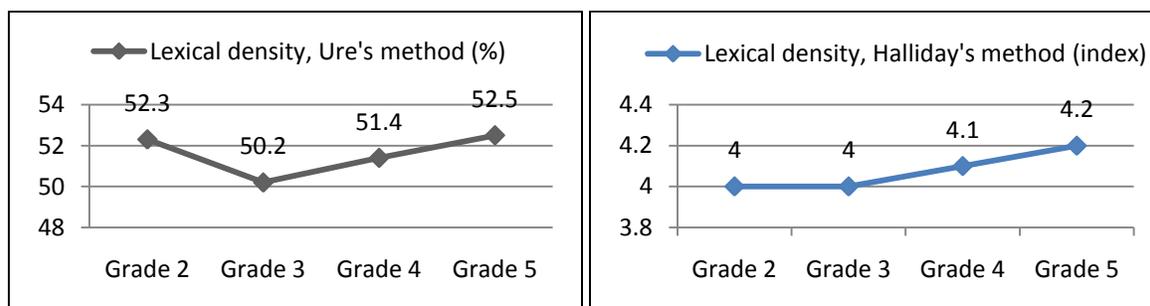
Figure 6. Lexical density calculated by different methods

Lexical variation.

With the exception of the 2nd grade, there is an increase in lexical variation across the grade levels: the indices are 25.4 for 3rd grade, 27.5 for 4th grade, 28 for 5th grade; that is, the same lexical items are used less frequently in higher grades (Table 2). Therefore, not only lexical density, but also lexical variation shows a tendency to increase with the increase of the grade level of the text.

Table 2

Lexical variation

Grade	2	3	4	5
Lexical words	993	1704	1689	1631
Lemmas (word families)	288	432	465	456
Lexical variation	29	25.4	27.5	28

The 2nd grade deviation in the lexical density and lexical variation will be addressed in the discussion section.

Grammatical intricacy.

The differences in grammatical intricacy across levels are not as large as those in lexical density and show a less clear pattern: the index slightly increases from 2.1 to 2.4 from 2nd to 3rd grade level, remains the same in 4th grade text (2.4), and then drops to 2.3 in 5th grade (Table 3).

Table 3

Grammatical intricacy

Grade	2	3	4	5
Grammatical intricacy	2.1	2.4	2.4	2.3

The maximum variation of indices reaches only 0.3, which proves that the proportion of ranking clauses to clause complexes changes from level to level insignificantly. Therefore, the grammatical intricacy calculated by Halliday's method can be assumed to be similar in all texts across levels.

Process types

The percentages of the number of processes belonging to different transitivity types reveal that all four textbooks employ process types similarly. The primary process types are distributed as follows (see Table 4):

Table 4

Process types distribution across levels

Grade	2	3	4	5
Material	100	170	176	159
	39.8%	39.6%	41.9%	39.7%
Relational	57	92	100	94
	22.7%	21.4%	23.8%	23.9%
Behavioral	41	50	57	61
	16.3%	11.7%	13.6%	15.2%
Mental	22	53	53	43
	8.8%	12.4%	12.6%	10.7%
Verbal	30	56	33	40
	11.9%	13%	7.9%	9.9%
Existential	1	5	1	4
	0.4%	1.2%	0.2%	1%
Total verbs 100%	251	429	420	401

Material processes.

The texts favor the material process (around 40% of all verbs at all levels) over the other process types, presumably because texts under analysis belong to an instructional/procedural genre that typically draws on the material processes heavily. In this regard Halliday mentions, "The material clauses construe the procedure as a sequence of concrete changes" (2004, p. 179). This can be clearly seen in the texts under discussion that describe writing as a procedure consisting of concrete steps. Examples that show this general pattern are as follows:

(22) Add P:mat. important ideas and details that you left out.

(23) Write P:mat. the answers on your note cards.

(24) Support P:mat. each reason with facts and details.

These and other similar clauses describe the experience people receive from the material world, either concrete or abstract.

Besides, as these texts are oriented toward elementary school students, the language of textbook contains more "tangible" processes, assuming that they contribute to a better comprehension of the texts.

Relational processes.

Relational processes are the second most frequently used process types: their use changes within a 21.4-23.9% range across the grade levels. They are used to construct descriptions and assign qualities, as in the following Examples 25 and 26.

(25) A thesaurus is P:rel. a list of words and their synonyms.

(26) [[Creating mental images, sketching, and detail drawing]] are P:rel. traits of good drawing.

The large number of relational processes in all the four texts is related to the fact that the Handbook contains a lot of explanatory material that relies heavily on relational processes in order to construct part-whole or member-class relations between entities (Schleppegrell, 2004, p. 85).

Mental processes.

Mental processes "are concerned with our experience of the world of our own consciousness" (Halliday, 2004, p. 211). The use of mental processes range from 8.8% to 12.6% across the levels. This somewhat low occurrence is typical of written genres in contrast with the spoken ones in which mental processes are frequently used interpersonally to construe the experience of the interlocutors.

Interestingly, mental processes used in the texts are mainly cognitive (Example 27), with much fewer occurrences of desiderative types (Example 28), up to the total exclusion of emotive (love, hate) and perceptive (hear, see) mental processes.

(27) Choose P:ment.: cognitive a way [[to share your work.]]

(28) You may want P:ment.: desiderative || to give an oral presentation of your writing.

Behavioural processes.

As for the subsidiary process types in the data, behavioural processes are used more often than mental processes, ranging from 11.7% to 16.3%. Being on the boundary between material and mental, behavioural processes combine the features of both: mental activity is exemplified by some physical manifestation. Behavioural processes are used in the texts to represent "the acting out of processes of consciousness" (Halliday, 2004, p. 171) as in the following Example 29, where speaking is a way to externalize thinking.

(29) As you speak P:beh., emphasize those points.

Verbal processes.

The frequency of the verbal processes occurrence is similar to that of mental ones: their use ranges from 7.9% to 13%. Processes such as "*write, say, ask, explain*" are used when writing represents sharing of one's experience and knowledge with others (see Example 30).

(30) Explain P:verb. at least three supporting reasons.

Such a function is necessary for the Handbooks as they intend to teach children to interact with the audience.

Existential processes.

Finally, existential processes occur in 0.4-1.2% in all cases and do not play a significant role in the text composition.

Thus, the transitivity analysis of the texts reveals a similar choice of process types in all the texts. The results are graphically represented as follows (Figure 7):
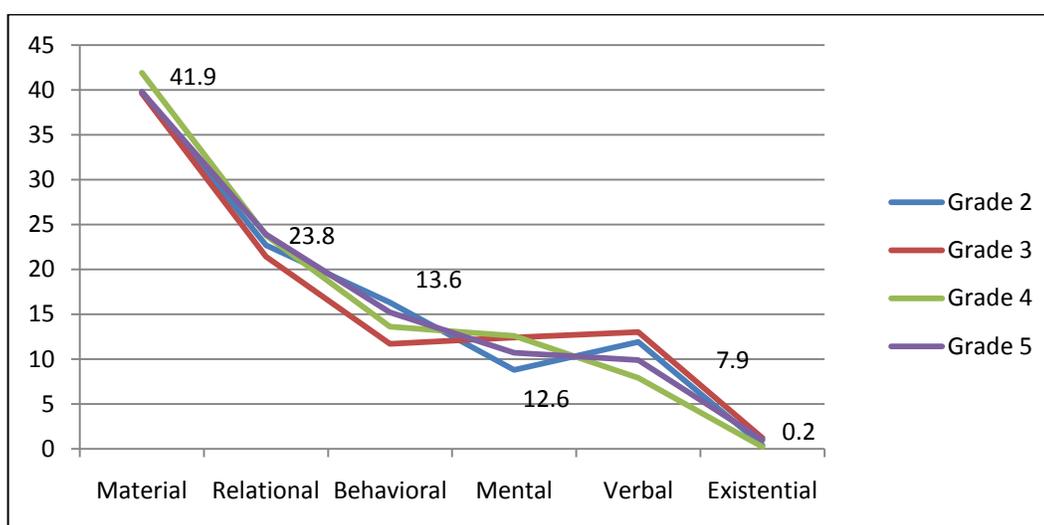

Figure 7. Percentages of processes distribution across levels

The analysis of the transitivity system shows that the lexical resources the texts employ are similar for all levels and thus cannot be considered as contributing to gradual changes in language of instruction from lower to higher grade levels.

Clause complexes

Although the analysis described in previous sections revealed many interesting features of the texts under discussion, the analysis of the lexico-grammatical structure can tell even more about the ways the language of the textbooks changes from 2nd to 5th grade. Clause complex analysis described in the following sections aims at different aspects of the clause structure, allowing to receive ample and detailed data on the text complexity.

Clause complexes and simplexes.

The first step in exploring the complexity of the texts included calculating the number of clause simplexes out of total number of sentences (Table 5).

Table 5

Clause simplexes and clause complexes among all sentences

Grade	2	3	4	5
Sentences	180	297	267	262
Clause simplexes	120	202	167	163
% of all sentences	67%	68%	62%	62%
Clause complexes	60	95	100	99
% of all sentences	33%	32%	38%	38%

There is a 5% difference in clause simplex distribution across grade levels: texts in grades 2 and 3 contain 67-68% clause simplexes, whereas texts in grades 4 and 5 contain 62% clause simplexes. Ideas, therefore, are represented more often as clause simplexes at lower grades and as clause complexes at higher grades (Figure 8).
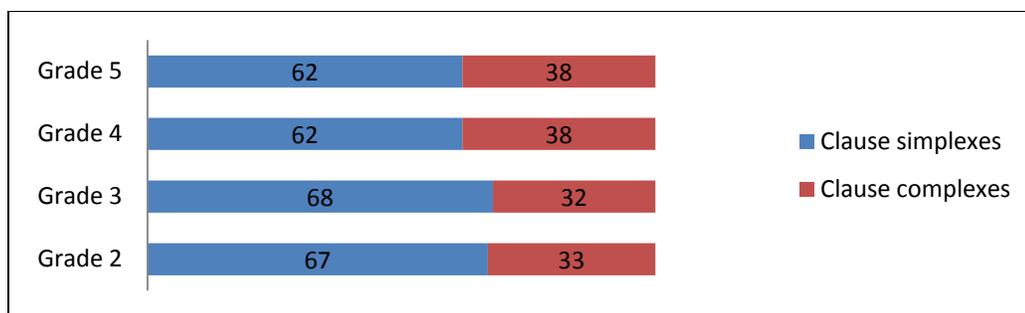
Figure 8. Clause complexes and clause simplexes (%)

This difference in the clause complex relations among grades becomes even more prominent if the ratio of clause simplexes and ranking clauses in clause complexes is examined (Table 6):

Table 6

Clause simplexes and ranking clauses

Grade	2	3	4	5
Clause simplexes	120	202	167	163
Ranking clauses within clause complexes	127	226	242	228

In the 2nd grade text, the number of clause simplexes is almost equal to that of ranking clauses. In grade 3, there are 24 more ranking clauses than clause simplexes. In grades 4 and 5, this difference is 75 and 65, respectively. It shows that though clause complexes roughly represent only one third of all sentences, the number of clauses within them first equals and then exceeds the number of clause simplexes in the texts, revealing the growing inner complexity of clause complexes.

These results deviate from the results of Halliday's grammatical intricacy calculation (see Table 3): the numbers obtained earlier showed little to no variation in grammatical intricacy across levels; however, the new data point at a significant difference in complexity of different texts.

Structure of clause complexes.

In order to explore the discrepancy between these two results, clauses comprising clause complexes were examined in more detail.

As for the number of clauses in each clause complex, a definite tendency is observed (see Table 7). In the 2nd grade text, the predominant pattern is to combine only two clauses in a clause complex (91.7% cases). The pattern changes in grade 3 with more ranking clauses getting involved in constructing clause complexes: 23.1% of clause complexes consist of three and more clauses in the 3rd grade text; 26% in the 4th grade text, 30% in the 5th grade text.

Table 7

The number of clauses comprising clause complexes

Grade	2	3	4	5
Total # of clause complexes	60	95	100	99
2 clauses	55	73	73	70
	91.7%	76.9%	73%	71%
3 clauses	4	14	20	23
	6.7%	14.7%	20%	23%
4 clauses	0	6	4	4
	0%	6.3%	4%	4%
5 clauses	1	0	1	1
	1.7%	0%	1%	1%
6 clauses	0	0	1	1
	0%	0%	1%	1%
7 clauses	0	2	0	0
	0%	2.1%	0%	0%
8 clauses	0	0	0	0
	0%	0%	0%	0%
9 clauses	0	0	1	0
	0%	0%	1%	0%

Graphic representation reveals the gradual change in the number of clauses within clause complexes from level to level (Figure 9).
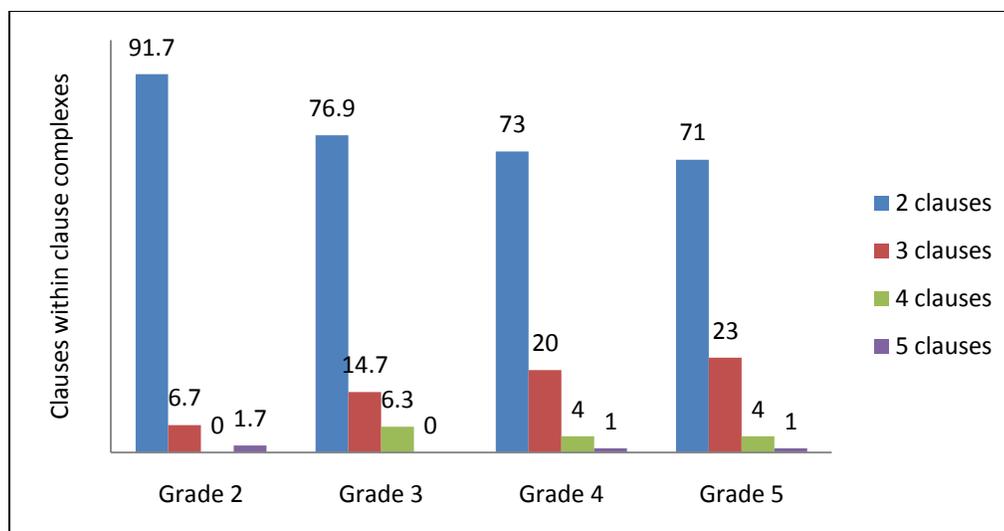

Figure 9. Clauses comprising clause complexes (%)

The data demonstrate that not only the number of clause complexes increases across levels, but they also become more intricate: the clause complexes at higher grade levels including more ranking clauses than clause complexes at lower grade levels. Clauses are combined into complexes when the author aims at "tighter integration in meaning" (Halliday, 2004, p. 365). Therefore, the textbooks designed for older children "pack" more information into each unit of a text for the sake of expressing more ideas in fewer words, as the following examples demonstrate:

(31) Hold your paper low || so that listeners can see your face. Look at your listeners || when you speak. (Grade 2)

(32) After you have finished you draft, || you will still have to change parts of it || to better fit your purpose and your audience. (Grade 4)

In Example 31, two consecutive clause complexes relate to the same situation of presenting a student's paper in front of his or her peers. The first clause complex contains the purpose clause (so that…), the second one defines time (when…). In Example 32, three clauses are grouped into one clause complex which combines temporal (after…) and purposive (to…) meanings in one sequence.

At the next step of the analysis, tactic complexity (the number of layers in each clause complex) was analyzed. Figure 10 demonstrates one layer of tactic complexity, and Figure 11 shows three.

1		55i	Choose your topic
+2		55ii	and organize your information.

Figure 10. Tactic complexity: 1 layer (2nd grade text)

α			73i	Writers use prewriting strategies like these
xβ	1		73ii	to get ideas
	+2	α	73iii	and to decide
		'β	73iv	what to include in their writing.

Figure 11. Tactic complexity: 3 layers (4th grade text)

Data in Table 8 and Figure 12 reveal that lower level texts utilize much less intricate patterns in constructing a clause complex, while texts of higher levels use this resource of complexity very frequently: only 6.6% of all clause complexes have two layers of tactic complexity in the 2nd grade text; 23.1% of clause complexes have two or more layers in the 3rd grade text; 25% and 29% of clause complexes contain two or more layers in the 4th and 5th grades, respectively.

Table 8

Tactic complexity

Grade	2	3	4	5
total clause complexes	60	95	100	99
2 layers	4	16	22	25
	6.6%	16.8%	22%	25.3%
3 layers	0	6	2	4
	0%	6.3%	2%	4.1%
4 layers	0	0	1	0
	0%	0%	1%	0%
total %	6.6%	23.1%	25%	29.4%

A prominent increase in tactic complexity from 2nd to 5th grade is demonstrated in the following chart (Figure 12).
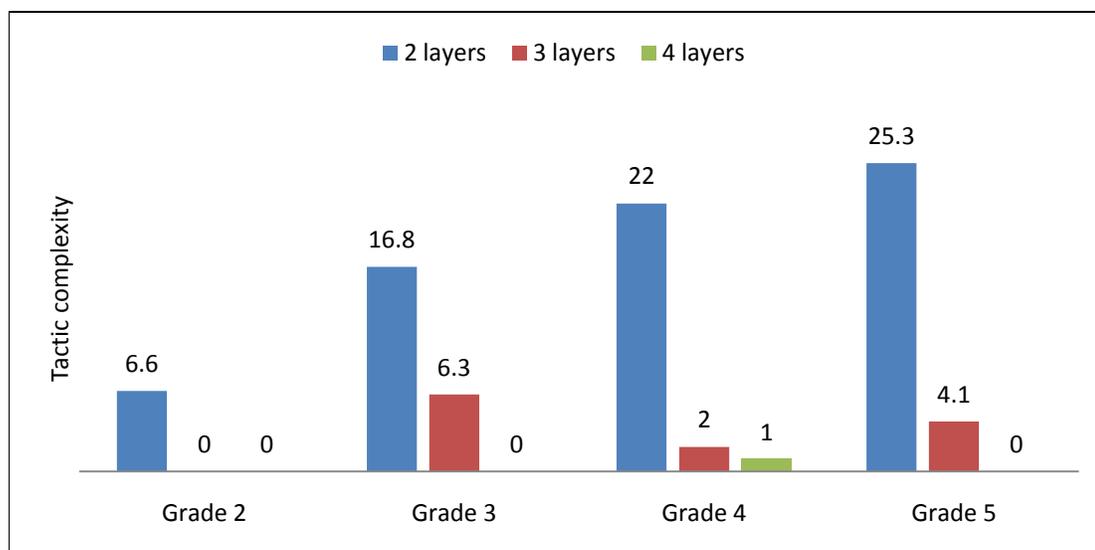
Figure 12. Tactic complexity (%)

In conclusion, the analysis of the structure of clause complexes demonstrates that first, there is a considerable change in lexico-grammatical complexity among the texts, and second, there is a distinct tendency of this change from lower to higher grades: lower grades, on average, have fewer clauses and fewer tactic layers within each clause complex, whereas higher grades show the opposite pattern.

Conclusions and Discussion

In this thesis, I presented the results of the analysis of four sample texts from the elementary school Language Arts textbooks (2nd to 5th grade) in order to trace the progression of the complexity of the language of instruction across grade levels. Analytical tools developed in Systemic Functional Linguistics were employed for the analysis as this theory allows the researcher to identify particular lexico-grammatical features that make each text what it is.

The language of instruction sections in the textbooks were chosen as the focus of the study because the pedagogical instruction depends on textbooks material to a great extent, and textbooks remain one of the major instruments of schooling today. The linguistic challenges the language of textbook instruction poses can considerably hinder the academic success of students. Unfortunately, such effects often remain hidden as educators see no linguistically problematic passages in the texts and oftentimes attribute the inadequate proficiency of the students to their lack of commitment to study. Linguistic analysis of the school textbooks helps reveal some of the linguistic challenges the textbooks pose and students have to face.

Even though common sense suggests that the language of textbook instruction becomes more complicated gradually with the increase of grade level, there is a lack of empirical evidence to show that. The research questions posed in the study were aimed at discovering the progression in the language of instruction from grade to grade. To address these questions, the *Writer's Handbook* sections of the four Language Arts textbooks were analyzed for lexical density, lexical variation, grammatical intricacy, process types, and clause complexes.

The results of the analysis demonstrate that although the changes in lexical density and lexical variation across grade levels are not significant, the changes in the frequency of occurrence of clause complexes, as well as their inner lexico-grammatical complexity, are more prominent. It could be concluded that the language of instruction at higher grade levels becomes more sophisticated as the analysis reveals the gradual increase of the lexico-grammatical complexity of the texts across grade levels.

One of the features analyzed was the lexical composition of the sample texts. The results of the calculation demonstrate that the lexical density slightly increases from 3rd to 5th grade (from 50.2% to 52.5% by Ure's method, and from 4 to 4.2 by Halliday's method); that is, more lexical and less functional items are observed with the increase of the grade level.

The same pattern was found for the lexical variation of the texts: the analysis produces index 25.4 for the 3rd grade, 27.5 for the 4th grade, and 28 for the 5th grade. It means that the higher the grade level, the less frequently the same words are repeated in the texts.

The analysis of the process types showed that there is a very similar pattern in all texts: the most prevailing was the material process type (around 40% of all verbs at all levels), followed by relational (21-24%) and behavioural (11-16%). Mental and verbal processes were similar in their occurrence in the sample texts (8-13%), whereas existential processes were used very infrequently (0.2-1.2%). Thus, there are no distinct differences in the ways the texts of different grade levels represent the world through the system of process types, probably because the main aim of all texts, irrespective of grade, is similar: to describe "good" writing and to instruct children as to how to produce it. Schleppegrell (2004) in this regard refers to "a constellation of grammatical and discourse features" (pp.41-42) that are typical of school texts, that are expected to be there and are reproduced again and again at

different grade levels. In other words, such a distribution of process types may be a typical feature of Language Arts genre. Future research can make further investigation about the regularities of occurrence of different process types in instructional and procedural genres.

Although variations in lexical characteristics of the texts and process type distribution were not significant across grade levels, the analysis of the clause complexes revealed more significant differences. The analysis showed that lower grade levels employed 5% more clause simplexes than higher grade levels (67-68% in grades 2 and 3 vs. 62% in grades 4 and 5). The structure of clause complexes was shown to become more intricate with the increase of the grade level: a steady raise in number of clauses per clause complex was found together with the prominent increase of tactic complexity from 2nd to 5th grades. Interestingly, these results conflicted with the data on grammatical intricacy obtained earlier. Calculation of the grammatical intricacy by Halliday's method produced a very similar grammatical intricacy index across levels (2.1-2.4), which meant that the texts were similar in terms of the grammatical intricacy. The new results, however, showed that the grammatical complexity of the texts differed considerably across grade levels. This finding makes it possible to talk about the necessity to look closer at the structure of clause complexes in order to define their grammatical intricacy. Future research could concentrate on exploring this issue.

Finally, it is necessary to address the "2nd grade deviation" issue mentioned earlier. The data clearly demonstrated that the 2nd grade definitely deviates in its lexical density, lexical variation and grammatical intricacy. Although the difference in lexical variation can be accounted for by the corpus size, there is no definite explanation for the lexical density and grammatical intricacy patterns. Even though the following speculation goes beyond the scope of the current research, it is interesting to suggest that the analysis seems to show an

important pattern of language development. It is quite well known among primary school teachers that there is a slump in academic achievement during the 4th grade, so common a phenomenon that it is dubbed "4th grade slump." To my knowledge, this 4th grade slump is quite a mystery among primary school teachers. Pending further research, it is quite interesting to speculate that because there is a lexicogrammatical gap between the language used for the 2nd and 3rd grades and that for the 4th and 5th grades, one of the factors contributing to this slump may have to do with the way that the lexico-grammatical patterns occur. For this hypothesis to be verified, there would have to be similar research on the language of the other subject content areas.

As a result, the research question posed in the introduction cannot be answered unequivocally because the changes in the language of instruction have different linguistic properties and scale. The results of the research showed that, although the lexical component of language of instruction in the Language Arts textbooks only slightly changed from the 2nd to 5th grade, the lexico-grammatical patterns of the texts became much more complicated with the increase of the grade level. The explanation of this phenomenon may lie in the genre theory. The texts under discussion preserve the features of the Language Arts genre across levels demonstrating similar lexical composition. At the same time, the necessity to progress from level to level is reflected in the complication of the lexico-grammatical patterns of the texts.

The present study suggests that a systemic functional analysis reveals many hidden linguistic features of the texts that otherwise remain unnoticed. Exploring the language of pedagogical instruction is beneficial to textbook writers who would rely not only on their

intuition in creating new textbooks, as well as to teachers who would use textbooks with more confidence, knowing possible pitfalls and challenges the language of instruction poses.

It should be noted that the results of the study are not generalizable to other school subjects as the described peculiarities appear to be characteristic of the Language Arts textbook instruction. Further research could focus on applying similar type of analysis to the language of other subject areas in order to reveal similarities and differences in the progression of language of instruction.

References

Abel, K., & Exley, B. (2007). Using Halliday's functional grammar to examine early years

worded mathematics texts . In McNamara, A., Rickwood, J., van Haren, R., &

Vereoorn, J. (Eds.), *Proceedings of Critical Capital: Teaching & Learning AATE &*

ALEA National Conference (pp. 1-12). Canberra: Australian National University.

Apple, M. (1991). The culture and commerce of the textbook. In Apple, M., and Christian-

Smith, L. (Eds.), *The politics of the textbook* (pp. 147-162). New York: Routledge.

Bauer, L. (2007). *Linguistics student's handbook.* Edinburgh: Edinburgh University Press.

Beck, I. L., McKeown, M. G., & Worthy, J. (1995). Giving a text voice can improve

students' understanding. *Reading Research Quarterly*. Vol. 20, No.2. April/May/June

1995. 220-238.

Beck, I. L., Farr, R.C., Strickland, D.S., Ada, A.F., Brechtel, M., McKeown, M., Roser, N.,

& Yopp, H.K. (2005). *Trophies. Just for you.* Orlando: Houghton Mifflin Harcourt.

Beck, I. L., Farr, R.C., Strickland, D.S., Ada, A.F., Brechtel, M., McKeown, M., Roser, N.,

& Yopp, H.K. (2005). *Trophies. Changing patterns.* Orlando: Houghton Mifflin

Harcourt.

Beck, I. L., Farr, R.C., Strickland, D.S., Ada, A.F., Brechtel, M., McKeown, M., Roser, N.,

& Yopp, H.K. (2005). *Trophies. Lead the way.* Orlando: Houghton Mifflin Harcourt.

Beck, I. L., Farr, R.C., Strickland, D.S., Ada, A.F., Brechtel, M., McKeown, M., Roser, N.,

& Yopp, H.K. (2005). *Trophies. Distant voyages.* Orlando: Houghton Mifflin

Harcourt.

Bloor, T. & Bloor, M. (2004). *The functional analysis of English: A Hallidayan approach*

(2nd ed.). London: Arnold.

Castello, E. (2008). *Text complexity and reading comprehension tests*. Bern: International

Academic Publishers.

Cazden, C., John, V. & Hymes, D. (Eds.). (1972). *Functions of language in the classroom.*

New York: Teachers College.

Chall, J. & Squire, J. R. (1991). The publishing industry and textbooks. In Barr, R., Kamil,

M. L., Mosenthal, P. B., & Pearson, P. D. (Eds), *Handbook of reading research* (pp.

120-146). New York: Longman.

Collier, P., & Horowitz, D. (2004) *The Anti-Chomsky Reader.* San Francisco: Encounter

Books.

Dale, E., & Chall, J. S. (1948). A formula for predicting readability. *Educational Research*

Bulletin, 27, 37-54.

Dole, J. A., & Osborn, J. (2003). Elementary language arts textbooks: A decade of change. In

J. Flood, D. Lapp, & J. R. Squire (Eds.), *Handbook for research on teaching the*

English Language Arts (pp. 631-639). New York: Macmillian.

Eggins, S. (2004). *An introduction to systemic functional linguistics* (2nd ed.). New York:

Continuum.

Elliot, D. & Woodward, A. (Eds.). (1990). *Textbooks and schooling in the United States*

(90th yearbook of the Society for the Study of Education). Chicago: University of

Chicago Press.

Everett, D. L. (2006). Biology and language. *Journal of Linguistics,* 42: 385-393.

Halliday, M. A. K. (1978). *Language as social semiotic: The social interpretation of*

language and meaning. Maryland: University Park Press.

Halliday, M. A. K. (1993). Towards a language-based theory of learning. *Linguistics and Education, 5*(1): 9-116.

Halliday, M. A. K. (1994). *An Introduction to Functional Grammar* (2nd ed.). London: Arnold.

Halliday, M. A. K., and Matthiessen, C. (2004). *An introduction to functional grammar* (3rd ed.). London: Arnold.

http://www.readabilityformulas.com/new-dale-chall-readability-formula.php

Martin, J. R. (2010). Semantic variation – Modelling realization, instantiation, and individuation in social semiosis. In: Bednarek, M., & Martin, J. R. (Eds.) *New discourse on language: Functional perspectives on multimodality, identity, and affiliation* (pp. 1-34). London: Continuum Press.

Martin, J. R., Matthiessen, C., & Painter, C. (1997). *Working with functional grammar.* New York: St.Martin's Press.

Moss, G. (2006). Textbook language, teacher mediation, classroom interaction and learning processes: The case of natural and social science textbooks in Barranquilla, Colombia. In Leila, B., & Sardinha, T. B. (Eds.) *Proceedings of 33rd International Systemic Functional Congress* (pp. 879-894). San Paulo: PUCSP.

Moss, G. (2010) Textbook language, ideology and citizenship: The case of a history textbook in Colombia. *Functions of Language 17*(1), 71–93.

Nathan, M. J., Long, S. D., & Alibali, M. W. (2002). The symbol precedence view of mathematical development: A corpus analysis of the rhetorical structure of textbooks. *Discourse Processes, 33*(1), 1-21.

Palincsar, A. S. & Duke, N. C. (2004). The Role of Text and Text/Reader Interactions in

    Young Children's Reading Development and Achievement. *Elementary School*

    Journal, 105 (2), 183-198.

Piaget, J. (1970). *Science of education and the psychology of the child.* (D. Coltman, Trans.).

    New York : Orion Press.

Reys, B. J., Reys, R. E., & Chávez, O. (2004). Why mathematics textbooks matter.

    Educational Leadership, 61(5), 61-66.

Rose, D. (2006). Towards a reading based theory of teaching. In Leila, B., & Sardinha, T. B.

    (Eds.) *Proceedings of 33rd International Systemic Functional Congress* (pp. 36-77).

    San Paulo: PUCSP.

Sabbatini R. (n.d.). *The mind, artificial intelligence and emotions. Interview with Marvin*

    Minsky. Brain & Mind Magazine. Retrieved from

    http://www.cerebromente.org.br/n07/opiniao/minsky/minsky_i.htm

Schleppegrell, M. J. (2004). *The Language of schooling: A functional linguistic perspective*.

    Mahwah: Lawrence Erlbaum Associates, Publishers.

Tyson, H. (1997). *Overcoming structural barriers to good textbooks.* Washington, DC:

    National Education Goals Panel. http://govinfo.library.unt.edu/negp/reports/tyson.htm

Watts-Taffe, S., Gwinn, C. B., Johnson, J. B., & Horn, M. L. (2003). Preparing Preservice

    teachers to integrate technology with the elementary literacy program. *The Reading*

    Teacher, 57 (2), 130 –138.

Wyatt-Smith, C. M., & Cumming, J. J. (2003). Curriculum literacies: Expanding domains of

    assessment. *Assessment in Education: Principles, Policy & Practice, 10*(1), 47-59.