

**UNDERSTANDING DISCOURSE KNOWLEDGE AND ITS ROLE IN
WRITING AMONG FIRST-GRADERS**

by

Huijing Wen

A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Education

Summer 2016

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by

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DEDICATION

This dissertation is dedicated to my family in China. I am forever grateful to my parents, Yunsheng and Qiulan, and my sisters, Huiling and Huili, for their consistent support and unconditional love. They taught me at young age to "think big and do small".

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ABSTRACT

Theoretical models of early writing support the importance of discourse knowledge to writing (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006). However, there is limited research on beginning writers' understanding of discourse knowledge and its relationship to writing outcomes. This study aims to explore: 1) what first-grade students' level of discourse knowledge is when they start school and how that knowledge develops across a school year; 2) whether first-grade students' discourse knowledge is predictive of end-of-year writing outcomes. 380 first-grade students participated in the study. Each student was given a six-question discourse knowledge interview and a battery of assessments in handwriting fluency, spelling, reading, vocabulary and writing. Descriptive statistics and paired-sample *t*-tests were used to understand first-grade students' discourse knowledge in the fall and its change across a school year. Hierarchical Linear Modeling was employed to investigate whether discourse knowledge is predictive of students' narrative and descriptive writing. Results showed that first-graders had limited but emerging discourse knowledge with slow development across the school year. Discourse knowledge was found predictive of writing, but its predictive role depended on the type and genre of end-of-year writing outcomes. The findings could contribute to our understanding of young

students' writing knowledge, and could offer teachers insight into first-grade writing instruction.

Keywords: discourse knowledge, narrative writing, descriptive writing, first grade

Chapter 1

INTRODUCTION

The goal of this dissertation was to investigate beginning writers' discourse knowledge and its role in their writing outcomes. More specifically, the goal was to understand first graders' discourse knowledge, its development across a school year and the role of discourse knowledge in predicting first graders' writing outcomes. Grounded in the cognitive models of early writing (Bereiter & Scardamalia, 1987; Beringer & Winn, 2006), the study was significant in two ways. First, it expanded empirical evidence to support or refine these cognitive models of early writing in terms of the contribution of discourse knowledge to writing performance. Second, understanding first-grade students' discourse knowledge and the role of discourse knowledge in writing performance had instructional significance. Information about students' discourse knowledge could allow teachers to follow first graders' cognitive development in acquiring discourse knowledge and plan meaningful and effective writing instruction.

Rationale

The Importance of Writing and Writing Difficulty in the U.S.

The importance of writing cannot be underestimated in American social and academic life. In the last decade, national policies and local practices produced compelling reasons to write for American students (CCSS, National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010; National Commission on Writing, 2003, 2004, 2005). In the report of National

Commission on Writing (2003), writing was considered as a basic means of communication in academic, professional and social worlds. Students who do not acquire writing skills find themselves at a serious disadvantage. More recently, the Common Core State Standards (CCSS, National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) placed high and rigorous standards on writing for students in K-12 setting (Graham & Harris, 2015; Shanahan, 2015). Writing is used as a tool to evaluate what students know and also as an effective way to strengthen students' learning through the idea of "writing to learn". As such, writing well has also become an essential requirement for today's students in the U.S. (Graham & Perin, 2007; Olinghouse, Graham, & Gillespie, 2014). As we stepped into an age when educators are held accountable for students' academic performance, policy makers, researchers and educators need to make a concerted effort to nurture a nation of proficient writers.

However, recent results from the National Assessment of Educational Progress (NAEP) writing subtest tell a discouraging story of American youth's writing proficiency. More than three-quarters of 8th- and 12th-grade students performed only at or above the basic level (National Center for Educational Statistics, 2012). The picture for younger students' writing performance is not much brighter. Fewer than 25% of 4th-grade students performed at or above the proficient level in writing (Salahu-Din, Persky, & Miller, 2008). The situation is even more discouraging for learners of English as a second language and students with learning disabilities.

The Complex Nature of Writing

The act of writing involves an orchestration of different cognitive skills that are implicitly or explicitly shown in recursive writing processes as illustrated in Hayes and Flower's cognitive models (1980). Writing is meanwhile shaped by the purposes for

writing and its sociocultural and historical context. In his review of literature on writing research, Graham (2006) recognized the myriad cognitive and sociocultural factors contributed to writing development. According to Graham, besides strategies, skills, motivation, self-efficacy, contextual factors (e.g. family context and school environment) and personal factors (e.g. gender, disability, SES, reading and oral language competence), knowledge such as knowledge of topic, intended audience, genre, task schema, and linguistic awareness plays instrumental roles in writing development. He argued that writing development is shaped by the changes of writers' self-regulatory or strategic behaviors, skills, knowledge or motivation. These multiple correlates of writing development showcase the complex nature of writing development. They also cast light on classroom writing instruction, raising classroom teachers' attention to develop students' specific skills, strategies, and knowledge of writing or motivation.

The Lack of Research on Writing-related Knowledge

Graham (2006) also pointed out that although much was known about writing and effective writing instruction, there was an unbalanced focus in writing research. Considerable attention has been devoted to the investigation of writing processes, but there was limited empirical evidence testing the role of knowledge in writing. Although the studies focusing on writing processes showed that writing performance is associated with frequency of planning and revising, the resources necessary to engage the processes are also important to know since writers access different kinds of knowledge during writing. For example, in order to plan or revise effectively, writers need to have a mental representation of the criteria for good writing and apply it to the intended text. This requires different types of knowledge to be at writers' disposal. However, writing research has only touched upon certain types of writing knowledge (i.e. topic knowledge, discourse knowledge) leaving much underexplored including other types of writing

knowledge (e.g. knowledge of audience awareness), the interactions among different types of knowledge, and how they are used in the writing processes (McCutchen, 1986).

As such, Graham (2006) called for more focused research on the relationship between writing-related knowledge and writing performance because of the important role knowledge plays in writing development. Writing is essentially a mode of representing and communicating knowledge with resources being activated during the writing processes (Barbeiro, 2011). Therefore, writing expertise depends on the development of both fluent language generation processes and extensive knowledge (McCutchen, 2000). Although Graham's review was written nearly ten years ago, his call for more research on writing-related knowledge is still relevant due to the thin empirical evidence on writing-related knowledge.

Purpose of the Study

This study was an attempt to respond to Graham's (2006) call to investigate types of knowledge relevant to writing outcomes. It addressed discourse knowledge of writing among first-grade students. The purpose of the study was dual. First it aimed to extend the understanding of beginning writers' general discourse knowledge and their discourse knowledge about narrative and descriptive writing in particular. Second, it attempted to test the role of discourse knowledge in writing based on the applicable cognitive models of early writing (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006).

To be more specific, the study first attempted to investigate how well first-grade students understand discourse knowledge when they start school, how the discourse knowledge changes across a school year and how they use discourse knowledge about genre conventions in narrative and descriptive writing. Second, the study also aims to examine whether discourse knowledge predicts first-grade students' writing outcomes.

The inquiry of the study was justified in two ways. First, understanding the role

of discourse knowledge in beginning writers' writing had instructional significance. Understanding what a student knows about writing might provide teachers with information about specific strategies students might use during writing, the writing processes they use, and their understanding of good writing (Graham, Schwartz, & MacArthur, 1993). As a result, information about students' discourse knowledge could inform writing instruction by helping teachers know which aspects of discourse knowledge to target in order to improve students' writing outcomes. Second, it was necessary to use empirical evidence to investigate the role of discourse knowledge in the writing performance of younger writers. A demonstration of the relationship between discourse knowledge and writing performance or the lack of such a relationship would help support or refine current theoretical models that identify discourse knowledge as an important factor for writing success (McCutchen, 2000).

Definition of Discourse Knowledge

Discourse knowledge is a generic term encompassing several types of knowledge. When defining discourse knowledge, McCutchen (1986) refers it to "schemata for various discourse forms, procedures and strategies involved in the instantiation of those schemata, as well as local sentence-generation procedures that draw on grammatical knowledge" (p.432). This widely cited definition demonstrates that discourse knowledge broadly includes metacognitive knowledge, genre knowledge and linguistic knowledge. As linguistic knowledge pertains to the semantic and syntactic domains of a language, it was beyond the scope of the study. Discourse knowledge in this study, therefore, is defined as including two components of metacognitive knowledge (knowledge of the characteristics of good writing in general, and knowledge of writing processes) and genre knowledge (Olinghouse & Graham, 2009). These two subtypes of discourse knowledge are described in greater detail.

Metacognitive knowledge reflects writers' beliefs about writing and their cognitive processes in the act of writing (Lin, Monroe, & Troia, 2007). In other words, metacognitive knowledge taps writers' awareness of the purposes and processes of writing and the self-regulation of such processes and related thoughts, feelings and actions. Three types of knowledge constitute metacognitive knowledge, including declarative knowledge of what constitutes good writing, procedural knowledge of writing processes, and conditional knowledge of strategies appropriate under different writing conditions (i.e. in different writing processes). To simplify, metacognitive knowledge mainly concerns knowledge of characteristics of good writing in general, knowledge of writing processes (i.e. understanding the importance and strategies to use during planning, translating and revising). Metacognitive knowledge is important because it determines how the composing process is carried out and what the eventual shape of the written product will be (Graham et al., 1993).

Genre knowledge refers to the attributes of different text structures (Olinghouse & Graham, 2009). For instance, when students approach a narrative writing task, they need to know the important elements of a story (genre knowledge) and understand when to use elements of a specific genre based on the audience's expectations. Previous research on children's genre knowledge examined knowledge at either the micro-level or the macro-level (Dovovan, 2001; Kamberelis, 1999). Micro-level features focus on the elements of text such as linguistic features within and between sentences that create cohesion or unity of the entire text. Micro-level features include lexico-grammar, specific vocabulary, and wordings and syntactic structures that are more specific to certain genres (Donovan, 2001). For example, the linguistic features in narratives are characterized by "real time" in past tense compared to the "timeless" or present tense used in informational text. Likewise, different text types employ distinctive vocabulary and syntax. A case in point

is that narrative often has the formulaic opening such as "once upon a time" while informational text generally opens the text with topic introduction followed by a thesis statement.

Compared to micro-level features of genre, researchers studying macro-level features regarded written genres as an organized text at a more global level (Pappas, Keifer, & Levstick, 1999). Macro-level features focus on global aspects of text including global elements (or the grammar of genres), and the global structure of content relationship. Global elements refer to the overall structure of elements, which includes specific elements that make up the grammars of a genre (Hasan, 1984; Papps, 1993; Stein & Glem, 1979). For example, setting, initiating events, internal reactions, attempts, and consequences constitute important elements in telling a story (Hasan 1984; Stein & Glenn, 1979). However, story grammar does not apply to other genres, such as informational texts, which have their own macro-level organization. According to Pappas (1993), the organization of informational text is characterized by topic presentation, description of attributes, characteristic events, and/or category comparison, final summary and/or afterword. Therefore, a written text, whether it is analyzed with its micro- or macro-level features, is structured differently in a way specific to its text type (Hasan, 1985). This understanding of how different text types are structured is commonly referred to as genre knowledge, which helps writers in the writing processes.

To sum up, this study framed Discourse Knowledge based on Olinghouse and Graham's (2009) study, in which a comprehensive definition of discourse knowledge was provided. Discourse Knowledge was defined as knowledge about the general characteristics of good writing, knowledge about writing processes, and genre knowledge. In this study, Discourse Knowledge is conceptualized as the type of knowledge that is readily available and can be explicitly discussed by students. As a

result, it was mainly measured by interview questions developed by Graham et al. (2003) and refined by Olinghouse and Graham (2009).

Organization of Chapters

The dissertation consists of five chapters. The first chapter previews the background of the study, the rationale for investigating first-grade students' discourse knowledge and its relation to their writing outcomes. The second chapter provides a theoretical and empirical review of literature on discourse knowledge. It begins with a review of the cognitive models of early writing and then moves on to describe the importance of discourse knowledge to writing in these models. The models of written expression lay the foundation for the study. Then chapter two elaborates on a review of empirical evidence regarding the discourse knowledge development and its relationship to writing outcomes. Empirical evidence on the important correlates of writing is also discussed. Chapter three delineates the design of the study, its sample, the measures used, the data analytic plan, data screening and treatment of missing data. Chapter four presents the results for each research question. Chapter five interprets the results, acknowledges the limitations of the study and discusses the implications for future researchers and classroom educators.

Chapter 2

LITERATURE REVIEW

Overview

This chapter provides a review of the relevant theoretical models of writing and an analysis of the empirical evidence for the role of discourse knowledge in writing and the important correlates of writing. The chapter starts with an explanation of the cognitive models of writing that delineate the complex nature of writing and the important components for writing development. Next, the role of writing knowledge is described in these theoretical models. Then the chapter provides a synthesis of the empirical evidence on the development of discourse knowledge, and the relation between discourse knowledge and writing outcomes. The important correlates of the writing are also discussed, serving as a rationale for the research design of the study. The chapter concludes with a discussion of the gaps in the literature and proposes the current study.

Cognitive Models of Writing

The conceptual framework of this study is based on theoretical models of early writing (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006). The Knowledge-Telling process model (Bereiter & Scardamalia, 1987) and the Not-So-Simple View of Writing (Berninger & Winn, 2006) describe the writing processes of young children. Derived from Hayes and Flower's (1980) influential cognitive model of writing processes, these two models of early writing address the cognitive aspects of writing for developing writers. This dissertation study is grounded in these two models of early writing because the models demonstrate that early writing development is constrained or

supported by a myriad of factors including cognitive processing skills, oral language skills, transcriptional skills as well as sources of knowledge for writing (i.e. discourse knowledge, topic knowledge etc.). The following section describes how the models of early writing were developed from model of writing processes by Hayes (1996) and Hayes & Flower's (1980) and how they specify the developmental writing of young children.

Cognitive Models of Skilled Writing

The most influential cognitive model of writing was proposed by Hayes and Flower in 1980. The model was based on a series of protocol studies on how skilled writers composed for specific writing tasks. It was found that skilled writing is the result of a recursive writing process of planning, translating and reviewing. In Hayes and Flower's (1980) model, skilled writing is depicted as a three-component processes (planning, translating, and reviewing) located within a problem-solving space that includes the task environment and the writer's long-term memory (McCutchen, 1996). The task environment constitutes the external factors such as nature of the writing task (i.e. the purpose of the written task, its targeted audience) and the developing text. The writer's long-term memory refers to the knowledge to be potentially activated and used by the writer, such as the knowledge of topic, of audience, genre knowledge, linguistic knowledge, etc. The three-component processes are interactive in nature and are coordinated by the monitor, which allows the writer to move between processes in a recursive way while determining areas that need attention. Each writing process, however, has sub-processes. When planning, the writer sets goals, generates appropriate content and organizes the content. When reviewing, the writer reads what has been written and makes necessary changes. These writing processes are prompted and supported in the task environment and the writer's long-term memory.

This model showcased the complexity of writing in that multiple cognitive challenges are presented during the writing process. To compose, good writers need an efficient orchestration of retrieving relevant information stored in the long-term memory, considering the potential readers of their writing and organizing the ideas into a coherent discourse fitting into the conventions of specific text type. Meanwhile, writers need to evaluate their writing to see if what has been written achieved their goals in writing, which might, in turn, result in rewriting what has been composed. In addition to orchestrating these cognitive challenges, skilled writers use their linguistic knowledge and vocabulary knowledge to translate their ideas into words, sentences and paragraphs.

Later Hayes (1996) reorganized the original model and added in the revised model new components of working memory and motivation. The revised model, generally described as an individual-environmental model, was a reaction to research findings over the years. The most noticeable difference of the revised model is that it was represented by two main components of the task environment and the individual compared to the three components in the earlier model (i.e. task environment, cognitive writing processes, the writer's long-term memory). In the revised model, the task environment includes the social environment (audience and collaborators) and the physical environment (developing text and the medium for composing). The individual component encompasses three cognitive processes (text interpretation, reflection and text production), the long-term memory with the newly added motivation, affect and working memory. Unlike the original model that mainly focused on the internal structure and sub-processes of each writing process, the revised model emphasized the three basic cognitive processes of text interpretation, reflection and text production. Working memory stores phonologically and visually-spatially coded information and is demonstrated as the key player in the three cognitive writing processes. Hayes (1996) also posited that motivation

and affect are elements to support the individual in the writing process. As such, the revised model aimed to describe how various aspects of cognitive capacity interact with tasks, distinguishing the roles of long-term memory, short-term memory and motivation and affect.

Although the revised model is more complicated and each component is detailed, it is similar to the original model in that the act of writing is represented as a complex activity with multiple cognitive demands and sets of skills involved during writing. The original and revised models demonstrated the writing processes for skilled writers since the translating process in the models seems automatic to expert writers. However, the model could not explain the writing processes of young children whose translating processes are more or less constrained by their developing language and transcriptional skills (Berninger & Winn, 2006).

Cognitive Models of Early Writing

In contrast to the Hayes and Flower's description of expert writing, Bereiter and Scardamalia (1987) modeled children's writing processes as an attempt to explain writing development. They developed process models to describe how skilled writers and developing writers approach writing tasks differently. Skilled writers compose in a way that transforms their knowledge through writing. This process is called the Knowledge-Transforming approach. In the Knowledge-Transforming approach, expert writers retrieve information as part of the planning process, evaluate its appropriateness, and reorganize the information before they translate ideas into words. As expert writers plan, set goals, consider problems, and gather and analyze information during writing, their thinking develops, changes and as a result a deeper understanding of the topic is obtained.

On the contrary, young, developing writers use a Knowledge-Telling approach (Figure 1) by heavily relying on immediate knowledge and writing down what is on their

mind. When given a writing task, young writers begin with a mental representation of the task that defines the topic and purpose of the writing task. They then probe for and retrieve the relevant knowledge stored in the long-term memory and translate the information into written text. This "retrieve-and-write" procedure coordinates content generation and text generation. According to McCutchen (1986), this Knowledge-Telling process can be viewed as a simplified version of the generating component within the planning component in Hayes and Flowers' model (1980). Therefore, in light of the component processes described by Hayes and Flower (1980), knowledge-tellers do little planning and revising but a lot translating. It is also important to note that although Knowledge-Telling model explains young writers' approach to writing tasks, the model was developed based on the data from children around 9-to-10 years old, when transcription skills are typically better developed. However, for beginning writers, getting the ideas into words and putting these words onto paper could be a major challenge (Berninger & Winn, 2006) and could complicate this model further. Therefore, the knowledge sources and processes in writing described in the Knowledge-Telling model can be viewed as knowledge or processes beginning writers are working towards.

Knowledge Telling Model
Adapted from Scardamalia
& Bereiter, 1987.

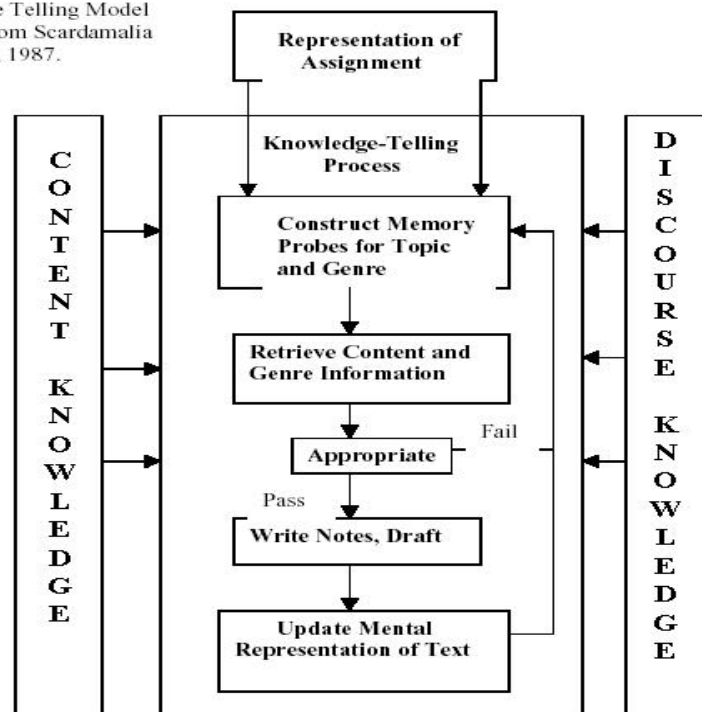


Figure 1 Knowledge-Telling Model (Bereiter & Scardamalia, 1987)

Another influential model that describe young children's writing process is the Not-So-Simple View of Writing (Berninger & Winn, 2006). The model is represented by a triangle (Figure 2) that includes three important domains for early writing development: transcription (handwriting, keyboarding and spelling), text generation (generating ideas and translating ideas into the text) and executive functions (supervisory attention and self-regulatory processes such as planning, reviewing). These components occur in an environment supported or constrained by different types of working memory (long-term memory, verbal working memory, non-verbal memory). The model posited that transcription and executive function are fundamental components for text generation.

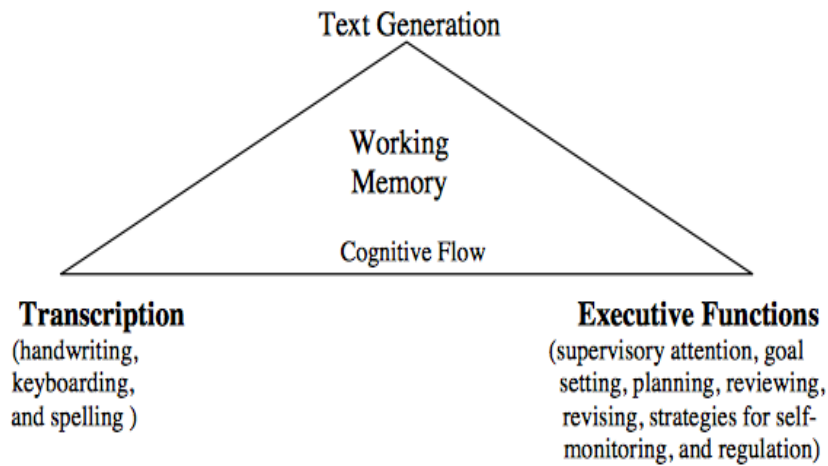


Figure 2 The Not-So-Simple View of Writing (Berninger & Winn, 2006)

Berninger and Winn (2006)'s model was developed from the Simple View of Writing (Berninger & Atmann, 2003). Both the Not-So-Simple and the Simple View of Writing models are represented by a triangle with the same three components (transcription, executive functions and text generation). Both models posit that transcription and executive function support text generation in a working environment. However, the Not-So-Simple View of Writing reflects a deeper understanding of the role of working memory and the role of attention within the executive function domain. In the Not-So-Simple View of Writing, working memory is broken down into components such as verbal working memory and non-verbal working memory. The new model also makes distinctions between short-term and long-term memory's contribution to the writing process. While long-term memory is activated during planning, composing, reviewing, and revising processes, short-term memory is only activated during reviewing and revising. In addition, executive function becomes a more refined role of the complex system of supervisory attention, which allows the writer stay on task in the act of writing.

The Not-So-Simple View of Writing incorporates three important cognitive processes (planning, translating and reviewing) included in Hayes and Flower's (1980) model. However, in order to describe developing writers' writing processes, the Not-So-Simple View specifies the important components for writing during the translating process (ideas to be translated into words and words to be transcribed on the page). The model also implies that text generation and transcription might develop at different rates. Individual differences in handwriting, spelling, oral language and levels of written language affect young writers' writing development. Two cognitive processing skills (i.e. executive functions and working memory) specified in the model also affect writing development. Executive functions regulate conscious attentions for planning, monitoring and revising while working memory environment coordinates long-term and short-term memory, thus providing cognitive resources to support transcription, text generation, and executive functions.

Summary of Cognitive Models of Writing

The models of writing that are discussed use a cognitive approach to study writing. They are complementary to each other and contribute to our understanding of writing and writing development. Hayes and Flower (1986) and Hayes (1990) built the theoretical foundation for writing research by describing the recursive nature of skillful writers' writing processes and the resources necessary for these writing processes to happen. Based on these models, Bereiter & Scardamalia (1987) and Berninger and colleagues (2003; 2006) extended the theories of written expression on skilled adult writers to explain the writing of young developing writers. The different approaches to composing specified in Bereiter & Scardamalia (1987)'s models showcased the fundamental differences developing writers have from skilled writers. Berninger and Winn's Not-So-Simple View of Writing (2006) identified important components for

writing development that include transcriptional (e.g. handwriting, keyboarding, spelling) and compositional skills (language skills at different level). In all, the cognitive models of early writing (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006) contribute to the conceptualization of the proposed study by providing a framework to understand developing writers and what cognitive skills are needed for writing development.

Types of Knowledge Important for Writing

The models of Hayes and Flower (1980), Hayes (1996), Bereiter and Scardamalia (1987) and Berninger and Winn (2006) suggested that writers capitalize on different types of knowledge during writing. These different types of knowledge may include and are not limited to topic knowledge and discourse knowledge. Therefore, it is important to understand the nature of different types of knowledge and how they facilitate writing processes. According to McCutchen (1986), knowledge important for writing includes topic knowledge and knowledge about how to write (namely, discourse knowledge). Knowledge about how to write includes genre knowledge, linguistic knowledge, knowledge about the reader, and knowledge about procedures for how to carry out specific writing tasks. All these types of knowledge will be discussed in turn.

Topic knowledge refers to a writer's specific knowledge or prior knowledge about a given topic (McCutchen, 1986). It is sometimes referred to as content knowledge. For example, topic knowledge for a baseball game can entail knowing the history of the game, understanding scoring rules, game actions, different roles for different players or even historical events related to the game. Well-developed knowledge of a writing topic helps facilitate planning processes. When the topic knowledge is easily accessed, there is lessened cognitive load on planning (Kellogg, 1987; McCutchen, 1986). Hence, writers can free up limited working memory and have more workload space for setting goals, organizing ideas and translating ideas into written texts. Returning to the baseball

example, for writers who have good knowledge of baseball, a picture of a baseball game can instantly activate their knowledge of baseball stored long-term memory, allowing writers to generate more specific ideas related to the topic and have more game-related information at their disposal during writing.

Discourse knowledge is a more generic term. It broadly refers to knowledge about written discourse and knowledge about the procedures and strategies involved in writing. Specifically, it includes knowledge about how texts are structured, how elaboration is generated and how to control the linguistic constructions and build coherent links within the text (Benton et al., 1995). This definition is shared by McCutchen (1986) who regarded discourse knowledge as sources of influence on how the content of the written text is conveyed within a given discourse. According to McCutchen (1986), discourse knowledge consists of an organized pattern of thought for various discourse forms, understanding of procedures and strategies of using these discourse forms as well as using knowledge (such as grammatical knowledge and linguistic knowledge) to generate sentences and create a cohesive text. Similarly, Olinghouse & Graham (2009) used a more simplified definition that identified discourse knowledge with the knowledge of the characteristics of good writing in general, knowledge about how to compose a paper and genre knowledge. To sum up, the above-mentioned definitions of discourse knowledge described several subtype knowledge such as metacognitive knowledge, genre knowledge, and linguistic knowledge.

Metacognitive knowledge reflects writers' beliefs about writing and their cognitive processes in the act of writing (Lin, Monroe, & Troia, 2007). Metacognitive knowledge is important because it determines how the composing process is carried out and what the eventual shape of the written product will be (Graham et al., 1993). Metacognitive knowledge includes declarative knowledge of what constitutes good

writing, procedural knowledge of writing processes and conditional knowledge of strategies appropriate under different writing conditions. Genre knowledge, often referred to as text structure, influences how well a writer organizes information for a given writing task. Linguistic knowledge refers to spelling, grammar knowledge and letter formation (Olinghouse & Graham, 2009). Linguistic knowledge helps writers to generate grammatically correct, cohesively linked, and coherently connected texts. Therefore, linguistic knowledge influences whether and how well a writer writes sentences or paragraphs consistent with accepted norms in written discourse. As mentioned in Chapter one, linguistic knowledge is beyond the scope of the study as this type of knowledge mainly concerns semantic and syntactic domains of a language. Overall, discourse knowledge enables writers to understand the characteristics of good writing, to carry out composition, and to adopt strategies to deal with a variety of constraints imposed by the writing situation. As such, patterns and formulas of written discourse, including conventional ways to introduce topics, identifying sources and organizing ideas are important sources of knowledge for any written task.

Besides discourse knowledge, there are other important types of writing knowledge stored in writers' long-term memory. For example, in Hayes and Flower's model (1980), knowledge of writing plans and knowledge of audience are also activated by task environments and exert influence on the writing processes. Knowledge of writing plans constitutes writers' understanding of outlines or goals to achieve for writing tasks while the knowledge of audience refers to writers' awareness of readers for the written text being produced and knowledge of strategies adopted in writing processes to meet the needs of readers. Sensitivity to audience is one of the hallmarks of sophisticated and skillful writers. Writers with high levels of audience awareness adjust the content, the style, and the rhetorical strategies to suit audience's knowledge and degree of interest in the topic (Hollaway & McCutchen, 2004).

Therefore, during the recursive writing processes, writers access, evaluate and use these different types of knowledge that are different in nature but all serve to facilitate writing processes. In the above-mentioned models of written expression that explain either skillful or young writers' writing, these different sources of knowledge (i.e. topic knowledge and discourse knowledge) are regarded as very important in facilitating planning, translating and reviewing processes.

The Importance of Discourse Knowledge for Writing

Theoretical Perspectives on the Role of Discourse Knowledge in Writing

The cognitive models of writing proposed in past decades also pointed to the importance of different types of writing knowledge (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006; Hayes, 1996; Hayes & Flowers, 1980). Writing knowledge can be regarded as a prerequisite to writing (McCutchen, 2000). Discourse knowledge, as a generic term that includes metacognitive knowledge, procedure knowledge of writing and knowledge of text type, was considered important across models.

In Hayes and Flower's model of skilled writing (1980) and Hayes's revised model of writing (1996), multiple sources of knowledge are identified as important in skillful writing. Knowledge of topic, audience and types of writing is stored in the writer's long-term memory and is activated by the task environment (such as the writing topic, the intended audience, motivating factors, and elements of the text already produced). The knowledge stored in long-term memory interacts with the task environment, which then influences the three writing processes of planning, translating and reviewing. For example, in order to generate ideas in the planning process, writers consider writing topics and start a memory probe to activate and retrieve the relevant information about the topics stored in long-term memory. Then writers use knowledge of different text

structures to organize the ideas being generated. Writers' knowledge about the intended audience is then needed and used in setting goals for the task. In the translation process, writers apply their linguistic and grammatical knowledge to translate ideas into written text. Knowledge of audience, topic and genre also play a role in the process of reviewing since writers evaluate and revise the text according to internal standards and intended audience (Benton, Corkill, Sharp, Downey, & Khramtsova, 1995). Both models defined skilled writing as the orchestration of multiple sources of knowledge during writing processes.

Knowledge of writing is also important in young children's writing development. Bereiter and Scardamalia (1987) recognized the importance of both content and discourse knowledge to explain how skilled writers employ a different composing process than young and immature writers. Bereiter and Scardamalia posited that children automatically activate and retrieve information about the topic and discourse knowledge and use automatic activation of information as the underlying mechanism for knowledge-telling approach. Children simply tell what they can remember about a topic by relying heavily on their immediate knowledge of topic and discourse conventions. However, skilled writers transform knowledge during writing as they strategically retrieve information about topic and discourse conventions stored in the long-term memory. Skilled writers first analyze the topic, audience and rhetorical issues about the writing task, which leads to multiple probes of long-term memory. Once the information is retrieved, skilled writers also evaluate, select and organize the information according to writers' goals (Alamargot & Chanquoy, 2001). Although Bereiter and Scardamalia described the difference of how retrieval happens for skilled writer and for young writers, these two distinct ways of composing both leverage content and discourse knowledge as writers generate ideas and compose genre-specific texts (Benton et al., 1995; Olinghouse et al., 2014; McCutchen, 2000).

The Not-So-Simple view of Writing proposed by Berninger and Winn (2006) also identified the importance of multiple sources of knowledge to writing. Like Hayes & Flower's (1980) model, this model showed that young writers also draw different types of knowledge from working memory (orthographic, grammatical, and linguistic knowledge) and long-term memory (e.g., topic, and genre knowledge) and the quantity and quality of text generation can be constrained by working memory resources (Berninger, Mizokawa, Bragg, Cartwright, & Yates, 1994). While generating text, young writers access linguistic knowledge sources such as vocabulary, grammar, and spelling knowledge (e.g., Coker, 2006; Olinghouse & Leird, 2009) as well as knowledge about topic and genre stored in the long-term memory (McCutchen, 2006). These separate skills allow young writers to transform language into orthographic symbols, yet they are also constrained by cognitive resources. Berninger and Winn (2006) 's model captured this aspect of young children's writing by explaining the nature of the translating process during writing. The model indicated that various types of knowledge play an important role in children's writing outcomes and writing development.

Discourse knowledge is also implied as an important part of the Not-So-Simple-View of writing because genre knowledge is needed for text generation. In the Not-So-Simple-View model, transcription and executive function are commonly interpreted as two important domain skills to support text generation. During text generation, young writers first generate ideas and then encode the ideas following the discourse conventions. Writers first depend on content knowledge to generate ideas. The more background a writer has on certain topic, the more information the writer could activate and retrieve for the writing task. Once ideas are generated, young writers use grammar knowledge, linguistic knowledge and genre knowledge to encode ideas into discourse at different level (paragraphs, sentences or words). Text generation would not be successful

without writers' understanding and application of the linguistic rules and genre features. For example, even though many ideas were generated, the text being written could fail to serve its purpose if the writer did not organize the generated information into a coherent discourse specific to certain text type. Given that discourse knowledge in this study includes as knowledge of attributes of good writing and genre knowledge, it is included as part of Not-So-Simple-View-of-Writing model through its role in text generation.

To sum up, different cognitive models of writing (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006; Hayes, 1996; Hayes & Flowers, 1980) signaled the importance of writing knowledge to writing and discourse knowledge is one of the important funds of knowledge source. It is not only important to skillful writers but also to young and developing writers.

Empirical Evidence on Discourse Knowledge and Its Relation to Writing

As specified in the cognitive model of writing (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006; Hayes, 1996; Hayes & Flowers, 1980), writing-related knowledge plays an important role in writing in addition to reading, transcriptional and oral vocabulary skills. However, the extant literature showed limited empirical research on knowledge about writing. Out of this limited line of research, these studies investigated different types of knowledge ranging from topic knowledge, metacognitive knowledge (i.e. knowledge of characteristics of good writing in general, of writing processes) to genre knowledge. Most studies used cross-sectional designs with fewer employing a longitudinal design to investigate the development of students' genre knowledge and metacognitive knowledge about writing (Kos & Maslowski, 2001). This section reviews these studies with a focus on discourse knowledge. As defined earlier, discourse knowledge in this study will encompass metacognitive knowledge (including knowledge of characteristics of good writing in general, knowledge of writing processes)

and genre knowledge, studies examining these subtypes of knowledge are examined together as different aspects of discourse knowledge.

Four lines of research regarding discourse knowledge are revealed. The first line of research probed into the role of discourse knowledge and found that discourse knowledge predicts writing quality. The second line of inquiry examined the development of discourse knowledge. The research findings revealed that there is a general development progression among students in discourse writing with the progression of age and schooling. The third line of research studied the impact of instruction of discourse knowledge on writing outcome. Positive results were documented that instruction in discourse knowledge can improve the length and quality of students' writing. The last line of research investigated the individual differences in discourse knowledge. It was found that there are differences in discourse knowledge between skilled and less skilled writers or between typically achieving students and students with learning disabilities. The following section details the research evidence for these four lines of research.

Discourse Knowledge as a predictor of writing outcomes. One line of research on discourse knowledge has investigated the relationship between discourse knowledge and writing outcomes. There is evidence from the correlational studies that discourse knowledge (mainly metacognitive knowledge and/or genre knowledge) is a predictor for writing performance among school-age children (Englert, Raphael, & Anderson, 1988; Gillespie, Olinghouse, & Graham, 2013; Olinghouse & Graham, 2009; Olinghouse et al., 2014; Saddler & Graham, 2007). The results suggested that discourse knowledge is important for writing development.

In a study exploring how students' knowledge of writing processes predicts expository writing, Englert et al. (1988) asked fourth and fifth graders to write two

expository texts. The investigators then interviewed students using three vignettes about the writing problems that children might experience. Students were asked to offer solutions to these problems regarding strategies for planning, editing and revising processes and strategies for using text structures to organize ideas during these processes. Students were sampled across ability levels including high achieving students (HA), low achieving students (LA) and students with learning disabilities (LD). Interview data showed that LD students were less adept at regulating and controlling writing processes. Correlations between knowledge of 10 different process-related variables and expository writing performance were positive ranging from .25 to .70. The study made a unique contribution to the research on discourse knowledge through the use of a concrete knowledge measure that included problem-solving scenarios. Compared to the general open-ended interview questions about writing processes and writing strategies used in other studies (Gillespie et al., 2013; Olinghouse & Graham, 2009; Olinghouse et al., 2014; Saddler & Graham, 2007), these knowledge measures may have been better able to elicit younger students' discourse knowledge for two reasons. First, the knowledge measures in this study tapped students' knowledge of strategy use and writing processes during each of the three stages of writing (planning, translating and revising) through problems presented in vignettes. Second, the measures made writing problems met by three imaginary students in the vignettes very concrete and specific, thus helping students understand the necessary vocabulary to answer the interview questions. The correlational analysis across ability groups identified that general process-related variables were associated with writing performance. However, it was unknown whether the individual differences in knowledge were associated with writing performance.

Saddler and Graham (2007) addressed the question of whether students' individual differences in metacognitive knowledge about writing were related to

differences in writing performance. In their study, students were grouped into skilled writers and less skilled writers defined by performance on standardized writing tests and a teacher rating. Students were asked to write and revise a story over a two-day period and were then interviewed about their writing knowledge. The interview included questions about the function of writing, the attributes of good writing, writing processes and their strategic knowledge about writing. The results indicated that more skilled writers knew more about the substantive aspects of writing and used more substantive procedures during composing. Significant positive correlations were found among three aspects of writing knowledge (Substantive Processes, Production Procedures, and Motivation) and two writing outcomes (length and quality of story writing). However, the positive correlations were present only for the more skilled writers. The authors suggested that less skilled writers had less integrated knowledge than that of skilled writers, limiting its application during writing. It is possible that a certain level of knowledge must be acquired before it impacts writing. The results from the study need to be taken with caution due to its limitations. First, the study had a small sample size. Second, the positive relations between discourse knowledge and writing outcomes used correlations but did not control for several potential writing-related factors (e.g. handwriting or spelling proficiency). It might be possible that students' writing quality or length is not mainly attributed to discourse knowledge, but to the lack of proficiency in transcriptional skills.

The positive relations between types of discourse knowledge and writing outcomes were further supported by a series of studies conducted by Olinghouse and colleagues (2009; 2013; 2014). The authors adopted the term discourse knowledge to include metacognitive knowledge (i.e. knowledge of characteristics of good writing in general, of writing processes) and genres conventions. Similar interview questions to

Saddler & Graham (2007)'s study were used. But the researcher extended the interview protocol by adding a few more questions about genre knowledge in narrative.

Olinghouse and Graham (2009) asked second- and fourth-grade students to write a narrative. Multiple regression analyses were used and students' transcription skills, reading skills, their interests in writing, and their planning skills were included as control variables. Their results showed that older students possessed more knowledge about how to write and placed more value on the substantive aspects of writing (Englert et al., 1988; Fidalgo, Torrance, & Garcia, 2008; Saddler & Graham, 2007). It was also found that discourse knowledge was a predictor of the quality of narrative writing and different aspects of discourse knowledge predicted different dimensions of writing. Specifically, knowledge of substantive aspects of writing predicted students' use of vocabulary in writing while knowledge of story elements and mechanical aspects of writing predicted students' story quality. The results from this study may be more reliable than previous work due to the larger sample size, the comprehensive knowledge measure, and the analysis that controlled for several writing-related covariates. However, since the study only explored narrative writing, the findings of study could not be applied to other genres.

In a recent study with fifth-grade students (Olinghouse et al., 2014), the authors continued to investigate the relationship between discourse knowledge and students' writing performance but extended the research in two other genres--persuasive and informational writing. The discourse knowledge was defined based on Olinghouse and colleagues' earlier studies (2009, 2013). The findings indicated that discourse knowledge predicted writing performance and the inclusion of genre elements in students' written text across different genres. This supported the findings of Gillespie et al. (2013) that discourse knowledge, knowledge of substantive writing process in particular, predicted

the students' level of genre knowledge. Although Olinghouse and colleagues (2014) used a relatively small sample ($N=50$), the inclusion of important control variables (i.e. text length, topic interests, age, grade, reading skills, and transcription skills) provided support for the relationship between discourse knowledge and writing performance. To control for the length of students' response in the interview task, the proportion of student responses of each response type was used for analysis. This is an improvement because the practices of simply calculating the number of idea units in each response type used in the previous studies might privilege students who provided longer responses.

The important role of discourse knowledge to writing can further be explained by studies that simultaneously explored discourse knowledge and topic knowledge within a single study. Most studies on writing-related knowledge investigated one type of knowledge (i.e. either discourse knowledge or topic knowledge), and few studies explored the interaction of different types of knowledge. Previous studies that dealt only with topic knowledge have shown that students' topic knowledge was related to the quality of text (Benton et al., 1995; Monsenthal, Conley, Colella, & Davidson-Mosenthal, 1985; MuCutchen, 1986; Voss, Vesonder, & Spilich, 1980) and was associated with more coherent and elaborate writing (Benton et al., 1995; MuCutchen, 1986). Topic knowledge was also related to longer texts (Chesky & Hiebert, 1987) and was associated with use of writing processes (DeGroff, 1987). Yet in the research on how discourse knowledge and topic knowledge interacted with each other or how they might combine to impact writing outcomes, discourse knowledge was found to explain more variance in writing outcomes than topic knowledge (McCutchen, 1986; Olinghouse et al., 2014).

In McCutchen's (1986) study, 300 students from 4th, 6th and 8th grades were asked to write a story about a football game and also a story on topics such as people or

school. Students' written texts were then analyzed to measure their discourse knowledge (mainly linguistic aspect of written English through an analysis of local coherence between sentences and hierarchical structure of the text) and topic knowledge. Results showed that both types of knowledge contributed to writing skills. Topic knowledge predicted the content representation of the topic, and discourse knowledge predicted the ability to use syntactically correct language and write in a logical and organized fashion. Although older students had better use of local coherence in writing, they did not necessarily have better topic knowledge. Younger students may produce more coherent texts when they know more about a topic. The author suggested that discourse knowledge may compensate for poor topic knowledge during writing, but adequate topic knowledge cannot guarantee good writing if the writer has poor strategy knowledge for writing. This author suggested that discourse knowledge was more important than topic knowledge when predicting writing performance.

McCutchen's (1986) conclusion that discourse knowledge had a relatively important role is further supported by a recent study by Olinghouse et al. (2014). Grounded in the Scardamalia and Bereiter's (1987) Knowledge-Telling model, Olinghouse et al. 's (2014) study investigated whether both content knowledge and discourse knowledge contributed to the writing outcomes. Fifth-grade students were asked to produce narrative, informational and persuasive texts about outer space. Topic knowledge was measured by a researcher-developed test on outer space. Discourse knowledge was measured by an interview protocol based on Graham et al. (1993), but the authors added questions to assess genre knowledge in informational and persuasive writing. A battery of tests in reading and handwriting was administered to students, and the analysis controlled for the text length, spelling and interest in the topic. The results showed discourse knowledge explained more variance than topic knowledge in writing

outcomes among upper elementary school students. In addition, discourse knowledge predicted genre-specific elements in students' written text across the examined genres, yet topic knowledge only predicted the genre elements in informational text.

Both studies (McCutchen, 1986; Olinghouse et al., 2014) converged on the findings that discourse knowledge played a more important role than topic knowledge in writing outcomes even though discourse knowledge was measured in different ways. McCutchen looked at linguistic aspects of discourse knowledge through text analysis whereas Olinghouse et al. examined discourse knowledge in terms of the knowledge of writing process, attributes of good writing and genre knowledge through student interview. Both studies concluded that discourse knowledge is different in nature from topic knowledge and may consequently relate to different writing processes during writing. These conclusions were partly supported by Benton et al.'s (1995) study that explored how discourse and topic knowledge interacted with topic interests during narrative writing processes among ninth-grade and undergraduate students. Students were asked to write a story about one-half of an inning in a baseball game. Then students were given a baseball knowledge test and a discourse knowledge test measuring students' understanding of standard written English and various forms of discourse. Students also rated their level of interest in baseball. Students' texts were scored for thematic maturity, content quality and for syntactic maturity. Results again showed that both types of knowledge contributed to writing performance, but discourse knowledge played a more important role during the translating process. Researchers concluded that topic knowledge was associated with planning processes for idea generation/organization while discourse knowledge was more related to the translating process, resulting in a significant relationship between syntactical complexity and thematic maturity.

In summary, studies exploring discourse knowledge found that discourse

knowledge is an important predictor of writing performance across genres and across grades. However, variation exists in the relative contribution of different types of discourse knowledge to writing quality. These relationships may also depend on the genre being written and the method for scoring students' writing. Given the broad nature of the term, researchers differed regarding what aspects of discourse knowledge were investigated. Some studies investigated discourse knowledge as a generic concept, while other studies only examined its subtype or combination of subtypes of discourse knowledge (e.g. knowledge of writing processes and/or genre knowledge). However, it was found across studies that different types of discourse knowledge were associated with students' use of complex linguistic and structural features and properties of different text types during writing. Discourse knowledge might also interact with topic knowledge during writing for school-aged children. Topic knowledge might inform the content while discourse knowledge may influence how the author says the content (McCutchen, 1986). Therefore, deep discourse knowledge together with topic knowledge may facilitate the planning and translating processes, leading to well-organized and coherent ideas in students' written texts.

Developmental progression of Discourse Knowledge with age and schooling.

The cross-sectional studies of students' discourse knowledge indicate that there is progressive growth in students' general discourse knowledge (Olinghouse & Graham, 2009), particularly in students' metacognitive knowledge (Graham, et al., 1993; Lin et al., 2007; Schoonen, & de Glopper, 1996) and genre knowledge (Donovan, 2001; Kamberelis, 1999). These studies demonstrated that a developmental pattern was observed with older students obtaining more in-depth and integrated metacognitive knowledge (i.e. knowledge of characteristics of good writing in general, of writing processes) than the younger students. The similar pattern was also found for genre

knowledge that students would have more mature and global understanding of different genres with age and schooling.

Lin et al. (2007) conducted a study to explore the developmental trends in students' metacognitive knowledge about writing for both typical writers (TW) and struggling writers (SW) in grades two through eight. By interviewing students about their perspectives on writing, the authors found that writing knowledge increased with age, and there was a developmental pattern of "slowly moving from a self-centered, local focus toward a more global, audience-oriented, self-aware and self-regulated focus" (p. 226). For example, younger TWs in the primary grades could not go beyond listing their knowledge about writing. In other words, they presented a less global and integrated understanding of writing. Older TWs had a deeper understanding of writing and showed their ability to reflect and integrate what they knew about writing when answering the interview questions. Like the previous studies between TWs and SWs, this study highlighted the differences across ability levels with SWs focusing more on superficial aspect of writing. Less sophisticated writers, including young students and less proficient writers, tended to place more emphasis on the value of production procedures (e.g. transcription, grammar usage and sentence construction skills) when writing. The study also contributed to our understanding of the writing knowledge by showing that discrepancies in writing knowledge between TWs and SWs seemed to widen with age because SWs not only had less sophisticated knowledge than TWs to start with and but had slower subsequent progress. This study, on the one hand deepens our understanding of the developmental pathways in student's writing knowledge. On the other, it did not specify characteristics by each grade level, nor does it establish a precise developmental model.

Similar findings were offered by Wray's (1993) study that explored students'

understanding of good writing in general among first- to fifth-grade students. In this cross-sectional study, students were asked to write a letter describing what makes writing good in the eyes of teachers. The results showed that students were overwhelmingly preoccupied with the technical aspects of writing, but there was developmental pattern shown among groups of children. Older students were less concerned with the technical part of writing, and the percentage of those who mentioned the compositional aspects of writing increased. The authors concluded that in the study students seemed to emphasize compositional aspects over technical aspects at the age 10 or 11. By the age of 15, compositional aspects of writing already were much more valued than technical aspects. This interpretation of the results must be tempered due to its cross-sectional design, the convenience sampling, and the lack of information about how the written texts were analyzed. In another study, Olinghouse and Graham (2009) interviewed second and fourth grade normally achieving students about their declarative and procedural discourse knowledge about various forms of writing. The study showed that fourth graders possessed more knowledge than the second graders about the role of the substantive nature of good writing and the role of substantive processes in composing.

Researchers have also reported a developmental pattern in the acquisition of genre knowledge across grades. In analyses across genres and with students in K-12 setting, researchers have found that children were sensitive to the features of various genres (Duke, 1999; Pappas, 1993; McCraw, 2011) and the acquisition of genre features progressed with age and schooling (Hemphill, Feldman, Camp, Griffin, Miranda, & Wolf, 1994; Lin et al., 2007; Newkirk, 1987). For the genre of narratives, Peterson and McCabe (1983) did a series of studies on the narrative structure of young students' oral narratives. About 96 white children aged from 3.5 to 9.5 years participated in the study. Children were assigned into six age groups and each child was given prompts to produce

at least three oral narrative stories prompted by pictures and interviewer. The data included a total of 1124 narratives. To understand the development of oral narrative, the authors used different analytical methods depending on how stories were defined. The most influential methods were episodic analysis and high-point analysis. In their episodic analysis, stories were regarded as logical sequences of statements and these statements can be classified into informational categories such as goals, actions, and consequences. Statement in their episodic analysis was loosely tied to linguistic forms but more reliant on an informational unit that conveys important distinctions. However, in their high point analysis, stories were considered to serve the referential function (relating information to the listener) and the function of evaluation (why the narrative was told). They took the independent clause as its unit of analysis but concentrated on categorizing the semantic function of that syntactic form. Although approaching story with different perspectives, both analyses followed three steps of defining a statement, categorizing the statement and finally organizing the statements into story structures. They found in their episodic analysis that children's oral narrative structure progressed from incomplete episodes to complete or even complex episodes with age. A similar developmental progression was found for the young students' oral narratives in their high point analysis. Children started with impoverished pattern and progressed to classic patterns of story telling that was similar to adults. Therefore, the study showed that though using different perspectives of how story is structured and employing different analytical methods, the similar developmental pattern of oral narratives was found among young children.

In addition to Peterson and McCabe (1983)'s line of research that focused on the thematic content or global text organization to study narrative development, Berman and colleagues examined the developmental patterns of language use in narrative text production. Their study mainly concerned with how linguistic forms are recruited and

deployed in order to meet given discourse functions. Berman and Slobin (1994) used the data collected for five age groups (3-year-olds, 4-year-olds, 5-year-olds, 9-year-olds and adult) in seven languages. Each participant was given a wordless book entitled *Frog, where are you?* and asked to orally tell the story. The oral narrative texts were first analyzed for the use of core plot components and then the level of explicitness of the event components. Reference to core components was evaluated by whether narrators made explicit reference to the story as having a beginning, middle and end. Event components were evaluated by participants' ability to explicitly describe individual scenes and series of scenes. For analyzing the plot and event components, two types of linguistic expressions were used for analysis: temporal anchoring (i.e., the use of inflectional marking of verb tense) and connectivity (i.e., the use of lexical and other overt markers of the relationship between events).

The findings showed that common threads were found in the development of narrative structure across the populations in seven different languages. Children developed knowledge of grammatical forms and lexical items for describing individual events as early as age three. Knowledge of narrative structure and how to use linguistic forms for event elaboration and event relations emerged later from around age five. Then when children started school, they were able to use an array of linguistic means to organize their narratives and achieve a higher level of coherence. They also started to know more about the storytelling norms of the culture. However, their ability to organize entire narratives around a common thematic thread developed much later. Only adults in their study had full rhetorical flexibility of using a range of expressive devices.

A similar developmental progression was also found in informational writing. In Hemphill et al. (1994)'s study, students with or without brain injury aged between five to seven years old were prompted to orally describe a picture in addition to other genre

tasks. Students without brain injury performed better in the descriptive task, and the growth modeling procedure used as the analytic method for the study showed that both groups of students showed developmental progression in all genres. Students at the age of five were able to distinguish description from story by avoiding using the protagonist and dialogue. Students at the age of six tended to present major details before the secondary details with a sense of closing to end the description. The oldest students in the study presented a more mature text in the description tasks. The seven-year-olds added a general opening statement to the details of description and avoided using deictic reference (i.e. that thing over there). Therefore, a clear progression was seen in the children's acquisition of description, which is a form of informational writing. Similarly, Newkirk (1987) found that young children gradually improved their way of information presentation in first through third grade. They learned to write paragraphs with general information presented before the detailed information. Compared to narrative development, informational text appeared to develop later (Berman & Katzenberger, 2004). The developmental change in informational writing across time might be due to the combination of general social cognitive development and exposure to this type of genre (Berman & Nir-Sagiv, 2004).

Other researchers tried to investigate students' genre knowledge of different text types within a single study. These studies revealed similar developmental patterns that describe children's gradual approximation of more advanced understanding of genre features over time. For example, both Kamberelis (1999) and Donovan (2001) found that students' complexity of writing increased with age and schooling in a modest way. Donovan (2001) found that for both narrative and informational writings, students produced modest change in the inclusion of genre elements between adjacent grades. Kamberelis' (1999) found that second grade students' genre knowledge in narrative and

informational writing was similar to the knowledge of first-graders but higher than kindergarteners. Both of the studies recognized the modest increase in genre use between adjacent grades, but they offered divergent evidence on what grade level students underwent bigger increase in genre knowledge. The results from Donovan's (2001) study showed larger differences between K-2 but smaller differences across grade 3-5, indicating that second grade might be a transitional year marking a sharp increase in genre development. This comes in contrast with Kamberelis' (1999) findings that second-graders' genre knowledge in narrative and informational writing was found to be similar to the knowledge of first-graders. The discrepant results might be a function of different sample sizes (54 vs. 222), different genre measures (micro and macro-level vs. macro-level only), and the sample characteristics. Another finding from these studies showed that children could distinguish narrative writing from informational writing at an early age. A study by Berman and Nir-Sagiv (2004) also showed that the narrative and expository genres were clearly distinguished in linguistic expression even by their youngest age group.

Many studies used cross-sectional designs to explore the developmental path of general discourse knowledge and genre knowledge in particular (Berman & Slobin, 1994; Kamberelis, 1999; Donovan, 2001). However, the cross-sectional designs limit the conclusions that can be made about developmental growth. Therefore, there is need for longitudinal research to be done to explore the development of writing-related knowledge. However, the extant literature found no longitudinal research on writing-related knowledge development except for one study that tracked the change of discourse knowledge among second-grade students across a school year (Kos & Maslowski, 2001). In this study, 17 second-grade students were interviewed about their conceptions of good writing first in January and then again in May. Observational data of teacher-student talk

during writer's workshop was also collected. The results revealed that students emphasized the mechanical aspects of writing in both of the interviews, indicating that not much improvement was made in their declarative knowledge about writing across the school year. Yet in their scaffolded talk with their teachers during the writer's workshop, they could talk more about compositional aspects of writing such as ideas, planning and organization. The study extended our understanding of students' general knowledge about writing growth at a specific grade level within a school year. It partially supported the findings from the previous studies that the developmental path across grades progresses slowly. Yet, given the study's small sample size, more research is needed. Furthermore, the design of the study had additional limitations in that the interview questions at the two time points were not the same, making it harder to detect the changes of students' declarative knowledge of writing in between four months.

In summary, findings from the cross-sectional studies seem to demonstrate that there was a progressive pattern in students' acquisition of discourse knowledge. Students' discourse knowledge (i.e. metacognitive knowledge and genre knowledge) increased with age and schooling. Younger and poorer writers were found to emphasize the technical aspects of writing while stronger writers tended to value the compositional aspects of writing (Barbiero, 2011; Gillespie et al., 2013; Graham et al., 1993; Kos & Maslowski, 2001; Wong, Wong, & Blenkinsop, 1989). The results from these studies should be interpreted with caution since the results from cross-sectional studies do not provide as strong developmental evidence as longitudinal studies. Therefore, more research using longitudinal data is needed to explore how students' discourse knowledge and genre knowledge of writing expands as they learn how to write during school years. In addition, past studies in the line of knowledge development provided clear evidences that students in first grade had some level of discourse knowledge-albeit not fully developed

knowledge-and they could display it. Therefore, studying discourse knowledge at this early age level is warranted.

The impact of instruction on Discourse Knowledge. In addition to the empirical evidence of the correlational relationship between discourse knowledge and writing outcomes, the extant literature documented possible causal relationships between discourse knowledge and writing in experimental studies for both typically achieving and learning-disabled students across grades. These intervention studies could be grouped into either the Self-Regulated Strategy Development (SRSD) (Graham & Harris, 2005; Harris & Graham, 1996) instruction or direct instruction of certain types of discourse knowledge. Experimental conditions in these studies involved either teaching writing processes (planning and/or revising) or genre knowledge, which are subtypes of discourse knowledge defined in this study. The control conditions included a variety of activities such as, vocabulary instruction, free writing, or business-as-usual activities. The results suggested that teaching students different types of discourse knowledge improved writing outcomes. However, the results from four studies, which used SRSD instruction as the intervention, should be interpreted with caution since SRSD is a multi-component intervention that targets numerous writing outcomes.

The effect of SRSD instruction in increasing young students' writing knowledge and performance was well documented in a recent meta-analysis (Graham, McKeown, Kiuahara, & Harris, 2012). The positive effect could be partly explained by the multiple-component SRSD instructional design. SRSD includes six components: (1) develop and activate background knowledge, (2) discuss the strategy, (3) model the strategy, (4) memorize the strategy, (5) support the strategy, and (6) independent performance. The first component of developing background knowledge of writing tasks and writing processes aims to increase students' knowledge of genre characteristics and writing

processes. SRSD studies that investigated the relationship between increased writing knowledge through intervention and writing outcomes measured students' writing knowledge through pre- and post-instruction interviews using Graham et al.'s (1993) protocols (Fidalgo et al., 2008; Graham, Harris, & Mason, 2005; Harris, Graham, & Mason, 2006; Zumbrunn & Bruning, 2013). For example, in Graham et al.'s (2005) study, third-grade, struggling writers were randomly assigned to three conditions: SRSD instruction only, SRSD plus peer support, and a comparison group. Students in the treatment groups were instructed in two genre-specific strategies for planning and writing a story and an opinion essay. The data from the post-intervention writing knowledge instruments showed that students in the two SRSD treatment groups placed greater emphasis on substantive writing processes when describing good and poor writing compared to the control group. The authors found that SRSD had a positive impact on children's knowledge about the substantive aspects of good and poor writing (e.g. planning, generating ideas) and SRSD instruction enhanced writing performance.

The impact of SRSD has also been assessed with students at different ability levels and age groups. For example, Harris et al. (2006) conducted a true experiment with second-grade, struggling students while Zumbrunn & Bruning (2013) used a multiple-baseline design with first-grade, normally achieving students. These studies found that there was the improvement of targeted writing knowledge and writing performance among students in the SRSD treatment groups.

In addition to the studies that tested the effective of SRSD instruction on discourse knowledge, there are seven experimental studies exploring how direct instruction in discourse knowledge affects writing performance (Fitzgerald & Teasley, 1986; Gambrell, & Chasen, 1991; Fidalgo et al., 2008; Torrance, Fidalgo & Garcia, 2007; McCutchen, Francis, & Kerr, 1997; Mosenthal et al., 1985; Wong, Butler, Ficzer &

Kuperis, 1996). In all of these studies positive effects of direct instruction on students' writing outcomes were found. For example, Fitzgerald & Teasley (1986) investigated the effect of instruction in narrative structure (i.e. genre knowledge of narrative writing) on 4th-grade students' writing. The results showed that direct instruction in story structure helped children improve the organization and quality of their essays. Similar positive findings for instruction on writing knowledge could also be found in intervention studies on topic knowledge (Mosenthal et al., 1985) and writing processes (Gambrell & Chasen, 1991; McCutchen et al., 1997; Wong et al., 1996). The positive effects on writing processes were also found in a series of strategy-focused interventions conducted by Torrance and colleagues. In these studies, large effects on both text quality and adoption of process strategies were found following strategy-focused instruction (Fidalgo et al., 2008; Torrance et al., 2007;).

Although the studies found positive effects of direct instruction on different types of discourse knowledge (e.g. knowledge of writing processes, genre knowledge), questions remain whether certain types of knowledge-related interventions lead to better writing outcomes. In a study with 6th-grade students, Torrance, Fidalgo, & Robledo (in press) tried to separate the effects of teaching process strategies from teaching genre knowledge on writing quality and writing processes. The authors compared a condition that included process knowledge and genre knowledge to instruction that just taught the genre elements. The results showed that the treatment groups (writing process strategy training and text structure training) outperformed the control group in the writing quality and in their use of writing processes. However, no difference was found in writing quality between the writing process strategy training group and the text structure training group except that students in the writing process strategy training group spent more time planning on the posttest. The authors concluded that strategy focused instruction had

value in improving students' writing outcomes but whether students benefited more from teaching process writing than teaching text structure was unknown. The findings that direct instruction had a positive impact on students' writing outcomes provided further support for the positive relation between intervention and students' writing outcome obtained from previous SRSD studies.

Another question that pertains to intervention studies is whether the intervention effect was maintained after the conclusion of the intervention. Raphael et al. (1989) examined the long-term effect of an intervention on several types of writing knowledge with fifth- and sixth-grade students. Students who had previously attended a 16-20 week intervention were placed in one of the four different conditions (text structure group, context group, context/text structure group and a business-as-usual control group). In total 140 students were given group questionnaires on writing-related knowledge. Then 48 students were individually interviewed about their genre knowledge, knowledge about audience, and purpose for writing. Students were also given think-sheets during pre-writing, drafting, and revising activities. The think-sheets allowed researchers to examine students' strategy use in the context of writing, providing information about students' conditional knowledge of the writing processes. The results showed that compared to the control group, all the treatment groups (text structure group, context group and context/text structure group) had better knowledge about writing processes and were more aware of using writing strategies during the pre-writing, drafting, revising processes. The authors concluded that students in the treatment groups improved their writing because targeted elements (e.g., purpose, audience) were included in students' revision tasks. The study has several limitations in its design. First, confounding factors were not controlled. As students were drawn from different classrooms after intervention, it is very possible that students in the treatment groups improved their writing not as a

result of the intervention but because of a more effective teacher. Second, a writing quality measure was not used. Thus, it is hard to say that inclusion of certain targeted elements led to better writing quality. In addition, the length of the intervention among three experimental groups was not equally assigned. Compared to context and context/text structure groups, text-structure group received less time in intervention. Finally, the study did not explain why only 48 students instead of 140 were selected for individual interviews. The choice of choosing a few representative students' writing sheets for analysis was also problematic. Due to questions about the design, the results from the study should be interpreted with caution.

Overall, most experimental studies that used direct instruction of certain types of discourse knowledge provided evidence that discourse knowledge instruction could lead to improved writing performance. This claim should be tempered when interpreting the SRSD studies because SRSD is a multi-component intervention that does not exclusively focus on improving writing knowledge. It is possible that students' improvement in writing outcomes or writing knowledge could be the result of instruction in explicit writing strategies and processes that are part of SRSD. The SRSD studies provide evidence for its global effectiveness. However, whether students' improved writing performance can be solely attributed to instruction in the domains of writing knowledge is still unknown.

Individual difference in Discourse Knowledge. The majority of writing knowledge research looked at how more proficient writers differed from their less skilled peers in writing knowledge and how the difference in writing knowledge was related to writing performance (Graham, et al., 1993; Graham, 2006; Graham & Harris, 2005; Saddler & Graham, 2007). These studies showed that differences existed between more proficient and less skilled peers regarding the purpose of writing and their knowledge

about the writing process. For example, to understand how students understand the purpose of writing, Saddler & Graham (2007) asked students to describe why writing is taught at school and how writing could help student in and out of school. They found that more skilled writers were more likely to describe the role of writings played in academics and to explain how writing would influence their future success in professional settings. Regarding students' knowledge of writing processes, results from the studies showed that skilled writers were also more knowledgeable about the writing process than their less skilled peers (Graham, et al., 1993; Graham, 2006; Graham & Harris, 2005). For example, in a study by Graham, Schwartz and MacArthur (1993), the researchers developed an interview protocol tapping students' declarative, procedural and conditional knowledge about writing and compared such knowledge about writing among groups of normally developing students and students with learning disabilities (LD) from the fourth, fifth, seventh and eighth grades. Graham et al. (1993) found that typically developing writers displayed more comprehensive declarative, procedural and conditional metacognitive writing knowledge than did their peers with LD. Students with LD had less sophisticated conceptualizations of the writing process than their normal achieving peers. The researchers concluded that typically achieving students put more emphasis on planning and revision strategies whereas students with LD valued more surface-level features of writing such as neat handwriting and good spelling. Other studies used a similar protocol to replicate the findings of Graham et al.'s (1993) study and similar findings were found (Graham & Harris, 2005; Harris & Graham, 1996; Olinghouse & Graham, 2009). These studies laid foundation for the research on writing knowledge. However, limitations also exist. One pertains to the smaller sample sizes at the chosen grade level. The other is related to the reliability of tapping students' knowledge through interviews. One could argue that interview questions might

underestimate students' writing for two reasons. It is possible that students do not have the adequate vocabulary to express themselves well. It is also possible that young children might not have the meta-language to fully verbalize what they know about writing.

The individual differences in discourse knowledge (i.e. knowledge of characteristics of good writing in general, writing processes and genre knowledge) were found not only existing among students with or without learning disabilities (Graham, et al., 1993; Graham, 2006; Graham & Harris, 2005; Saddler & Graham, 2007), but also between more skilled or less skilled writers in the typically achieving student population. Schoonen and de Glopper (1996) studied the writing knowledge and performance of three performance groups in ninth grade (low, average, and proficient groups defined by students' average scores on given writing tasks). Students' writing knowledge was measured indirectly by writing a letter to younger peers that described what good writing entails. The study found that proficient writers focused more of their advice on organization and less on superficial aspects of writing, such as writing mechanics. The less proficient writers focused primarily on surface-level features, such as spelling, punctuation and grammar. In a more recent study by Olinghouse and Graham (2009), second- and fourth-grade, typically achieving students were interviewed about their declarative and procedural discourse knowledge about various forms of writing. The results indicated that fourth graders possessed more knowledge than the second graders about the characteristics of good writing and more procedural knowledge about how to write.

Many of studies that examined writing knowledge employed a cross-sectional design (Graham, et al., 1993; Graham, 2006; Graham & Harris, 2005; Olinghouse & Graham, 2009; Saddler & Graham, 2007; Schoonen & de Glopper, 1996). Some

researchers contended that with smaller sample sizes for each grade, it was hard to draw a generalization and much is less known about writing knowledge of students at each grade level (Graham, et al., 1993; Saddler & Graham, 2007). Gillespie and colleagues (2013) attempted to address this concern in a study with 50 fifth-graders. The researchers examined students' knowledge about the writing processes and their genre knowledge in three text types (narrative, persuasive and informational texts). The study also explored whether students' knowledge of writing processes predicted their genre knowledge. Writing achievement tests were given and the writing knowledge interviews were conducted based on the modified version of the protocol designed by Graham et al. (1993). The results showed that fifth graders emphasized substantive processes over form and mechanics. The results supported the findings from earlier studies with normal achieving students in the upper-elementary grades (Barbiero, 2011; Graham et al., 1993; Wong et al., 1989). In addition, Gillespie et al. (2013) found that fifth graders' had different levels of writing knowledge depending on the genre. For example, fifth graders in the study knew more about narrative writing than informational and persuasive writing. With the use of hierarchical regression analysis, the study found that students' knowledge of substantive aspects of writing (e.g. the compositional aspects of writing such as knowledge of writing processes, idea organization, etc.) is an important predictor of students' genre knowledge after controlling for gender, writing achievement and students' emphasis on production procedure (such as grammar, handwriting and spelling). The study was the first of its kind in studying the writing knowledge at a specific grade level. However, like the previous studies that compared knowledge of writing among students across grades, the authors pointed out the limitation of a small sample size and the possibility of underestimating students' discourse knowledge about writing in the interview protocol.

Therefore, studies examining the individual differences in students' writing knowledge seemed to indicate that good writers not only valued more substantive features of writing, but also possessed greater knowledge about the attributes and structures of different genres (Graham, et al., 1993; Graham, 2006; Graham & Harris, 2005; Olinghouse & Graham, 2009; Saddler & Graham, 2007; Schoonen & de Glopper, 1996). Further research also showed that good writers were more strategic when carrying out the processes of writing than poor writers (Englert et al., 1988).

Summary. The extant literature, although limited, offered a basic understanding that there were individual differences and a developmental pattern is found in the acquisition of discourse knowledge among school-aged students. In addition, correlational and causal relationships between discourse knowledge and writing outcomes were empirically supported although results from intervention studies need to be interpreted with caution. Discourse knowledge was a predictor of writing outcomes and instruction on discourse knowledge tended to produce better writing outcomes. Overall, the findings from this review provided support for the claim that discourse knowledge plays an important role in young students' writing development (Graham, 2006). Empirical support was also found for the theoretical proposition that discourse knowledge is an important construct in the Knowledge-Telling approach (Bereiter & Scardamalia, 1987). Better discourse knowledge is believed to automatize writing processes so that writers may allocate their cognitive resources to translate ideas into written text (Kellogg, 1987).

Empirical Evidence on Correlates of Writing

Though research has provided empirical evidence that support the theoretical importance of discourse knowledge in writing, it is also important to document the evidence on the correlates of writing identified in the cognitive models of writing

(Bereiter & Scardamalia, 1987; Berninger & Winn, 2006; Hayes, 1996; Hayes & Flowers, 1980). The cognitive models of writing that guide the study showed that writing is a complex activity requiring an orchestration of multiple skills. This section reviews empirical evidence for these theoretically important factors for writing, including transcription skills, vocabulary knowledge and reading skills. The extant literature showed that the role of these skills in writing has been empirically well supported.

Transcription skills refer to handwriting and spelling skills (Berninger & Winn, 2006). According to Berninger and Winn's Not-So- Simple View of Writing (2006), limited transcriptional skills put constraints on the written expression due to the shared limited working memory. In a study by King and Rentel's (1981), primary grade students were asked to either dictate, write or word process papers. Results showed that dictated composition ranked the highest in quality and length compared to the other two conditions. Therefore, the results of the study seemed to indicate that the length and the quality of writing were associated with transcriptional skills.

In an attempt to understand the relation between transcriptional and literacy skills and dimensions of written composition in first-grade, Kim, Otaiba, Folsom, Greulich and Puranik (2014) evaluated 527 first-graders' written composition on length, quality, syntactical complexity and writing conventions (e.g. capitalization and punctuation). Then data for students' language and literacy skills were collected. Structural equation modeling analysis found that these two aspects of transcriptional skills were associated with different dimensions of writing. For example, handwriting predicted writing length, quality and writing conventions. Spelling was found to be a significant predictor of syntactic complexity and writing conventions.

In cross-sectional studies with elementary-school students, handwriting and spelling have been found to predict writing quality (Juel, Griffith, & Gough, 1986;

Graham, Berninger, Abbott, & Whitaker, 1997), and length (Graham et al., 1997). These two studies (Juel et al, 1986; Graham et al., 1997) found that spelling explained more variance in writing outcomes for younger students than older students. The relationship between transcriptional skills and writing outcomes was further tested by intervention studies. For example, handwriting instruction for both normally achieving and students with learning disabilities in first grade was found to impact students' targeted skills in handwriting fluency, the length, and the quality of students' writing (Berninger, et al., 1997; Graham, Harris, & Fink, 2000; Jones & Christensen, 1999;). Similarly, a spelling intervention led to improved skills in sentence construction and the length of the written text (Berninger et al., 1998; Graham et al., 2002).

Oral language was also found to contribute to writing quality. Coker (2006) found that the receptive vocabulary skills predicted end-of-year writing among first grade students from low SES background. An earlier study on first-grade students revealed that the generated number of oral ideas was found to be associated with writing quality (Juel et al., 1986). A recent study that explored dimensions of writing in first grade also found that oral language was a significant predictor of substantive quality, a writing dimension on writing quality (Kim et al., 2014). Similar evidence on the role of oral language in writing quality was found in studies conducted beyond first grade. In a cross-sectional study with students in the primary and upper elementary grades, it was found that oral expression was found to explain a unique variance in the writing of third- and seventh-grade students (Berninger & Abbott, 2010). In addition to the studies that explored the correlational relationship between oral language and writing outcomes, intervention studies on vocabulary instruction also showed the positive relationship between the two. It was found that instruction in relevant vocabulary improved the better use of targeted vocabulary and quality of narrative (Duin & Graves, 1986).

Another important correlate of writing is reading skills. Reading and writing share a common knowledge source such as topic knowledge and discourse knowledge (Shanahan, 1984). They also use similar cognitive processes (Fitzgerald & Shanahan, 2000). A notable research has been done on the reading-writing connections (Fitzgerald & Shanahan, 2000; Shanahan, 1984, 2006; Tierney & Shanahan, 1996). By employing the analytical methods such as the structural equation modeling or path analysis, Shanahan and colleagues (1996; 2000; 2006) found that the relationship between writing and reading was bidirectional. For example, correlations between reading and writing were higher for lower-level factors such as spelling, decoding and vocabulary. Meanwhile, significant correlations were found between comprehension and writing quality and the structure of the written text.

The empirical evidence on how reading skills are associated with writing outcomes was further strengthened by findings from correlational studies (Berninger et al., 2002; Coker, 2006) and experimental studies (Beal, Garrod, & Bonitatibus, 1990; Holliway & McCutchen, 2004; Paris & Paris, 2007). For instance, letter and word identification skills were found to predict end-of-year writing quality in first grade (Coker, 2006; Kim et al., 2014), length and writing conventions (Kim et al., 2014). Word recognition skills were significant predictors for spelling and handwriting from first through six grades (Berninger et al., 2002; Kim et al., 2014). At the comprehension level, studies showed that instruction on comprehension strategies improved oral production of stories in first-grade (Paris & Paris, 2007), strengthened revising skills among students in upper elementary grades (Beal et al., 1990; Holliway & McCutchen, 2004).

In addition to the empirical evidence showing the importance of transcriptional, reading and oral skills to writing, age and gender are two additional factors associated with writing outcomes. An enormous body of evidence showed that there is a

developmental pattern observed for children's writing development (Graham, 2006). Older children had better transcriptional skills, wrote longer and produced better quality written texts than their younger peers (McCutchen, 2006). There is also a significant body of research reporting significant gender differences in writing (Berninger & Fuller, 1992; Knudson, 1995; Newkirk, 2000).

There is consistent difference between male and female in the mode of writing. For example, a case study following two writers from kindergarten through second grade showed that girls students produced more free writing pieces that included personal comments than did their male counterparts (Kamler, 1993). A study on college students' expository and narrative writing showed that female students were found using three times as many exclamation points as men (Rubin & Green, 1992). The researchers concluded that girls are encouraged to discuss feelings and personal perspectives whereas boys are not. Gender difference was also found in attitude towards writing (Knudson, 1992; Pajares & Valiante, 1999) and transcriptional skills (Berninger & Fuller, 1992). Girls were found to have more positive attitude toward writing (Knudson, 1992; Pajares & Valiante, 1999) and had better transcriptional skills (Berninger & Fuller, 1992). The gender difference in writing is also revealed in writing outcomes. The most recent NAEP results showed that girls were found achieving higher levels of writing proficiency than boys (National Center for Educational Statistics, 2012). The results were supported with the earlier findings from the Department of Education report entitled *The Condition of Education 1997*, in which girls were approximately one and a half years ahead of boys in writing competency (National Center for Education Statistics, 1997). A recent study by Kim, Otaiba, Wanzek, and Gatlin (2015) extended previous findings in early grades. The researchers found that among 494 second and third graders, boys had statistically significant lower scores than girls in writing quality and length measures as well as

curriculum-based measurement (CBM) after controlling for age, skills in language, reading, transcription and attention and rapid automatized naming skills.

To sum up, the extant literature provided empirical support for the theoretically important factors for writing. Descriptive and experimental studies converged on the findings that reading skills, transcriptional skills and vocabulary skills were empirically important in their relation to writing. Given the rich literature on the important role reading, transcriptional and oral vocabulary skills together with age and gender in students' writing outcomes, these correlates of writing are important contributors to consider when investigating students' writing outcomes.

Gaps in Literature

The review of the cognitive models of writing (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006; Hayes, 1996; Hayes & Flowers, 1980) suggests that discourse knowledge is an important ingredient and a catalyst for writing development. Yet the models did not explain how different types of writing knowledge are used in the writing process (McCutchen, 1986). In addition, the relationship between each type of knowledge and writing performance is not well specified. Research on discourse knowledge has signaled its importance to writing achievement for students in the upper elementary grades. However, there are also gaps in the research due to limitations in methodology and the scope in the available studies.

A noticeable gap of the research on discourse knowledge is that there is very limited investigation of beginning writers. The research evidence from cross-sectional designs documented the developmental pattern of discourse knowledge. In other words, there was evidence that older students had a better understanding of discourse knowledge than younger students (Graham et al., 1993; Lin et al., 2007; Olinghouse & Graham 2009). However, there are few studies on younger students' discourse knowledge. Many

of the participants were in second grade or above, leaving many questions about the beginning writers' general discourse knowledge. First grade is a critical grade to motivate students to write as young writers are learning written English and acquiring types of writing-related knowledge necessary for successful writing at school. Therefore, understanding their level of discourse knowledge in first grade is helpful to teachers for instructional purposes.

Another limitation is that little is known about the development of students' discourse knowledge within a school year. This is important for first-grade students as many of them start to learn how to write. It is possible that they develop discourse knowledge fairly fast in first grade due to students' lack of such knowledge when they start school. It is also possible that the acquisition of discourse knowledge takes a long time to develop as this type of knowledge entails abstract thinking and practice. Understanding whether first graders develop discourse knowledge within a school year can inform research on the underlying mechanism for its development for beginning writers. It can also assist teachers to identify important types of discourse knowledge that need more instructional attention. Therefore, research evidence is needed to fill the gap regarding what is first-grade students' understanding of general discourse knowledge and how they display their discourse knowledge in narrative and description writing. It is also important to investigate how discourse knowledge changes across a school year, and whether there are individual differences in discourse knowledge between more skilled and less skilled first-grade writers.

Finally, gaps also existed in the research about the role of discourse knowledge in writing. Different aspect of discourse knowledge predicted a range of writing outcomes for students beyond first grade (Gillespie et al., 2013; Olinghouse & Graham, 2009; Olinghouse et al., 2014). Therefore, it is unclear whether such a relationship exists for first-grade writers.

Given the gap existed in extant literature, it necessitates the investigation of first-graders' understanding of discourse knowledge and its relation to writing outcomes. This study can not only potentially contribute to the theoretical model of early writing (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006), but also extend the empirical evidence of discourse knowledge to beginning writers.

The Current Study

Given the gaps in the literature and the call for research on writing-related knowledge (Graham, 2006), the purpose of the study is to contribute to the evidence on the understanding of discourse knowledge and its relation to writing outcomes in first grade. In this study, I examined first-grade students' understanding of general discourse knowledge and their use of genre elements in narrative and descriptive writing—two commonly encountered genres for beginning writers. Then the relationship between discourse knowledge and writing outcomes in first grade was explored in two ways. First, students' discourse knowledge in the fall was used to predict the end-of-year writing outcomes. Second, students' change of discourse knowledge across a school year was tested as a potential factor in predicting their end-of-year writing outcomes. Overall, the goal was to describe first-grade students' discourse knowledge, support the theoretical models of writing about the role of discourse knowledge, and to extend or challenge extant empirical evidence about the role of discourse knowledge in writing.

Chapter 3

METHODS

Study Overview

Based on the existing research on discourse knowledge, many questions remain about first grade students' understanding of general discourse knowledge and its role in writing outcomes. Therefore, the study aimed to 1) investigate first-grade students' general discourse knowledge; 2) examine the change of discourse knowledge across a school year; 3) understand first-graders' use of genre knowledge in narrative and descriptive writing; 4) examine whether discourse knowledge is predictive of writing outcomes among first-graders.

Research Questions

In this study, two overarching research questions with five sub-questions were asked:

1. What do first-graders know about discourse knowledge in writing (i.e. knowledge of characteristics of good writing in general, writing processes and genre conventions)?
 - a. What do first-grade students know about discourse knowledge at the beginning of the school year?
 - b. How does first-grade students' discourse knowledge change across a school year?
 - c. What do first-grade students know about genre conventions in narrative and descriptive writing?

2. What is the relationship between students' discourse knowledge and narrative and descriptive writing performance after controlling for writing-related factors (vocabulary, reading skills, transcription skills, age and gender)?
 - a. Does students' fall discourse knowledge predict end-of-year writing performance in first grade?
 - b. Does change in students' discourse knowledge across a school year predict end-of-year writing performance in first grade?

The hypotheses of the study included the following: 1) first-grade students' discourse knowledge about writing is still not established. First-graders are hypothesized to put much more emphasis on the mechanical aspects of writing than the compositional aspect of writing. However, discourse knowledge is hypothesized to be a predictor of the quality and length of narrative and descriptive writings. Different aspects of discourse knowledge would be likely to predict different writing outcomes. For example, knowledge of substantive processes (i.e. knowledge of compositional aspect of writing) and genre knowledge may explain unique variances in quality of narrative and descriptive writings but knowledge of production procedures (i.e. knowledge of mechanic aspects of writing) may not. 2) First-grade students have a developing knowledge of story elements. However, their genre knowledge of descriptive writing is expected to be weaker than narrative writing due to their greater exposure to narratives at home and school. 3) There is the likelihood of modest improvement of students' discourse knowledge between the fall and the spring, especially on the compositional aspects of the writing given evidence from past research findings on the slow progression in knowledge development.

The goal of this section is to discuss the methods for the study. It includes the background of the study, the participants, procedures, measures, data analysis plan, data screening and treatment of missing data.

Background of the Study

The study was embedded into a four-year larger study aimed to identify effective instructive practices relating to students' writing growth using nested data across classrooms and schools (Coker, MacArthur, & Farley-Ripple, 2014). Data collection for the larger study was completed in two years (from 2012-2014), with the first year (2012 Fall-2013 Spring) sampling 170 students in 21 classrooms and the second year (from 2013 Fall-2014 Spring) sampling 226 students in 29 classrooms. Student data collection occurred in the fall and then spring. All the sampled students in the larger study consented to participate in the study.

Across the 50 classrooms where students were sampled, information about writing instruction was obtained through a survey. Not all teachers responded to every item. Teachers' responses to the survey showed that there was considerable variation in the writing curriculum that teachers reported, even within the same school. The most common response was that the writing curriculum was integrated with the reading curriculum ($n=26$). The second most common was no standard curriculum ($n=21$) or a non-fiction writing program ($n=3$). Teachers reported using writer's workshop approach to writing instruction and allocating an average of 135 minutes per week on writing instruction ($SD=73.70$).

Participants

Participants in this study included 396 first-grade students from 50 classrooms in 13 schools in three school districts in a Mid-Atlantic state. The districts are demographically diverse, medium-size districts (ranging from about 10,000 to 17,000 students) in urban and suburban neighborhoods. The participating schools serve a diverse range of students in terms of ethnicity, language status, and socioeconomic status (SES). Table 1 and Table 2 display the demographic information for the participating school districts and schools. As the districts did not provide student-level SES information, only

the school-level SES was reported in this study. Between the school year of 2012-13 and 2013-14, the state revised its policy regarding how the SES is defined. As a result, school-level SES statistics changed markedly between these two academic years. However, there was no change in districting or population composition in this area. To maintain consistency, the school-level SES information for the participating school districts and schools was based on school reports from the first year of data collection, which was academic year 2012-13.

Table 1 Demographic Information by School District

	District A <i>n</i> = 16,807 %	District B <i>n</i> = 9,941 %	District C <i>n</i> = 16,297 %
Ethnicity			
African American	40.6	43.7	22.8
Caucasian	34.7	32.5	47.4
Hispanic	17.9	19.1	22.7
Asian	4.3	2.9	5.9
Hawaiian	0.1	0.1	0.0
Multiracial	2.2	1.6	1.1
American Indian	0.3	0.2	0.2
Special Education status	14.9	12.6	11.2
English Language Learner status	7.6	9.5	9.9
Low Income status	60.8	60.6	48.5

Table 2 Demographic Information by School

	1	2	3	4	5	6	7	8	9	10	11	12	13
	%	%	%	%	%	%	%	%	%	%	%	%	%
Ethnicity													
African American	39.6	20.2	31.9	44.2	64.2	33.7	30.5	20.6	11.3	42.5	45.0	21.5	3.7
Caucasian	29.9	62.2	40	39.2	16.1	39.8	43.9	46.8	38.7	38.4	38.0	38.7	84.6
Hispanic	23.2	8.5	18.6	8.9	12.6	8.2	17.9	5.2	42.7	17	8.0	37.0	5.8
Other	7.3	9.1	9.5	7.7	7.1	18.3	7.7	27.4	7.3	2.1	9.0	2.8	5.9
Special Education status	8.5	7.2	8.1	11.3	12.0	7.6	9.2	7.1	10.8	8.4	18.2	8.3	6.8
English Language Learner status	8.0	2.8	6.2	3.5	3.2	6.9	9.3	26.2	34.4	11.5	5.0	22.3	1.1
Low Income Status	84.6	35.7	62.5	48.9	65.9	36.4	64.2	44.1	59.0	72.3	48.5	75.4	15.9

Note. 1) Other includes Asian, Multiracial, Native American, Native Hawaiian. 2) Due to the policy change on low-income status between 2012-13 and 2013-14 and no population change in the districts, low-income status was reported in the table according to the state report of 2012-13.

The sampling frame for the proposal was in alignment with that of the larger study (Coker et al., 2014.) First, all the student participants in the larger study were included for the study. This constituted a sample of 396 first-grade students. Second, in the larger study, about six to nine students representing low, middle and high level of incoming reading skills were selected from each classroom. Students' incoming reading skills were indexed by their fall Phonemic Segmentation Fluency (PSF) subtest scores in Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminiski, 2002). DIBELS were developed to assess the key early literacy skills (phonological awareness, alphabetic knowledge and fluency) identified by National Reading Panel (2000). The PSF subtest was used as a standardized measure measuring students' phonological awareness. In the test, students were asked to segment three- and four-phoneme words into their individual phonemes. The test was found to be a good predictor of later reading achievement (Kaminski & Good, 1996) and thus was used in the study to index students' early literacy skills. Those students who gave consent to the study were placed into low, middle and high groups according to their PSF score. The grouping of students at low, middle and high levels was intended to ensure the variability of students' incoming literacy skills among the sample. Among those students who gave permission to the study, about three students were randomly selected for each group, with a total of 9 students from each classroom. The decision of sampling 9 students from each of the 50 classrooms was to avoid the issue of attrition in the larger study where the sample came from. The statistical power analysis from the larger study showed that a sample size of 300 would give the

study adequate statistical power for analysis. As the study was embedded in the larger study, data from all student participants ($N = 396$) were included for analysis. For this study, the attrition rate across the two years' data collection was about 9%.

Student demographic information is reported in Table 3. For this study, students' average age is 6.5 years old ($SD = 4.38$ month). 52.1% are female students and 47.9% are male students. The sample includes 28.4% African American students, 47.9% Caucasians, 12.2%, Hispanics and 8.2% Others (including Asian, Multiracial, Native American, Native Hawaiian).

Table 3 Demographic Information for Participants

	Mean (<i>SD</i>)	Range
Age (Month)	78 (4.38)	66-94
Race		
African American	28.4%	
Caucasian	47.9%	
Hispanic	12.2%	
Other	8.2%	
Gender		
Male	47.9%	
Female	52.1%	

Note. $N = 396$. Other includes Asian, Multiracial, Native American, and Native Hawaiian.

General Procedures

As the study was embedded in the larger study, the general procedures for data collection in this proposal study also aligned with those for the larger

study. In the larger study, student-level data was collected over two school years, including students' skills in reading, oral vocabulary, transcription and writing.

In order to understand first-graders' discourse knowledge and its relation to students' writing outcomes in this study, students were also given a discourse knowledge interview. The discourse knowledge interview was given twice, one at the beginning of fall, the other late spring. The writing outcome measures (i.e. narrative and descriptive writing prompts) were given only once in the late spring. Reading, handwriting fluency, spelling, and oral vocabulary assessments were also only given at the beginning of fall. Table 4 shows the data collection time points for all the student assessments included for the current study.

Table 4 List of Measures

Measures	Fall	Spring
Transcription		
Handwriting Fluency	✓	
WJ-III Spelling	✓	
Vocabulary		
EOWPVT-4	✓	
PPVT-4	✓	
Reading		
WJ-III Letter-Word Identification	✓	
WJ-III Word-Attack	✓	
PSF	✓	
Discourse Knowledge		
Discourse Knowledge Interview	✓	✓
Writing		
Narrative Prompt		✓
Descriptive Prompt		✓

Note. PSF=Phonemic Segmentation Fluency; EOWPVT-4 = Expressive One-Word Picture Vocabulary Test-4th Edition; PPVT-4 = Peabody Picture Vocabulary Test-4th Edition; WJ-III = Woodcock-Johnson-3rd Edition.

Measures

In total, nine assessments were given to students to assess their writing, transcriptional, oral vocabulary, and reading skills as well as their understanding of discourse knowledge. The nine tests included researcher-developed Narrative and Descriptive Writing Prompt (Coker et al., 2014),

Woodcock Johnson Third Edition Test of Achievement (WJ-III; Woodcock, McGrew, & Mather, 2001) Spelling subtest, Handwriting Fluency test (Abbott & Berninger, 1993), Picture-Prompted Vocabulary Test (PPVT-4; Dunn & Dunn, 2007), Expressive One Word Picture Vocabulary Test (EOWPVT; Martin & Brownell, 2011), WJ-III Letter Identification subtest, WJ-III Word Attack subtest (Woodcock et al., 2001) and the Discourse Knowledge Interview (Olinghouse & Graham, 2009). For the sake of clarity and organization, these tests are detailed after being grouped into the following five skill categories: writing tasks, transcriptional skills tests, vocabulary skills tests, reading skills tests and discourse knowledge interview.

Writing Tasks

Two measures were used to index first-graders' writing quality. They were Narrative Prompt and Descriptive Prompt.

Writing Prompts. Two writing prompts were used to measure students' writing at the level of connected text. Students wrote a narrative and a description in response to sentence prompts. The prompts were similar to the prompts used in previous research with elementary school students and were found significantly correlated to students writing performance on standardized assessments (Roid, 1994). The test administrator(s) read both prompts aloud to students. The Narrative Prompt was scripted as “Think about one of your favorite activities. Write a story about a time that you had fun doing this activity.” The Descriptive Prompt was scripted as “Think about a person you know well. It could be someone in your family or a friend. Describe that person and tell what he or she is like to someone who doesn’t

know him or her.” The prompt topics were chosen carefully to be relevant to students' personal lives in order to control for the role of content knowledge. In a previous study that examined the role of discourse knowledge, data on both content knowledge and discourse knowledge were collected (Olinghouse et al., 2014). Results showed that both types of knowledge contributed to writing outcomes. To reduce the confounding factor of content knowledge in the writing process, the prompts were designed to have topics familiar to students.

Administration. The two writing prompts were given by the trained research assistants (RAs) to students in the spring in a group setting of three to four students. The order of prompts given to students was counterbalanced across testing time to reduce testing effect. Generally, at least a day was given in between these two prompts to reduce the fatigue effect among students. When testing, the RAs gave each student a pencil and a lined paper with the prompt at the top of the page. Then the RAs read aloud the prompts and asked the students to begin. When students finished writing, the RAs would prompt students to read back and check what they wrote. Students were given 20 minutes to complete each writing task.

Scoring. The scoring process for the Narrative and Descriptive Prompts involved four coding systems designed for different dimensions of writing (See Appendix A-E). Both prompts were scored for length, quality, and genre elements. Before scoring, students' narrative and descriptive writing prompts were first typed verbatim into a spreadsheet. Then spelling mistakes, punctuation and capitalization errors in the middle of the sentences in

students' written text were corrected prior to scoring. Both procedures aimed to reduce rater's potential bias that mechanical factors such as poor handwriting and spelling might exert during the scoring process (Troia, Graham, & Harris, 1999).

For scoring the length of both prompts, students' writing was scored by using the word count feature in the spreadsheet. In other words, the total number of words written in each genre was counted by the computer (As length scoring is done by the program, no inter-scorer agreement is needed.)

For measuring the quality of both prompts, a traditional holistic rating rubric was developed by the researchers on the larger project. Students' writing was scored on a 6-point scale, with 6 representing the highest quality of writing and 1 representing the lowest quality. The quality rubric focused on three dimensions in forming a judgment about overall quality: topic and detail; organization and supporting details; word choice (See Appendix A). A score was given to each dimension according to the rubric before a holistic score was given to each written text. Both narrative and descriptive prompts used the same rubric for scoring quality.

For scoring both prompts, representative anchor papers for low, medium and high writing in both genres were chosen from the sample and used to guide the scoring process. When scoring, two raters were first trained with practice samples. Once they reached a threshold of 90% inter-scorer agreement in the round of practice scoring, one of the raters scored the total sample. After the scoring was finished, the other trained rater double scored 20% of the scored total samples to calculate inter-scorer agreement. The inter-

scorer agreement for different dimensions of narrative and descriptive writing was as followed: 96.2% for Narrative Quality within one point score difference, 96.8% for Descriptive Quality within one point score difference. The correlation coefficient between two scorers for both Narrative Quality and Descriptive Quality was .87.

Students' genre knowledge was measured by using two separate analytic rubrics for narrative and descriptive writing. The use of genre elements reflects the degree to which students include traditional genre-specific elements of considered important to narrative and descriptive writing (Gillespie et al., 2013). When scoring genre-specific elements, these two scoring rubrics assess the present/absence and the number/quality of each genre element. Both rubrics involve the sum of total points awarded for each element. Appendices B and D include the narrative and descriptive genre elements definitions and examples, which guides the creation of the scoring rubrics and serve to ensure the scoring reliability. Appendices C and E are the scoring rubrics with detailed definitions and examples while Appendices F and G are the samples of narrative and descriptive genre elements scoring rubric used by the raters during the scoring process.

The narrative scoring rubric for genre elements (see Appendix F) used in the study was recently refined and used by Gillespie et al. (2013) based on previous work by Glenn & Stein (1979) and Graham and colleagues (Graham & Harris, 1989; Troia et al., 1999). It evaluates elements within three main categories: Setting, Plot and Other. Under each category, there is a subset of elements specific to the category. Setting assesses the presence/absence and

development of a main character, locale and time. Plot measures the presence and the development of the events/actions of the story, including an initiating event, internal plan of the character, external event, direct consequence, and reactions from the main character. Other includes whether the title is included and whether dialogue is present throughout the story. Scores for each element ranged from 0-2, with 0 indicating the absence of the element, 1 indicating the inclusion of the element but with little development, and 2 indicating that the element is present and well-developed. In total, there is a maximum of 20 points in the scale.

The descriptive scoring rubric for genre elements (see Appendix G) assesses how well the writing reflected the genre features for descriptions. It is based on Hemphill and colleagues' (1994) work. The rubric includes elements in four categories: the opening thematic statement, the hierarchical ordering of information, the level of description, and the first introduction of the character. Unlike narrative writing, information in descriptive writing tends to be presented in a hierarchical order so that more general and important information (i.e. thesis statement) is presented at the beginning. In addition, supporting details are organized depending on their importance to the topic. Generally speaking, major details come before the secondary details. The descriptive rubric measures how well the elaboration is carried out, whether the adjectives, adverbs, big words (i.e. non-frequency words) are used. The last scoring element in the descriptive rubric is how the character is introduced to the reader. Compared to narrative writing, impersonal depiction of the character is more typical in descriptive writing. Therefore, more points

will be awarded for impersonal depictions (e.g., "the woman," "Miss Smith") as opposed to more intimate initial references (e.g., "she"). For this category, a range of points (0-3) will be given for how the main character or subject is first mentioned. However, for the first three categories of elements (i.e. the opening thematic statement, the hierarchical ordering of information, the level of description), each element was awarded a score of 0-2 for how well it is presented. Zero indicates the lack of the element. One represents the inclusion of the element with little development, and two means the element is included with better development. In total, there is a maximum of 19 points in the scale.

The researcher and one trained undergraduate RA participated in scoring the genre elements for the narrative and descriptive texts. The researcher trained the undergraduate RA using blinded, first-grade writing samples obtained from other studies. After a 90% item-by-item inter-scorer agreement (i.e. straight agreement for each genre element in both prompts) was reached during practice scoring, the RA scored all the narrative and descriptive writing samples obtained in the study. Then the researcher of the study double scored 20% of the randomly selected written samples for both genres to calculate inter-scorer agreement. The item-by-item inter-scorer agreements for narrative prompts were: 94.4% for Main Character, 90.1% for Locale, 94.3% for Time, 95.8% for Initiating Event, 97.2% for Internal Plan, 93% for both External Event and Direct Consequence, 95.8% for Reaction from the Main Character, 97.2% for Title and 98.6% for Dialogue. The item-by-item agreements for descriptive prompts were: 94.3% for Opening

Statement, 92.9% for Detail Presentation, 97.1% for Elaboration of Details, 100% for Dialogue, 91.4% for both Adjectives Used and Richly Descriptive Words, 100% for Adverbs used, 95.8% for Big Words Attempted and 97.1% for First Mention of Character.

Transcriptional Skills Tests

Transcription generally refers to handwriting (producing letters) and spelling (producing words). They were measured by a handwriting fluency test (Abbott & Berninger, 1993) and the WJ-III Spelling subtest (Woodcock et al., 2001).

Handwriting Fluency Test. Handwriting fluency test was used to measure students' automaticity in writing 26 lower-case alphabetic letters in order within one minute. The timed-test is widely used in many research studies with primary grade students and has been demonstrated to predict writing quality and compositional fluency for young children (Abbott & Berninger, 1993).

Administration. A trained RA administered the test with individual students in the fall. Students were given a piece of lined paper and a pencil without an eraser. Then the examiner asked students to write 26 lower-case alphabetic letters in one minute. Students were also informed that every 15 seconds the examiner would mark a slash on the lined paper to indicate students' progress. Students were encouraged to write alphabetic letters in order as fast as possible.

Scoring. Students' handwriting was scored following a set of rules. A point was awarded to the correct formed letter in the right order. The letters

that were illegible or formed incorrectly or out of alphabetic order were scored as 0. Then the total number of correct written letters in the first 15 seconds was counted for analysis. The inter-scorer agreement for handwriting fluency test is 100%.

WJ-III Spelling Subtest. Spelling ability was measured by the norm-referenced Spelling subtest from WJ-III Test of Achievement (Woodcock et al., 2001). The test measures students' spelling skills using words with increasing level of difficulty. The test was reported in the WJ-III manual of having a split-half reliability of .92 for 6-year-olds and .91 for 7-year-olds. The criterion validity coefficient between WJ-III Basic Writing Skills (i.e. Spelling) and the Kaufman Test of Educational Achievement (KTEA; Kaufman & Kaufman, 1985) Spelling was .77 (McGrew & Woodcock, 2001).

Administration. The test was individually administered by the trained RAs in the fall. The students were given a piece of lined paper and asked to write the targeted letters or words dictated by the examiner. For all the targeted words, the examiner would read each twice, first in isolation and then in the context of a sentence using the targeted word. The test includes items that begin with drawing lines, tracing or producing letters and end with words that are increasingly difficult to spell. The test administrator needs to establish basal and ceiling during test administration. To establish basal, students need to spell correctly eight targeted words/letters consecutively. If students misspell six targeted words consecutively, the test is discontinued.

Scoring: Two trained raters scored the correct number of items completed by students. Then the raw score was entered in the WJ-III software

and a W score for WJ-III Spelling subtest was computed and used for analysis. The spelling test was double scored by two trained RAs. Inter-rater reliability of the two raters was 100%.

Oral Vocabulary Skills Tests

Oral vocabulary skills were measured by assessing students' receptive and productive oral language proficiency. Two norm-referenced instruments: the Peabody Picture Vocabulary Test- Fourth Edition (PPVT-4, Dunn & Dunn, 2007) and the Expressive One-Word Picture Vocabulary Test- Fourth Edition (EOWPVT-4, Martin & Brownell, 2011) were used. These two tests showed high correlations (between .80 to .84) with each other across age groups (Dunn & Dunn, 2007; Martin & Brownell, 2011).

PPVT-4. Students' receptive language ability was measured by the PPVT-4. It is a norm-referenced instrument for assessing the extent and nature of a person's knowledge of Standard English words. The test has a wide range of vocabulary levels from preschool through adult. The test starts with high frequency, commonly used words and moves onto lower frequency, more difficult words. The PPVT-4 manual reported an internal consistency reliability of .95 and .97 for 6- and 7-year-olds respectively. The test-retest reliability for 5- and 6-year-old and for 7-10 year olds was .84 and .91 respectively (Dunn & Dunn, 2007).

Administration. A trained RA individually administered the test in the fall. In the test, students were asked to select a picture that best illustrated the meaning of a word provided by the examiner. The examiner then said a word, and the student chose one out of the four pictures provided. The PPVT-4 has a

basal set of eight items and ceiling set of six items to be established during test administration.

Scoring. Two trained raters scored the examiner's recorded sheet for students' oral responses. The raw score is the total number of corrected answered words. All students' responses were double scored by two raters. The inter-scorer agreement for the PPVT-4 was 99.6%.

EOWPVT-4. Productive language ability was measured by the EOWPVT in the fall. It is a norm-referenced instrument to assess students' ability to generate words. Test items are presented in a sequence that starts with the easiest concepts and ends with those that are less frequently encountered. The test has a high internal reliability and validity. The Cronbach's coefficient alpha for its internal consistency reliability reached .97 and .95 for 6- and 7-year-olds. The test also showed high correlations with the PPVT-4 (between .80 to .84) across age groups (Martin & Brownell, 2011).

Administration: The test was given to students individually by a trained RA in the fall. In the EOWPVT, the students were asked to name a picture with one word. The examiner prompted students by asking "What one word would describe the picture?" The examiner then recorded students' responses on the answer sheet. The raw score was the total number of correct words produced by the student. The test has basal and ceiling set to be established during administration. Students need to correctly answer eight consecutive items to establish basal. The test would be stopped when students give wrong answers to six consecutive items.

Scoring: Two trained raters scored students' responses. The raw score is the total number of corrected answered words. All students' responses were double scored and the inter-scorer agreement between two scorers was 98.3%.

Reading Skills Tests

To assess first graders' reading skills, two reading tests were used. Both are subtests from WJ-III: WJ-III Letter Word Identification (WJ-III LWID) and Word Attack Subtests (WJ-III WA). These two reading subtests form WJ-III were designed to measure students' decoding and word recognition skills (McGrew, Schrank, & Woodcock, 2007).

WJ-III Letter Word Identification Subtest. The WJ-III Letter Word Identification subtest assesses students' decoding skills by asking students to identify individual letters and to read words in isolation. The test had a split-half reliability of .98 and .97 for six- and seven-year-olds and reported a correlation coefficient of .75 with WJ-III Word Attack subtest (McGrew et al., 2007). The criterion validity coefficient between WJ-III Basic Reading (i.e. Letter-Word Identification and Word Attack) and the Kaufman Test of Educational Achievement (KTEA; Kaufman & Kaufman, 1985) Reading Decoding was .66 (McGrew & Woodcock, 2001).

Administration. The test was individually administered in the fall by trained RAs. Students were shown a list of words to be read out with an increasing level of difficulty. A basal and ceiling set (correctly answer eight consecutive items for establishing basal and incorrectly answer six consecutive items for establishing ceiling) needed to be established for administration.

Scoring. Two trained raters double scored the test. The number of correctly read letters or words were totaled as the raw score, which was then translated into the W score by the WJ-III software. The inter-scorer agreement between two raters for WJ-III Letter Word Identification test was 100%.

WJ-III Word Attack Subtest. The WJ-III Word Attack subtest was used to measure students' decoding skills. Students were asked to read pseudo-words aloud. The use of pseudo-words is to reduce the confounding factor of familiar words for students when measuring decoding skills. To decode the pseudo-words, students need to identify the sounds of individual letters or letter strings. The split-half reliability for Word Attack for 6- and 7-year-olds was .94 and .92 (McGrew et al., 2007). The criterion validity coefficient between WJ-III Basic Reading (i.e. Letter-Word Identification and Word Attack) and the Kaufman Test of Educational Achievement (KTEA; Kaufman & Kaufman, 1985) Reading Composite was .76 (McGrew & Woodcock, 2001).

Administration. The test was individually administered by trained RAs in the fall. The examiner provided lists of pseudo-words for students to read aloud and recorded students' responses. The test has basal (correctly answer eight consecutive items) and ceiling set (incorrectly answer six consecutive items) to be established during the test.

Scoring. Two trained raters double scored students' responses. The total number of corrected read pseudo-words was the raw score, which was then computed into a W score by the WJ-III software for data analysis. The

inter-scorer agreement for scoring WJ-III Word Attack between the two scorers was 100%.

Discourse Knowledge Interview

Six interview questions developed by Graham et al. (2009) and modified from Graham, Schwartz, and MacArthur (1993) were used to assess students' knowledge about good writing (declarative knowledge), writing processes (procedural knowledge), and elements of story (genre knowledge). The protocol is presented in Appendix H.

The six interview questions (see Appendix H) were designed to assess three major constructs of students' discourse knowledge. The first two questions (Questions 1-2) assess students' declarative knowledge about the characteristics of good writing. The next three questions (Questions 3-5) ask about the procedural knowledge of writing and writing process. The last question (Question 6) assesses students' knowledge of story since narrative form of writing is the dominant genre for first-graders, especially for students at the beginning of the first grade. Therefore, students' knowledge of descriptive writing was not measured in the interview. However, it is important to understand young students' genre knowledge in a range of text types since narrative, informational and persuasive writings are central in the CCSS (CCSS, National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

When assessing Discourse Knowledge in young students, one challenge is that they may not be able to fully articulate what they know due to their developing meta-language or lack of vocabulary about discourse

knowledge. Researchers have responded to this challenge by measuring Discourse Knowledge in multiple ways. The measures used in past studies include either inferring students' discourse knowledge by examining students' written texts or by asking them about what they know about how to write (Gillespie et al., 2013; Graham et al., 1993; McCutchen, 1986; Olinghouse & Graham, 2009; Olinghouse et al., 2014; Schoonen & de Glopper, 1996; Wray, 1993). While recognizing that an interview can be a limited measure of Discourse Knowledge for younger students, it is still an appropriate measure given that most children communicate better in oral language than writing (Wood, 1981; Vygotsky, 1978).

Administration. The interview was given first in the fall and then again in the spring. It took place in a quiet place outside of classrooms, was given one-on-one by trained RAs, and was audio recorded. Each question was read aloud by the RAs. The interview questions were designed to be open-ended. The RAs strictly followed the protocol for the interviews. For each question, the RAs prompted student by asking "Anything else?" until the student was clearly finished answering the question. If the student gave a vague or general response, the RAs would prompt with "How would you do that?" or "Can you tell me more?". The question would be repeated when students did not understand or misunderstood the question. The whole interview took about 3 to 9 minutes to complete.

Scoring. Before scoring, the interviews were transcribed verbatim by two trained RAs. After the interviews were transcribed, the scoring process involved the following five steps: defining the idea unit, classifying idea units

into response types according to the categorization system (Appendix I), calculating the total number of idea units for each response type for each of the three sets of questions measuring the same construct; summing the number of idea unit for each response type across the six interview questions, creating five discourse knowledge variables based on literature: Production Procedures, Substantive Processes, Story Elements, Motivation, and Irrelevant. These five knowledge variables represent different dimensions of discourse knowledge (Olinghouse & Graham, 2009), and their scores were used for data analysis. The scoring system is based on previous work of Graham and colleagues (2009; 2013; 2014). It has been used in previous studies on discourse knowledge (Graham et al., 1993; Saddler & Graham, 2007; Graham et al., 2005; Harris et al., 2006). The scoring system was also found to be valid as the scores obtained from the scoring system could differentiate between stronger and weaker writers and were sensitive to the effects of writing instruction (Olinghouse & Graham, 2009). The following details the scoring process for the discourse knowledge interview.

In the first step, each transcribed response was divided into idea units. An idea unit is defined as, “a specific, unit idea in a student’s response” (Olinghouse & Graham, 2009, p. 40). For example, a response such as, “Some children have trouble writing because they can’t think of any good ideas,” is considered one idea unit; whereas, “Some children have trouble writing because they can’t come up with ideas to write about and they can’t stay focused on their writing,” is scored as two idea units (i.e., 1: can’t come up with ideas, 2: can’t stay focused). Any repeated information is not considered

a new idea unit. Additionally, elaborations for an idea unit that do not provide unique information are not marked as a new idea unit. For example, “Good writers plan their ideas before they write them...Planning means you have to plan out your ideas before you start writing them down,” is only scored as one idea unit as the second statement only provides additional information about planning. However, “Good writers plan before writing...For planning, a writer could use a chart or maybe even a web,” is scored as three idea units (i.e., 1: good writers plan, 2: use a chart, 3: use a web).

After the number of idea units was identified, the second step was to categorize each idea unit according to its response type. The categorization is based on a system developed by Graham et al. (1993) and modified by Olinghouse and Graham (2009). The scoring categories are displayed in Appendix I and J. Questions 1-5, which assess knowledge of attributes of good writing in general and knowledge of writing processes, followed the same categorization system used in Olinghouse and Graham's (2009) study. Question 6, which assesses genre-specific knowledge, follows a separate categorization system from that of question 1-5. The categories for each question and their illustrative answers can also be found in Appendix I and J.

For Questions 1-5, each idea unit could be categorized as one of the following categories: Environmental Structuring (statement indicating students' efforts to select or arrange the physical environment to make learning easier; e.g. "Find a quiet room." "Get my materials ready."), Production Procedures (statement referring to a mechanical aspect of writing

or the written product; e.g. "Write neatly" "Spell the word correctly"), Substantive Processes (statements referring to writing processes, such as planning, drafting, and revising; e.g., "Keep a clear focus." " Use a story map to plan it." "Write a first draft, revise and edit it), Seeking Assistance (statements indicating efforts to solicit help from others or other resources; e.g. "Ask the teacher/ my mom." "I will look at the word wall for spelling."), Motivation (statement referring to motivation for writing or imagined rewards or punishment for success or failure; e.g. "They give up." "They keep doing it until they do it well."), Ability (statements referring to competence or innate abilities; e.g. "Because they are smart"), Other Related (statements clearly related to the question under consideration that cannot be classified in one of the other categories; e.g. "Sometimes people take time for their handwriting." "Good writers write what the teachers say and understand what she is saying." "It makes it hard for them to write because it might be too hard of a question for them.") or Irrelevant (statements unrelated to the question under consideration; e.g. "Because I like it" "It is on the computer." "When if you are writing on the computer, type slow." "If you have a notebook, it will take you long if you go all the way to the bottom.").

For Question 6 that assesses the genre knowledge in narratives, each idea unit can be grouped into one of the following categories: Story Elements (statement referring to the story grammar such as setting, characters, plot, problem, and solution; e.g., "setting, plot and character"), Organization (statement referring to the organization of the story in content or form; e.g., "beginning, middle and the end"), Creativity (statement indicating that the

story has something special to make it interesting and exciting; e.g., "It grabs you." "It is very funny."), Production Procedures (statement relating to the written product, such as spelling, handwriting, mechanics or grammar; e.g., "Words are spelled correctly." "Grammar has to be right."), Ideation (statement about ideas or topics included in the story; e.g., "Write about what you know."), Clarity (statement about making the story acceptable to the readers; e.g., "Read it out to see if it makes sense."), Vocabulary (statement referring to use words to make the story exciting; e.g., "Words paint a picture."), Other Related (statements clearly related to the question under consideration but that cannot be classified in one of the other categories; e.g., "Glossary, index; pages and numbers";) and Irrelevant (statements unrelated to the question under consideration; e.g., "You need to think about it.").

For both of the categorization systems, distinguishing response types between Other Related and Irrelevant posed major challenges during scoring. The important guideline for differentiating these two response types was to examine whether the response was off topic for the question under consideration. Responses that were related to the question being asked but unable to fit into other response types were Other Related. However, responses that did not make sense or failed to answer the question were categorized as Irrelevant. Other Related usually included responses that were related to characteristics of writing but were usually not important features related to the study. For example, in question 1 about the characteristics of good writing, responses such as "Take your time" were counted as Other Related since the response indicated that writing is a complex task and good

writers plan and revise their writing instead of rushing into it. “Good writing takes feeling.” is another Other-Related example for question 1 about characteristics of good writing since some types of writing appeal to emotions, but voice is not a response type in the categorization system. However, for question 1 about what good writing looks like, responses such as “You can break letters.” “They are on their best behavior.” “A good writing is doing things you write about.” “I make most of the picture books and all of the school and comics books.” “They don’t know the question and answers.” were coded as Irrelevant. These responses either made no sense or presented irrelevant information for the question being asked. Other-Related and Irrelevant responses were examined case by case. It is possible that the same response can be categorized as Other Related for one question but Irrelevant for another question. For example, response “Because the teacher did not teach them a whole bunch about writing.” was Other-Related for question 2 about what makes writing hard. However, it was counted as Irrelevant for question 1 about characteristics of good writing. Similarly, the response “You need to think about it.” was coded Substantive Processes for question 3 that measures students’ knowledge in planning. However, the same response was coded “Irrelevant” for question 6 that assesses students’ knowledge in story grammar.

After each idea unit was categorized into a response type, the third step was to calculate the total number of idea units for each response type in questions 1-2, questions 3-5 and question 6. As questions measuring the same construct (i.e., questions 1-2 for declarative knowledge of good writing,

questions 3-5 for procedural and conditional knowledge of writing processes) might solicit the same or similar responses, simply counting the number of idea units and response types in these grouped questions has the potential of inflating students' discourse knowledge. Therefore, when counting the number of idea units within the set of questions tapping the same construct, any repeated ideas were not counted twice in students' responses. For instance, questions 1-2 assessed students' declarative knowledge of writing. Therefore, if students mentioned handwriting in both question 1 and 2, only one idea unit was represented and the response type for this idea unit was Production Procedure (where handwriting falls). The scoring procedure of not counting repeated responses twice applied to questions 3-5 (knowledge of writing processes) and question 6 (genre knowledge in story). For instance, if handwriting was mentioned again twice in questions 3-5, one idea unit of Production Procedures would be recorded for question 3-5. Then if handwriting was mentioned again when responding to question 6, one idea unit of Production Procedures would be recorded for question 6. In all, the third step summed the total number of idea units for each response type in each of the three sets (i.e., questions 1-2, questions 3-5 and question 6)

After calculating the total numbers of idea units for each response type in each of the three sets of questions, the fourth step was to total the number of idea units for the same response type across three sets of questions. In step three, to avoid the inflation of idea units for all response types, the same response type from the same set of questions were not repeatedly counted. However, in step four, the same response type needs to be totaled across three

sets of questions to be used as a final measure of students' discourse knowledge. For example, if the number of idea units for Production Procedures were 2 in questions 1-2, 3 in questions 3-5 and 1 in question 6, the total number of idea units for Production Procedures would be 6. Totaling the same response type across interview questions as indicator of aspects of Discourse Knowledge was necessary because the frequency of mentioning the same response type across three sets of question showcased students' understanding toward different aspects of Discourse Knowledge in writing. For example, if students mentioned handwriting across three sets of questions, it might indicate that students understand that Production Procedures is an important part of writing (as an attribute of good writing, as a part of writing processes and genre knowledge). In total, the summed scores yielded totals of the following response types: Environmental Structuring, Substantive Processes, Production Procedures, Motivation, Seeking Assistance, Ability, Other Related, Irrelevant, Story Elements, Organization, Clarity, Vocabulary, Creativity and Ideation.

After these total response type scores were calculated, the last step was to identify the most frequent and most theoretically important response types to represent different dimensions of discourse knowledge. Out of the response types scores coded in the six interview questions, five major response types were used in the analyses: Production Procedures, Substantive Processes, Story Elements, Motivation, and Irrelevant. The rationale for choosing these response types over the other response types was based on several factors. First, these responses aligned with how discourse knowledge

was conceptualized in the study. Secondly, previous research used these five response types to define discourse knowledge (Olinghouse & Graham, 2009; Gillespie et al., 2013; Olinghouse et al., 2014). Finally, these five response types either represented the major responses in the interview or had theoretical and empirical importance. For example, while Production Procedures and Substantive Processes accounted for most of the responses in the Discourse Knowledge interview (Graham et al., 1993; Olinghouse & Graham, 2009), Story Elements, Motivation were particularly interesting theoretically and were also found important for writing (Graham et al., 1993; Olinghouse & Graham, 2009; Gillespie et al. 2013). Compared to other response types that were dropped from analysis, Story Elements and Motivation were considered as factors relating to students' writing quality. Story Elements signaled students' knowledge in genre conventions and was found a significant predictor for writing among elementary students (Olinghouse & Graham, 2009; Gillespie et al. 2013). Motivation was indicative student' knowledge of effort as an important aspect of writing. Research has shown that elementary students started school with strong motivation in writing but their motivation decreased with more schooling (Graham, 2006; Graham & Harris, 1989). Given that there were more theoretical interests for Story Elements and Motivation, it is important to investigate into these two response types in the analysis even though they were not dominant response types in the interview.

As a result, Discourse knowledge was defined as having three important dimensions for writing: knowledge about the attributes of good

writing, knowledge of writing processes and genre knowledge. The response type labeled Story Elements was used to identify students' narrative genre knowledge. The response type labeled Substantive Processes reflected knowledge relating to writing processes, Production Procedures represented important skills/features in good writing: good spelling, neat handwriting, correct punctuation etc. These three response types (Substantive Processes, Production Procedures, Story Elements) together with Motivation were found to be associated with writing achievement (Saddler & Graham, 2007; Olinghouse et al., 2014; Olinghouse & Graham, 2009; Graham & Harris, 2005). The creation of an Irrelevant response type was used to assess the amount of students' irrelevant knowledge about Discourse Knowledge. The Irrelevant Knowledge variable can be an important indicator of students' level of discourse knowledge by looking at its growth across a school year or its relationship with the writing outcomes. If Irrelevant knowledge decreased from the fall to spring, it may indicate that students' irrelevant information about discourse knowledge decreased across a school year. In addition, the analysis of the relationship between Irrelevant Knowledge and writing may indicate whether Irrelevant Knowledge was positively or negatively related to writing quality. If there was a negative relationship between Irrelevant Knowledge and writing quality, it may suggest that students with weaker writing performance tended to respond to interview questions with more Irrelevant Knowledge.

Since students' knowledge about writing was measured through the frequencies of idea units in each coded category, the unit of analysis for

Discourse Knowledge was the use of counts instead of the proportion of idea units in students' response category. Although the proportion of idea units has the advantage of controlling for the length of the responses, this metric could not be used to calculate the gain scores of Discourse Knowledge. For example, when calculating the change of Story Elements across the school year, it is very possible that the percentage of Story Elements decreases even though there are more idea units of Story Elements in the spring. It could be the function of the increased total number of all response types in spring. Without the same total number of idea units for both spring and fall, it was impossible to interpret the change of discourse knowledge using percentage scores. Even though the percentage was used as the unit of analysis in previous studies by Graham et al. (1993) and Olinghouse et al., (2014), there was evidence showing that the two measures produced similar results (Graham et al., 1993). Therefore, simple counts were used as the unit of analysis in this study.

Since the interview was conducted in the fall and spring, two types of knowledge scores for each five knowledge variables were computed. One was the fall knowledge score and the other was the gain score. Fall knowledge scores were analyzed to understand first-grade students' initial level of discourse knowledge. The gain score using the simple count of idea units was computed to measure students' change of discourse knowledge across a school year. Gain scores were the differences in the number of idea units of each of the five discourse variables by subtracting the fall scores from the spring scores. For example, the gain score for the Discourse Knowledge-Production

Procedure was the difference in the number of idea units in students' response across six interview questions relating to Production Procedure between spring and fall.

Two undergraduate students research assistants participated in the interview scoring process. They were trained to transcribe and score the interviews. One RA transcribed the interview. After the transcription was completed, all transcriptions were checked for accuracy. Twenty percent of the interviews were re-transcribed by the other RA to calculate transcription reliability. The inter-scorer agreement for interview transcribing was 100%. Two trained RAs independently divided responses into idea units for 20% of the transcribed interviews. The inter-scorer agreement for idea unit segmentation was 93%. Each RA completed the segmentation for half of the samples (198 students). To establish scoring reliability, each RA independently scored 20% of the randomly selected interviews scored by the other RA. Percent of exact item-by-item agreement between the double-scored interviews for responses ranged from 85% to 98% (Question 1: 94 %, Question 2: 87%; Question 3: 98%; Question 4: 91%; Question 5: 88%; Question 6: 90%).

Data

The data used for the study included student scores from nine measures: the narrative task, the descriptive task, the PPVT-4, the EWOPVT-4, Handwriting Fluency, the Discourse Knowledge Interview, and the following subtests from the WJ-III tests of achievement Letter-Word Identification, Word Attack, and Spelling subtest. Scores from the narrative

and descriptive writing prompts were used as writing outcomes (i.e. length and quality score, genre elements). Scores from reading, transcription and vocabulary tests were used as control variables, as they are writing-related skills. In addition, the participants' age and gender were included as control variables given the empirical evidence showing their relation to writing outcomes (McCutchen, 2006; Kim et al., 2015). Finally, data from the Discourse Knowledge Interview was used to create five variables tapping important aspects of discourse knowledge (i.e. Production Procedures, Substantive Processes, Story Elements, Motivation, and Irrelevant). For the Discourse Knowledge variables, there were five fall knowledge variables developed by the fall interview data and five knowledge variables gain scores created by using the fall and spring interview data. The following sections detail the specific analytic plan for each research question followed by the data screening and treatment of missing data.

Analytic Plan

Analytic Plan for Research Question 1

Research Question 1: What do first-graders know about discourse knowledge in writing (i.e. knowledge of characteristics of good writing in general, writing processes and genre conventions)?

This research question aimed to provide a basic understanding of what first-graders know about different aspects of discourse knowledge, whether their discourse knowledge changes across a school year, and how they use genre knowledge in narrative and descriptive writing by either looking at what

students explicitly stated in their interview or by analyzing students' writing samples. The following three sub-questions were guided by the first overall research question. The analytic plan for each question is addressed in detail as follows.

Research Question 1.a. What do first-grade students know about discourse knowledge at the beginning of the school year? To answer the first part of the question, students' responses to Discourse Knowledge interview questions in the fall were used for analysis. Therefore, the percentage of all the response types across questions was calculated. In addition, the descriptive statistics for the five knowledge measures were calculated, which included the mean and standard deviations of five knowledge variables (i.e. Production Procedures, Substantive Processes, Story Elements, Motivation, and Irrelevant).

Research Question 1.b. How does first-grade students' discourse knowledge change across a school year? To understand how the five aspects of discourse knowledge change across a school year, students' responses to Discourse Knowledge interview questions both in the fall and spring were used for analysis. The percentages of all response types across six interview questions in the spring were calculated and compared to those response types in the fall interview. Then the fall and spring Discourse Knowledge variables were compared to examine the magnitude of growth among these five Knowledge Gain variables. Paired-samples *t*-tests for knowledge change were conducted. As all students were interviewed at two time points using the same knowledge interview, each student was compared to himself/herself on the

score of knowledge measures. An alpha level of $p < .05$ was used for detecting variables with statistically significant change.

Research Question 1.c. What do students know about genre conventions in narrative and descriptive writing? The data sources for this sub-question were students' inclusion of genre elements in their narrative and descriptive writing samples. The data analysis for this sub-question was to present the means, standard deviations and percentage of rating for the total genre elements (i.e., the total count of genre elements in narrative and descriptive writing) and specific genre elements (i.e., plot element, plot element for story; thesis statement element, information presentation element for descriptive writing) in students' narrative and descriptive writing.

Analytic Plan for Research Question 2

Research Question 2: What is the relationship between students' discourse knowledge and narrative and descriptive writing performance after controlling for writing-related factors (vocabulary, reading skills, transcriptional skills, age and gender)?

To answer the question, hierarchical linear modeling (HLM) was chosen over multiple regression analysis (MRA). Previous studies exploring the relationship between discourse knowledge and writing outcomes used multiple regression analysis (MRA) for analysis (Olinghouse et al., 2014; Olinghouse & Graham, 2009). To determine if HLM was the appropriate method, the amount of variance at the classroom level was investigated for each dependent variable (Narrative Quality, Descriptive Quality, Narrative Length, Descriptive Length). The interclass correlation coefficient (ICC) was

first calculated to determine how much classroom-level variance there was in the data. The variance at the classroom level was found to be statistically significantly different than 0, and the amount of variance explained at the classroom level for three out of the four dependent variables reached 10% (10.3% for Narrative Quality, 5.4% for Descriptive Quality, 22.3% for Narrative Length, and 14.2% for Descriptive Length). As a result, HLM were chosen for the analysis because of its ability to model clustered data (Raudenbush & Bryk, 2002).

There are several reasons for choosing HLM over MRA when using clustered data. On the one hand, HLM can address the issue of independence assumption violation under a single-level model. Given the nested data in the study, the inclusion of a classroom random intercept helps address this issue by taking into account of the variance that occurs between classrooms. On the other, HLM provides more realistic standard errors than OLS, thus decreasing the chance of Type 1 error. Field (2013) and Raudenbush and Bryk (2002) stated important advantages of HLM over the traditional MRA approach. HLM can take group-level variables into consideration and factor them into the analysis to overcome these non-independence observations by including a unique random effect for each of the group level unit.

A total of eight HLM models were run for the different writing outcomes (i.e. Narrative Length, Descriptive Length, Narrative Quality and Descriptive Quality) and the type of knowledge variables being used (either fall knowledge variables or knowledge gain variables). For all the eight models, a random effect was added to the intercept and the slopes during the

model building process. However, all the eight models did not include classroom-level and school-level variables in the analysis even though the sample included students from multiple classrooms per school, and HLM allows for answering questions about units at multiple levels (i.e., students, classrooms and schools). The justification is dual. First, the study primarily concerned with relationship between student-level discourse knowledge and student writing outcomes, teacher or classroom characteristics were not the focus of the study. Second, although data were collected from different schools, Level 3 units (13 schools) were too few to reliably estimate fixed effects or variance parameters. Research on the methodology of three-level models has suggested 30 as a minimum number of Level 3 units to draw likelihood-based inferences (Kreft & de Leeuw, 1988; Maas & Hox, 2005).

To run all the HLM models, five steps were followed. First, an exploratory factor analysis (EFA) was conducted on the multiple control variables obtained from WJ-III Letter-Word Identification, WJ-III Word Attack, WJ-III Spelling subtests, Handwriting Fluency, PPVT-4 and EWOPVT-4 tests. The EFA could potentially reduce multiple control variables into factors. The EFA conducted for the larger project using the same data produced two factors of early literacy skills (decoding, spelling, and handwriting) and vocabulary skills (receptive and expressive vocabulary). The EFA in the study yielded the same factors from these control variables. Second, after two factors were exacted, two factor scores were obtained for each student and was included in the HLM models as the new controls together with Age and Gender. Third, five knowledge variables (fall score or

gain score across a school year) were entered in the model to determine their relationship with the writing outcomes. Fourth, a random effect was added to the intercept and the slopes of all HLM equations during the model building process to check if the intercept and slope varied randomly across classrooms. Fifth, based on the model fit data, a final model that fit the data best was chosen. This included eight different HLM models depending on the type of writing outcomes (i.e. Narrative Length, Descriptive Length, Narrative Quality and Descriptive Quality) and the nature of knowledge variables (i.e. fall Discourse Knowledge variables or Discourse Knowledge Gain variables).

Research Question 2.a. Does students' fall discourse knowledge predict end-of-year writing performance in first grade? To answer this question, the following steps were followed. First, all control variables (i.e., WJ-III Letter-Word Identification, WJ-III Word Attack, WJ-III Spelling subtests, Handwriting Fluency, PPVT-4 and EWOPVT-4) were extracted into factors by employing EFA. Second, since HLM permits the partitioning of variance in hierarchically structured data, the ICC was calculated to determine whether a significant proportion of variance in students' writing outcomes that is attributable to the classroom level ($>10\%$). Four unconditional models were run to estimate the variance between classrooms and variance within classrooms for each dependent variable. These unconditional models excluded all covariates and included only the dependent variables—one of the narrative and descriptive writing outcomes. In other words, one-way random effect ANOVA models in which a single fixed effect- the mean outcome-were estimated. These unconditional models could be expressed as follows:

$$\text{Level 1: } Y_{ij} = \beta_{0j} + \beta_{1j} + e_{ij}$$

$$\text{Level 2: } \beta_{0j} = Y_{00} + u_{0j}$$

The combined equation for the unconditional model is:

$$Y_{ij} = Y_{00} + u_{0j} + \beta_{1j} + e_{ij}$$

After the ICC showed the proportion of variance at classroom level was statistically significantly different than 0 and was more than 10%, HLM was chosen for analysis and the model building process was conducted to find the best model for the data. A total of four HLM models were estimated to understand whether discourse knowledge predicts four types of writing outcomes (Narrative Length, Narrative Quality, Descriptive Length and Descriptive Quality). The overall guiding HLM two-level model could be broadly expressed as follows:

$$Y_{wrt_{ij}} = \beta_{0j} + \beta_1 (Age)_{ij} + \beta_2 (gender)_{ij} + \beta_3 (early\ literacy\ skills\ factor)_{ij} + \beta_4 (vocabulary\ skill\ factor)_{ij} + \beta_5 (Fall\ Production\ Procedures)_{ij} + \beta_6 (Fall\ Substance\ Processes)_{ij} + \beta_7 (Fall\ Story\ Elements)_{ij} + \beta_8 (Fall\ Motivation)_{ij} + \beta_9 (Fall\ Irrelevant)_{ij} + u_{0j} + e_{1j}$$

where i represents students $\{1, 2, \dots, n\}$ per classroom, j represents classrooms $\{1, 2, \dots\}$. In this equation, β_{0j} is the random intercept and β_{1j} is the random slope, or coefficient for classroom j . The error term associated with each student is indicated as e_{ij} and is assumed to be randomly distributed with a mean of 0 and variance σ^2 . The value of u_{0j} represents the random effect associated with classroom j , which is assumed to have a mean of 0 and variance of τ_{00} .

Simply put, the equation means the writing outcome for student i from class j is a function of many factors. It equals to the average writing score across classrooms, plus the function of that student's age, gender, early literacy

skills, vocabulary skills, and his/her level of discourse knowledge plus some error e specific to that students and error u specific to the classroom the student is in.

Research Question 2.b. Does change in students' discourse knowledge across a school year predict end-of-year writing performance in first grade?

This question investigated whether growth of discourse knowledge predicted end-of-year writing performance. The steps for analysis were the same with 2.a. First, the factor scores were obtained and included in the model as control variables. Age and gender were included as control variables. Second, all the five Knowledge Gain variables were calculated by subtracting the spring score from the fall score. After that, an ICC was calculated on the dependent variables, and HLM models were chosen for analysis. Four HLM models were run following the steps for RQ 2.a. The only difference was using the gain score for all the discourse variables for RQ 2.b. The rationale for using gain scores as the predictors in the models instead of using the spring knowledge variables as predictors with Fall Discourse Knowledge variables as covariates was that the research question focused on whether and how much the change in students' Discourse Knowledge was associated with their end-of-year writing outcomes.

Like previous analysis, all the four HLM models for Q2.b. also had only student-level variables but no teacher-level variables. The model building process was conducted to find the model that fit the data best. The following was the guiding equation for the four HLM two-level models for answering research question 2.b.:

$$Y_{wrtij} = \beta_{0j} + \beta_1(Age)_{ij} + \beta_2(gender)_{ij} + \beta_3(early\ literacy\ skills\ factor)_{ij} + \beta_4(vocabulary\ skill\ factor)_{ij} + \beta_5(Production\ Procedures\ Gain)_{ij} + \beta_6(Substantive\ Processes\ Gain)_{ij} + \beta_7(Story\ Elements\ Gain)_{ij} + \beta_8(Motivation\ Gain)_{ij} + \beta_9(Irrelevant\ Gain)_{ij} + u_{0j} + e_{1j}$$

where i represents students $\{1, 2, \dots, n\}$ per classroom, j represents classrooms $\{1, 2, \dots\}$. In this equation, β_{0j} is the random intercept and β_{1j} is the random slope, or coefficient for classroom j . The error term associated with each student is indicated as e_{ij} and is assumed to be randomly distributed with a mean of 0 and variance σ^2 . The value of u_{0j} represents the random effect associated with classroom j , which is assumed to have a mean of 0 and variance of τ_{00} .

Simply put, the equation means the writing outcome for student i from class j is a function of many factors. It equals the average writing score across classrooms, plus the function of that student's age, gender, early literacy skills, vocabulary skills, and his/her change of discourse knowledge (represented by the gain scores of the five knowledge variables) across a school year plus some error e specific to that students and error u specific to the classroom the student is in.

Data Screening of Observed Variables and Treatment of Missing

Data screening was conducted using SPSS after data for all the variables were entered. Univariate outliers were evaluated by examining the frequency distribution of Z scores. Scores with a Z score beyond ± 3.29 were identified as possible outliers as such a Z score represents a score more than three standard deviations above or below the mean (Field, 2009; Tabachnick & Fidell, 2013). Multivariate outliers were evaluated by examining the Mahalanobis distance statistics that was beyond critical value of $\chi^2(10) =$

29.59. All outliers with a p value less than .001 were examined (Field, 2009; Tabachnick & Fidell, 2013). In total, 10 outliers were found across all measured variables. These 10 scores had extremely high values. However, the cases with extreme scores were not deleted given that the scores could represent the population to be sampled, and the deletion of them did not help the normal distribution of the observed variables.

After all the variables were examined from data screening, a systematic and thorough check was conducted on all the variables for missing data. Cases that had missing data on all the fall knowledge variables or had missing scores on all spring measures were deleted from the analysis. In total, 16 cases had systematic missing data on these measures and were removed from the analysis. In addition, 11 cases were found having missing data for the control variables such as PPVT-4, EWOPVT-4 and WJ-III Word Attack subtest. The Missing Value Analysis (MVA) function of SPSS (v. 22) was applied to detect patterns of these missing data (Tabachnick & Fidell, 2013). Data were found to be missing at random (MAR), and all these missing data were imputed using multiple imputation. The multiple imputation method was chosen due to its advantage that it could be used for any form of General Linear Modeling (GLM) analysis (Tabachnick & Fidell, 2013). After the data screening process, data from 380 students were used for analysis.

Chapter 4

RESULTS

The goal of this dissertation was to examine students' understanding of Discourse Knowledge, its development across a school year, and the relation between Discourse Knowledge and writing outcomes in first grade. In this chapter descriptive statistics, checking normality assumptions, and results for each research question are presented.

Descriptive Statistics

Table 5 provides means and standard deviations for all the control, knowledge and writing measures. For the WJ-III standardized subtests, PPVT-4 and EWOPVT-4, standard scores were used for describing means and standard deviations to facilitate comparison across these measures. For the non-standardized tests (i.e. knowledge measures and narrative and descriptive writing measures), raw scores were reported. However, W scores from the WJ-III subtests were used for data analysis. The sample had high mean scores (about one standard deviation above the mean for norm groups) for all the three WJ-III subtests. This might be explained by the sampling weakness for the norm groups. Grenwelge (2009), in his review for WJ-III Test of Achievement, pointed out a notable weakness for the WJ-III battery of tests was the small sample sizes used to norm the test for each age group. It is also possible that students' high mean scores were a function of strong early literacy instruction.

Checking Normality Assumption

The normality of the variables was evaluated by examining the histograms and the skewness and kurtosis statistics (see Table 5). The control variables and two of the writing outcomes variables (i.e., Narrative Quality and Descriptive Quality) were normally distributed. However, the other two writing outcome variables (i.e., Narrative Length and Descriptive Length) and all fall knowledge variables except for Production Procedures had skewness and kurtosis indices greater than one, indicating that these variables may not be normally distributed. Other variables that had skewness and kurtosis indices greater than one were two of the knowledge gain variables (i.e., Substantive Processes Gain and Irrelevant Gain) and two narrative genre feature variables (i.e., Plot and Others). Several procedures were followed to address variables that violated the normality distribution (Field, 2009). As outliers tend to skew the distribution, common practices to deal with non-normality are to reduce the impact of the outliers by either removing the problem cases or transforming the data (Field, 2009). The first step taken was to examine the cases that were identified as outliers according to the univariate and multivariate outlier evaluation criteria mentioned above and then remove these cases. In total, 10 outliers were found and deleted from the database. However, the normality statistics were not improved.

Then the second step was taken by transforming these variables that had the skewness and kurtosis statistics greater than one (Tabachnick & Fidell, 2013). For the variables that had skewness less than one but kurtosis greater than one (Substantive Gains and Irrelevant Gain), the transformation was not conducted as data transformation was based on the skewness index. As these variables were all

positively skewed, a logarithm transformation was applied. All the variables improved in terms of the skewness and kurtosis statistics (ranged from $-.70$ to $.71$) (see Table 5 for the skewness and kurtosis indices after data transformation). However, the histogram showed that the transformed Discourse Knowledge variables were still positively skewed, which was likely due to a floor effect. The knowledge variables were measured by counting the occurrence of the number of idea units in students' interview responses. A value of 0 was recorded when no idea unit for a response type was given, and this was common in the data. The mode for most of the knowledge variables was zero making any type of transformation ineffective. After the transformation for the knowledge variables failed, another recommended procedure was to deal with the non-normality by replacing the extreme scores with a score that was the mean plus two standard deviations (Field, 2009). However, this procedure did not improve the normality statistics.

Another way to deal with non-normality is the bootstrap method that can be used for the correlations and t-tests. Bootstrapping is recommended as a general procedure for assessing the impact of non-normal data by estimating the properties of the sampling distribution from the sample data (Efron & Tibshirani, 1993; Field, 2009; Grim & Yarnold, 1995; Mooney, Duval, & Duval, 1993). The bootstrap method creates an empirical distribution for a sample statistic through repeated sampling with replacement from the original sample. Bootstrapping does not require the assumption that the standard error in the observed values be randomly and normally distributed in order for the classical statistical analysis to work effectively. When bootstrapping, random samples (of size equal to the original sample) are drawn, with replacement, from the obtained data. The standard error of the statistics is estimated from the

standard deviation of the sampling distribution created from the bootstrap samples. Confidence intervals and significance tests can be computed from the standard error. The procedure, after typically repeating 1000 times, produces a mean or median of the bootstrap sampling distribution as the best estimate of the population value. The upper and lower tails of the distribution are used for significance testing for establishing whether the null hypothesis value falls below or above the 2.5% or 97.5% values (Field, 2009; Efron & Tibshirani, 1993; Grim & Yarnold, 1995). If the original sample estimates fall within the confidence intervals created by the bootstrap distributions, the results of bootstrap procedure indicate that the chances of replication of the original sample results are high. Therefore, bootstrapping can provide a more reliable statistical estimate by using the empirical data rather than assuming a theoretical sampling distribution. In this study, bootstrapping was used for the correlation and *t*-test analyses.

Table 5 Means, Standard Deviations and Univariate Normality for All the Observed Variables ($N=380$)

Variable	Descriptive Statistics			Normality Statistics		Normality Statistics with Transformation	
	<i>M</i>	<i>SD</i>	<i>Min-Max</i>	<i>Skew-ness</i>	<i>Kurtosis</i>	<i>Skew-ness</i>	<i>Kurtosis</i>
<i>Control Variables</i>							
Handwriting	5.09	2.51	0-15	0.37	0.05		
WJ-III Spelling	106.47	13.72	65-147	0.38	0.01		
WJ-III Word Attack	110.41	9.57	74-134	-0.37	0.65		
WJ-III Letter-word Identification	111.28	13.37	67-153	.02	-0.02		
PPVT-4	102.13	13.63	58-141	-0.04	-0.14		
EWOPVT-4	98.37	14.12	55-137	0.07	-0.25		
<i>Knowledge Variables</i>							
Fall Production Procedures	2.98	2.49	0-12	0.96	0.63		
Fall Substantive Processes	1.32	1.55	0-11	1.82*	5.39*	0.13	-0.89
Fall Story Elements	1.02	1.47	0-7	1.26*	0.67	0.76	-1.07
Fall Motivation	0.48	0.82	0-5	2.01*	4.48*		0.23
Fall Irrelevant	1.06	1.42	0-8	1.79*	3.58*	1.20*	
Production Procedures	0.23	2.70	-8-11	0.17	1.09	0.65	-0.69
Gain							

Substantive Processes Gain	0.42	2.02	-10-12	0.20	5.19*	NA	NA
Story Elements Gain	0.51	1.95	-7-6	0.02	0.85		
Motivation Gain	0.13	1.08	-3-4	0.27	0.25		
Irrelevant Gain	-0.32	1.50	-8-4	-0.78	3.14*	NA	NA
<i>Genre Feature Variables</i>							
Narrative Genre Feature	4.07	1.90	0-11	0.84	0.48		
Total							
Setting	1.80	1.01	0-5	1.00	0.58		
Plot	2.21	1.35	0-8	1.19*	1.97*	0.03	-0.01
Others	0.06	0.24	0-2	4.47*	20.75*	4.17*	16.13*
Descriptive Genre Feature	6.38	2.25	0-15	-0.10	0.97		
Total							
Thesis Statement	.81	.65	0-2	0.22	-		
					0.72		
Detail Presentation	1.03	.50	0-2	0.06	1.02		
Detail Elaboration	1.28	.66	0-2	0.67	0.81		
Level of Description	2.34	1.49	0-8	0.72	0.53		
Character(s) Introduction	2.20	.65	0-3	-0.74	1.58		
<i>Writing measures</i>							
Narrative Quality	3.31	1.00	1-6	0.23	-0.35		
Descriptive Quality	3.25	0.86	1-5	-0.01	-0.40		
Narrative Length	34.70	25.11	2-147	1.44*	2.23*	-0.25	-0.21
Descriptive Length	35.39	24.89	4-170	1.61*	3.15*	-0.05	-0.21

Note: 1)* indicates there is a deviation from the normality assumption. 2) Handwriting= Handwriting Fluency test; PPVT-4= Picture Prompt Vocabulary Test-4th Edition; EOWPVT-4= Expressive One Word Picture Vocabulary Test-4th Edition.

Correlations among Observed Variables

The correlations among the control, Discourse Knowledge and writing outcomes (Quality, Length and Genre Feature for both narrative and descriptive writings) variables are presented in Table 6. The reported correlation coefficients were estimated after the bootstrap method was applied. Bootstrap results showed that all the coefficients obtained from the original sample fell within the confidence intervals created by the bootstrap distributions, indicating that these coefficient estimates from the original sample were reliable and replicable from the bootstrap distributions. To interpret the strength of the relationship between two variables, Cohen's (1988) conventions were used to report the correlations among all the observed variables (.10 as small, .30 as moderate and .50 as large). Correlation coefficients among all the control variables suggested that there were small to large positive correlations among control variables (coefficient r ranged from .25 to .83). Between handwriting, spelling and vocabulary skills, most correlations were between small and medium (coefficient r ranged from .25 to .45). Between reading and spelling skills, there were large positive correlations (coefficient r ranged from .75 to .83). The control variables were also positively related to the writing outcomes with small to moderate relationships (coefficient r ranged from .18 to .42).

In addition, both the fall Discourse Knowledge variables and their Gain variables shared little variance with each other and the magnitude of their relationship was small (coefficient r ranged from -.11 to .22). Except for fall Motivation variable, the fall Discourse Knowledge variables had small correlations with the Quality variables of both narrative and descriptive writing measures (coefficient r ranged from

-.11 to .22). However, their correlations with Length scores of both genres were close to zero. The Irrelevant Knowledge variable in the fall had a negative correlation with the other knowledge variables and the writing outcomes. Most Discourse Knowledge Gain variables were not correlated to the writing outcomes except for Substantive Processes Gain and Story Elements Gain. Substantive Processes Gain was positively correlated with the Narrative Quality and Length (with small coefficients of .11 and .14), but it was not correlated with descriptive writing. Story Elements Gain was found to only have a small positive relationship with Narrative Quality ($r=.10$). Regarding the Genre Features variables in both the narrative and descriptive genres, there were small to medium positive correlations with the control variables (coefficient r ranged from .19 to .32). The Genre Features variables also had medium to large relationships with the Quality and Length variables for both genres (coefficient r ranged from .30 to .61). The writing outcomes variables (Length and Quality in both narrative and descriptive writing) were significantly related to each other with medium-to-large correlations (coefficient r ranged from .34 to .75).

Table 6 Bivariate Correlations among Control Variables and Outcome Variables: Narrative and Descriptive ($N= 380$)

Note: 1) Fall Discourse Knowledge (DK) variables are: Fall-PP (Production Procedures); Fall -SP (Substantive Processes); Fall-M (Motivation); Fall-IR (Irrelevant information); Fall-SE (Story Elements); 2) Control variables are Handwriting Fluency (HW), WJ-III spelling subtest (Spelling), Picture Prompt Vocabulary Test (PPVT-4), Expressive One Word Picture Vocabulary Test (EOWPVT-4), WJ-III letter word ID subtest (WJLWID), WJ-III Word Attack subtest (WJWA); 2) Growth Discourse Knowledge variables: Gain score in Production Procedures (PP Gain); Gain score in Substantive Processes (PP Gain), Gain score in Motivation (M Gain), Gain score in Irrelevant (IR Gain); 3) Genre element variables are Narrative total genre feature score (N_GF) Descriptive total genre feature score (D_GF) 4) Outcome variables: Narrative Quality(N-Quality), Descriptive Quality (D-Quality, Narrative Length (N_Length), Descriptive Length (D_Length); 5) * $p < .05$; ** $p < .01$

Results for Research Question 1

Research Question 1.a: What do first-grade students understand about Discourse Knowledge at the beginning of the school year? To determine what first-grade students understand about writing in the fall of first grade, several types of data were used for analysis. First, the percentage of all the response types across questions was calculated. Second, the number of idea units for the fall five Discourse Knowledge variable was used for analysis. Table 7 presents the descriptive statistics (means and standard deviations) for the response types across questions 1-2, questions 3-5 and question 6 at two time points (fall and spring). The total means and standard deviations for the five Discourse Knowledge variables across all the six interview questions can be referred back to Table 5. For questions 1-5 that measured students' knowledge about good writing in general and writing processes, the response types were Environmental Structuring, Production Procedures, Substantive Processes, Seeking Assistance, Ability, Motivation, Others and Irrelevant. For interview Question 6 that asked about students' story knowledge, the response types were Story Elements, Organization, Creativity, Production Procedures, Ideation, Clarity, Vocabulary, Others and Irrelevant.

In the fall interview, the most common response types across the six questions were Production Procedures (31%), followed by Substantive Processes (14%), Irrelevant Knowledge (11%), Story Elements (10.6%), Others (10%), Seeking Assistance (7%) and Motivation (5%). The remaining response types each accounted for less than 2% of the total idea units produced in the interview. Overall, except for Others and Seeking Assistance, the major response types were the ones that describe Discourse Knowledge (Production Procedures, Substantive Processes, Story Elements,

Motivation and Irrelevant Knowledge). Although Others accounted for 10% of the total idea units, most responses in this response type category were theoretically unimportant answers such “take your time” “Be patient,” and no obvious pattern in these responses was found. Given that Others was not one of the variables of interest in this study, this response type was not used in the analysis. The response type Seeking Assistance included students’ answers such as “Ask your mom” or “Ask your teacher” without presenting specific strategies when asked about how to solve problems encountered during writing. Out of 380 students, only one student mentioned seeking assistance from online resources as a writing strategy when encountering writing problems.

Out of the five response types that describe Discourse Knowledge (Production Procedures, Substantive Processes, Story Elements, Motivation and Irrelevant), Production Procedures and Substantive Processes were the top two response types. Although Story Elements only accounted for about 11% of the total responses across all the six questions, its percentage was 45% of the total responses in Question 6 where Story Elements was measured. Irrelevant Knowledge responses were produced evenly across questions, accounting for 11% of the total responses. Motivation was the least mentioned response type that describes Discourse Knowledge.

The following section presents students’ responses in questions 1-2, questions 3-5 and question 6 respectively given that the interview was designed to measure discourse knowledge in three important aspects: knowledge of good writing in general (measured by questions 1-2), knowledge of writing processes (measured by questions 3-5) and genre knowledge in the story (measured by question 6).

Knowledge of good writing in general. Questions 1-2 assessed students' knowledge of the attributes of good writing and the challenges of writing. Across the two questions, students produced an average of 3.19 ideas. Five categories accounted for the majority of their responses: Production Procedures (48%), Irrelevant (10%), Substantive Processes (9%) and Motivation (8%) followed by Ability (6%).

First graders defined good writing primarily by referring to Production Procedures or the Substantive Processes but with much greater emphasis on Production Procedures. When students mentioned Production Procedures, handwriting (27%), spelling (20%) and punctuation and capitalization (26%) were common responses. When students talked about Substantive Processes, the majority of responses were information generation (24%), writing and drafting (15%) and others (44%). Common responses about production features classified as others included "write neat" "sound out words" "capitalization at the beginning of the sentence and period at the end." Common responses about substance included "think of good ideas" "think about what to write" and "write it down." In addition, Motivation and Ability were mentioned as attributes of good writers. Common responses for Motivation were "They tried hard and don't give up." "They keep practicing." Common responses for Ability was "They are just good writers."

Knowledge of writing processes. Questions 3-5 asked students about their procedural knowledge of writing. Across the three questions, students produced an average of 4.16 ideas. Three categories, Production Procedures (28%), Substantive Processes (25 %), and Seeking Assistance (14%) were the most common answers. Irrelevant accounted for 10% of the responses while Motivation accounted for 5% of

the responses. By contrast, Ability was rarely mentioned as important for the writing processes (less than 1%).

When students gave responses about Production Procedures, they mentioned punctuation and capitalization (35%), handwriting (21%) and spelling (15%). Common responses about production features included "period, question marks," "write neat," "sound out words". When students were asked about Substantive Processes, they mainly mentioned writing and drafting (28%) and information generation (22%). Common responses about substance included "thinking in general" "planning in general" "attention to task" write it down" "think about what to write" and "make a table".

Knowledge of story writing. Question 6 was designed to explore students' genre knowledge about story. In response to this question, students produced an average of 2.27 idea units. Story Elements (45%) was the most common response followed by Irrelevant Knowledge (12%), Organization (11%), Production Procedures (10.9%) and Ideas (10%). Vocabulary and Clarity were rarely mentioned (less than 2%).

Common responses about Story Elements included "beginning, middle and the end" and "characters, setting and plot". Common responses about Production Procedures included "period and capitalization". Responses related to Ideas described practices such as "listing characters" and "telling a story they know". Organization of a story included chronological responses like "first, second and last".

Table 7 Mean Number of Responses (and Standard Deviations) for Discourse Knowledge Interview by Category in the Fall and Spring ($N= 380$)

Category	Environmental Structuring		Production Procedures		Substantive Processes		Seeking Assistance		Motivation		Ability		Irrelevant			
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
Declarative knowledge of the characteristics of good writing: Questions 1-2	0.04 (0.21)	0.06 (0.28)	1.55 (1.46)	1.65 (1.32)	0.29 (0.65)	0.44 (0.88)	0.07 (0.26)	0.08 (0.29)	0.26 (0.56)	0.39 (0.68)	0.20 (0.46)	0.17 (0.41)	0.34 (0.67)		0.32 (0.61)	
Procedural knowledge of how to write: Questions 3-5	0.07 (0.30)	0.10 (0.31)	1.18 (1.29)	1.28 (1.22)	1.03 (1.21)	1.30 (1.40)	0.60 (0.50)	0.67 (0.53)	0.21 (0.44)	0.22 (0.47)	0.03 (0.22)	0.04 (0.20)	0.43 (0.83)		0.21 (0.54)	
Declarative knowledge of the characteristics of a story: Question 6	Story Elements		Organization		Creativity		Production Procedures		Ideation		Clarity		Vocabulary		Irrelevant	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
	1.02 (1.47)	1.52 (1.78)	0.26 (0.88)	0.27 (0.86)	0.02 (0.14)	0.11 (0.42)	0.25 (0.62)	0.29 (0.75)	0.23 (0.51)	0.20 (0.44)	0.01 (0.10)	0.03 (0.20)	0.02 (0.17)	0.01 (0.12)	0.28 (0.58)	0.21 (0.48)

Research Question 1.b: How does first-grade students' Discourse

Knowledge change across a school year? Several types of data were used to answer the question about first-graders' development of Discourse Knowledge across the school year. First, the fall and spring Discourse Knowledge variables were used to obtain the gain scores and to compare the magnitude to the gains across these five knowledge variables. A paired-sample *t*-test was used to examine if the knowledge variables had significant change from the spring to fall. Second, the percentages of all response types across six interview questions in the spring were calculated and compared to those in the fall. The mean number of response types for questions 1-2, questions 3-5 and question 6 in the spring are presented earlier in Table 7 with the fall response type statistics.

Overall, there was a slight increase in the number of average idea units across six questions of the interview from the fall ($M=9.62$) to spring ($M=10.58$). The gain scores for four of the Discourse Knowledge variables suggested a very small growth in students' writing knowledge. Production Procedures, Substantive Processes, Motivation and Story Elements had slight increases with a mean gain score ranging from 0.13 to 0.51. However, Irrelevant Knowledge decreased by 0.32 idea units from fall to spring.

Analysis of the proportion of response types showed that in both the fall and the spring, first-graders defined good writing and writing processes as either Production Procedures or Substantive Processes. In their responses, there was a greater emphasis on Production Procedures over Substantive Processes. The mean of idea units for Production Procedures across all questions is 2.98 for fall and 3.22 for spring, which accounted for about 31% and 30% of the total number of idea units

respectively. The overall means of the idea units for Substantive Processes was 1.32 for fall and 1.74 for spring, which accounted for 14% and 16% of the total number of idea units respectively. The percentage of Substantive Processes for these questions in fall and spring was lower compared to that of Production Procedures. Motivation had an average idea unit less than one in both fall (0.47) and spring (0.61). As in the fall, students in the spring mentioned Motivation more often when defining good writing than discussing writing processes. The averaged idea unit of Irrelevant response across the six questions decreased from 1.83 in the fall to 0.74 in the spring. The percentage of Irrelevant response decreased from 11% in the fall to 7% in the spring.

To understand whether there was a statistically significant change in students' Discourse Knowledge from fall to spring, paired-sampled *t*-tests were conducted to compare the spring scores to fall scores on the five Discourse Knowledge variables. Table 8 shows the results of the paired-sample *t* tests as well as the bootstrap *t*-tests results with 1000 replications. For all the five knowledge variables, the bootstrap results showed the mean gain scores for the original sample overlapped with the bootstrapped scores and fell within the computed bootstrapped confidential intervals. Therefore, the original estimates were not likely to be biased and thus reliable. Gain score means for the original sample were included in the table to reveal if the means from the original sample fell within the bootstrapped estimates of 95% confidence intervals.

Four of the knowledge variables, Substantive Processes, Story Elements, Motivation and Irrelevant, had significant differences in the fall and spring scores. For the Substantive Processes knowledge variable, there was a significant increase between the fall ($M= 1.32$; $SD= 1.55$) and spring scores ($M= 1.74$; $SD= 2.28$;) with a

small effect size ($t(379) = 4.04, p < .001; d = .18$, Cohen's, 1988). The t -test results for Story Elements showed a significant increase between the fall ($M = 1.02; SD = 1.47$) and the spring scores ($M = 1.52; SD = 1.78$), with a small effect size ($t(379) = 5.04, p < .001; d = .26$). For the Motivation knowledge variable, there was also a significant increase between the fall ($M = .48; SD = .82$) and the spring scores ($M = .61; SD = 1.15$;) with a small effect size ($t(379) = 2.37, p < .001; d = .11$). For the Irrelevant Knowledge variable, there was a significant decrease between ($M = 1.06; SD = 1.42$) and the spring scores ($M = .74; SD = 1.63$;) with a small effect size ($t(379) = -4.18, p < .001; d = .17$). However, no statistically significant differences were found between fall ($M = 2.98, SD = 2.49$) and spring scores ($M = 3.22; SD = 3.29$) of the Production Procedures for both the original sample estimate and for the bootstrap estimate ($t(379) = 1.69, p = .09$).

Table 8 Paired-Sample t -tests Comparing Discourse Knowledge from Fall to Spring with Bootstrap Estimates (1000 Replications; $N = 380$)

	Original Sample Estimate			Bootstrapped Estimate			
	Gain Score Mean	t	p	Bias	Stand Error	95% Confidence Intervals	p
Production Procedures	0.23	1.69	.09	-.002	.14	-.04, .50	.10
Substantive Processes	0.42	4.04	<.001	.002	.10	.22, .64	<.001
Story Elements	0.51	5.04	<.001	-.002	.10	.31, .69	<.001
Motivation	0.13	2.37	.02	.001	.06	.02, .24	.02
Irrelevant	-0.32	-4.18	<.001	.002	.08	-.48, -.17	<.001

RQ 1.c: What do students know about genre conventions in narrative and descriptive writing? To address the question about first-graders' knowledge of genre conventions in their writing, the total number and percentage of genre features identified in their descriptive and narrative texts were calculated. For narrative writing, the average genre feature score was 4.07 out of a possible of score of 20. On average, the written story contained just over 20% of the possible genre features contained in the narrative coding system. By comparison, the average genre feature score for descriptive writing was 6.39 out of a possible score of 19. Therefore, the written descriptions contained about 34% of the possible genre features contained in the descriptive coding system.

Table 9 presents the means, standard deviations and the percentage of written texts that contained each genre feature in the narrative coding system. Each feature was coded as well developed, partially developed, or absent. Examining the percentage of students who received credit for each element of the genre feature scores revealed some patterns. For narrative writing, most first-graders displayed well developed information of characters. However, more than two-thirds of the students did not present information on Time (77.5%) and Place (67%) when writing. In developing the Plot, most students included an External Event, but they provided limited information on features such as Direct Consequence and Characters' Reaction to the Consequence. Genre features like Initial Event and Internal Plan were also rarely used in most students' writing. First-graders tended to present the recounted events in chronological order, to provide some details, and to conclude with some evaluative comments on the event. However, there was little attention given to

presenting complications of the plot. In terms of Other features of narrative writing, students in this study rarely used dialogue or wrote a title for their stories.

Table 10 displays the means, standard deviations and the percentage of students whose written texts contained each genre feature in the descriptive coding system. Each descriptive feature was coded as well developed, partially developed, or absent. Students demonstrated well-developed knowledge of features such as Character Introduction, Detail Presentation and Detail Elaboration in descriptive writing. Nearly all students (91%) introduced the character with some level of specificity and used impersonal references. In addition, more than two-thirds of the students (67%) presented a thematic statement at the beginning of their descriptive text. Students also tended not to describe things with descriptive words or dialogue. Although half of the students used common, high frequency adjectives, a majority of students did not use adverbs, big words, descriptive words or dialogue in their description.

Table 9 Means and Standard Deviations of Rubric Scores for Narrative Genre Elements in Students' Written Narratives and the Percentages of Those Elements That Were Well Developed, Partially Developed and Absent ($N= 380$)

		M	SD	Percentage (%)		
				Absent	Partially developed	Well developed
Setting	Character	1.03	0.28	2.3	5.7	92
	Place	0.47	0.73	67	19	14
	Time	0.30	0.60	77.5	15	7.5
Plot	Initial Event	0.18	0.49	86	10	4
	Internal Plan	0.11	0.36	91	7.5	1.5
	External Event	1.28	0.56	6	60	34
	Direct	0.34	0.57	71	24	5
	Consequence					
	Characters' Reaction to consequence	0.28	0.53	75	20	4
Other		0.03	0.18	97	3	0
	Title Dialogue	0.02	0.14	97	3	0

Table 10 Means and Standard Deviations of Rubric Scores for Descriptive Genre Elements in Students' Written Descriptions and the Percentages of Those Elements That Were Well Developed, Partially Developed and Absent ($N= 380$)

		M	SD	Percentage (%)		
				Absent	Limited developed	Well developed
Thematic statement	Opening statement	0.80	0.66	33	53	14
Details	Details Presentation	1.02	0.50	11	75	14
Elaboration	Detail Elaboration	1.28	0.66	11	49	40
Level of Description	Dialogue	0.03	0.21	98	1	1
	Adjective used	0.79	0.70	36	48	16
	Richly descriptive words used	0.18	0.46	84	13	3
	Adverb used	0.03	0.16	97	3	0
	Big words attempted	0.04	0.21	96.3	3.4	0.3
Character Introduction	First mention of character(s)	2.18	0.65	2	6	91

Results for Research Question 2

Research Question 2: What is the relationship between students'

Discourse Knowledge and their end-of-year writing outcomes?

This section presents the results for research question 2 on the relationship of Discourse Knowledge to students' narrative and descriptive writing. To address the question, two steps were taken. First, an Exploratory Factor Analysis (EFA) was conducted on the writing-related control variables (PPVT-4, EWOPVT-4, Handwriting, WJ-III Spelling, WJ-III Letter-word Identification and WJ-III Word Attack) to reduce the data and extract common factors underlying the control variables. EFA was used because of the uncertainty surrounding the underlying structure of the control variables. Confirmatory Factor Analysis (CFA) might also have been used, but empirical work has indicated that CFA may be a less desirable technique for determining the number of factors measured by a data set (MacCallum, 1986; MacCallum, Roznowski & Nowrwitz, 1992). Second, HLM analysis was conducted to understand the role of Discourse Knowledge on the writing outcomes due to the variance attributed at the classroom level (>10%). In the HLM analysis, the modeling building process was presented followed by the results of final models for each of the sub-questions for RQ 2.

EFA Analysis

In order to reduce the number of writing-related control variables in the HLM analysis, an Exploratory Factor Analysis (EFA) was conducted on the six control variables using promax rotation for factor extraction. The Kiswer-Meyer-Olkin (KMO) tests showed that sampling was adequate for the analysis (KMO=0.78) (Field,

2009). Barlett's test of sphericity ($\chi^2(15) = 1434, p < .001$) indicated that correlations between these variables were sufficiently large for factor extraction method of Principle Component Analysis. The results showed that two components had eigenvalues over Kaiser's criterion of 1 and in combination explained 77.82% of the variance. The screen plot showed inflexions that would justify retaining two components (Tabachnick & Fidell, 2013). Table 11 presents the rotated pattern matrix for the two-factor solution. The two factors were interpreted according to the magnitude and meaning of their salient pattern coefficients. All coefficients greater than 0.71 were considered strong and satisfied Comrey and Lee's (1992) standard for 'excellent' loadings. The first factor was characterized by variables that measured early reading and writing skills. Assessments that loaded on the first factor included WJ-III Letter-Word Identification, WJ-III Word Attack, WJ-III Spelling and Handwriting. Consequently, the first factor was named *Early Literacy Skills*, and this factor aligned with the theoretical and empirical importance of transcriptional and decoding skills for early literacy development (Berninger & Winn, 2006; Graham, 2007; McCutchen, 2006). The second factor was characterized by strong loadings on measures of oral language (PPVT-4 and EOWPVT-4). As a result, the factor was named *Vocabulary Skills*, and this factor also aligned with theoretical importance and empirical findings of oral vocabulary skills for early literacy development (Berninger & Winn, 2006; Graham, 2007; McCutchen, 2006).

Table 11 Exploratory Factor Analysis for Fall Control Variables

	Rotated Factor Loadings		Communality
	Factor 1: Early Literacy Skills	Factor 2: Vocabulary Skills	
PPVT-4		.96	.90
EOWPVT-4		.92	.89
Handwriting	.62		.38
Spelling	.93		.84
Letter-word ID	.93		.87
Word Attack	.87		.80
Eigenvalue	3.54	1.14	
% of Total Variance	58.82	18.99	
Total Variance		77.82	
Correlation between two factors	.46		

Note: $N=380$. Factor loading over .40 are reported; Rotation method: Promax with Kaiser normalization; Factor extraction method: Method of principle components.

Modeling Building Process

This section describes the iterative process of fitting HLM models for each part of the second research question. In order to analyze the role of Discourse Knowledge in students' writing outcomes, models were tested using HLM 7.0. For each sub-question of Research Question 2, four final models were built to predict each of the writing outcomes- Narrative Quality, Descriptive Quality, Narrative Length and Descriptive Length. Before each of the final models was built, three different models were run and compared for each writing outcome in the model building process: unconditional model, conditional model with level-1 control variables and random intercept, conditional full model with all variables and random intercept. During the

model fitting process, the variables were entered in a consistent order for all the writing measures. To avoid redundancy in reporting, the model building processes for all the sub-questions were described together. However, the models were built and fitted separately during data analysis.

Model 1: Unconditional model. The first step in the model building process was to determine the amount of the total variation in students' writing outcomes accounted for at each of the two levels (i.e., student and classrooms). Unconditional models (empty models) were tested for each writing outcome in each sub-question. The unconditional models for all the writing outcomes showed level-2 ICCs ranging from 5.4% to 22.3% (10.3% for Narrative Quality, 5.4% for Descriptive Quality, 22.3% for Narrative Length, and 14.2% for Descriptive Length). Except for Descriptive Quality, these percentages showed that there was a sufficient variance in the outcome attributable to the classroom level (>10%). Therefore, the analyses for all the writing outcomes justified the use of HLM instead of multiple regression analysis (Field, 2009; Raudenbush & Bryk, 2002).

Model 2: Conditional model with Level-1 control variables and random intercept. The model with the control variables at level-1 without random slopes was tested next. This model was tested to determine whether the control variables (Age, Gender, Early Literacy Skills and Vocabulary Skills) accounted for a significant amount of the total variation in students' writing outcomes as suggested by early research (Berninger & Abbott, 2010; Coker, 2006; Duin & Graves, 1986; Kim et al., 2014). In this model, all the four control variables were used as Level 1 predictors of writing outcomes, and there were no classroom-related predictors. Error variances of the level-1 predictors were determined to be not significant (i.e. the slopes did not vary

across classrooms), and thus were treated as fixed here (i.e. constrained to zero) rather than random across schools (i.e., at level 2).

Model 3 Conditional full model with all Level-1 variables and random intercept. The third model included all the five knowledge variables (either fall Discourse Knowledge variables or Discourse Knowledge Gain variables) as level-1 predictors, in addition to the predictors that were tested in model 2. Error variances of the level-1 predictors were determined to be not significant, and thus were treated as fixed here (i.e. constrained to zero) rather than random across schools (i.e., at level 2).

In the models presented above, model fit was evaluated by the likelihood-ratio test, which compared the deviance statistics between models. In general, the larger the deviance, the poorer the fit to the data. If the deviance difference between two models was at least twice as large as the number of estimated parameters and there was large value of the chi-square statistic, it was taken as evidence that there was significant difference between two models (Snijders & Bosker, 2012). During the model building process, fixed effects and random effect were fitted for Model 2 and Model 3. However deviance tests showed that models without level-1 random slope fit the data better. Models were also compared based on the proportion reduction in variance at both levels. The decrease of the variance component at both levels compared to the previous model indicated the new model explain the variation in writing outcomes better than the previous model.

For all the three models tested, variables were entered into the models using grand mean centering. Although there are two centering methods in HLM— group mean centering and grand mean centering—grand mean centering was used mainly because 1) there were no level-2 predictors for level-1 variables to be grouped. 2)

grand mean centering is normally used unless there is a clear theory (or empirical rationale) supporting the priority of individuals' relative group standings in relation to the dependent variable, in which case group mean centering is preferred (Snijders & Bosker, 2012).

Checking Model Assumptions

HLM assumptions, including linear relationships between each predictor and the outcome variables, normality, and homogeneity of variance were checked, and the results indicated that the assumptions were met.

First, to evaluate whether the predictors had a linear relationship with the writing outcomes, the writing outcomes were plotted against all level-1 predictors in the regression models. These plots suggested that a linear model seemed reasonable. The plots of the continuous variables (five knowledge variables and two factor scores) also suggested that a linear model was an appropriate choice for the model. For the dichotomous Gender variable, a linear model is thought to be appropriate (Singer & Willett, 2003). The level-2 linear relationship was not evaluated, as there was no predictor at level 2. Second, the normality assumption was evaluated by plotting level-1 and level 2 residuals using the normal probability plots. All plots showed normal residual distributions. Last, the assumption of homoscedasticity was examined by looking at the plots of level-1 residuals against the group of level-1 predictors. The plots revealed that the variance in the residuals was relatively equivalent and indicated that the assumption of homoscedasticity was satisfied. Meeting the HLM assumptions ensured the conclusions were reliably drawn based on the results of the analyses (Snijders & Bosker, 2012).

HLM Results for Research Question 2

This section presents the HLM results for two sub-questions of Research Question 2. Tables 12- 20 present the model building processes and statistics for each of the model. Based on a comparison of fit statistics and the significance levels of predictors, Model 3 in these Tables were chosen as the final model and results reported here were based on the statistics for these final models.

Research Question 2.a: Does students' fall Discourse Knowledge predict end-of-year writing outcomes in first grade? To address the question about the relationship between the fall Discourse Knowledge variables and writing outcomes, four models are presented. These four models include the control variables (Age, Gender, Early Literacy Skills, Vocabulary Skills) and the five fall Discourse Knowledge variables. These final models included a random intercept but no random slopes. The results of the final models using Narrative and Descriptive Quality as writing outcomes are presented first, followed by the models using Narrative and Descriptive Length as writing outcomes.

Final model predicting Narrative Quality. The models that included the fall Discourse Knowledge variables to predict Narrative Quality estimated the average Narrative Quality score to be 3.28 points at the end of first grade (Table 12). Among the control variables, Gender and Early Literacy Skills were significantly, positively related to students' Narrative Quality. The coefficient indicated that girls were estimated to score 0.29 points higher on Narrative Quality than boys. Students whose Early Literacy Skills score was a unit higher were estimated to score 0.40 points higher on Narrative Quality. However, Age and Vocabulary Skills were not significant predictors.

For the fall knowledge variables, the five Discourse Knowledge variables (i.e. Production Procedures, Substantive Processes, Motivation, Story Elements and Irrelevant) were not significant predictors of Narrative Quality.

Final model predicting Descriptive Quality. The models that used the fall Discourse Knowledge variables to predict Descriptive Quality estimated that the average Descriptive Quality score was 3.25 points at the end of first grade (Table 13). The control variables Gender and Early Literacy Skills were significant predictors of Descriptive Quality. Girls were estimated to score 0.43 points higher on descriptive writing quality than boys. Early Literacy Skills were positively associated with students' Descriptive Quality. Every one-unit increase in Early Literacy Skills was associated with respectively 0.36 point change in Descriptive Quality. However, control variables Age and Vocabulary Skills were not significant predictors.

In this model Production Procedures was found to be a significant predictor of Descriptive Quality. A one-unit, increase in knowledge of Production Procedures was associated with 0.05 points change in Descriptive Quality. The remaining fall Discourse Knowledge variables (i.e., Substantive Processes, Motivation, Story Elements and Irrelevant) were not significant predictors of Descriptive Quality.

Table 12 Multilevel Regression Estimates and Model Comparisons across Three Models Predicting Narrative Quality with Fall Discourse Knowledge Variables ($N= 380$)

Variables	Model 1		Model 2		Model 3	
	Estimate	SE	Estimate	SE	Estimate	SE
Fix effects						
Principle Intercept						
(β_{0j})						
Intercept (y_{00})	3.28***	.07	3.28***	.06	3.28***	.06
Age			-.001	.01	.001	.01
Gender			.33***	.09	.29**	.09
Early Literacy Skills			.42***	.05	.40***	.05
Vocabulary Skills			.13*	.05	.08	.05
Fall Production Procedures					.03	.02
Fall Substantive Processes					.05	.03
Fall Story Elements					.01	.03
Fall Motivation					-.07	.06
Fall Irrelevant					-.04	.03
Variance Component						
Level 1 (student)	.93	.97	.68	.82	.67	.82
Level 2 (classroom)	.09***	.30	.10***	.31	.10***	.32
Proportion of variance accounted for with added variables	NA		26.9%		1.4%	
Model Deviance	1102.06		988.56		1007.04	
Number of Parameter Estimated	2		2		2	
Degrees of freedom	87.61		102.15		106.41	
Chi Square (degrees of freedom)	(49)		(49)		(49)	

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

Note: Model 1=Unconditional Model; Model 2= Conditional model with Control Variables; Model 3= Final Full Model.

Table 13 Multilevel Regression Estimates and Model Comparisons across Three Models Predicting Descriptive Quality with Fall Discourse Knowledge Variables ($N= 380$)

Variables	Model 1		Model 2		Model 3	
	Estimate	SE	Estimate	SE	Estimate	SE
Fix effects						
Principle Intercept						
(β_{0j})						
Intercept (y_{00})	3.25***	.05	3.25***	.05	3.25***	.05
Age			-.01	.01	-.01	.01
Gender			.37***	.04	.43***	.07
Early Literacy Skills			.35***	.04	.36***	.04
Vocabulary Skills			.12**	.04	.08	.05
Fall-Production					.05**	.02
Procedures						
Fall-Substantive					.01	.03
Processes						
Fall-Story Elements					.02	.03
Fall -Motivation					.05	.05
Fall -Irrelevant					.02	.03
Variance Component						
Level 1 (student)	.71	.84	.49	.70	.48	.69
Level 2 (classroom)	.04*	.20	.04**	.20	.04**	.21
Proportion of variance accounted with added variables	NA		31%		2%	
Model Deviance	985.24		852.29		870.39	
Number of Parameter Estimated	2		2		2	
Chi Square (degrees of freedom)	69.94 (49)		79.16 (49)		79.88 (49)	
* $p < .05$. ** $p < .01$. *** $P < .001$						

Note: Model 1=Unconditional Model; Model 2= Conditional model with Control Variables; Model 3= Final Full Model.

Final model predicting Narrative Length. The models that used fall Discourse Knowledge variables to predict Narrative Length estimated that the average Narrative Length score was 33.47 words at the end of first grade (Table 14). The control variables Gender and Early Literacy Skills were significant predictors of Narrative Length. Girls were estimated to write 7.66 more words in the narrative task than boys. Similarly, a one-unit increase in Early Literacy Skills was associated with 6.13 more words in the narrative task. The other control variables, Age and Vocabulary Skills, were not significant predictors. None of the fall Discourse Knowledge variables were significant predictors of Narrative Length.

Final model predicting Descriptive Length. The models that used fall Discourse Knowledge variables to predict Descriptive Length estimated that the average Descriptive Length score was 35.70 words at the end of first grade (Table 15). Gender and Early Literacy Skills were significant predictors. Girls were estimated to write 11.94 more words on descriptive writing than boys. Early Literacy Skills was positively associated with students' descriptive length scores. It was estimated that a one-unit increase in Early Literacy Skills was associated with writing 6.06 more words in descriptive writing task. Age and Vocabulary Skills were not significant predictors in the model. Of the Discourse Knowledge variables, fall Production Procedures and Motivation were significant predictors of Descriptive Length. A one-unit higher score in Production Procedures was associated with an increase of 1.16 words in Descriptive Length. A one-unit higher score in Motivation was associated with an increase of 3.55 words in Descriptive Length. The other Discourse Knowledge variables- Substantive Processes, Story Elements, Irrelevant- were not significant predictors of Descriptive Length.

Table 14 Multilevel Regression Estimates and Model Comparisons across Three Models Predicting Narrative Length with Fall Discourse Knowledge Variables ($N= 380$)

Variables	Model 1		Model 2		Model 3	
	Estimate	SE	Estimate	SE	Estimate	SE
Fix effects						
Principle Intercept						
(β_{0j})						
Intercept (y_{00})	33.76***	1.95	33.48***	1.83	33.47***	1.84
Age			.13	.26	-.12	.26
Gender			7.66***	2.21	7.66***	2.25
Early Literacy Skills			6.17***	1.27	6.13***	1.30
Vocabulary Skills			2.52*	1.29	2.36	1.41
Fall Production Procedures					.35	.48
Fall Substantive Processes					-.06	.79
Fall Story Elements					.003	.82
Fall Motivation					-.07	1.43
Fall Irrelevant					.15	.87
Variance Component						
Level 1 (student)	499.28	22.34	427.73	20.68	432.57	20.80
Level 2 (classroom)	123.24***	11.10	108.69***	10.43	110.69***	10.52
Proportion of variance accounted with added variables	NA		14.3%		1.1%	
Model Deviance	3551.48		3434.97		3429.06	
Number of Parameter Estimated	2		2		2	
Chi Square (degrees of freedom)	147.72 (49)		148.03 (49)		147.71 (49)	

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

Note: Model 1=Unconditional Model; Model 2= Conditional model with Control Variables; Model 3= Final Full Model.

Table 15 Multilevel Regression Estimates and Model Comparisons across Three Models Predicting Descriptive Length with Fall Discourse Knowledge Variables ($N= 380$)

Variables	Model 1		Model 2		Model 3	
	Estimate	SE	Estimate	SE	Estimate	SE
Fix effects						
Principle Intercept						
(β_{0j})						
Intercept (γ_{00})	35.86***	1.86	35.66***	1.81	35.70***	1.82
Age			.13	.28	.09	.28
Gender			11.21***	2.36	11.94***	2.38
Early Literacy Skills			6.00***	1.35	6.06***	1.37
Vocabulary Skills			-.50	1.38	-.81	1.48
Fall Production					1.16*	.50
Procedures						
Fall Substantive					-.06	.83
Processes						
Fall Story Elements					-.66	.86
Fall Motivation					3.55*	1.51
Fall Irrelevant					.94	.92
Variance Component						
Level 1 (student)	559.55	23.65	493.87	22.22	484.18	22.00
Level 2 (classroom)	99.41***	9.97	97.72***	9.89	99.84***	9.99
Proportion of variance accounted with added variables	NA		11.7%		2%	
Model Deviance	3585.62		3481.56		3464.43	
Number of Parameter Estimated	2		2		2	
Chi Square (degrees of freedom)	115.45 (49)		120.60 (49)		122.68 (49)	
* $p < .05$. ** $p < .01$. *** $p < .001$						

Note: Model 1=Unconditional Model; Model 2= Conditional model with Control Variables; Model 3= Final Full Model.

RQ 2b. Does change in students' Discourse Knowledge across a school year predict end-of-year writing performance in first grade? To address the question examining the relationship between Discourse Knowledge Gain variables and writing outcomes, the results of four final models were presented. These four models included control variables (Age, Gender, Early Literacy Skills, Vocabulary Skills) and five Discourse Knowledge Gain variables. These models included the random intercept but no random slopes. The results of the final models predicting Narrative and Descriptive Quality are presented first, followed by the models predicting Narrative and Descriptive Length.

Final model predicting Narrative Quality. The model that predicted Narrative Quality using gain scores in Discourse Knowledge estimated that the average Narrative Quality score was 3.28 points at the end of first grade (Table 16). Gender, Early Literacy Skills, and Vocabulary Skills were significant predictors of Narrative Quality. Girls were estimated to score 0.34 points higher than boys in Narrative Quality. A one-unit increase in students' Early Literacy Skills was associated with a 0.42 point increase in Narrative Quality. A one-unit increase in students' Vocabulary Skills was associated with 0.12 point increase in Narrative Quality.

Only one Discourse Knowledge Gain variable (i.e., Story Elements Gain) predicted students' Narrative Quality. For example, a one-unit higher Story Elements Gain score was associated with a 0.05 point increase in Narrative Quality. However, gains in Production Procedures, Substantive Processes, Motivation and Irrelevant were not significant predictors for end-of-year Narrative Quality.

Table 16 Multilevel Regression Estimates and Model Comparisons across Three Models of Discourse Predicting Narrative Quality with Discourse Knowledge Gain Variables ($N= 380$)

Variables	Model 1		Model 2		Model 3	
	Estimate	SE	Estimate	SE	Estimate	SE
Fix effects						
Principle Intercept						
(β_{0j})						
Intercept (γ_{00})	3.28***	.07	3.28***	.06	3.28***	.06
Age			-.001	.01	<.001	.01
Gender			.33***	.09	.34***	.09
Early Literacy Skills			.42***	.05	.42***	.05
Vocabulary Skills			.13*	.05	.12*	.05
Production Procedures					.01	.01
Gain						
Substantive Processes					.02	.02
Gain						
Story Elements Gain					.05*	.02
Motivation Gain					.02	.04
Irrelevant Gain					.02	.03
Variance Component						
Level 1 (student)	.93	.91	.68	.82	.68	.82
Level 2 (classroom)	.09***	.33	.10***	.31	.09***	.30
Proportion of variance accounted for with added variables	NA		26.9%		0%	
Model Deviance	1102.06		988.56		1010.62	
Number of Parameter Estimated	2		2		2	
Degrees of freedom	87.61		102.15		96.37	
Chi Square (degrees of freedom)	(49)		(49)		(49)	

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

Note: Model 1=Unconditional Model; Model 2= Conditional model with Control Variables; Model 3= Final Full Model.

Final model predicting Descriptive Quality. The models that predicted Descriptive Quality and included the Discourse Knowledge Gain variables estimated that the Descriptive Quality score was 3.25 points at the end of first grade (Table 17). All control variables except for Age were associated with the Descriptive Quality. Girls were found to perform 0.44 point higher than boys in their Descriptive Quality. Students' Early Literacy Skills was a significant predictor where a unit increase in students' Early Literacy Skills was associated to 0.37 points increase in Descriptive Quality. Vocabulary Skills was also a significant predictor for Descriptive Quality, indicating that a one-unit increase in Vocabulary Skills was associated with 0.13 points high score in Descriptive Quality. None of the Discourse Knowledge Gain variables were significant predictors of students' Descriptive Quality.

Final model predicting Narrative Length. The models that predicted narrative length and included the gain scores in Discourse Knowledge estimated that students wrote 33.54 words at the end of first grade (Table 18). The control variables Gender and Early Literacy Skills were significant predictors. Girls were estimated to write 7.79 words more than boys. A one-unit higher score in Students' Early Literacy Skills was associated with 6.07 more words in narrative length. However, Vocabulary Skills just missed the conventional 0.05 significance level marginally ($\gamma = 2.46, p = .06$). Age was not a significant predictor of Narrative Length. None of the Discourse Knowledge Gain variables predicted students' Narrative Length. However, Story Elements Gain just missed the conventional .05 significance level marginally ($\gamma = 1.09, p = .06$).

Final model predicting Descriptive Length. The final models that predicted Descriptive Length using the Discourse Knowledge Gain variables estimated that first-grade students wrote 36.65 words (Table 19). The control variables Gender and Early

Literacy Skills were positively associated with the Descriptive Length. Girls were estimated to write 11.41 more words than boys, and a one-unit higher score in Students' Early Literacy Skills was associated with 5.90 more words in descriptive writing. Neither the control variables Age and Vocabulary Skills nor the Discourse Knowledge Gain variables were significant predictors.

Table 17 Multilevel Regression Estimates and Model Comparisons across Three Models Predicting Descriptive Quality with Discourse Knowledge Gains ($N= 380$)

Variables	Model 1		Model 2		Model 3	
	Estimate	SE	Estimate	SE	Estimate	SE
Fix effects						
Principle Intercept						
(β_{0j})						
Intercept (y_{00})	3.25***	.05	3.25***	.05	3.25***	.05
Age			-.01	.01	-.01	.01
Gender			.37***	.04	.44***	.07
Early Literacy Skills			.35***	.04	.37***	.04
Vocabulary Skills			.12**	.04	.13**	.04
Production Procedures					.002	.01
Gain						
Substantive Processes					-.01	.02
Gain						
Story Elements Gain					.004	.02
Motivation Gain					-.01	.03
Irrelevant Gain					-.03	.02
Variance Component						
Level 1 (student)	.71	.84	.49	.70	.49	.70
Level 2 (classroom)	.04*	.20	.04**	.20	.04**	.19
Proportion of variance accounted	NA		31%		0%	
Model Deviance	985.24		852.29		881.76	
Number of Parameter Estimated	2		2		2	
Chi Square (degrees of freedom)	69.94 (49)		79.16 (49)		74.63 (49)	

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

Note: Model 1=Unconditional Model; Model 2= Conditional model with Control Variables; Model 3= Final Full Model.

Table 18 Multilevel Regression Estimates and Model Comparisons across Three Models Predicting Narrative Length with Discourse Knowledge Gain Variables ($N= 380$)

Variables	Model 1		Model 2		Model 3	
	Estimate	SE	Estimate	SE	Estimate	SE
Fix effects						
Principle Intercept (β_{0j})					A	
Intercept (y_{00})	33.76***	1.95	33.48	1.83	33.54***	1.78
Age			-.13	.26	-.09	.26
Gender			7.66***	2.21	7.79***	2.21
Early Literacy Skills			6.17***	1.27	6.07***	1.27
Vocabulary Skills			2.52*	1.29	2.46	1.31
Production					.72	.42
Procedures Gain						
Substantive					.85	.57
Processes Gain						
Story Elements Gain					1.09	.58
Motivation Gain					.16	1.04
Irrelevant Gain					-.04	.75
Variance						
Component						
Level 1 (student)	499.28	22.34	427.73	20.68	426.78	20.66
Level 2 (classroom)	123.24***	11.10	108.69***	10.43	100.28***	10.01
Proportion of variance accounted with added variables	NA		14.3%		<1%	
Model Deviance	3551.48		3434.97		3423.82	
Number of Parameter Estimated	2		2		2	
Chi Square (degrees of freedom)	147.72 (49)		148.03 (49)		138.86 (49)	
* p< .05. ** p<.01. *** P<.001						

Note: Model 1=Unconditional Model; Model 2= Conditional model with Control Variables;
Model 3= Final Full Model.

Table 19 Multilevel Regression Estimates and Model Comparisons across Three Models Predicting Descriptive Length with Discourse Knowledge Gain Variables ($N= 380$)

Variables	Model 1		Model 2		Model 3	
	Estimate	SE	Estimate	SE	Estimate	SE
Fix effects						
Principle Intercept						
(β_{0j})						
Intercept (y_{00})	35.86***	1.86	35.66***	1.81	36.65***	1.83
Age			.13	.28	.10	.28
Gender			11.21***	2.36	11.41***	2.37
Early Literacy Skills			6.00***	1.35	5.90***	1.36
Vocabulary Skills			-.50	1.38	-.58	1.40
Production					-.03	.45
Procedures Gain						
Substantive Processes					-.13	.61
Gain						
Story Elements Gain					.74	.62
Motivation Gain					-1.42	1.12
Irrelevant Gain					-.01	.81
Variance Component						
Level 1 (student)	559.55	23.65	493.87	22.22	495.64	22.26
Level 2 (classroom)	99.41***	9.97	97.72***	9.89	99.97***	10.00
Proportion of variance accounted with added variables	NA		11.7%		<1%	
Model Deviance	3585.62		3481.56		3474.90	
Number of Parameter Estimated	2		2		2	
Chi Square (degrees of freedom)	115.45 (49)		120.60 (49)		121.10 (49)	

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

Note: Model 1=Unconditional Model; Model 2= Conditional model with Control Variables; Model 3= Final Full Model.

Summary of Significant Results

For the first question addressing the general understanding of first-graders' Discourse Knowledge, results showed that first-graders at the beginning of the school year conceptualized writing in terms of Production Procedures and Substantive Processes with more emphasis on Production Procedures. Across the school year, students slightly increased the number of idea units in Production Procedures, Substantive Processes, Story Elements and Motivation. However, students' responses about Irrelevant knowledge about writing decreased across the school year. Paired-sample *t*-test showed students' knowledge of Substantive Processes, Story Elements, Motivation and Irrelevant had significant changes from fall to spring. However, there were only small effect sizes for these fall-to-spring changes. From their narrative writing tasks, students used well-developed Characters and External Events, but their stories contained fewer problem and solution elements. When writing descriptions, first-graders displayed well-developed knowledge of how to introduce characters with some level of specificity and of using impersonal references. Students tended to write descriptions that contained a thesis statement followed by details that were coherent. However, most students did not display use of richly expressive adjectives, adverbs or dialogues for description.

For the second research question investigating the relationship between Discourse Knowledge and writing outcomes, Gender and Early Literacy Skills were consistent and significant predictors across all models. Girls were found write better than boys. Vocabulary Skills was also a significant predictor for Narrative and Descriptive Quality only when modeling the relationship between writing outcomes with the Knowledge Gain variables. Second, of the Discourse Knowledge variables, Production Procedures was important predictor for only descriptive writing outcomes.

Motivation was found a significant predictor for Descriptive Length. For Discourse Knowledge Gain variables, Story Elements Gain was associated with Narrative Quality.

Chapter 5

DISCUSSION

Overview of the Study

The notion that writing is complex in nature and that writing skills take long time to develop is widely accepted. Decades of writing research have cast light on the important contributors to writing development (Graham, 2006; McCutchen, 2006). In his review of writing research, Graham (2006) pointed out that skill, knowledge, strategy and motivation shape writing development. Regarding the role of knowledge, a widely held assumption is that individual differences in knowledge are related to the writing performance (Graham, 2006; Saddler & Graham, 2007). However, there is limited research on the role of knowledge in writing. The scarcity of this line of research is particularly obvious for young writers. This study examined first-graders' discourse knowledge, which was defined by aspects of knowledge students acquired in school, including knowledge about good writing in general, composing processes, genres expectations, and application of these aspects of knowledge when approaching various writing tasks.

To examine students' discourse knowledge, an interview was used to measure students' understanding of good writing in general, writing processes and genre expectations. In addition, knowledge of genre conventions was assessed by looking at students' narrative and descriptive writing samples. To understand the relationship between discourse knowledge and writing, HLM analyses were conducted to examine the predictive role of five aspects of discourse knowledge in writing after controlling

for important writing-related factors (i.e. Vocabulary Skills, Early Literacy Skills, Age and Gender). Based on the findings of past research, hypotheses for the study were made as follows: 1) First-graders had emerging discourse knowledge with more emphasis on writing form than substance. 2) Discourse knowledge developed very slowly across a school year. 3) Discourse knowledge was a predictor of writing outcomes. Given the thin empirical evidence on young writers' writing knowledge, this study holds theoretical and practical value for writing researchers and classroom teachers.

This chapter discusses the results for each of the two overarching research questions and addresses the limitation of the study. It concludes with directions for future researchers and implications for classroom teachers.

Discussion for Research Question 1

RQ1: What do first-graders know about discourse knowledge?

Form over Substance

Results of this study showed that among the five response types that describe Discourse Knowledge (Production Procedures, Substantive Processes, Story Elements, Motivation and Irrelevant), first-graders at the beginning of the school year and across the school year both defined good writing and the writing processes in terms of Production Procedures and Substantive Processes. However, Production Procedures was the more common response in the interview. Production Procedures is an indicator of surface-level, mechanic aspects of writing (i.e. handwriting, spelling, punctuation and capitalization) while Substantive Processes indicates substantive aspect of writing such as organization, idea, and writing processes (Graham et al.,

1993). The results suggested that first-graders in the study put greater emphasis on form over substance throughout first grade.

The finding that first-graders in this study emphasized form over content was supported by a range of empirical studies. Earlier studies reported that school-aged children emphasized superficial aspects of writing over substantive aspects of composition (Graham et al., 1993; Lin et al., 2007; Schoonen & de Glopper, 1996; Wray, 1993). In Wray (1993)'s study that examined 7-11 year-olds' knowledge of writing, younger children were more likely to describe mechanical skills (handwriting, spelling) and less likely to be able to describe compositional skills (idea generation, organization). Other researchers have also provided evidence that the emphasis on mechanical aspects of writing continued to middle school students (Schoonen & de Glopper, 1996). In Schoonen & de Glopper's study (1996) on three groups of 9th-grade students (high, intermediate and low), students in the low group described writing primarily in terms of surface features. There is also research evidence showing that limited transcriptional skills put constraints on the written expression for young writers. For example, transcription skills predicted the length and quality among elementary students (Graham, Berninger, Abbott, & Whitaker, 1997; King & Rentel, 1981). However, transcription skills explained more variance in the writing outcomes of younger students (Graham et al., 1997; Juel, Griffith, & Gough, 1986). These studies implied that for beginning writers, transcription skills constitute key skills for early writing development. The difficulty that many first graders face getting words on the page could explain why students emphasized form over substance in this study.

In addition to the empirical support for the importance of transcription skill to elementary students, there is also research evidence indicating the heavy focus of

writing instruction on skills and mechanics in elementary classrooms (Coker, Farley-Ripple, Jackson, Wen, MacArthur, & Jennings, 2016; Cutler and Graham, 2008; Graham et al., 2003). Survey research on primary writing instruction showed that primary-grade teachers devoted considerable instructional time to grammar and lower-level skill instruction (Cutler and Graham, 2008) and composing received less attention than lower-level skills (Graham et al., 2003). These findings were further supported by a recent observational study across 50 first-grade classrooms. The study showed that lower-level skill instruction was the most frequent focus of writing instruction (Coker et al., 2016). Therefore, the heavy instructional focus on the mechanical skills of writing might be another explanation for the findings of this study that first-graders' emphasized form over substance.

A possible theoretical explanation for younger writers' emphasis of form over substance is Berninger and Winn's Not-So-Simple View of Writing (2006). This theoretical model of early written expression explains why young writers tend to be focused on the production demands of writing. This focus is likely attributed to the challenges associated with transcription, which is common for young writers (Berninger & Atmann, 2003; Berninger & Winn, 2006; McCutchen, 2006). In the Not-So-Simple View of Writing (2006), three important domains (transcription, executive function, text generation) occur in an environment supported or constrained by different types of working memory. In a limited working memory environment, different cognitive demands compete for cognitive resources during the act of writing. When one component skill is lacking, it imposes more cognitive constraints on the writer. Beginning writers are still learning and refining fluent forms of handwriting and spelling knowledge. During writing, more cognitive resources are allocated and

used for transcribing the words onto the page. Therefore, the finding of the study supported the theoretical proposition that mechanical aspect of writing (i.e. handwriting, spelling) is one of the major skills to develop for young writers.

Although students put less emphasis on Substantive Processes in relation to Production Procedures, they tended to mention Substantive Processes more frequently when prompted to talk about writing processes. For example, for questions 3-5 that assessed students' knowledge of writing processes, students' responses referenced Substantive Processes and Production Procedures equally. Kos and Maslowski (2001) found similar results in their study of second-graders' perceptions about writing. In that study, second-graders emphasized form over substantive aspects of writing when describing attributes of good writing. However, in the scaffolded talk with teachers during writers' workshop, second-graders were able to talk more about idea generation, planning and organizations of stories and had more awareness of authorship and audience awareness. The authors speculated that second-graders' metalinguistic ability to talk about more abstract aspects of writing (e.g., organization, writing processes) was still developing and might have constrained their ability to describe their own writing processes without teacher scaffolding. In the scaffolded situation, students may have been put in *zone of proximal development* (Vygotsky, 1978), which likely supported students and made it easier to discuss the more abstract aspects of writing knowledge. In this study, students were asked six general questions about characteristics of good writing, procedures of writing processes and genre features of stories. During the interview, no scaffolded talk (i.e. giving hint, presenting the topic, giving examples) was given by the examiner during the interview. It is possible that students were able to talk more about writing processes

and other substantive aspects of writing when they were asked more specific questions or given hints with concrete examples.

Emerging Knowledge of Genre Conventions

Findings from this study showed that first-graders had emerging but limited knowledge about genre conventions and could differentiate between these genres in their writing. Their limited knowledge about narrative genre conventions was evident in the interview data. When asked about story elements, a majority of students identified "beginning, middle and end", which is a basic structure. Their writing samples also indicated that students did not have control over all of the elements of each genre. In students' narrative writing samples, their stories only contained about 20% of the total possible genre scores for story writing. They tended to have well-developed knowledge of Characters but failed to present information on Place and Time. In Plot development, students mainly recounted the past events in chronological order without presenting Initiating Events, an Internal Plan and any Complications of the Plot. Students also failed to include a Title or Dialogue to their stories. However, the results were slightly different for descriptive writing.

First-graders also had developing but limited understanding of genre conventions about descriptive writing. Data from their descriptive writing showed students tended to introduce a thesis statement at the beginning and then present details in an organized, coherent order with some level of elaboration. They were also able to present the character with some level of specificity and impartial referencing. This indicated that first-graders may have been aware that the reader was unfamiliar with the person they were describing. However, students' level of description was still developing as they presented details with facts about the characters, but their character

descriptions had few examples of expressive language. Students tended to use high frequency, less expressive adjectives instead of adverbs, richly descriptive words, and dialogues in their depiction.

When comparing students' genre knowledge about narrative writing to descriptive writing, first-graders in the study included a higher percentage of genre elements for descriptive writing (34%) than narrative writing (20%). However, this comparison does not warrant the claim that students' had better knowledge of descriptive writing than narrative writing since the elements are different for both genres. The difference in students' genre element use in their narrative and descriptive writing might be due to the different categories of elements used in the study. Another possible explanation for the difference is related to the prompt itself. The narrative prompt asked students to write about a story when they had fun doing their favorite activities. Many students described their favorite activities instead of writing a story about it. Another possible explanation was that descriptive writing was present across several types of genres--narrative, informational or persuasive texts. Therefore, students may have exposure to descriptions in the context of other genres and may have developed more extensive knowledge about descriptive writing.

Data from students' use of genre features suggested that even though first-graders had nascent genre knowledge, they could differentiate narrative from descriptive writing. In both genres, students included many genre features unique to narrative or descriptive writing. For example, students tended to use past tense in narrative writing but generally used present tense in descriptive writing. It is also more common to find events described in chronological order in narrative writing than in descriptive writing. When describing Character in both genres, students adopted a

higher level of specificity and impartial referencing in descriptive writing than in narrative writing. Students' writing also showed a pattern of introducing a thesis statement at the beginning in descriptive writing but not in narrative writing. These findings seem to indicate that students in first grade understood that the focus of narrative writing was the plot while descriptive writing was more about presenting the attributes of the character(s).

These results echo Donovan (2001)'s study on children's development of written story and informational genres. Donovan analyzed the micro-level features of different genres and found that kindergarten and first-grade writers included fewer story and informational elements compared to older students. However, even at kindergarten students could differentiate between genres. For example, students in Donovan's study (2001) adopted formulaic opening such as "once upon a time" in the narrative but opened the text with topic introduction followed by a thesis statement in the informational text. It was found that students could employ distinctive vocabulary and syntax for different text types. Therefore, the findings of this study seemed to lend support to the theory of genre development that genre learning is a complex and emergent process of differentiation and integration (Kamberelis, 1999).

Slow Discourse Knowledge Development

The results showed that there was positive growth in discourse knowledge, but the growth was modest. This was supported by three findings. First, students had small but significant positive changes in Substantive Processes, Motivation and Story Elements. For these three knowledge variables, the mean gain score and the effect sizes for the change were small. This suggested that first-graders in the study developed more knowledge about the compositional aspects of writing, had better

understanding of genre knowledge in stories, and knew that good writing took effort, but all these changes were modest. Second, there was no statistically significant change for Production Procedure across the school year. This indicated that students' knowledge about the surface-level of writing did not grow significantly across the school year. Third, students' overall Irrelevant knowledge about writing decreased across the school year. Although the decrease of Irrelevant knowledge does not necessary mean the increase of Discourse Knowledge, it suggested that students' irrelevant response to the interview questions decreased across the school year.

These findings of this study, on the one hand, supported the previous findings that young students developed their knowledge about writing at a modest pace. Cross-sectional studies on genre development signaled that metacognitive knowledge and genre knowledge developed slowly (Donovan, 2001; Kamberelis, 1999; Lin et al., 2007). For example, Lin et al. (2007) found a developmental pattern of metacognitive knowledge among second- to eighth-graders. It was found that as students grew older and had more schooling, their knowledge about writing shifted from a focus on form at local levels to a focus on meaning at a global level. Similarly, findings of Danovan (2001) and Kamberelis (1999) also showed a general developmental pattern in students' genre knowledge from kindergarten through the elementary grades.

The findings of this study also suggested that measurable growth in genre knowledge could be detected in a single school year. In contrast, Kos and Maslowski (2001) reported that students' perceptions of writing remained constant during five months despite the teacher's intensive modeling of more substantive aspect of writing, such as writing processes and textual organization. In this study, knowledge variables such as Substantive Processes, Motivation, and Story Elements all had significant

growth across a school year. The different results between this study and Kos and Maslowski (2001)'s study might be a function of the differences between the two samples and the measures used. Kos and Maslowski examined second-graders' knowledge about writing across a school year using classroom observation and two slightly different interview protocols. Comparatively, the current study's participants were first graders and the study used the same interview protocol across a school year. It is possible that the different interview protocols contributed to differences in the findings. It is also possible that first-grade students might respond to instruction better and make faster progress because they might have very limited or no discourse knowledge. For example, first-graders in this study started school with very little knowledge of story, which can be seen in the average number of Story Elements identified in the fall ($M=1.02$; $SD=1.47$). By contrast, second-graders might have already acquired a basic understanding of discourse knowledge, and it might be harder for them to acquire discourse knowledge as quickly.

In short, the findings of the study painted a complex nature of knowledge development. On the one hand, the results supported some of the findings of previous studies on the slow developmental growth of discourse knowledge. On the other hand, the findings indicate that measurable growth in genre knowledge may occur in a single academic year.

Discussion for Research Question 2

RQ2: What is the relationship between students' discourse knowledge and narrative and descriptive writing performance?

The Role of Discourse Knowledge

Results of the study showed that discourse knowledge predicted first-graders' writing, and its predictive role depended on the type and the genre of writing outcomes. In this study, there were two types of writing outcomes (Quality and Length) for two genres (Narrative and Descriptive). Knowledge of Production Procedures predicted Descriptive Quality and Descriptive Length. Motivation only predicted Descriptive Length while Story Elements Gain were only associated with Narrative Quality. However, it is important to notice that in all of these models, the Discourse Knowledge variables were unable to explain much additional variance and the coefficients for all these significant predictors were small compared to the coefficients of other control variables (e.g., Early Literacy Skills, Gender). In addition, across the models, Substantive Processes and Irrelevant Knowledge were not predictors of any writing outcomes.

The findings of this study provided partial support for an earlier study by Olinghouse & Graham (2009). Both of these studies showed that Production Procedures, Story Elements and Motivation were associated with students' writing and that Irrelevant knowledge was not. However, the findings of this study differed from Olinghouse and Graham's (2009) results in three ways. First, in this study most of the measures of discourse knowledge predicted descriptive writing but not narrative writing. Except for Story Elements Gains that predicted Narrative writing, Production Procedures and Motivation were predictors of Descriptive writing. While in Olinghouse and Graham's (2009) study, Production Procedures, Motivation and Story Elements were important predictors of Narrative writing. Second, Substantive Processes in this study was not a significant predictor for any writing outcomes. This runs contradictory to Olinghouse and Graham's (2009) study that Substantive

Processes predicted Narrative writing. Third, in this study, Story Elements Gain instead of Story Elements was a significant predictor of Narrative writing.

Differences in these studies in how aspects of discourse knowledge predicted writing outcomes were likely due to a variety of factors, such as the grade level of students, the type and number of variables controlled, and the different writing measures. Olinghouse and Graham (2009) studied second and fourth-grade students. Their study only used narrative writing as a writing outcome. In addition, there were differences in the control variables; they included three non-writing related factors (grade, gender, and basic reading skills) and four writing-related factors (handwriting, spelling, attitude toward writing, and advanced story plan). In comparison, this study examined first-grade students, and both narrative and descriptive writing were used as writing outcomes. In addition, a different set of control variables was included in this study (age, gender, handwriting, spelling, oral vocabulary, decoding skills). Comparing to Olinghouse and Graham's (2009) study, students' attitude toward writing and advanced story plan were not used in this study as control variables. These differences may explain the different results between the two studies even though the design was similar.

Although these findings were partially confirmed by a similar study (Olinghouse & Graham, 2009), the findings provided plausible explanations for the challenges of writing that young writers face. One of the major different findings was that Production Procedures and Motivation predicted the Length or Quality of only descriptive writing. This outcome suggests that these predictors were more important for description than narrative. One possible explanation for this finding is the difference between students' familiarity with the two genres. There is evidence that

young students are exposed to narratives more than other genres (Donovan, 2001; Duke, 1999). It may be that for less familiar genres, such as description, students struggle more to produce the texts. The quality and length of the descriptions may be associated with higher motivation, which helps students persevere during a challenging task. In this study, Motivation was measured by counting responses that identified effort as a characteristic of good writing or as a solution to writing problems. It is possible that students who identified effort as an important component of writing may have written longer texts even in less familiar genres. In terms of the role of Production Procedure in descriptive writing, it is possible that when facing the challenge of a less familiar genre, students needed to allocate more cognitive resources to the genre conventions, which put more constraints on students' transcriptional skills. As a result, more knowledge of the surface-level skill of writing could have contributed to the task of writing.

Another major difference between this and the Olinghouse and Graham (2009) study was that Substantive Processes were not found to be a significant predictor of any outcome. This finding might also be explained by first-graders' challenges with transcriptional skills. Previous studies with older students revealed that Substantive Processes was an important predictor of writing (Gillespie et al., 2013; Olinghouse & Graham, 2009; Olinghouse et al., 2014). Substantive Processes refer to compositional aspects of writing such as writing processes, organization, ideas, content and concern the text as a whole. It is possible that first-graders in the study knew less about the writing processes than the older students in these previous studies. Another possible explanation is related to the challenges posed by transcribing words onto paper. First-graders might know that good writers tend to plan and revise, add details to their

writing, and organize the ideas coherently. However, when students were challenged by getting their words on paper, they had limited cognitive resources to integrate the substantive aspect of composition in the act of writing.

The last major divergent finding was that Story Elements Gain instead of Story Elements was a significant predictor of Narrative Quality. It is also possible that when students started school, they were overwhelmed with the transcriptional demands during writing, thus limiting their ability to integrate the genre knowledge in their writing to make an adequate impact in writing quality. This interpretation corresponds to the findings that Production Procedures was an important predictor for writing outcomes. As students' transcriptional skills developed across a school year, their cognitive loads on transcription were lessened, thus freeing part of their cognitive resources to use genre knowledge in their writing. Another explanation could be that first-graders' knowledge of story elements was very low in the fall. They know just about one story element on average ($M = 1.02$; $SD = 1.47$). Students who strengthened their knowledge of narrative elements may have been able to apply that knowledge in their writing, which contributed to the quality of their writing.

The Role of Control Variables

In addition to the important role of discourse knowledge, the study confirmed the findings of past studies on the important role of gender, early literacy skills and vocabulary skills for early writing. One consistent finding that emerged was that Gender and Early Literacy Skills consistently predicted Quality and Length across the two genres. Girls in the study were found to write better and longer narrative and descriptive texts. The finding is consistent with the review of empirical evidence documenting that girls performed better in early writing (Peterson, 2006). In addition,

Early Literacy Skills was found to be a significant predictor of all writing outcomes. These findings were supported by research indicating the important role of the decoding, handwriting, spelling in early writing development (Berninger et al., 2002; Coker, 2006; Graham et al., 1997; Juel et al., 1986; Kim et al., 2014). For example, handwriting fluency has been shown to contribute to first-grade students' writing quality (Graham et al., 1997; Jones & Christensen, 1999; Kim et al., 2013; Wagner et al., 2011). Spelling was shown to be an important contributor to writing outcomes throughout the elementary grades (Berninger et al., 1998; Graham et al., 2002). However, Vocabulary Skills were significant predictors for Narrative and Descriptive Quality but not for Length. In the literature, there was also evidence suggesting that oral vocabulary was related to writing outcomes (Coker, 2006; Hooper et al., 2001; Kim et al., 2011). When students have wide and deep vocabulary, they have more resources to use during text generation. Better vocabulary skills are likely to facilitate idea generation and allow more flexibility in encoding ideas into written language at the word, phrase, and sentence levels.

Therefore, the findings of the study provided strong support for previous research on the role of handwriting, spelling, early reading skills, vocabulary and gender in early writing development. Individual differences in transcriptional and early reading skills, vocabulary and gender were closely related to early writing outcomes (Coker, 2006; Graham et al., 1997; Jones & Christensen, 1999; Kim et al., 2013; Peterson, 2006; Wagner et al., 2011).

Support for Empirical Evidence

The findings for Research Question 2 provided some support for the empirical evidence on the role of discourse knowledge and early literacy skills (Coker, 2006;

Gillespie et al., 2013; Hooper et al., 2001; Kim et al., 2011; Olinghouse & Graham; Olinghouse et al., 2014). On the one hand, findings in this study suggested the limited role of Discourse Knowledge on writing outcome for beginning writers due to the small variance explained by the Discourse Knowledge for writing outcomes. The findings may indicate a complex picture of how various types of discourse knowledge were related to students' writing. In this study, the role of discourse knowledge in writing, though limited, seemed to differ by genre and by type of writing outcomes. This corresponds to a previous study on the role of discourse knowledge for older students, which revealed an inconsistent pattern of discourse knowledge predictors for different writing outcomes in narrative writing (Olinghouse & Graham, 2009). Studies explored the role of discourse knowledge in different writing genres also found the significance of discourse knowledge varied across different genres (Gillespie et al., 2013; Olinghouse et al., 2014). On the other hand, findings in this study recognized the important role of early literacy skills to writing outcomes. In this study, Early Literacy Skills were a consistent predictor for writing outcomes across models. It supported findings from past studies showing the important role of early reading, vocabulary and transcriptional skills for young children's early literacy development.

Support for Theoretical Models

The findings for Research Question 2 also provided partial empirical support for the theoretical models of early writing (Berninger & Winn, 2006; Bereiter & Scardamalia, 1987). These findings provided partial support for the Knowledge-Telling process model where discourse knowledge was described as one of the two important sources of knowledge to writing among young writers. In this study, several Discourse Knowledge variables (Production Procedures, Story Elements Gain,

Motivation) were found as significant predictors. Given that multiple important writing-related control variables were included in these models (Age, Gender, Early Literacy Skills, Vocabulary), the significance of the Discourse Knowledge variables could be regarded as an important finding. However, it is important to recognize that these knowledge variables explained very little variance in the writing outcomes. In this study, the finding that Story Elements Gain predicted one writing outcome supported at least one aspect of the Knowledge-Telling process model proposed by Bereiter and Scardamalia (1987), in which developing writers were described as relying on immediate genre knowledge for writing tasks. The study also found that Substantive Processes was not a significant predictor. This finding contradicted results of studies with older children where the role of Substantive Processes was found to be a significant predictor (Gillespie et al., 2013; Olinghouse & Graham, 2009; Olinghouse et al., 2014). As Substantive Processes are an important aspect of discourse knowledge, this finding suggested partial support for the Knowledge-Telling model. One possible explanation lies in the fact that the knowledge-telling model was developed using data from 9-to-10 year-old children. Students in this study were younger and were likely to face greater challenges associated with transcription. Therefore, knowledge sources and processes in writing described in the knowledge-telling model may not be entirely applicable to these results. However, the first graders in the study could be considered moving toward the Knowledge-Telling model.

The findings of the study also provided support for the Not-So-Simple View of Writing (Berninger & Winn, 2006). The importance of Production Procedures, Early Literacy Skills, and Vocabulary Skills corresponded to the theoretical proposition that transcription and text generation are fundamental in early writing development

(Berninger & Winn, 2006). In the Not-So-Simple View of Writing, text generation was supported by transcriptional skills and executive function. In this study text generation and transcriptional skills were measured through vocabulary knowledge and handwriting and spelling skills. When transcribing, writers need to have handwriting automaticity and orthographic knowledge to encode the sound into letters. During text generation, writers translate ideas into words and sentences. It is without doubt that writers need to use vocabulary as a channel for expressing ideas. Therefore, vocabulary skills are also important for writing. This was supported by the findings that Vocabulary Skills was significant predictor for Narrative and Descriptive Quality.

To sum up, the findings in the study provided partial support for the theoretical proposition that aspects of discourse knowledge and the transcriptional skills are important elements in early writing development. However, due to the minimal variance explained by the Discourse Knowledge for writing outcomes, it is important to acknowledge that Discourse Knowledge may not be as important for young students as it is for older students.

Limitations

Although the study had a fairly large sample and the HLM models were constructed to control for many writing-related factors, it harbors its own limitations, and the interpretation of the findings should be approached with caution. Overall, there are two major limitations that need to be acknowledged in the study. These two limitations concern the measures and the timeline of the data collection. This section first details the limitations related to the measures, followed by the limitation related to data collection.

Measures

Measures of Discourse Knowledge. The major limitation of the study was related to the measures selected to assess discourse knowledge. When measuring students' discourse knowledge, no interview questions were asked about students' revising processes and students' knowledge of descriptive writing. The interview was based on Olinghouse and Graham (2009)'s protocol, which was limited to questions about narrative. Adding questions to the interview about students' revising processes could provide more information about students' writing process knowledge. In addition, it would be beneficial to include questions about students' understanding of descriptive writing. With a student interview that collected information about both genres, it might be possible to develop a more comprehensive picture of the knowledge-related predictors of early writing.

Another limitation concerning the measures of discourse knowledge was the possibility that young students might have difficulty understanding the questions. The interview questions required that students have adequate vocabulary and engage in abstract thinking. An advantage of the open-ended questions was that they did not constrain students' possible answers. However, students' lack of metalinguistic skills or their difficulty understanding the questions might have impeded their ability to provide a comprehensive response. Therefore, it is important to bear in mind that much of the discourse knowledge being measured in this study is the knowledge that students can state explicitly in the interview. Although the study also measured students' discourse knowledge through analyzing students' writing sample, it is possible that students have more knowledge that they cannot tell through interview.

Given the challenges of measuring young students' discourse knowledge, in the future, researchers could assess students' discourse knowledge by collecting more

comprehensive data by combining direct measures with indirect measures. For example, students' knowledge about writing processes could be measured by giving students a task for the planning and revising processes. A good example of such a measure was Englert et al.'s (1988) study that used several vignettes to elicit information about how students approach problems during planning, drafting and revising informational texts. In addition, measures such as observing teacher-student talk during writer's workshop (Kos & Maslowski, 2001) or asking students to write a letter addressing attributes of good writing (Schoonon & de Glopper, 1996; Wray, 1993) could be adopted or modified for use with younger writers.

Measures of Writing. An additional limitation of the study was related to the writing measures. In this study, two dimensions of writing (Length and Quality) across two genres were analyzed. However, in order to deepen our understanding of the relationship between discourse knowledge and writing outcomes, more dimensions of writing could be included as outcomes such as thematic maturity, syntactic maturity, contextual spelling, vocabulary diversity and mechanics of writing. A recent study by Kim et al. (2014) looked at the multidimensionality of first-graders' writing skills and found that different reading and writing-related skills predicted different dimensions of writing. Therefore, in this study, students' narrative and descriptive writing could be scored in terms of additional dimension including mechanics, syntax, vocabulary diversity, and contextualized spelling. These additional scores could be used to examine the multi-dimensional nature of first-grade writing. Given that writing is complex in nature, having constructs of first-graders' writing skills from different dimensions would provide a more refined understanding of the role of discourse knowledge in writing.

Measures of Topic Knowledge and Verbal Skills. Another limitation of the study was the lack of measures on students' topic knowledge and verbal skills. There is both theory (Bereiter & Scadarmalia, 1987) and evidence indicating that topic knowledge is predictive of writing outcomes (Benton et al., 1995; Monsenthal et al., 1985; MuCutchen, 1986; Olinghouse et al., 2014; Voss et al., 1980). However, in this study no measures of topic knowledge were included. The inclusion of topic knowledge as a control measure would be useful because the relationship between discourse knowledge and writing performance could have been influenced by topic knowledge. Olinghouse and colleagues (2014) measured both topic knowledge and discourse knowledge in their study and found both types of knowledge are important predictors of writing outcomes. Although including measures of topic knowledge would be an improvement for the study, it could be argued that the lack of this measure would not alter the findings. In this study, the topics of both the narrative and descriptive prompts were designed to elicit information about students' personal lives. The narrative prompt asked students to write a story about a fun time playing their favorite activity, and the descriptive prompt was about describing a person students knew well. Therefore, both writing prompts require background knowledge on personal life, thus ensuring each student to have similar level of topic knowledge to draw on for the writing tasks.

Another improvement of the study would be to include more measures of students' verbal skills. When measuring Discourse Knowledge with an interview, it was possible that some students produced fewer responses due to weaker verbal skills rather than a lack of discourse knowledge. In Saddler and Graham (2007)'s study on discourse knowledge, the authors used an interview protocol and also measured

students' verbal skills through the Formulated Sentences subtest from the Clinical Evaluation of Language Fundamentals-Revised assessment (CELF-R; Semel, Wiig, Secord, & Sabers, 1987) to eliminate potential confounding factors that might have affected students' responses to interview questions. To complete the Formulated Sentences subtest, students draw on their vocabulary and syntactic knowledge. In this study, students' verbal skills were assessed using receptive and productive vocabulary tests. These tests only measured vocabulary knowledge, and there were no assessments of syntax, which is a limitation. Including measures that assess a wider range of students' verbal knowledge would serve as stronger controls.

Measures of Classroom-level Variables. Another limitation of the study was the lack of classroom-level data. Research showed that classroom instruction can make a difference in the knowledge students were able to produce (Raphael et al., 1989). It would be important to know how the instructional contexts of these first-grade classrooms relate to students' discourse knowledge. Classroom-level variables that might be of interest in future research include measures of the classroom print environment, the time spent on instruction, and the type of writing instruction. Adding classroom-level variables could provide insight into the sources of discourse knowledge and whether teachers addressed this important question in their classrooms.

Timeline of Data Collection

The timing of the study was also a limitation. Data collection for the fall semester started in October due to the complicated procedures of obtaining consent from the district, teachers and students. The interview data in the fall was collected at least one month after students began first-grade. Therefore, the fall data might not be very representative of students' incoming discourse knowledge in that classroom

instruction and writing practice in that first month of school might have strengthened students discourse knowledge. In the future, researchers should attempt to begin data collection immediately after school begins.

Implications

The findings from this dissertation provide insight into first-graders' understanding of discourse knowledge, its development, students' use of genre conventions in narrative and descriptive writing, and the relationship between discourse knowledge and writing outcomes. These results provide implications for researchers investigating writing-related knowledge, and they may indicate ways that teachers can boost students' discourse knowledge through classroom instruction.

Future Research

Findings from this study confirmed findings of past studies about young writers' emerging and limited discourse knowledge and the role of discourse knowledge in writing outcome. However, questions remain regarding the interactions between discourse knowledge and early literacy skills, the development of discourse knowledge, the refinement of measures of discourse knowledge and writing, and the sources of discourse knowledge.

Interaction Effects of Discourse Knowledge. This study looked at whether discourse knowledge is a predictor of students' writing outcomes after controlling for important writing-related factors. However, the study did not explore interactions between discourse knowledge and other early literacy skill. Nor did the study explore the interactions between fall discourse knowledge variables and discourse knowledge gain variables. To have a more refined understanding of the relationship between

discourse knowledge and writing outcomes, future studies could explore how discourse knowledge interacts with important writing-related factors to impact writing outcomes.

Longitudinal Studies. Although the study investigated the discourse knowledge development across a school year, more research is needed to replicate and extend the findings. Further investigation is also needed to explore the development of discourse knowledge using longitudinal data. Limited research has been conducted on the development of writing-related knowledge using cross-sectional data. The findings of the study supported the slow development of discourse knowledge documented in earlier cross-sectional studies (Donovan, 2001; Lin et al., 2007; Kamberelis, 1999). However, a significant change of discourse knowledge across a school year was detected in the study but not in Kos and Maslowski's study with second graders (2001). Therefore, more research is needed on the development of different aspects of discourse knowledge and students' use of genre conventions across school years.

Knowledge Instrument. As was discussed earlier in section of Limitations, one major methodological concern in this line of research was whether an interview is the best way to tap young students' knowledge about writing. It is very likely that young children do not have fully developed metalinguistic skills to express their understanding of writing. Therefore, future research could investigate ways to obtain various sources of discourse knowledge in a single study. This process might include using interview data, student writing, and indirect measures of discourse knowledge. One particularly promising approach may be the use of vignettes to elicit student knowledge (Englert et al., 1988). Additional research on refining or creating discourse

knowledge measures would help researchers explore the scope and depth of discourse knowledge.

Multidimensional Writing Outcomes. This study explored the relationship between discourse knowledge and Quality and Length of narrative and descriptive writing. Future research could address the relationship between discourse knowledge and multiple dimensions of writing across different genres. Multiple dimensions of writing might include thematic maturity, syntactic maturity, mechanics, contextualized spelling and vocabulary diversity. As the CCSS required students to learn narrative, informational and persuasive writing starting in kindergarten, these three genres could be investigated together in a single study so as to provide a more sophisticated understanding of the role of discourse knowledge in different genres.

Sources of Discourse Knowledge. The study provided insight into first-graders' discourse knowledge, and it supported the theoretical role of discourse knowledge in writing. However, questions remain regarding where students learn about discourse knowledge and how classroom instruction might support students' discourse knowledge acquisition. Future research could explore what instructional variables are important for students' acquisition of discourse knowledge. Future research could also investigate how the type of writing instruction, the time on writing practices, the genres instructed, and the classroom environmental print contribute to students' knowledge development. Investigations in this line of research could potentially provide valuable guidance for classroom instruction.

Classroom Application

The findings of the study offered some practical guidelines for classroom instruction by providing teachers with a better understanding of first-graders' discourse

knowledge at the beginning of the school year and across a school year. The findings could also benefit classroom instruction by empowering teachers with an understanding of students' genre convention use and the aspects of discourse knowledge that may be beneficial to writing. Because of the limited role of discourse knowledge to writing found in this study, it is important to note that the practical application is limited in first-grade.

First, the findings suggested that first-graders' level of discourse knowledge plays a limited role in students' writing ability. Although Production Procedures and Story Elements Gain were found to predict writing, they only explained a small amount of variance in the writing outcomes. According to the recommendations of the IES Practice Guide for writing instruction, teachers should help students to become fluent with handwriting, spelling, and sentence construction and teach students to write for a variety of purposes (Graham, Bollenger, Olson, D'Aoust, MacArthur, McCutchen, & Olinghouse, 2012). Although the role of discourse knowledge may be limited for young writers, the findings suggested that writing instruction that addresses transcription and discourse knowledge may be necessary and can be potentially beneficial for beginning writers. Given that first-graders were found to have an emerging but limited understanding of genre knowledge and that past research has signaled the importance of genre knowledge for older writers (Olinghouse & Graham, 2009; Gillespie et al., 2013; Olinghouse et al., 2014), it might benefit students in the long run if teachers could address genre knowledge in the primary grades. Teachers can increase students' exposure to a variety of genres and provide instruction in the genre elements. Appropriate practices include talking about genre features during writing, studying model texts, and increasing the richness of environmental print.

Other than teaching genre knowledge, it might be necessary for teachers to teach students knowledge of writing processes. One might argue that Substantive Processes was not found a significant predictor in the study, making it unnecessary to teach for beginning writers. However, as mentioned earlier, the lack of significance of Substantive Processes might have been due to the challenges of getting words on paper for beginning writers. Teaching writing processes in the classroom is necessary and can be justified with two reasons. First, there was empirical evidence from previous studies suggesting that Substantive Processes was an important factor for writing outcomes and it took long time to develop (Gillespie et al., 2013; Olinghouse & Graham, 2009; Olinghouse et al., 2014). Second, there was also research evidence showing that teaching writing processes was not a focus in most elementary classrooms (Coker et al., 2016; Graham, Harris, Fink-Chorzempa, & MacArthur, 2003). According to the results from national survey data on elementary teachers' writing instruction (Graham et al., 2003), teachers spent more time on grammar and spelling than on revising, planning, organization, and the inclusion of details. This instructional focus on mechanical aspects of writing might partly explains why first-graders in this study emphasized form over meaning. Therefore, to nurture effective writers, teachers need organize more writing activities or provide instruction on the compositional aspects of writing in the primary grades.

Second, the role of motivation in writing, though limited, suggested that teachers create an engaged community of writers so as to increase students' interests in writing. There are many effective ways to increase students' motivation in writing. According to Graham et al. (2012), teachers should participate as members of the community by writing and sharing their writing, giving students writing choices,

encouraging students to collaborate as writers, providing students with opportunities to give and receive feedback throughout the writing process, publishing students' writing, and extending the community beyond the classroom.

Third, the important role of early literacy skills across writing outcomes in both genres suggested that classroom teachers should continue to focus on developing handwriting, spelling and decoding skills. Instructions on transcriptional and decoding skills are recommended to occur on a daily basis. Development of early literacy skills can be integrated in reading and writing tasks since decoding and spelling shared similar cognitive skills and used the same orthographic knowledge.

To sum up, the findings suggested ways to improve students' discourse knowledge, which may potentially benefit students' writing skills in the long run. These different practices suggest that the traditional "one size for all" instruction mode may be ineffective as writers' instructional needs depend on their varying level of knowledge and skill. Overall, this study provides a better understanding of first-graders' discourse knowledge and helps teachers to identify malleable aspects of discourse knowledge that can be strengthened through meaningful and effective writing instruction.

Conclusion

The current study investigated first-graders' discourse knowledge at the beginning of the school year, across a school year, and its relationship to beginning writing. Findings of the study provided some empirical support for the limited importance of discourse knowledge for early writing. Findings of the study also signaled that beginning writers had limited discourse knowledge and that it developed

slowly across a school year. Overall, the study painted a complex picture of discourse knowledge and its predictive role in different writing outcomes.

The study contributed to the line of research on writing-related knowledge in two ways. First, it extended the findings of earlier research to a sample of beginning writers and provided some theoretical support for the role of discourse knowledge in writing for beginning writers. The findings that knowledge of Production Procedures and Story Elements Gain in the study provided partial empirical support for previous study (Gillespie, 2013; Olinghouse & Graham, 2007; Olinghouse et al., 2014) and partial theoretical support for the Knowledge-Telling process model (Bereiter & Scardamalia, 1987), which specified discourse knowledge as an important source of knowledge for young writers. As the model mainly depicts writing processes for young students beyond first grade, the findings of the study partly extended its application to beginning writers with some limitations. For example, Substantive Processes was not found to be an important predictor as found in the studies with older children. In addition, the consistent findings of importance of Early Literacy Skills to writing outcomes supported past research studies and also provided theoretical support for the Not-So-Simple View of writing (Berninger & Winn, 2006) that positions transcriptional skills as fundamental to young children's writing development. Second, the study provided important suggestions for classroom instruction. The implications are that different aspects of discourse knowledge should be developed together with early literacy skills (i.e. decoding, handwriting and spelling) since early grade.

Overall, this study is important for researchers in that it provided empirical evidence for the limited role of discourse knowledge for beginning writers and pointed out directions for future work. The study also is of importance to classroom teachers

since it offered suggestions for improving students' writing through potentially promoting their discourse knowledge in writing instruction. The research can also make a difference for targeting and supporting at-risk beginning writers through understanding their level of discourse knowledge and its relation to writing outcomes.

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Appendix A

NARRATIVE AND DESCRIPTIVE WRITING PROMPTS QUALITY SCORING RUBRIC MANUAL

Dimensions	1	2	3	4	5	6
Topic and supporting details.	Does not include a complete idea, or the content is brief and unrelated to the prompt. It may be incomprehensible.	Topic is clear and related to the prompt. There are no details beyond the topic or any details are unclear or off topic. Or the topic is not clearly defined but a few details are related to the prompt.	Topic is clear. There is a single detail about the topic, a list of features, or multiple details loosely related to a topic.	Topic is clear. There are a few (2-4) simple details about the topic that stay on the topic. One or two details may be connected or briefly elaborated.	Topic is clear and the paper stays on topic. There may be multiple details (5+), or the details may be descriptive.	Topic is clear and the paper stays on topic. There are multiple details that are highly descriptive.
Organization and closure.	No organization because there is insufficient information to organize.	May begin with a topic but otherwise there is no organization.	The topic is mentioned first followed by a detail. There is no closure.	The topic is mentioned first followed by details. In general, the sentences are related to the topic but not in	Organization of details is evident in the grouping or sequencing of details in some of the paper. Linking terms	Organization of details is evident in most of the paper, and linking terms are used several times for most of the paper. Overall, the paper

				any particular order. There is no closing statement or just a conventional ending (e.g., The End; It was fun.)	may be used but not for most of the paper. There is an ending that gives some sense of closure.	is coherent. There is an ending that gives a clear sense of closure related to the topic.
Word choice.	A few simple words are used.	Words are common but related to topic.	Words are common but appropriate to the meaning.	Most of the words are common, but there is some variety of words.	Some less common words or specific words are used in description or to create a feeling.	Descriptive words are used to create images. Words are chosen to convey specific meanings. Words may be used in colorful and creative ways.
Overall.						

Appendix B

DEFINITIONS AND EXPLANATIONS FOR NARRATIVE GENRE ELEMENTS

Category	Definitions and Examples		
Characters (C)	What do characters do? What characters are going to do?	People in the story Name the character	Who is it going to be about? Describe the characters
Locale/Place (L)	Setting Places characters go	Where the characters would be? Where it takes place?	Background scenery Atmosphere
Time (T)	Once upon a time	When the story takes place	
Initiating event (IE)	A tragedy occurs	What goes wrong?	Problem/difficulty
Plot (P)	You must have a plot		
Goals (G)	What do the characters want to do?	What do the characters plan to do?	How do the characters plan to solve the problem?
Action (A)	Actions/attempts to solve the problem	Things that would happen;	Things you might see Event
Reactions (R) /Emotional responses	Tell how the characters feel		

Beginning (BE)*	Introduction	Background	What happens first
Middle (M)*	Climax		
End (E)*	Solution Ending paragraph Quick summary of story	Conclusion Situation gets better/fixed Reflections/thoughts	Outcome Wrap it up Result
Title (TTL)	Name of the story		
Dialogue (D)	Conversations between characters		Someone is talking

[Adopted from Gillespie, Olinghouse & Graham (2013).]

Appendix C

NARRATIVE GENRE ELEMENTS SCORING RUBRIC MANUAL

Categories		0=absent of the element	1=present of the element with little development	2=Present with better development
Setting	Main character	No main character(s) is/are presented.	Character(s) is/are only referenced using a pronoun (<i>e.g. I, he, she, we</i>) and/or is/are labeled (<i>e.g. the dog, my dad</i>) without description (<i>e.g. He was cute</i>).	Character(s) is/ are labeled (<i>e.g. my mom</i>) and described (<i>e.g. beautiful and fun; she is a director of 31</i>), or the character (s) is/are given a proper name (<i>e.g. Kyle</i>). <i>Note: If multiple characters are introduced with some referenced as a pronoun, others labeled and described. Scores are given based on the presence of the higher-level characterization.</i>
	Local	No information is given about the place where the story happened.	The place where the story happened is referenced without description or vaguely introduced (<i>e.g. outside; outfield; in the park</i>)	A specific place was referenced or described (<i>e.g. when I went to north Carolina; at my house</i>).
	Time	No information about when the story happened.	When the story happened is introduced with vague or broad time frame (<i>e.g. once; one time, one day; at night</i>). Note: Formulaic phrase such as "once upon a time" can be counted as time.	A specific time was referenced (<i>e.g. on Saturday; On November 17th; today; It was my birthday</i>) or described (<i>e.g. the time I played violin; one hot day;</i>)
	Initiating event	Problem/conflict is not created or introduced.	Problem is clearly stated but not described.	Problem is clearly stated and described with background information or event.

Plot			<i>(e.g. "I wanted to swing (goal) but I didn't know how to (problem)."</i>	<i>(e.g. "I wanted to climb it(the big stairs)but first I was scared to climb it because it was so high.(problem)" "One day I drew a picture. It was good so I gave it to my sister (background event) but my sister ripped it. (problem)"</i>
	Internal plan (Goal)	The plan or goal of the character(s) is not given.	What the character(s) wants to do or plans to do is clearly stated but not described. <i>(e.g. "my sister's boot got stuck in the mud (problem)and I tried to pull it out (goal)."</i>	What the character(s) wants to do or plans to do is clearly stated and described. Or multiple plans of the character(s) are presented. <i>(e.g. Once my Mom went shopping. She did not tell me what she was buying (problem). I wish it would be fun (goal 1). So I wait and wait (goal 2).</i>
	External event (Attempt to achieve goal)	No information is given about character(s)' action to solve the problem or achieve the goal.	The action leading to the solution of the problem is introduced but not described. <i>(e.g. "Then I tried it.")</i> This category also applies to the chronological record of less than three past events without presenting problems or goals.	The action(s) of the characters is/are presented and described. <i>(e.g. "My dad was there with me, so I stopped being scared. I jumped into the water and used all my swimming skills." "I hit the ball in the outfield and no one caught it and I was safe on first base and then I got a home run.)</i> This category also applies to the chronological record of more than two past events without presenting problems or goals. <i>e.g. "I went the beach and I collected seashells and made a sand castle and I got a hotel and had lots and lots of fun."</i>
	Direct consequence (Consequence of attempt)	No solution of the problem is presented.	Some evidence of solution is presented but not described. The solution may not be realized. <i>(e.g. "I got a lot of cards". " We finally went home." "The dog is very dirty (problem) it has to take a bath and if it don't get all the mud of him he will have to take a bath</i>	Evidence of solution is clearly presented and/or described. There are more than one solution being presented. <i>(e.g. "My brother let me win. It was so fun my mom only let us play video games on Friday, Saturday, Sunday.")</i>

			<i>again and again (here's the evidence of a solution but it's not realized).</i>	
	Reactions from the main characters	No information about how the character(s) feel after the event.	The way the main character(s) feel after the event is presented without description. (e.g. " <i>We had fun.</i> " " <i>I was sad.</i> ")	How the multiple character(s) feel after the event is presented with description or with summary of the whole event. (e.g. " <i>My mom was fun that day and I was exciting.</i> " " <i>It was fun playing tag with Kyle and Conrad</i> "; " <i>My brother was surprised I was surprised too that time.</i> ")
Other	Title	No title is given.	A title is given.	The title that well describes the story is given. (e.g. <i>Hiding from my brother Chase</i> ; <i>Going to Maine</i>)
	Dialogue	No dialogue is presented.	A record of conversation(s) is presented. Dialogue can be recorded in indirect quotation. Recorded dialogue can have missing quotation marks.	A record of conversation(s) is presented. Dialogue must be recorded in direct quotation. Recorded dialogue should not have missing quotation marks.

[Based on the refined version of Gillespie, Olinghouse & Graham (2013) based on the work of Stein & Glenn (1979).]

Appendix D

DEFINITIONS AND EXPLANATIONS FOR DESCRIPTIVE GENRE ELEMNETS

Categories	Definitions and Examples
Opening thematic statement	Give the reader overall information who the writing is about at the beginning. Specify one thing about the person being written about. Introduce the person (name or relationship with the author) being written about.
Major details presented first and secondary details later	A simple hierarchical structure is evident for presenting the information. Supporting information follows general statement about the subject. Sentences flow naturally and indicate coherence, making the text logically organized.
Elaboration of details	Give specific details. Write detailed descriptive paragraphs. Provide supporting details. Include a lot of information about the subject or important event of the subject. Explain the information with examples of details (e.g. what the person looks like, what he/she does, the personality, etc.)
Use of adjectives	Make the subject more interesting to read. Use descriptive words to describe the subject. This usually refers to more commonly used and general adjectives, such as nice, pretty, good.
Use of adverb	Make the subject more interesting to read. Use vivid words to describe the action related to the subject or the attribute(s) of the subject.
Use of richly descriptive words	Make reader want to read or keep reading and help the reader visualize. Readers would tend to create mental image(s) or a vivid association in their mind. This includes the use of correct words, similes, metaphors, and onomatopoeia. Use good words/vocabulary.
Use of big words	Use descriptive words that are not high-frequency words, such as <i>energetic</i> , <i>playful</i> , <i>trustworthy</i> , etc.
First mention of subject(s)	Tell whether the subject is introduced in a specific way or not. It can be very general (e.g. she, he") to more specific (e.g. my neighbor, Ann, or my brother Adrian.)

[Based on Hemphill et al., 1994.]

Appendix E

DESCRIPTIVE GENRE ELEMNETS SCORING RUBRIC MANUAL

Categories		0=absent of the element	1=present of the element with little development	2=Present with better development
Topic/ Theme	Opening statement	No statement about the subject is made. Or the writer repeats the prompt without giving clue to readers who is being written. e.g. <i>"I am writing someone I know very well."</i> or the writing starts with details about the subject. e.g. <i>"My dad has a hat"</i> .	A general idea is given about the person being written. But no conclusive statement is made for the subject. e.g. <i>"I know my sister well."</i> <i>"The person I know well is my dad."</i>	A clear and specific idea is given for the subject being described. e.g. <i>"My mom is nice, loving and pretty."</i> <i>"I like Rachel because she is my best friend."</i> <i>"Scott is a quiet person."</i> <i>"My mom is the best mom ever."</i>
Detail	Details presentation order	No hierarchical structure is evident for presenting the information. No supporting information follows general statement about the subject. Sentences are not coherent and not logically organized. e.g. <i>"My friend is nice on the bus. Even my families are nice to me. Anyone is my friend."</i>	A simple hierarchical structure is evident for presenting the information. Supporting information follows general statement about the subject. Sentences flow naturally and indicate coherent. e.g. <i>"Luke is funny (general statement of the subject) and he has black hair and he likes to play video games (supporting information but not closely relate to Luke being funny.)"</i>	A well-developed hierarchical structure is evident for presenting the information. Supporting information follows general statement about the subject. Sentences are coherent and logically organized. e.g. <i>"He is good and nice (general statement of the subject). He taught me how to ride a bike (supporting information follows logically and closely relate to he being good and nice)."</i>

Level of Description	Elaboration of details	There is no elaboration to support the opening statement. The paragraphs are made up of sentences with multiple unsupported ideas. e.g. <i>"His hair color is blonde. He been my friend since kindergarten."</i>	Give general details or supporting details and the details are appropriately related. <i>"I have a friend. Her name is Savannah. She has curly short hair and she's small. And cute and squishy!"</i> <i>"He is in 5th Grade. He goes to the same school I go to. He is in room 23."</i>	The details include a lot of information about the subject or important event of the subject. Information is explained by giving examples of details. e.g. <i>"She has brown hair. And an Adidas jacket. And pants and hot pink and blue and hot yellow Nikes on her feet."</i> <i>"He's good at a lot of sports like baseball, karate, soccer and lacrosse. He loves to play on his I pod. He likes to read the books such as Harry Potter and Percy Jackson."</i>
	Dialogue	No dialogue is given.	A brief direct or indirect quote or dialogue is given. e.g. <i>"Ella is funny! She always says, "Get your tousle out of my face!"</i>	A quoted conversation exchange is given.
	Adjective used	No adjective being used to describe the subject. e.g. <i>"My cousin Destiny lives in my neighborhood. And she has a bathroom and so do I. And she has the same necklace on as me."</i>	Use adjectives to describe the subject. Descriptive words are common general adjectives, such as <i>nice, pretty, good, fun.</i>	Use adjectives to describe the subject. Descriptive words are more specific adjectives, such as <i>tall, sweet, great, awesome, cute, kind.</i>
	Richly descriptive words used	No expressive words that create vivid images are used.	One or two rich descriptive words that create vivid images is/are used. e.g. <i>"She is helpful."</i> e.g. <i>"She got her nose pierced."</i>	More than two rich descriptive words that create vivid images are used. e.g. <i>"She has curly short hair and she's small. And cute and squishy!"</i> <i>"My cousin Philip is very athletic I have seen him jump one time and do two back flips!"</i>

	Adverbs used	No adverb is used to describe the action or the adjectives.		One or two adverbs is/are used to describe the action or adjectives. e.g. <i>"He draws neatly."</i>	More than two adverbs are used in describing an action or the adverb usage creates more vivid images. e.g. <i>"We wrestled fast and hard."</i>
	Big words attempted	No big words are used.		One or two non-high-frequency adjectives are used such as <i>playful</i> , <i>tanned</i> .	More than two non-high-frequency adjectives are used. e.g. <i>"She is elegant, peaceful and trustworthy."</i>
Character Introduction	First mention of character	0=no specific mention e.g. No character is introduced or the description is too illegible for readers to understand.	1=non-specific pronoun e.g. <i>"she"</i> , <i>"he"</i>	2=Somewhat specific mentioning. There is either information only about the character's name or information only about the relationship to the writer. e.g. <i>"My neighbor"</i> , <i>"Ann"</i> .	3= Very specific mentioning of the character. The mentioning includes a descriptive phrase about the character (e.g. <i>"My cool brother"</i>) or phrases telling both subject's name and its relationship to the author (e.g. <i>"My mom Kate"</i>).

[Based on Hemphill et al., 1994.]

Appendix F

SAMPLE OF NARRATIVE GENRE ELEMENTS SCORING RUBRIC

Main categories	Subcategories	0 (The element is absent)	1 (The element is present but with little development)	2 (The element is present and well developed.)
Setting	Main character			
	Locale			
	Time			
Plot	Initiating event			
	Internal plan (Goal)			
	External event (Attempt to achieve goal)			
	Direct consequence (Consequence of attempt)			
	Reactions from the main characters			
Other	Title			
	Dialogue			

[Based on the refined version of Gillespie, Olinghouse & Graham (2013) based on the work of Stein & Glenn (1979).]

Appendix G

SAMPLE OF DESCRIPTIVE GENRE ELEMENTS SCORING RUBRIC

Main Categories	Subcategories		0 (The element is absent)	1 (The element is present but with little development)	2 (The element is present and well developed.)
Topic/ Theme	Opening statement				
Detail	Details presentation order				
Level of Description	Elaboration of details				
	Dialogue				
	Adjective used				
	Richly descriptive words used				
	Adverbs used				
	Big words attempted				
Character Introduction	0= no specific mention	1= non-specific pronoun (e.g. "she", "he")	2= Somewhat specific mentioning. Have specific name or noun. (e.g. "the lady" "Ann" "My neighbor")	3= Very specific mentioning of the character. Have both name and noun. Or have specific adjective and noun (e.g. "the lovely lady" "My brother Joe")	

[Based on Hemphill et al., 1994.]

Appendix H

DISCOURSE KNOWLEDGE INTERVIEW PROTOCOL

Each question is read aloud to the child and responses are audiotaped. Questions are intended as open-ended. For each question, prompt by asking “Anything else?” until the child is clearly finished. If a child gives a vague or general response, prompt with “How would you do that?” or “Can you tell me more?”

- 1: “Suppose you were asked to be the teacher of your class today and one of the other kids asked you—What is good writing? What would you tell that student about good writing?”
- 2: “Why do you think some kids have trouble with writing; what makes writing hard for them?”
- 3: “What do good writers do when they write?”
- 4: “What if you were having difficulty or trouble with a writing assignment; what kinds of things would you do?”
- 5: “When you are asked to write a paper for class or for homework, what kinds of things can you do to help you plan and write your paper?”
- 6: “Suppose you have a friend who had to write a story for a class. If your friend asked you what kinds of things are included in a story, what would you tell him/her the parts of a story are?”

[Based on interviews used with elementary and middle-school students in Graham, Schwartz, & MacArthur, 1993 and with second and fourth-grade students in Olinghouse & Graham, 2009.]

Appendix I

DEFINITIONS AND EXAMPLES OF RESPONSE TYPES CATEGORIES FOR DISCOUSE KNOWLEDGE INTERVIEW QUESTIONS 1-5 AND QUESTION 6

Response Types Categories for Q1-5

Categories	Definition	Example
Environmental Structuring (ES)	Statements indicating students' efforts to select or arrange the physical environment to make learning easier. This can include the materials needed for the writing (e.g. pen, pencil, eraser, etc.)	• <i>"Find a quiet room."</i> • <i>"Get my materials ready."</i>
Production Procedures (PP)	Statements referring to the written product and the process of producing written product.	• <i>"Write it neatly."</i> • <i>"Spell the words correctly."</i> • <i>"Use a computer."</i> • <i>"Sound it out."</i>
Substantive Processes (SP)	Statements referring to writing processes, such as planning, drafting, and revising.	• <i>" Make note to use when writing."</i> • <i>"Use good words,"</i> • <i>"Write a first draft, revise and edit it, "</i> • <i>" Use a story map to</i>

		<i>plan it."</i> <i>"Include a plot."</i> <i>"Keep a clear focus."</i> <i>"Think hard about it."</i>
Seeking Assistance (SA)	Statements indicating efforts to solicit help from others or resources. A list of people mentioned is counted as one idea unit.	<i>"I would ask my teacher".</i> <i>" Find out about the assignment from a friend".</i>
Motivation (M)	Statements referring to motivation for writing or imagined rewards or punishment for success or failure.	<i>"They give up."</i> <i>"They keep doing it till they get an A."</i> <i>" They need practice a lot."</i>
Ability (A)	Statements referring to general ability, natural competence or innate abilities.	<i>"Because they are smart."</i> <i>"He writes well."</i>
Other Related (OR)	Statements clearly related to the question under consideration but that cannot be classified in one of the other categories.	<i>"Sometimes people take time for their handwriting."</i> <i>"Good writing takes feeling."</i>
Irrelevant (IR)	Statements unrelated to the question under consideration.	<i>"They are on their best behavior."</i> <i>"Because I like it. "</i> <i>"If you have a notebook, it will take you long if you go all the way to the bottom."</i>

Response Types Categories for Q6

Categories	Definition	Examples
Story Elements (SE)	Statement referring to the story grammar such as setting, characters, plot, problem, solution.	• <i>"Tell what happened."</i> • <i>"...has a problem."</i> • <i>"Pictures are part of the story."</i>
Organization (O)	Statement referring to the organization of the story in content or form. It could be how the story is pieced together by chronological order or the linguistic forms such as "beginning", "middle" and "the end".	• <i>"You know how it ends."</i> • <i>"Things are in order."</i> • <i>"Use transition words."</i> • <i>"One thing follows another."</i> • <i>"Beginning, middle and end."</i>
Creativity (CR)	Statement indicating that the story has something special to make it interesting and exciting.	• <i>"It grabs you."</i> • <i>"It has lots of new ideas."</i> • <i>"It is very funny."</i>
Production Procedures (PP)	Statement relating to the written product, such as spelling, handwriting, mechanics or grammar.	• <i>""Words are spelled correctly"</i> • <i>"Grammar has to be right."</i> • <i>"Makes a complete sentence."</i>
Ideation (I)	Statement about ideas or topics included in the story. A list of random topics or grouped topics is counted as one idea unit.	• <i>"Write about what you know."</i> • <i>"It's about an animal with</i>

		• <i>a mother."</i> • <i>"What the story is going to mean."</i>
Clarity (CL)	Statement about making the story acceptable to the readers.	• <i>"It is believable."</i> • <i>"Read it out loud to see if it makes sense."</i>
Vocabulary (V)	Statement referring to use words to make the story exciting.	• <i>" Words paint a picture."</i> • <i>"Big words."</i> • <i>"Some words are long and hard."</i>
Other Related (OR)	Statements clearly related to the question under consideration but that cannot be classified in one of the other categories.	• <i>"I like writing."</i> • <i>"It makes it hard for them to write because it might be too hard of a question for them."</i>
Irrelevant (IR)	Statements unrelated to the question under consideration.	• <i>"You can break letters."</i> • <i>"I make most of the picture books and all of the school and comics books."</i>

Appendix J

ALL RESPONSE TYPES CATEGORIES OF DISCOURSE KNOWLEDGE INTERVIEW Q1-6

Category	Environmental Structuring	Production Procedures	Substantive Processes	Seeking Assistance	Motivation	Abilities		Other Related	Irrelevant
Declarative knowledge of the characteristics of good writing: Questions 1-2									
Procedural knowledge of how to write: Questions 3-5									
Category	Story Elements	Organization	Creativity	Production Procedures	Ideation	Clarity	Vocabulary	Other Related	Irrelevant
Declarative knowledge of the characteristics of a story: Question 6									

Appendix K

INSTITUTIONAL REVIEW BOARD APPROVAL LETTER



RESEARCH OFFICE

210 Hallibren Hall
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Ph: 302/831-2136
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DATE: August 31, 2015

TO: David Coker, EdD
FROM: University of Delaware IRB

STUDY TITLE: [369515-12] Year 2: Investigating the Impact of Classroom Instruction and Literacy Skills on Writing Achievement in First Grade

IRB REFERENCE #:
SUBMISSION TYPE: Continuing Review/Progress Report

ACTION: Approved for Data Analysis Only
APPROVAL DATE: August 31, 2015
EXPIRATION DATE: August 26, 2016
REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category # (7)

Thank you for your submission of Continuing Review/Progress Report materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.

Please note that all research records must be retained for a minimum of three years.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.

If you have any questions, please contact Nicole Famese-McFarlane at (302) 831-1119 or nicolefm@udel.edu. Please include your study title and reference number in all correspondence with this office.