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PATTERNS IN AND PREDICTORS OF ELEMENTARY STUDENTS' READING PERFORMANCE: EVIDENCE FROM THE DATA OF THE PROGRESS IN INTERNATIONAL READING LITERACY STUDY (PIRLS)

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PATTERNS IN AND PREDICTORS OF ELEMENTARY STUDENTS' READING PERFORMANCE: EVIDENCE FROM THE DATA OF THE PROGRESS IN INTERNATIONAL READING LITERACY STUDY (PIRLS)

By

Yonghan Park

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ABSTRACT

PATTERNS IN AND PREDICTORS OF ELEMENTARY STUDENTS' READING PERFORMANCE: EVIDENCE FROM THE DATA OF THE PROGRESS IN INTERNATIONAL READING LITERACY STUDY (PIRLS)

By

Yonghan Park

This dissertation consists of two manuscripts reporting on patterns in and predictors of fourth-grade students' reading performance. By analyzing the data from the *Progress in International Reading Literacy Study* (PIRLS), the studies in this dissertation focused on student-level and classroom-level information in order to explore significant predictors of U.S. students' reading performance. The multilevel model was the main analytical approach of the studies in this dissertation, which involved students nested within classrooms. The studies drew on a complex view of the development of reading.

In the first study of this dissertation, I explored predictors of student performance on two different purposes of reading, that is, informational reading and literary reading. The inspiration for this study came from the fact that U.S. students have a large performance gap favoring literary reading over informational reading on average according to the reports from PIRLS 2001 and 2006. In order to understand this gap, the study examined differential contributions of literacy-related variables to informational versus literary reading performance on a country-level and within selected countries including the United States. The results indicated that several genre-related activities and curriculums were significantly related to fourth-grade children's reading performance on either literary or informational reading and, in some cases, across both of these genres. In the U.S., for instance, more instruction with informational text in classroom predicted higher reading performance in informational reading. The implication of this study is that substantial opportunities to learn with both literary and informational text and also opportunities to learn text style and structure should be provided in primary grades for all children.

The second study focused on the variables of reading motivation, based on their strong relationships to student reading performance shown in the first study. The purposes of the study were to explore underlying factors in reading motivation measured in PIRLS and to investigate the relationships between those factors and reading performance. Exploratory and confirmatory factor analyses revealed that motivational items in PIRLS consisted of four different factors which also could be clustered as two contrasting facets (internal orientation and external orientation) under two different dimensions (attitudes toward reading and reading self-concept). Further analysis discovered interaction effects between internally oriented motivation and externally orientated motivation to predict better reading performance. Although the relationship of one motivational facet to reading performance was different depending on the levels of its contrasting facet, internally oriented motivation was always a positive predictor of student reading performance. Extrinsic motivation under the dimension of attitudes toward reading, for example, positively related to reading performance if a student had high intrinsic motivation. However, it was a negative predictor of reading performance for those students with low intrinsic motivation. Finally, four motivational factors together explained 17% of the student-level variance in overall reading performance.

To Juwon, Jungwon, Eun-I, and my Parents

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INTRODUCTION

The ability to read is critical in and out of school from childhood through adulthood in modern society. Still, many students in the U.S. are not developing appropriate reading skills in spite of a long history of national efforts to improve children's reading abilities. According to a recent report from the *National Assessment of Educational Progress* (NAEP) 2007, for instance, 34% of fourth-grade students and 27% of eighth-grade students read below basic level which is defined as "partial mastery of prerequisite knowledge and skills that are fundamental for proficient work at a given grade" (Lee, Grigg, & Donahue, 2007). Given this, how can we improve children's reading abilities? This is the main research question that I have been examining throughout my graduate studies.

Reading is not a simple process and thus it requires more complex approaches that consider a variety of components including decoding, language comprehension, memory, speed, vocabulary, world knowledge, type of texts, motivation and so on (Pressley et al., 2008). This complexity implies that better reading programs should reflect a comprehensive model of reading involving reader, text, activity and context in order to fully develop children's reading abilities (RAND Reading Study Group, 2002).

Drawing on the less simple perspective for reading and reading instruction, my first research interest during my graduate program focused on a rather neglected topic in the field of reading research, that is, reading motivation. As a part of my practicum, I conducted a study to develop an instrument to measure elementary students' volition in reading (Park & Duke, 2005). In this study, volition was defined as an individual's character and behavior for an effortful pursuit of goals, which enables him/her to

overcome obstacles and preserve intention despite adverse circumstances in the process of reading. The concept of volition was distinguished from that of motivation, in that the latter concerns initial commitment that provokes goal-directed learning activities while the former concerns the maintenance of the initial motivation to achieve the goal. The instrument found six factors under volitional character and volitional strategy use to measure children's volition in reading.

A second strong interest during my graduate career has been international reading studies. Large-scale international studies on student academic performance provide useful information which researchers and policy makers can analyze to see how their nations are doing compared to other countries and to explore what factors within/across countries explain their academic achievement in fundamental subject areas. Several international studies have been conducted for examining literacy achievement, especially focusing on reading abilities.

International Studies of Reading

This section describes some significant international studies of reading performance in which the U.S. has participated since 1990. These are the IEA Reading Literacy Study, the International Adult Literacy Survey (IALS), the Adult Literacy and Life Skills Survey (ALL), the Programme for International Student Achievement (PISA), and the Progress in International Reading Literacy Study (PIRLS). Brief descriptions of each study are given below.

IEA Reading Literacy Study

In 1991, the International Association for the Evaluation of Educational Achievement (IEA) conducted the Reading Literacy Study to assess the reading skills of

fourth and ninth graders in 32 countries or jurisdictions around the world. This study defined reading as "the ability to understand and use those written language forms required by society and/or valued by the individual" (Binkley & Rust, 1994, p. 103). It measured student reading performance with three different types of text that students often encounter in school and in everyday life: narrative prose, expository prose, and documents. The study defined *narrative prose* as text in which the writer tells a factual or fictional story. *Expository prose* was defined as text in which the writer conveys factual information or opinion. Documents referred to information displays such as charts, maps, tables, graphs, lists, or sets of instructions. Reading scores were scaled with an international mean of 500 and a standard deviation of 100. U.S. fourth graders placed second (Mean = 547) among the participating countries on a combined score. U.S. ninth-grade students were ranked ninth (Mean = 535) on a combined score among the participating countries. Eight countries scored higher than the U.S., but only one country among them showed a statistically significant score difference with the U.S. The mean scores and relative ranks of U.S. students on three reading subscales are shown in Table I.1 (Elley & Schleicher, 1994). It is noticeable that U.S. fourth graders had a large score difference between narrative and expository prose reading, which was the second biggest achievement gap favoring narrative over expository prose reading among the 32 countries. This is consistent with the result from PIRLS 2001 in which, as discussed later, U.S. fourth graders had the largest achievement gap favoring literary reading over informational reading. In 2001, nine of the initially participating countries in the IEA Reading Literacy Study replicated the study using only fourth graders to look for any changes in their children's reading performance. Overall reading scores of U.S. students

in 2001 did not change significantly from 1991 (Martin, Mullis, Gonzalez, & Kennedy, 2003).

International Adult Literacy Survey

The International Adult Literacy Survey (IALS) was the first comparative study of adult literacy skills ever undertaken internationally. Over 75,000 adults aged 16 to 65 from 22 countries or jurisdictions including the U.S. were interviewed and tested in their homes in 15 languages between 1994 and 1998. The main purposes of this study were to find out how well adults use information to function in society and to investigate the factors that influence literacy proficiency at home, at work, and across countries (Tuijnman, 2000). IALS defined literacy as "the ability to understand and employ printed information in daily activities, at home, at work and in the community-to achieve one's goals, and to develop one's knowledge and potential" (OECD & Statistics Canada, 2000, p. x). It assessed adult literacy in three categories: prose literacy, document literacy, and quantitative literacy. Prose literacy assessed the knowledge and skills needed to understand and use information from continuous texts including editorials, news stories, brochures, poems, and fiction. Document literacy tested the knowledge and skills required to locate and use information contained in various noncontinuous texts, including job applications, payroll forms, transportation schedules, maps, tables, and charts. Quantitative literacy evaluated the knowledge and skills required to apply arithmetic operations to numbers embedded in written text. IALS measured literacy proficiency for each domain on a scale ranging from 0 to 500. As shown Table I.2, the average scores of U.S. adults were 273.7 on prose literacy, 267.9 on document literacy, and 275.2 on quantitative literacy. Those average scores were ranked

10th on prose literacy, 15th on document literacy, and 13th on quantitative literacy among the 22 participating countries (OECD & Statistics Canada, 2000).

Adult Literacy and Life Skills Survey

The Adult Literacy and Life Skills Survey (ALL) was an international study conducted in 2003 to provide participating countries or regions with comparative information about reading and other abilities of their adult populations. This study measured adults' life skills in four domains: prose literacy, document literacy, numeracy, and problem solving, although the U.S. did not field the problem solving domain. Two literacy domains, prose literacy and document literacy, were adapted from IALS described above. Although similar to quantitative literacy in IALS, numeracy in ALL was defined more broadly and thus considered a different domain. The subjects were the adults aged 16 to 65 from seven participating countries. The average scores of U.S. adults in two literacy domains were 268.6 (5th ranked) on prose literacy scale and 269.8 (5th) on document literacy scale (see Table I.3). Compared to the average scores in the IALS, the U.S. average score on prose literacy in ALL decreased significantly, while there was no significant change on document literacy (Statistics Canada & OECD, 2005). *Programme for International Student Assessment*

The Programme for International Student Assessment (PISA) is an international comparative study that has been conducted by the Organisation for Economic Cooperation and Development (OECD) every three years beginning in 2000, to assess 15year-old students' knowledge and skills in reading, math, science and problem solving. The numbers of the participating countries or jurisdictions were 43 in 2000, 41 in 2003 and 56 in 2006 (OECD, 2006). This study defined reading as "the ability to understand, use and reflect on written texts in order to achieve one's goal, to develop one's knowledge and potential, and to participate effectively in society" (OECD, 2003, p. 108). The items in reading assessment were constructed considering text formats (continuous texts and non-continuous texts), reading processes (retrieving information, interpreting texts, and reflection and evaluation), and reading situations (reading for personal use, reading for public use, reading for work, and reading for education). Scores were scaled with a mean of 500 and a standard deviation of 100 (OECD, 2003). The average overall reading scores of U.S. 15-year-old students were 504 (15th) in 2000 and 495 (18th) in 2003 (OECD, 2004). There was no statistically significant difference between these two scores. PISA 2000 provided reading performance scores on different text formats and different reading processes. U.S. average reading performance scores on different text formats were 504 (13th) on continuous texts and 506 (14th) on non-continuous texts. In relation to different reading processes, U.S. average reading scores were 499 (15th) for retrieving information, 505 (15th) for interpreting texts, and 507 (11th) for reflection and evaluation (see Table I.4).

Progress in International Reading Literacy Study

The Progress in International Reading Literacy Study (PIRLS) is a 5-year cycle of international comparative reading assessment that was first carried out in 2001. It was conducted under the supervision of the International Association for the Evaluation of Educational Achievement (IEA). The assessed children were typically in the fourth grade and the average age was around 10 in most countries including the United States (Mullis, Martin, Gonzalez, & Kennedy, 2003). The numbers of participating countries or jurisdictions were 35 in 2001 and 45 in 2006. PIRLS provided separate reading scores

for overall reading, literary reading, and informational reading. Those scores were scaled with an international mean of 500 and a standard deviation of 100.

The results from PIRLS 2001 and PIRLS 2006 indicate that U.S. fourth-grade students read better than the international average in both literary and informational reading. The average scores of U.S students in 2001 were 542 (9th highest) on overall reading proficiency scale, 550 (4th) on literary reading scale, and 533 (13th) on informational reading scale. In 2006, those scores were 540 (18th) on overall reading proficiency scale, 541 (18th) on literary reading scale, and 537 (19th) on informational reading scale. These average scores of U.S. students did not show a statistically significant change between 2001 and 2006 (see Table I.5; Mullis, Martin, Gonzalez, & Kennedy, 2003; Mullis, Martin, Kennedy, & Foy, 2007).

Overview of the Dissertation

This dissertation was formatted in an alternative style (Duke & Beck, 1999) in order to report the results from my dissertation research effectively and move the dissertation to publication efficiently. Following this part of overall introduction, two independent but related studies I conducted using the data from PIRLS 2006 are presented in two stand-alone manuscripts prepared for submission to academic journals.

The purpose of my dissertation research was to examine important predictors of elementary student reading performance in broader contexts. Using the data from PIRLS 2006, I was able to explore various literacy-related home/school background variables of fourth-grade students and examine reading performance for literary reading and informational reading separately. In addition, the result from the U.S. could be compared with those from other countries.

In the first study, I explored various predictors of student performance in different types of reading to find out whether and, if so, how those variables differentially predict student performance on informational reading and literary reading. The inspiration for this study came from the fact, as noted earlier, that U.S. fourth-grade students had a large performance gap favoring literary reading over informational reading. The study addressed the following questions: First, what are the significant country-level predictors of countries' average reading performance in informational and literary reading? Seconds, within the U.S., what variables from inside and outside classrooms are related to student performance in different genres? Third, are there any similarities or differences between the U.S. and other countries regarding the predictors of student reading performance? By analyzing the country-level data and within-country data from PIRLS 2006 using multiple regression and hierarchical linear modeling, this study showed that genre-related in and out-of-school activities and curriculums were significantly related to student reading performance in a specific genre and, in some cases, across different genres, within countries and also across countries. The implication of this study is that we should provide substantial opportunities to learn with both literary and informational text and also opportunities to learn text style and structure in primary grades for all children.

As the first study showed that reading motivation was a consistently significant predictor of student reading performance, in the second study, I focused on motivational variables. As noted earlier, reading motivation has been a research interest of mine throughout my graduate studies. The purposes of this study were to explore underlying factors in reading motivation measured in PIRLS and to investigate the relationships

between those motivational factors and students' reading performance. A special interest was given to interactions between different motivational facets to predict better reading performance. The study analyzed the U.S. data from PIRLS 2006 using exploratory/confirmatory factor analysis methods and hierarchical linear modeling. This study first showed that PIRLS motivation items clustered under two motivational dimensions: attitudes toward reading and reading self-concept. Within each dimension. two contrasting facets represented students' internal or external orientation of reading motivation. Specifically, student attitudes toward reading consisted of extrinsic motivation and intrinsic motivation, while student reading self-concept was composed of self-referenced perceived competence and peer-referenced perceived competence. Second, internally oriented motivational facets and externally oriented motivational facets interacted with each other in relation to student reading performance. Although this interaction means that the relationship of one motivational facet to reading performance is dependent on the levels of its contrasting facet, this study found that internally-oriented motivational facets were always more positive predictors of student reading performance than externally-oriented motivational facets. Extrinsic motivation under the dimension of attitudes toward reading, for example, positively related to reading performance if a student had high intrinsic motivation. However, it was a negative predictor of reading performance for those students with low intrinsic motivation. Third, reading motivation was a strong predictor of reading performance even after other literacy-related variables were statistically controlled. Four reading motivational facets in this study explained 17% of the student-level variance in students' reading performance. This study confirms that reading motivation has a

multidimensional and multifaceted nature and that internally oriented motivation is especially strongly linked to better reading performance. Without support from internally oriented motivation, externally oriented motivation has a negative relation to performance. The study suggests that researchers should consider interacting relationships of different motivational constructs.

In summary, the studies in this dissertation offer important implications for genre and reading motivation in relation to the development of reading abilities. They also provide another demonstration of how data from large-scale international studies can be meaningfully used for reading research.

Grade	Performance	Overall	Narrative	Expository	Documents
4th	Mean (S.E.)	547 (2.8)	553 (3.1)	538 (2.6)	550 (2.7)
Grade	Rank	2nd	2nd	3rd	3rd
9th	Mean (S.E.)	535 (4.8)	539 (4.9)	539 (5.6)	528 (4.0)
Grade	Rank	9th	6th	5th	14th

U.S. Students' Reading Performance in the IEA Reading Literacy Study

Note. A total of 32 countries or jurisdictions participated in the IEA Reading Literacy Study.

Performance	Prose literacy	Document literacy	Quantitative literacy
Mean (S.E.)	273.7 (1.6)	267.9 (1.7)	275.2 (1.7)
Rank	10th	15th	13th

U.S. Adults' Reading Performance in the International Adult Literacy Survey (IALS)

Note. A total of 22 countries or jurisdictions participated in the IALS.

Performance	Prose literacy	Document literacy
Mean (S.E.)	268.6 (1.3)	269.8 (1.5)
Rank	5th	5th

U.S. Adults' Reading Performance in the Adult Literacy and Life Skills Survey (ALL)

Note. Only seven countries or jurisdictions participated in the ALL.

U.S. 15-Year-Olds' Reading Performance in the Programme for International Student Assessment (PISA)

Performance	Overall	Text formats		
renomance		Continuous texts	Non-continuous texts	
Mean (S.E.)	504 (7.1)	504 (7.1)	506 (7.2)	
Rank	15th	13th	14th	

Note. The scores and ranks above are based on the report in *Reading for Change: Performance and* Engagement across Countries (OECD, 2002) which conducted the analysis with a set of 31 countries or jurisdictions from PISA 2000.

U.S. Fourth-Grade Students' Reading Performance in the Progress in International Reading Literacy Study (PIRLS)

Year	Performance	Overall	Literary	Informational
2001	Mean (S.E.)	542 (3.8)	550 (3.8)	533 (3.7)
	Rank	9th	4th	13th
2006	Mean (S.E.)	540 (3.5)	541 (3.6)	537 (3.4)
	Rank	18th	18th	19th

Note. A total of 35 countries or jurisdictions participated in 2001 and 45 in 2006.

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STUDY ONE

PREDICTORS OF ELEMENTARY STUDENTS' READING PERFORMANCE IN INFORMATIONAL AND LITERARY READING

Abstract

In increasingly information-rich societies, the ability to acquire and use information from text effectively is becoming more important. This informational reading, however, has received little attention in U.S. primary-grade classrooms. As might be expected then, according to the results from the Progress in Informational Reading Literacy Study (PIRLS), U.S. fourth-grade students have a large performance gap favoring literary reading over informational reading. In order to explore predictors of reading performance in these two different types of reading, this study analyzes the data from PIRLS 2006. In addition to general demographic predictors, several genrerelated predictors were examined in relation to student reading performance in informational reading and literary reading across countries and within selected countries. This study found that in- and out-of-school genre-related activities and curriculum significantly predicted children's reading performance in a specific genre and even across different genres. The results suggest that we should provide substantial opportunities to learn with both informational and literary text and also opportunities to learn text style and structure in primary grades for all children.

Introduction

Narrowing the gaps in students' academic achievement has long been one of the crucial issues for educational researchers and policy-makers in the United States (Stedman & Kaestle, 1987). But the effort to eliminate those gaps seems not yet successful, as they have not substantially narrowed. In relation to reading achievement, for example, Klecker (2006) argued that there continued to be a gap in reading achievement between females and males, favoring females over males, according to the longitudinal analysis of the *National Assessment of Educational Progress* (NAEP) reading scores. Thernstrom and Thernstrom (2003) highlighted a steady reading achievement gap among different racial groups from the NAEP results showing the relatively low achievement of Black and Hispanic students compared to that of White and Asian students. Lemke and associates (2005) pointed out another reading achievement gap from the U.S. data of the *Programme for International Student Assessment* (PISA) 2001, finding that U.S. reading achievement was significantly differentiated by socioeconomic status (SES) as well as gender and ethnic groups.

Although many have raised issues regarding gaps in reading achievement of U.S. students as seen above, their focus has been mainly on gaps due to the characteristics of the readers, which is related to the question of *who reads*. There seems to have been little interest in gaps surrounding the questions about *what they read* and *why they read*. The RAND Reading Study Group (2002) has contended that reading comprehension— "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (p. 11)—consists of three elements: 1) reader, 2) text, and 3) activity or purpose for reading. Since critical views regarding the reader element in various reading achievement gaps have been already expressed by many researchers as mentioned above, this study focuses on the gaps related to the other elements: specifically, text and purpose for reading. These two elements can be reduced to the concept of *genre* in literacy (Kirk & Pearson, 1996; Paré & Smart, 1994; Swales, 1990).

In the *Progress in International Reading Literacy Study* (PIRLS), which is an international comparative study of fourth graders' reading performance, students have been tested with texts of different genres and, more specifically, their reading scores have been reported in two different reading purposes: literary reading and informational reading. According to reports from PIRLS (Mullis, Martin, Gonzalez, & Kennedy, 2003; Mullis, Martin, Kennedy, & Foy, 2007), U.S. fourth-grade students showed the largest performance gap between these two reading purposes favoring literary reading over informational reading among the participating countries in 2001 and the gap still existed in 2006, although the size of the gap was smaller than before.

So why is U.S. informational reading performance relatively lower than its literary reading performance? And what might be done in order to improve children's performance in different types of reading? These are questions with serious implications because, in modern society, it is becoming increasingly important to have good informational reading abilities (Benson, 2002; Doyle, 1994; Eisenberg, Lowe., & Spitzer, 2004). Moreover, it is noteworthy that the subjects of PIRLS are students in the fourth grade, a time when students are believed to experience the so-called fourth-grade slump (Hirsch, 2003). Some researchers have argued that the fourth-grade slump may be linked to the relative expansion of informational text at that grade (Chall, Jacobs, & Baldwin,

1990). Other studies have shown that U.S children in primary grades have very little experience with informational text (Duke, 2000; Pressley, Rankin, & Yokoi, 1996; Yopp & Yopp, 2006). Accordingly, there may be some connections among large reading performance gaps between different genres, students' experience with texts of different genres, and their academic difficulties at the fourth grade. This provides a compelling argument for the importance of studying the predictors of student reading performance in different text genres.

Theoretical & Empirical Background

Genre

A discussion of the second and third elements in the RAND Reading Study Group (2002) model – text and activity/purpose – can be found in genre theory, which emphasizes the relationship between language and its social context (Halliday, 1978). From the perspective of genre theory, our oral and written language is the result of the social situation in which we are communicating. Thus, people use different types of language in different social contexts in which they have different purposes. In short, context, purpose, and type of communication build the basis of genre theory (Stamboltzis & Pumfrey, 2000).

The Oxford English Dictionary defines genre as "a particular style or category of works of art; especially a type of literary work characterized by a particular form, style, or purpose." In the field of literacy, Duke and Purcell-Gates (2003) defined genre as "patterns in the situations in which a text is used and patterns in the features of that text including its language, format, structure and content" (p. 31). They further defined it as a set of identifiable linguistic forms that are dynamic and fluid to serve different social
purposes that are situated within socio-cultural contexts (Purcell-Gates, Duke, & Martineau, 2007). Therefore, genre is not about independent text structures but about the interactions between texts we use and social contexts in which we live (Littlefair, 1992).

In general, genre is considered to include two aspects of text: the purposes for which it is written (or spoken) and the features with which it is constructed (Chapman, 1999; Kirk & Pearson, 1996). According to Littlefair (1991), the purpose of text is a primary determinant of genre as authors write with different purposes such as promoting particular values through a story, conveying information, entertaining with a poem, teaching someone to read, and so on. These different purposes, in turn, have an effect on the second aspect of genre, that is, the text features, which refer to the ways in which words, sentences, graphics and other text elements are patterned and organized. The same applies to reading. A reader often picks up a certain text with a certain purpose, and the texts chosen for different purposes usually contain different features.

Genre can help us better understand the complex relationships among texts, readers, and authors (Epstein-Jannai, 2005). It arouses expectations in readers by organizing what is read as a significant construct and allowing readers to anticipate what is coming. Additionally, genre is conceptualized as a framework one can use to understand and interpret a text. That is, it acts as a cultural framework that shapes meaning and fulfills social and cultural goals while enabling an examination of the possible ways of creating meaning as a kind of social exchange (Cope & Kalantzis, 1993).

Genre Terminology

In the field of literacy, many different terms have been used to refer to specific text genres and there is no complete consensus on the definitions of these terms. Nevertheless, most would agree that texts can be categorized broadly into two types: *fiction* and *nonfiction* (e.g., Cooper, 1995; Harkrader & Moore, 1997; MacLean & Chapman, 1989). This distinction was initially used in bibliographic classification and subject analysis for librarians in the early 1900s and, since then, has remained almost unquestioned in discussion of text genres (Beghtol, 2001). Another popular distinction is *narrative* and *non-narrative* (e.g., Caswell & Duke, 1998; Georgakopulou & Goutsos, 2000), narrative texts being those that involve a series of events constrained by the temporality and the causality of the successive action and non-narrative texts being those that do not (Labov, 1972). These above-mentioned distinctions are related to different aspects of text. That is, the fiction versus nonfiction distinction deals with the content of text whereas the narrative versus non-narrative distinction concerns the form of text. In fact, there can be narrative fiction, narrative nonfiction, non-narrative fiction, or nonnarrative nonfiction by these dimensions of text genre.

Many other experts in literacy have differentiated text types or genres using other terminologies. The distinction between *narrative* texts and *expository* texts is another popular categorization in use (e.g., Abadiano & Turner, 2002; Saenz & Fuchs, 2002). Saenz and Fuchs (2002) defined narrative texts as stories written to entertain while expository texts as materials written to communicate information to help readers learn something new. There were also other categorizations with more than two genres. For example, Littlefair (1991) categorized four different text types including *literary*,

expository, procedural and reference, and Arnold (1992) suggested three different text genres including narrative, autobiographical, and informational.

In recent years, narrative texts and informational texts have become a popular distinction between genres (e.g., Duke, 2000; Kletzien & Dreher, 2004), although this is similar to the distinction between narrative texts and expository texts. The contrast between narrative and informational texts can be difficult to determine in many instances, because those two terms refer somewhat to different text properties. The word informational is related to the content or purpose of text, while narrative often refers to the style of text. Thus, as Duke (2000) indicated, we can find informational texts which have the styles of narrative texts and poems, so-called narrative-informational texts and informational-poetic texts. To avoid this confusion, it might be more advisable to use the terms literary texts and informational texts, both of which refer to the purposes of reading or purposes of text. This differentiation between literary and informational reading is being used in large-scale literacy assessments such as NAEP and PIRLS (Campbell et al., 2001; National Assessment Governing Board, 2006). These various ways of categorization among text genres in literacy, however, share many common features, in that all try to contrast something more informative and/or expository with narrative and/or literary texts.

Several researchers have provided evidence that different text genres affect the process of reading differently. Kirk and Pearson (1996), for instance, conducted a small experimental study with 20 children in first and second grade, and found that children read a narrative text with greater accuracy and showing more predictions when they were asked to suggest how the passage might end, while children read an informational

text with a higher level of engagement in its meaning in that they made more meaningful substitutions for unknown words when reading an informational text. Wolfe (2005) investigated how text genres moderate the effect of semantic association on memory in reading and found that semantic association played a larger role in memory with expository texts than in memory with narrative texts. Kucan and Beck (1996) studied the differential effects of narrative and expository texts on the reading process with fourth graders. They found that readers made more inferences, predictions, and interpretations to synthesize and integrate whole text information by extracting important ideas when reading narrative texts, whereas they drew more on personal knowledge and experience focusing on local text information when reading expository texts. These and other data offer a glimpse of genre effects on the reading process and thus imply that we should consider text genre as an important factor when we teach children to read. All genres have something to offer the developing reader (Stamboltzis & Pumfrey, 2000). Thus, each of them can be used to develop particular aspects of reading in literacy education. U.S. Performance in Informational Reading

Informational reading is getting more attention from educators and researchers, because contemporary society is attaching more importance to the ability to find, understand, and manage information from text in this information-rich environment. In her discussion of the effect of genre on literacy, Duke (2000) has termed knowledge of socially-valued genres *semiotic capital*, a form of cultural capital. This term denotes that fluency in a type of discourse valued in a particular social context can be a significant power. In turn, this capital affects the quality of one's life in communities, schools, and workplaces (Bourdieu, 1991; New London Group, 1996), as do other types of capitals

such as cultural capital and economic capital. However, there has been relatively little large-scale research evidence on how this new semiotic capital, that is, informational reading, is distributed to children in our society.

As noted earlier, PIRLS is one of the few large-scale literacy studies from which students' reading performance in literary and informational reading can be seen separately. When comparing the average informational reading score of each country with its average literary reading score in PIRLS, many countries performed relatively better or worse on one type of reading than on the other. The results from PIRLS 2001 and 2006 indicate that U.S. fourth grade students read better than international averages with both literary and informational texts (Martin, Gonzalez, & Kennedy, 2003; Mullis, Martin, Kennedy, & Foy, 2007). The average overall reading scores of U.S. students were 542 in 2001, the 9th highest among 35 countries or jurisdictions, and 540 in 2006. the 18th highest among 45. However, there are notable differences between informational and literary reading achievement in the U.S. The average reading scores of U.S. students on the two genres had a significant gap favoring literary over informational reading. More specifically, in 2001 the average reading scores of U.S. students were 550 (4th highest) in literary reading and 533 (13th) in informational reading. The score gap between two genres was 17, which is the largest gap in favor of literary reading among 35 participating countries or jurisdictions in 2001. This gap narrowed in 2006, with 541 (18th) in literary reading and 537 (19th) in informational reading, but U.S. fourth graders still scored lower in informational reading than in literary reading at the .05 level of statistical significance. (According to PIRLS, the average U.S. scores in overall, literary, and informational reading did not change between 2001 and 2006 in a statistically

significant manner, although there was a relatively large drop in the literary reading score and rank.) This pattern was consistent across genders, with both girls and boys scoring lower on informational reading than literary reading (and girls scoring significantly higher than boys in both types of reading; see Table 1.1).

Factors Related to U.S. Performance in Informational Reading

So why do U.S. students struggle with informational text? And under what conditions do they have greater success with such texts? The answers to these questions are not yet readily apparent. One possibility is relative inattention to informational text in the primary grades. In the United States, a large proportion of the literacy experience children have in and outside of school in their early years is devoted to narrative and literary text genres (Caswell & Duke, 1998). Yopp and Yopp (2006) analyzed readaloud titles at school and in the homes of children in early grades, and their findings suggest that children have far less exposure to informational texts (less than 10% of read-alouds) than narrative texts (more than 75% of read-alouds). Pressley, Rankin, and Yokoi (1996) surveyed primary-grade teachers and found that only 6% of the reading in their classrooms was of expository genres while 73% of the reading was of literary and narrative genres. Duke (2000) also showed that informational texts were scarce in firstgrade classrooms, particularly in classrooms in low-SES settings. This study supports the argument that semiotic capital is being distributed unequally to children depending on their socio-economic status.

Reporting the findings from a three-year longitudinal study conducted with children in the United Kingdom from age 8 to 13, Chapman (1987) suggested that many primary-grade children (especially poor readers) would have reading problems later in

their upper grades when they meet texts of less familiar genres. Chall, Jacobs, and Baldwin (1990) also suggested, as mentioned earlier, that the fourth-grade slump in children's literacy achievement might come from their difficulties with informational text reading. Thus, lack of experience with informational texts in early grades has been identified as a likely negative influence on children's literacy development.

In spite of the importance of experiencing various types of reading in early grades, why is there an imbalance between genres in primary classrooms, i.e. why is there the scarcity of informational texts compared to the prevalence of literary texts? The lack of informational reading in the early grade classrooms may depend on widespread, but largely unfounded, beliefs that young children cannot handle informational texts, do not like informational texts, and should first learn to read and then read to learn (Duke, Bennett-Armistead, & Roberts, 2003). These beliefs, however, have little research evidence to support them. In contrast, researchers have recently reported some evidence that refute those unsupported beliefs. Hall, Sabey, and McClellan (2005), for instance, investigated the effectiveness of an instructional program designed to teach reading comprehension with expository texts in second-grade classrooms and showed that young children were able to be taught successfully with expository texts to improve their reading comprehension. Reutzel, Smith, and Fawson (2005) also found that it was beneficial to teach second-grade students comprehension strategies using science informational texts. In her dissertation research, Jacobs (2004) conducted an intervention study with at-risk first grade students in low-SES, low performing urban schools. She provided them with 18 twenty-minute lessons designed to explicitly teach precursory skills for expository text comprehension. Children in treatment groups performed better

than children in control group on several reading measures. Mohr (2006) asked firstgrade students to select one book of their preference from a set of books which were different in their attributes such as genres, genders, ethnic groups, and so on. The overwhelming majority (84%) of the students selected nonfiction books rather than fiction books, and almost a half of the students (46%) selected informational books in particular. These and other studies suggest that children in primary grades can handle informational texts successfully through adequate instruction and that many actually have positive attitudes toward informational texts.

However, there is still a lack of empirical evidence about what kinds of literacy experiences are differentially related to student performance in different types of reading: informational reading and literary reading. Most research on predictors of reading achievement has not distinguished different types of reading, even in the rare studies that have assessed reading performance separately for different types of reading (e.g., NAEP; Perie, Moran, & Lutkus, 2005).

Purposes of the Study

The main purpose of this study is to explore various predictors of student performance in different types of reading to find out how those variables differentially predict informational reading performance and literary reading performance. To do this, the data from PIRLS 2006 were analyzed to address the following questions. First, what predicts country-level performance in different types of reading? Second, within the U.S., what kinds of student-level and classroom-level variables are related to student performance in informational reading and literary reading. Third, are there any similarities or differences between the U.S., a country with a performance gap favoring

literary reading over informational reading, and other countries with different countrylevel patterns in two types of reading performance. Looking at the data through this lens will provide explanations about the relatively lower performance of U.S. children in informational reading over literary reading and will suggest possible ways in which children's literacy in different genres could be improved—avenues to investigate in future research.

Methods

The design of this study is a secondary analysis, the reanalysis of existing data (Sales, Lichtenwalter, & Fevola, 2006), using the data collected for PIRLS in 2006. To explore genre-related predictors, various literacy-related information from the PIRLS background questionnaires was collected and scaled, if necessary, for further analysis. Next, by using ordinary least square multiple regression, country-level predictors were explored in relation to country-level average reading performance with different genres and country-level percentage of students with a large gap between informational reading and literary reading. Then, by using hierarchical linear modeling with student-level and classroom variables, U.S data were analyzed to investigate significant predictors of U.S. student performance on different types of reading. Finally, the data from selected countries were analyzed by the same analysis method and then compared with the results from the analysis of U.S. data.

Progress in International Reading Literacy Study (PIRLS)

The PIRLS is a 5-year cycle of international comparative reading assessment which has been conducted under the supervision of the International Association for the Evaluation of Educational Achievement (IEA). It assesses the reading performance of

children in the upper grade of the two adjacent grades that contain the largest portion of 9-year-olds at the time of testing. These children were typically in the fourth grade and the average age was around 10 in most countries including the United States (Mullis, Martin, Gonzalez, & Kennedy, 2003). The first data collection took place in 2001 with subjects from 35 countries or jurisdictions and the second in 2006 with subjects from 45 countries. PIRLS not only assessed children's reading performance but also obtained a variety of literacy-related information, such as reading motivation, out-of-school literacy experience, classroom literacy instruction, school culture, and national literacy curriculum, from children, parents, teachers, school administrators, and national coordinators of the assessment.

PIRLS defined reading as "the ability to understand and use those written language forms required by society and/or valued by the individual. Young readers can construct meaning from various texts. They read to learn, to participate in communities of readers in school and everyday life, and for enjoyment" (Mullis, Kennedy, Martin, & Sainsbury, 2006, p. 3). Based on this definition, PIRLS tried to build a thorough and theoretically cohesive framework of reading in order to develop a reading assessment with strong validity. In general, the framework consisted of two broad aspects of reading comprehension: processes of comprehension and purposes of reading. *Processes of comprehension* were reflected in the assessment through four different types of comprehension questions—questions that require students to: (a) focus on and retrieve explicitly stated information; (b) make straightforward inferences; (c) interpret and integrate ideas and information, and (d) examine and evaluate content, language, and textual elements. *Purposes for reading* were reflected in the types of reading materials,

in other words, text genres, used in the assessment. PIRLS focused on two reading purposes that account for most of the reading done by young students both in and out of school: (a) reading for literary experience and (b) reading to acquire and use information (Campbell, Kelly, Mullis, Martin, & Sainsbury, 2001). These two broad purposes for reading are associated with certain text genres that bring different reading experiences. When reading for a literary purpose, a reader becomes involved in imagined events, settings, actions, consequences, characters, atmospheres, feelings, and ideas, and the reader brings his or her own experiences, feelings, appreciation of languages, and knowledge of literary forms to the text, which is usually narrative fiction. On the other hand, when reading for information, a reader engages informational or expository texts not with an imagined world but with a real universe.

Measures and Variables

The reading assessment of PIRLS 2006 was comprised of 10 different texts, five for each of the two reading purposes. Each text was accompanied by approximately 12 test items with half in the multiple-choice format and half in the constructed-response format. Students participating in PIRLS received one of the 12 test booklets, each of which included 2 of the 10 prepared texts. Their reading performance scores were scaled for overall reading, literary reading, and informational reading separately with an international mean of 500 and standard deviation of 100 using the Item Response Theory. The median Cronbach's alpha reliability coefficient of this reading assessment across the booklets was .88 on average across all countries (Mullis, Martin, Kennedy, & Foy, 2007).

To identify the factors related to children's reading performance, PIRLS developed five background questionnaires: Student Questionnaire, Home Survey,

Teacher Questionnaire, School Questionnaire, and Curriculum Questionnaire. The Student Questionnaire asked participating students about their general demographic information, educational resources, literacy-related activities in and outside of school, and reading motivation. The Home Survey asked a parent of each participating student about his or her literacy-fostering activities with child, home educational resources, and other home literacy information. This parent questionnaire was not administered in the U.S. and thus was excluded from the analysis in this study. The reading teachers of participating students completed the Teacher Questionnaire about the teacher's demographic information, class characteristics, instructional materials and technologies, instructional strategies and activities, homework assignments, and so on. The principals of the sampled schools completed the School Questionnaire about school characteristics, school policy and curriculum, school environment and resources, literacy resources, community relations, and school climate. This principal questionnaire was excluded from the within-country analysis of this study because the information from the principal questionnaire was less closely related to the focus of this study. The national research coordinators of the participating countries completed the Curriculum Questionnaire that asked about the nature of the development and implementation of a nationally defined reading curriculum in addition to national demographics, emphasis on literacy, governance and organization of education system, curriculum characteristics, and so on.

Among the information collected from the PIRLS questionnaires, of particular interest in this study are the variables related to the development of children's general and genre-specific literacy. The country-level variables of this study included not only the country-level information from the Curriculum Questionnaire but also the national

average values or percentages of students providing particular responses on other questionnaires. The within-country variables consisted of the information obtained from the Student Questionnaire and the Teacher Questionnaire, because the information in these two questionnaires best represented students' literacy-related activities and resources in and out of classroom. The variables included for the analysis in this study were selected on the basis of the preliminary inspection of correlations between the variables in PIRLS and student performance and on the basis of findings from prior large-scale research such as PIRLS, PISA, and NAEP that studied contextual predictors of reading performance.

Participants

A total of 45 countries or jurisdictions participated in PIRLS in 2006 (see http://pirls.bc.cdu/pirls2006/ for more details). In each country, a representative sample of students was selected using a two-stage stratified cluster sample design, with schools as the first stage and one or two classes within each sampled school as the second. In the U.S., a total of 5,190 fourth-grade students from 253 classrooms from 183 schools participated in the final sample in 2006. Preliminary analyses were conducted to identify significant variables associated with children's reading performance with the country-level data across the countries and also with the class- and student-level data of the United States.

After arranging a set of key variables, country-level analyses were conducted using the data of 41 out of 45 countries or jurisdictions in PIRLS. Four countries—Hong Kong, Kuwait, Luxembourg, and Morocco—were excluded from the analyses because of substantial country-level missing information. Then within-country data were

analyzed, with listwise deletion of missing values. In addition to the U.S., data were analyzed for three other countries—Denmark, England, and Taiwan—whose average overall reading scores were not statistically different from the U.S. score. Those three countries, however, were different in their performance patterns between literary and informational reading. Like the U.S., Denmark had a statistically significant gap favoring literary over informational reading, whereas Taiwan had a gap favoring informational over literary reading. The gap was not statistically significant in England. More details about these countries will be discussed later in this article.

Analysis Procedures

The main analytic methods of this study were multiple regression for the country-level analysis and the two-level hierarchical linear modeling for the within-country analysis. As mentioned above, PIRLS collected the data on multilevel bases and the current study focused on the literacy-related information from students and teachers. Because the actual sampling units of PIRLS were classes and students within sampled classes participated in the study, the data had a hierarchical structure with students nested within classes. The hierarchical linear model is a recommended statistical method when analyzing the data with this nested structure (Raudenbush & Bryk, 2002). SPSS 15.0 and HLM 6 were used as the tools for the statistical analyses of this study.

Many variables in this study were scaled by the Rasch model (Rasch, 1980; Wright, 1997) using WINSTEPS 3.63.0, when the variables were constructed from multiple questions addressing the same construct. The classical techniques of the variable construction by summing or averaging the responses have several limitations (Bond & Fox, 2007; Smith, 2000). First, these variables are usually measured on the

ordinal scale, which is weaker than the interval scale in its interpretation and statistical application. In many cases, the response options in the PIRLS questionnaires were presented using the Likert scale: for example, 1) Every day or almost everyday, 2) Once or twice a week, 3) Once or twice a month, and 4) Never or almost never. This Likert scale itself is not an interval but an ordinal scale and, when summing or averaging this kind of responses from several questions, it is difficult to interpret what the values mean practically. The second limitation of the classical techniques is that they cannot consider the characteristics of persons and the characteristics of items simultaneously. When the responses of multiple questions are summed or averaged for one variable, it is assumed that each question contributes equally to the variable, which is not always true. In many cases, some questions among them contribute more to the variable, while the others contribute relatively less. The Rasch model can overcome these limitations. Thus, using the Rasch model, the variables were standardized with the person mean of 0 and the person standard deviation of 1 with non-extreme responses (Bond & Fox, 2007; Smith, 2000).

Results

In order to investigate the predictors associated with U.S. students' performance gap favoring literary reading over informational reading, various country-level variables were explored in relation to children's performance in informational and literary reading and the gap between the two across nations using the data from PIRLS 2006. Then, these variables were more closely examined with U.S. data to study their relations with U.S. students' reading performance in different genres. The analyses were focused especially on opportunities for literacy learning afforded to children in and outside of classrooms.

Finally, the analysis results of the data from several selected countries were compared in detail with those from the U.S. to see whether there are any similarities or differences among the countries in predictors of student achievement in informational and literary reading.

Predictors of the Country-level Reading Performance

The country-level data were analyzed first, in order to explore the predictors and patterns of literacy performance on different types of reading across 41 participating countries or jurisdictions in PIRLS 2006. This analysis focused on five country-level outcome variables: (a) informational reading score, (b) literary reading score, (c) overall reading score, (d) the percentage of students with a large gap favoring literary over informational reading, and (e) the percentage of students with a large gap favoring informational over literary reading. In this study, the 'large gap' between informational and literary reading was defined operationally as above or below one standard deviation of score difference between those two types of reading (difference = 'informational reading score' minus 'literary reading score', international mean = 1.06, S.D. = 32.27). Detailed descriptions of all predictor variables are presented in Appendix A. Table 1.2 presents the means, standard deviations, and intercorrelations of the country-level variables of interest.

Early emphasis—*before* fourth grade—of school curriculum on genre features such as text style and structure predicted positively the country-level informational reading performance as well as literary reading performance. Meanwhile, *at* fourth grade neither teaching with informational texts at least weekly nor teaching text style/structure at least weekly significantly predicted any types of country-level reading performance.

Regression analyses in Table 1.3 indicate that the higher national average scores on informational, literary, and overall reading were all predicted by lower infant mortality rate, less formal reading instructional time at the fourth grade, more students taught with literary texts at least weekly, and more students in schools with a major emphasis of reading curriculum on text style and structure before the fourth grade. In addition, a country's average class size negatively predicted its literary reading score.

In relation to the reading score gap between different genres, the percentage of students with a large score gap favoring informational reading over literary reading correlated with several demographic variables (see Table 1.2). A country's higher percentage was significantly predicted by its higher infant mortality rate and higher average class size (see Table 1.3). In other words, more developed countries have fewer students with a large reading performance gap favoring informational over literary reading. According to these country-level analyses, the infant mortality rate best explains the variance in country-level reading performance on overall, literary, and informational reading as well as the variance in country-level percentage of students with a large performance gap favoring informational reading. This is not surprising in that infant mortality rate has been considered as one of the best predictors of state failure and life quality (King & Zeng, 2001). The percentage of students with a large score gap favoring literary reading, however, showed no significant correlations with any variables of interest and its regression model was not significant.

Country-level reading curriculum emphasis on different reading purposes at fourth grade is related to country-level reading performance. A country with more emphasis of their national reading curriculum on one reading purpose scored higher on

that type of reading performance as well as on the other type of reading performance. Table 1.4 shows the means and standard deviations of the country-level reading outcomes according to the degrees of emphasis in the national reading curriculum at the fourth grade on each of the two reading purposes, that is, informational reading and literary reading. Among 41 countries or jurisdictions, 25 responded that their fourth grade curriculum had strong emphases on both informational reading and literary reading. Although the mean differences were not analyzed statistically due to the small number of the participating countries, visual inspection of results suggested that the countries with more emphasis on each of the reading purposes had higher reading performance scores than those with less emphasis. This tendency was also more salient for the emphasis of informational reading purpose than for literary reading purpose. For example, the score differences in reading performance—informational, literary, and overall—between the countries with strong emphasis and the countries with moderate emphasis was about 20 points for the emphasis on informational reading purpose but less than 7 points for the emphasis on literary reading purpose.

The relationships were less clear, however, between the national curriculum emphasis on reading purposes and the large gaps in reading performance between two types of reading. Table 1.4 shows that the countries with major emphasis on each of the two reading purposes have smaller percentages of students with a large performance gap favoring literary reading over informational reading than the countries with some emphasis. On the contrary, the countries with major emphasis of their national fourthgrade reading curriculum on each of the two reading purposes have slightly larger percentages of students with a large performance favoring informational reading over

literary reading than the countries with some emphasis on average. No statistical mean differences were examined because of the small number of countries in each emphasis category, and thus conclusions are based only on visual inspection.

Predictors of U.S. Students' Literacy Performance

In order to explore the predictors and patterns of students' reading performance in different genres in more detail, this study looked into the U.S. data focusing on classroom-level and student-level variables. The classroom-level variables included students' literacy experience and resources at school, while the student-level variables explained their literacy experience and resources outside of school (see Appendix A for the variable descriptions). After missing data deletion, the data from 4,508 students in 249 U.S. classrooms were analyzed. Table 1.5 and Table 1.6 present the means, standard deviations, and intercorrelations of the variables on the classroom-level from the teacher questionnaire and on the student-level from the student questionnaire respectively.

On the classroom-level (see Table 1.5), the class mean overall, informational, and literary reading scores correlated positively with the class mean SES and negatively with the proportion of students with reading difficulties in class. Teachers' computer use for reading instruction and their instruction for informational reading had significantly positive correlations with the class mean informational reading score, and they did not correlate significantly with class mean literary reading performance. Reading homework assignment by teachers had a significantly negative correlation with class mean literary reading performance. There were also more students with a large score gap between the two genres favoring literary over informational reading in class, when the class had less instructional time for reading and had fewer students with reading difficulties. These are

bivariate correlations, though. When class-level variables were considered together to predict student reading performance scores, many of those variables did not have a significant prediction and thus were excluded from the analysis models.

On the student-level (see Table 1.6), many variables of interest correlated significantly with students' reading performance scores. For example, students' overall, informational, literary reading scores had positive correlations with gender (as being girls), books at home, student SES, attitudes toward reading, and reading self-concept, whereas they had negative correlations with students' reported home/school computer use and abnormal amount of reading (a great deal of reading and no reading) outside of school. In addition, students' informational reading outside of school correlated negatively with their reading scores, while their literary reading outside of school correlated positively with the reading scores. Finally, the students with a large gap favoring literary reading were more likely to be better readers, while those with a large gap favoring informational reading were more likely to have lower reading performance scores. These student-level variables were still significant predictors of reading performance even when considered together in the hierarchical linear models.

Two-level HLM analyses were conducted to explore the significant predictors of students' informational reading performance and their literary reading performance respectively. When predicting informational reading performance scores, 26% of the variance was between classrooms (intraclass correlation = .26). The student-level variables of this analysis in Model 1 explained 26% of the within-class variance in students' informational reading performance, while the classroom-level variables accounted for 32 % of the between-class variance in students' informational reading

scores (see Table 1.7). When predicting literary reading performance scores, 22 % of the variance existed between classrooms (intraclass correlation = .22). Thus, there was 4 percentage points more between-class variance in informational reading performance than in literary reading performance. When looking at literary reading performance, 27% of the within-class variance was explained by the student-level variables in Model 1, while 31% of the between-class variance was accounted for by the classroom-level variables in Model 2 (see Table 1.8).

Reading with informational texts played different roles in the prediction of student reading performance depending on whether it is led by teachers in classrooms or is self-initiated by students out of school. Teachers' use of informational texts for reading instruction positively predicted the class mean informational reading performance. Specifically, a class in which the teacher used informational texts for reading instruction one standard deviation more often than other teachers scored 3.66 points higher in informational reading with other variables held constant (Beta = 3.66, p < .05; see Table 1.7). However, any genre-related classroom variables including informational reading instruction and literary reading instruction did not predict the class mean literary reading performance significantly as shown in Table 1.8 (p > .10). Among the genre related student-level variables, students' literary reading (Beta = 4.45, p < .001 for informational reading; Beta=5.40, p < .001 for literary reading), whereas students' informational reading outside of schools negatively predicted their reading performance in both types of reading), whereas students' informational reading outside of schools negatively predicted their reading performance (Beta = -7.22, p < .001 for informational reading; Beta = -8.65, p < .001 for

literary reading). This last finding is surprising and will be discussed further in the Discussion section below.

Gender has been considered to be an important predictor of reading achievement and so was it in this study. According to the report from PIRLS 2006, the average reading scores of girls were higher than those of boys in both genres in most countries including the U.S., although in a few countries there was no statistically significant difference between girls and boys in reading performance. Boys did not outperform girls on average in both literary and informational reading in any participating countries or jurisdictions (Mullis, Martin, Kennedy, & Foy, 2007). When other variables were considered, however, the relationship between gender and reading performance was only marginal in the United States as Table 1.7 and Table 1.8 show. Notably, the gender effect was less salient in informational reading performance, in which the gender coefficient was not statistically significant (Beta = 2.55, p > .10; see Model 1 of Table 1.7), than in literary reading, in which it was (Beta = 4.45, p < .10; see Model 1 of Table 1.8). However, the gender variable interacted with the class mean SES in predicting students' informational reading performance (Beta = -7.37, p < .10; see Model 2 of Table 1.7). Specifically, girls outperformed boys in informational reading in the classrooms with low to medium average SES while boys outperformed girls in those classrooms with high average SES. This interaction was not statistically significant in relation to literary reading performance (p > .10).

Another variable that differentially predict informational reading performance and literary reading performance in the U.S. was whether students reported that they did not read at all outside of school. Students who reported no reading outside of school

scored significantly lower in informational reading (Beta = -6.07, p < .01) than those who reported at least some reading outside of school, but it was not significant in literary reading (Beta = -3.95, p > .10). This may imply that student performance on informational reading is more sensitive to the amount of out-of-school reading than performance on literary reading.

The remaining variables in Table 1.7 and Table 1.8 were related to student reading performance in the same way for informational reading and literary reading. Positive predictors of literary and informational reading performance were class mean SES on class-level, and books at home, student SES, attitudes toward reading, and reading self-concept on student-level. Negative predictors were proportion of students with reading difficulties on class-level, and abnormally large amount of reading outside of school students reported and the frequency of home/school computer use on studentlevel.

Because most genre-related variables were standardized with a mean of 0 and standard deviation of 1 by the Rasch scaling, they do not provide an actual amount or frequency of reading teachers and students reported. They only provide the relative amount or frequency of reading. Table 1.9 shows the means and standard deviations of U.S. average raw responses in major variables for the analyses above. Classroom teachers answered that they used different types of informational texts and literary texts more often than once a month but less than once a week on average for their reading instruction (see Table 1.9 for more detail). Students also reported that they read various types of informational and literary texts outside of school and use the computer in and out of school more often than once a month but less than once a week. According to the

standard deviations in this table, there was slightly more variation for informational reading than for literary reading across classrooms, while more variation was found for literary reading than for informational reading outside of the classroom. Students' reported average reading amount outside of school was between one hour and three hours per day, but had a relatively large variation. However, these means and standard deviations should be interpreted with caution, because the response options were not interval scales but ordinal scales.

In sum, as shown in Table 1.10, U.S. student informational reading performance was positively predicted by class mean SES, more reading instruction with informational texts, gender (specifically, girls in classroom with low to medium mean SES), books at home, student SES, attitudes toward reading, reading self-concept, and the frequency of literary reading outside of school, when other predictors are controlled. Most of these predictors also predicted student literary reading performance in the same pattern except two variables: more instruction with informational texts and gender. That is, students taught by teachers who use more informational texts had higher informational reading performance scores on average, whereas any class-level genre variables such as informational reading instruction and literary reading instruction did not predict student literary reading performance significantly. Also, boys were found to be better readers in informational reading if they were in high SES classrooms, while girls were always better readers in literary reading regardless of class mean SES.

Comparisons with Other Countries

Data from three additionally selected countries were analyzed in the same way that the U.S. data were analyzed in order to explore any similarities or differences

among those countries. In PIRLS 2006, there were 12 other countries whose average overall reading scores were not statistically different from the U.S. overall reading performance score. For reasons explained in the Methods section, Denmark (with higher literary reading on average), England (with no significant difference between informational and literary reading on average), and Taiwan (with higher informational reading on average) were selected out of those 12 countries according to their reading performance patterns between literary and informational reading. Table 1.11 presents basic descriptive statistics about these countries including the United States. Compared to other countries in this table, the U.S. had more formal reading instruction hours per week, more students in poverty schools, and more teaching of informational and literary texts.

Among the selected countries only in Denmark, a country with a significant gap favoring literary reading over informational reading on average, was the average overall reading performance score lower for the students with a large score gap favoring literary reading than for the students with a large score gap favoring informational reading. In three of four countries, students with a large gap favoring informational reading over literary reading had lower overall reading scores. Table 1.12 shows students' average performance scores in informational, literary, and overall reading in each country by the size of gaps between informational and literary performance. When looking at literary reading scores by the groups, students who had a large gap favoring informational reading had lower average literary reading scores in all the countries than students who had a small gap or a large gap favoring literary reading. For informational reading scores, however, the students with a large gap favoring informational reading had the lowest

average informational reading scores in the U.S. and Taiwan, while the students with a large gap favoring literary reading had the lowest average informational scores in Denmark and England. As seen in Table 1.12, results failed to provide a systematic relationship between country-level reading performance gap and within-country grouping by informational-literacy performance gap.

Several key findings are worth noticing when the results from separate HLM analyses of within-country data for each country are compared with those from the analysis of the U.S. data. Appendix B, Appendix C, and Appendix D present these results from Denmark, England, and Taiwan respectively, and Table 1.13 displays the coefficients of predictors from all selected countries for comparison.

Compared to the intraclass correlations of the U.S. data (.26 for informational reading performance and .22 for literary reading performance), the intraclass correlations of other countries were small. Taiwan had the lowest intraclass correlations (.09 for both informational and literary reading performance) and Denmark was next (.14 for both informational and literary reading performance). The intraclass correlations of England were .22 for informational reading performance and .21 for literary reading performance. Therefore, the U.S. had the largest between-class variance in student reading performance among the four countries, whereas Taiwan had the smallest between-class variance in predicting student reading performance.

Only in the U.S. did more informational reading instruction in the classroom better predict students' informational reading performance (Beta = 3.66, p < .05). Any genre related class-level variables such as informational reading instruction and literary reading instruction did not predict student reading performance significantly in all other

countries. For genre related student-level predictors, more literary reading outside of school predicted higher performance on literary and informational reading performance in all four countries. The coefficient of literary reading out of school ranged from 2.08 (Denmark) to 7.48 (England) for informational reading performance and from 2.79 (Denmark) to 8.73 (England) for literary reading performance with one standard deviation change in literary reading out of school. But informational reading outside of school negatively predicted student reading performance in all four countries. The coefficient of informational reading out of school ranged from -7.22(U.S.) to -10.66 (England) for informational reading performance and from -8.12 (Taiwan) to -13.49 (England) for literary reading performance with one standard deviation change in students' informational reading outside of school.

SES was a consistently significant predictor of students' performance on informational reading and literary reading both at the student-level and at the classroomlevel in all those countries. The coefficients of student-level SES ranged from 2.52 (Taiwan) to 6.42 (U.S.) for informational reading performance and from 3.65 (Taiwan) to 6.82 (Denmark) for literary reading performance. In all four countries, however, student-level SES had a curvilinear relationship with student reading performance and thus this relationship between SES and reading performance was especially larger for lower SES children. The coefficients of class mean SES ranged from 8.90 (Denmark) to 28.47 (U.S.) for informational reading performance and from 8.62 (Denmark) to 28.54 (U.S.) for literary reading performance with one standard deviation change in class mean SES.

When other variables were considered, student gender was a significant predictor of literary reading performance in the U.S. (Beta = 6.37, p < .05), Denmark (Beta = 8.33; p < .01), and Taiwan (Beta = 4.49, p < .05), but not in England. Gender was also a significant predictor of informational reading performance in the U.S. (Beta = 4.27, p < .10) and Denmark (Beta = 6.68, p < .001), but not in England and Taiwan. While the gender variable interacted with class mean SES in predicting informational reading performance in the U.S., in Denmark regardless of class mean SES girls performed better on average.

Students' reading motivation, measured by their attitudes toward reading and their reading self-concept, was a consistent predictor of student performance on informational and literary reading. The coefficients of attitudes toward reading ranged from 3.92 (England) to 6.50 (U.S.) when predicting informational reading performance and from 2.98 (Denmark) to 8.30 (U.S) when predicting literary reading performance scores by one standard deviation change in students' attitudes toward reading. The coefficients of reading self-concept ranged from 8.54 (Taiwan) to 22.88 (Denmark) for informational reading performance and from 9.42 (Taiwan) to 21.62 (England) for literary reading performance with one standard deviation change in students' reading self-concept.

Among the remaining variables in the HLM analyses, abnormal amount of reading out of school students reported (no reading or a great deal of reading) and students' reported home/school computer use predicted students' informational reading performance scores negatively (see Table 1.13). These negative relationships were also true for literary reading performance except in the U.S. (insignificant coefficient for no

reading) and in Taiwan (positive relationship below the average amount of students' reported home/school computer use but negative above the average). The proportion of students with reading difficulties in class was also a negative predictor of class average informational and literary reading performance in all countries except Taiwan in which it was a statistically insignificant predictor. More books at home, on the contrary, always predicted better reading performance on informational reading and literary reading in all selected countries.

Discussion

In this study, various literacy related variables in and out of classroom were examined in relation to student reading performance in two different genres informational reading and literary reading, by analyzing the data from PIRLS 2006. The purpose was to explore whether and, if so, how those variables differentially predicted student informational reading performance and literary reading performance in order to understand the U.S. reading performance gap favoring literary reading over informational reading. Country-level data were analyzed across 41 countries and also within-country data were analyzed using two-level Hierarchical Linear Modeling with students nested in classrooms. The main findings and implications are as follows.

This study strongly supports the contention that reading is genre-specific (Duke, 2005). Student reading performance and its relations to other variables showed different patterns depending on genres--informational reading and literary reading. When looking at student reading performance gap between informational reading and literary reading, for example, more than 20% of students in the four selected countries of this study showed over 30 score differences between two genres. Among those students, some had

a large score gap favoring literary reading over informational reading, while others had a large gap favoring informational reading over literary reading. These different performance patterns between different genres were also true for country-level average reading performance. As mentioned in the beginning of this paper, the U.S. average reading performance in PIRLS had the largest gap favoring literary reading over informational reading in 2001 and this pattern was repeated in 2006 although the gap narrowed and it was not the largest gap any more among participating countries. Other countries also showed different patterns in reading performance between informational reading and literary reading. In addition, cross-national and within-country analyses of the relationships between literacy related variables and reading performance indicated that some variables predicted literary reading performance and informational reading performance in different ways. The variables, such as country-level class-size, classroom informational reading instruction, and student gender, for example, predicted only literary or informational reading, but not both in some countries.

This genre-specificity of reading has been often underrecognized. For instance, many reading assessments widely used across schools do not specify genre and do not separate results for different genres. Certainly, PIRLS and other studies of reading achievement should continue to assess student reading performance in different purposes or genres. Through this, they can provide better assessments of reading that are more informative for children, teachers, and policy makers.

It is important to provide elementary students with more opportunities to learn different genres for reading in school. The opportunity to learn (OTL) has been considered to be an important indicator for interpreting student performance and for

evaluating the quality of education (McDonnell, 1995; Schmidt & McKnight, 1995). According to Chapman (1987) and Chall, Jacobs, and Baldwin (1990), less opportunity to learn with different genres in reading might cause later academic and reading problems. The present study provided the evidence showing that more genre-specific opportunity to read in classroom is related to higher reading performance. In the country-level analysis, for example, country-level average performance on both literary and informational reading was higher as more students were taught with literary texts at least weekly in classroom and as more students were taught at the schools whose reading curriculum put major emphasis on text style and structure before fourth grade. As well, more emphasis of national reading curriculum on each of two different reading purposes—reading to acquire information and reading for literary purpose—were positively related to country-level performance on both information reading and literary reading. These results suggest that reading curriculum and instruction should consider provision of more opportunity to learn various genres to students for better reading performance.

Although previous results imply that children's experience with the genrespecific opportunity to read is important for reading development, it seems that all experiences are not the same but they are more likely context-dependent. For instance, as noted earlier, this study showed that, in the U.S., fourth-grade children who get more instruction with informational texts in the classroom had higher reading performance on informational reading. More informational reading out of school, on the contrary, was not related to higher reading performance of those children. In fact, they had a negative relation (this was also true for all other selected countries). It is not clear from the

analysis of this study why more out-of-school informational reading is negatively related to student reading performance. Among other things, the analysis in this study did not specify information about what kinds of informational texts students were reading and how different kinds of informational texts were differentially related to their reading performance. This may be an important factor. In a study with fifth grade students by Anderson, Wilson, and Fielding (1988), for example, time spent in reading newspapers/magazines and reading mail out of school, which can be considered as outof-school informational reading, predicted student's reading related abilities including comprehension, vocabulary, and speed negatively or nonsignificantly. Further analysis will be necessary to consider more specific kinds of texts and their relations to reading performance. Another piece of information we have from the PIRLS dataset that may be relevant is that students' out-of-school informational reading was more related to the frequency of computer use students reported than out-of-school literary reading. The computer use negatively predicted student reading performance as well. This might indicate that, although students report more out-of-school informational reading, this does not necessarily mean they read with the types of informational texts and in the types of ways that translate to achievement in informational reading as measured by the PIRLS. It is noteworthy that research shows a relatively low relationship between online reading comprehension skill and offline reading comprehension skill (Hartman, Morsink, & Zheng, in press). Possibly, only certain types of informational text may be associated with success on the types of informational reading required in assessments like PIRLS.

Another explanation for opposite relationships between reading and performance depending on whether the reading happens in or outside of classroom is that a more

systematic approach like classroom reading instruction might be necessary for informational reading and thus simply reading more informational text is not enough to develop informational reading skills. Students have relatively little instruction with informational texts in the primary grades and may not have naturally developed appropriate skills or strategies through out-of-school reading to understand informational texts well. Researchers have suggested that more explicit instruction of reading skills and strategies helps struggling students to develop their reading abilities and facilitate reading development (e.g., Pressley, 2006; Pressley & Wharton-McDonald, 1997). This explicit instruction may be necessary for novice informational text readers.

The relationships between literary reading in and outside of school and literary reading performance were also different according to the context of reading, whether more literary reading happened in classroom or out of school. Although more literary reading in the classroom was not significantly related to higher reading performance, more literary reading outside of school was a significant predictor of higher reading performance. Most possibly, this is because literary reading is common across U.S. fourth-grade classrooms and the amount of literary reading is relatively consistent across classrooms. As shown in Table 1.11, about 92% of U.S. students receive reading instruction with some kinds of literary reading and student reading performance should be understood in the context of the fact that more out-of-school literary reading of U.S. students was positively related to more books at home, higher motivation, and amount of reading outside of school. These relationships were not seen for informational reading outside of school. In addition, the variance in literary reading outside of school

was larger than that of informational reading outside of school. More research is needed to clarify this context-dependence of the relationship between different types of reading and reading achievement.

Girls are widely known to be better readers than boys on average (e.g., Klecker, 2006). This female advantage in reading, however, seems to be more evident in literary reading than in informational reading. For instance, the analysis of U.S. data in this study showed that, when other predictors were controlled, reading performance of girls were clearly better than boys in literary reading on average. In informational reading, however, boys outperformed girls in the classrooms with high mean SES. When comparing average reading scores of girls and boys in 45 countries or jurisdictions participating in PIRLS 2006 (Mullis, Martin, Kennedy, & Foy, 2007), average scores of girls were significantly higher than those of boys in all participating countries except only one country for literary reading. For informational reading, there was no statistically significant difference in performance scores between boys and girls in five countries. Gender difference between two genres might come from differences in their preference or choice of text. Coles and Halls (2002) asked 10- to 14-year-old U.K. children about their book reading habits, finding that girls generally read more books than boys but more boys described themselves as non-fiction readers than girls. From a study with second through fifth grade U.S. children, Watson (1985) also found that girls read more books about family stories and romance while boys read more books about science and animals. Additional studies are needed, however, especially regarding why gender and class-SES interact for reading performance as shown in the analysis of the U.S. data.

The results of the present study support that SES, quantity of books at home, and reading motivation are strong predictors of reading performance, which is consistent with prior studies (e.g., Aikens & Barbarin, 2008; Weinberger, 1996; Wigfield & Guthrie, 1997). However, the finding of a negative relationship between reading performance and student home/school computer use is inconsistent with some past research, though consistent with other past research. Nævdal (2007), for example, investigated this relationship with Norwegian adolescents and found that time spent working on the computer at home positively predicted students' achievement in English at school. This positive relationship was more evident for poor readers and girls. On the other hand, O'Dwyer, Russell, Bebell, and Tucker-Seeley (2005) argued that the relationship between computer use and achievement would be dependent on the purposes of computer use. Their study with U.S. fourth grade students showed that, when controlling for prior achievement and SES, more computer use of students at school was positively related to higher English/language arts test scores if it was used to edit papers but not if it was used to prepare presentation. Also, students' recreational use of computer at home was a negative predictor of student achievement. In the present study, teachers' reported frequency of computer use for reading instruction had a positive correlation to student performance in informational reading in the U.S., though this correlation was not statistically significant when other variables were controlled. The student-level variable for computer use was a Rasch scaled composite score of students' reported frequency of computer/Internet use at home and at school in order to use it in regression analyses. Further research will be necessary to clarify this issue.

Another limitation is that the variables this study explored in relation to fourth graders' reading performance were mainly from the information about students' literacy experience at the fourth grade in and outside of classroom. This study had only a little information available about students' experience in earlier grades. Literacy experience in early grades certainly influences later literacy performance and literacy development of children (e.g., Chapman, 1987; Stanovich, 1986). In order to examine the predictors of fourth graders' reading performance, it will be good to know what kinds of literacy experience those students had when they were in primary classrooms. For instance, in the U.S., informational reading is scarce in primary grades (Duke, 2000) though it is more common in fourth grade classrooms. Thus, the difference of informational reading experience in earlier grades might tell us more about a possible source of the difference in fourth graders' informational reading performance.

Finally, this study is not an experimental study but a correlational study. In this study, there is no strong evidence for causal inference about whether or not more instruction with texts in a specific genre actually improves reading performance in that genre. Future research will be necessary to confirm this causality and to provide policy makers and educators with more compelling results.

In summary, this study found that genre-related activities and curriculum were definitely related to children's reading performance in a specific genre and across different genres. Because of the U.S. performance gap favoring literary reading in PIRLS, this study has focused more on informational reading and the results have shown that more instruction with informational text in U.S. fourth grade classrooms makes a significant difference in student performance on informational reading. This does not
mean, however, that we can disregard another type of reading, that is, literary reading. In fact, students' literary reading out of school and literary text instruction on country-level were significant predictor of both literary and informational reading. In addition, student with higher literary reading performance over informational reading were better readers on average in three of the four selected countries. The results of this study suggest that we should provide substantial opportunities to learn with both literary and informational text and an early emphasis on text style or structure for all children. This may help shape children's reading experiences with genres they will encounter throughout their lives.

Average Reading Scores of U.S. Students by Reading Purpose and Gender in PIRLS 2001 and 2006

Reading]	PIRLS 2001	l	PIRLS 2006				
purpose	Girls	Boys All		Girls	Boys	All		
Literary	558 (4.2)	542 (4.6)	550 (3.8)	547 (3.6)	534 (4.1)	541 (3.6)		
Informational	541 (4.1)	525 (4.3)	533 (3.4)	542 (3.1)	532 (4.4)	537 (3.4)		
Overall	551 (3.8)	533 (4.9)	542 (3.8)	545 (3.8)	535 (4.4)	540 (3.5)		

Note. The scores are based on the PIRLS international reports (Mullis, Martin, Gonzalez, & Kennedy,

2003; Mullis, Martin, Kennedy, & Foy, 2007).

() Standard errors appear in parentheses.

Means, Standard Deviations, and Intercorrelations of Country-level Variables and

Country-level				Zero-or	der corre	lations	
Variables	м	SD	1	2	3	4	5
National Demographic Variable	: S						
1. Infant mortality rate	10.22	11.19	1				
2. Net enrollment rate (%)	95.95	5.39	*** 67	1			
3. Hours of formal reading instruction	2.56	.91	.30	*** 55	1		
4. Average class size	24.10	4.80	.36*	02	15	1	
 Students in poverty schools (%) 	33.97	20.27	.72***	*** 58	.47**	.29	1
 Achievement gap between students in low and high poverty schools 	33.18	28.50	*** .54	21	12	.63	.55
Genre-related Variables							
7. Teaching informational texts weekly (%)	62.11	16.21	.01	.05	.31	.02	.14
8. Teaching literary texts weekly (%)	86.51	11.25	01	14	.16	34*	10
9. Teaching text style or structure weekly (%)	52.71	22.94	.26	** 44	.50**	.12	.51**
10. Major emphasis on text style and structure before 4 th grade at school (%)	39.63	20.25	29	.32**	.17	.02	04
11. Emphasis on various reading purpose	.425	1.36	02	.07	23	.26	10
Reading Performance							
12. Informational reading score	511.38	54.43	72***	.43**	25	39*	*** 68
13. Literary reading score	511.56	57.04	73***	.44	24	45 ^{**}	*** 69
14. Overall reading score	511.90	57.21	73***	.43**	25	42**	*** 69
15. Students with large scoregap favoring literary reading(%)	15.06	6.35	.11	09	.22	28	.13
16. Students with large score gap favoring informational reading (%)	13.41	7.64	.57***	43**	.12	.55**	.49**

Reading Performance (N=41)

Country-				:	Zero-orde	r correla	itions			
level Variables	6	7	8	9	10	11	12	13	14	15
National D	emograp	hic Vari	ables							
1.										
2.										
3.										
4.										
5.										
6.	1									
Genre-rela	ated Varia	ables								
7.	.07	1								
8.	11	* .31	1							
9.	.16	.13	.04	1						
10.	02	.42**	.01	.29	1					
11.	.28	.17	.11	38*	23	1				
Reading F	Performan	ice								
12.	50**	.15	.35*	06	.42**	01	1			
13.	53	.14	.37*	06	.43	05	.99	1		
14.	52**	.14	.36*	06	.43**	03	.99	.99	1	
15.	11	03	.26	.20	.03	22	12	.00	06	1
16.	** .45	.03	17	.16	29	.25	49 ^{**}	60*	*** 55	44**

Table 1.2 Continued

* p < .05; ** p < .01; *** p < .001

Multiple Regression Analysis Summary for Country-level Variables Predicting Countrylevel Reading Performance (N=41)

		Informatio	onal		Literary			
Country-level variables		reading so	ore		reading so	core		
	B (SE)	Beta	t	B (SE)	Beta	t		
Constant	446.56 (60.59)		7.37	454.55 (58.50)		7.77****		
General National Variables								
1. Infant mortality rate	-2.55 (.57)	52	-4.49	-2.62 (.55)	51	-4.78		
2. Net enrollment rate (%)	t	t	t	†	†	t		
3. Hours of formal reading instruction	-17.57 (7.06)	29	- 2.49	-17.83 (6.82)	28	-2.62*		
4. Average class size	-2.04 (1.37)	18	-1.50	-2.70 (1.32)	23	-2.05*		
 Students in poverty schools (%) 	+	t	†	•	t	t		
6. Achievement gap between students in low and high poverty schools	t	t	t	t	t	t		
Genre-related Variables								
7. Teaching informational texts weekly (%)	01 (.39)	00	03	08 (.37)	02	22		
8. Teaching literary texts weekly (%)	1.54 (.51)	.32	3.05**	1.67 (.49)	.33	3.41**		
9. Teaching text style or structure weekly (%)	.39 (.28)	.16	1.39	.39 (.27)	.16	1.43		
10. Major emphasis on text style and structure before 4 th grade at school(%)	.78 (.32)	.29	2.45	.87 (.31)	.31	2.82**		
11. Emphasis on various reading purpose	2.18 (4.52)	.05	.48	1.43 (4.36)	.03	.33		
F	F(8, 32)=11	.77	F(8, 32)=14.58				
Adjusted R ²	.68 .73							

Table 1.3 Continued

Country-level variables	re	Overall ading sco	ore	% of students with large score gap favoring literary reading			% of students with large score gap favoring informational reading		
	B (SE)	B Beta (SE)		B (SE)	Beta	t	B (SE)	Beta	t
Constant	450.80 (60.80)		7.42***	-	-	-	2.94 (10.92)		.27
General Nat	ional Varia	bles							
1.	-2.65 (.57)	52	-4 .65	-	-	-	.24 (.10)	.34	2.34
2.	†	t	+	-	-	-	†	†	†
3.	-18.23 (7.09)	29	-2.57*	-	-	-	t	t	†
4.	-2.47 (1.37)	21	-1.80	-	-	-	.51 (.24)	.32	2.11*
5.	†	t	t	-	-	-	Ì, t	†	t
6.	+	t	†	-	-	-	†	t	†
Genre-rela	ted Variab	les							
7.	05 (.39)	02	14	-	-	-	.05 (.07)	.10	.69
8.	1.65 (.51)	.32	3.24**	-	-	-	.08 (.10)	12	84
9.	.39 (.28)	.16	1.40	-	-	-	.05 (.05)	.16	1.13
10.	.85 (.32)	.30	2.67**	-	-	-	09 (.06)	24	-1.55
11.	1.80 (4.54)	.04	.40	-	-	-	.98 (.85)	.18	1.16
F	F(8, 32)=13.31***			n.s.			F(7, 33)=5.42***		
Adjusted R ²		.71			-			.44	

n.s. Not significant statistically

 † These variables were eliminated from the analysis due to multicollinearity.

Means and Standard Deviations of Country-level Reading Performance by Country-level Curriculum Emphasis at 4^{ih} grade on Reading to Acquire Information and Reading for Literary Experience (N=41)

		Country-level curriculum emphasis on reading purposes							
Reading performance	Statistics	To acquire	information	For literary purpose					
		Strong	Moderate	Strong	Moderate				
Informational	Mean	517.38	496.63	517.44	511.52				
reading score	(S.D.)	(52.29)	(59.66)	(54.30)	(40.62)				
Literary	Mean	516.57	497.68	516.23	514.06				
reading score	(S.D.)	(56.19)	(59.75)	(58.81)	(39.77)				
Overall	Mean	517.53	497.21	517.39	513.25				
reading score	(S.D.)	(55.71)	(61.27)	(58.15)	(41.08)				
% of students with	Mean	14.13	15.93	13.79	17.80				
literary reading	(S.D.)	(5.47)	(7.15)	(5.23)	(8.53)				
% of students with large score gap favoring	Mean	13.89	13.11	14.24	12.48				
informational reading	(S.D.)	(7.86)	(7.28)	(8.33)	(6.42)				
Number of countries		27	13	27	11				

Note 1. Twenty-five countries reported strong emphasis on both informational and literary reading. The U.S. reported strong emphasis on both reading to acquire information and reading for literary purpose. Note 2. A few countries reported little emphasis on either purpose. One country (Hungary) reported little emphasis on reading to acquire information, while three countries (Poland, Qatar, and Belgium-French) reported little emphasis on reading for literary purpose.

Means, Standard Deviations, and Intercorrelations of U.S. Classroom-level Variables

Class-level	Meen	<u> </u>		Zero-order	correlations	
variables (U.S.)	Mean	5.D.	1	2	3	4
General Classroom Variables						
1. Class mean SES	.21	.47	1			
2. Weekly instructional time for reading	8.88	4.30	07	1		
3. Proportion of students with reading difficulties	.25	.17	*** 27	.14*	1	
4. Reading comprehension strategy instruction	.31	1.21	05	.12	.10	1
5. Computer use for reading instruction	13	1.11	.11	.12	08	.23***
6. Autonomy support in reading instruction	.02	1.04	.05	.11	02	.16
7. Social activities in reading	03	1.09	01	.14	.12	.38
8. Homework for reading	06	1.17	16*	.19**	.10	** .19
Genre-related Classroom Varia	bles					
9. Instruction for Informational reading	.00	.99	02	.08	11	.37***
10. Instruction for literary reading	.00	.99	.02	.14*	.02	.37
Reading Performance						
11. Class informational reading score	532.91	39.84	*** .56	05	43***	.00
12. Class literary reading score	536.00	41.90	.55	05	*** 44	01
13. Class overall reading score	535.27	42.07	.56***	06	*** 43	01
14. % of students in class with large score gap favoring literary reading	12.90	8.52	.04	16***	*** 18	02
15. % of students in class with large score gap favoring informational reading	7.40	6.65	10	01	.09	05

and Reading Performance (249 classrooms)

Table 1.5 Continued

Class					Zero-ord	er correl	ations			
ievel Varia	bles 5	5 6	7	8	9	10	11	12	13	14
Gene	ral Clas	sroom Vai	iables							
1.										
2.										
3.										
4.										
5.	1									
6.	.20**	1								
7.	.29***	.30***	1							
8.	.03	.20**	.12	1						
Genr	e-relate	d Classroo	m Variab	les						
9.	.39	.28	.33	.14	1					
10.	.26	.31 ***	*** .34	** .19	.35	1				
Read	ling Perf	ormance								
11.	.14	.09	03	12	.13*	.03	1			
12.	.12	.10	03	* 13	.11	.01	*** .99	1		
13.	.13	.10	03	12	.12	.02	*** .99	.99	1	
14.	09	.01	09	11	05	11	.09	.20**	.14	1
15.	02	.04	.02	.05	.05	.08	** 18	*** 27	22***	25

* p < .05 ; ** p < .01 ; *** p < .001

Means, Standard Deviations, and Intercorrelations of U.S. Student-level Variables and

Student-level	Maan	S D		Zero-	order correl	ations	
variables (U.S.)	Wiedli	3.D.	1	2	3	4	5
General Student Variable	es						
1. Gender (0-Boy, 1-Girl)	.51	.50	1				
2. Books at home (0-Few books, 1-Many books)	.65	.48	.06	1			
3. Amount of reading outside of school 1 – No reading (0-No, 1-Yes)	.27	.44	*** 12	*** 10	1		
4. Amount of reading outside of school 2 – A great deal of reading (0- No, 1-Yes)	.11	.31	.07***	.04**	21***	1	
5. SES	.23	1.18	.07***	.22***	*** 13	.02	1
6. Attitudes toward reading	.11	1.21	*** .17	*** .18	27***	*** .10	*** .10
7. Reading self-concept	.54	1.48	.03	.18	*** 07	.07***	.14
8. Computer use	14	1.31	.05**	.04**	*** 11	.06	.13
Genre-related Student Va	ariables						
9. Informational reading outside of school	14	1.20	.04**	.01	28***	.22***	.05***
10. Literary reading outside of school	.26	1.81	*** .19	.20***	30****	.11	.15
Reading Performance							
11. Informational reading score	539.19	63.03	.07***	.25***	10***	09***	.25***
12. Literary reading score	542.82	69.78	*** .08	**** .24	*** 08	*** 10	.23***
13. Overall reading score	542.11	67.76	.07***	.25***	09****	09	.23***
14. Large score gap favoring literary reading (0-No, 1-Yes)	.14	.342	.03	.01	.01	04*	.00
15. Large score gap favoring informational reading (0-No, 1-Yes)	.07	.26	*** 06	.01	03*	.04*	01

Reading Performance (4,508 students)

Student-				Zero-o	order corre	lations			
variables	6	7	8	9	10	11	12	13	14
General S	tudent Va	riables							
1.									
2.									
3.									
4.									
5.									
6.	1								
7.	.25	1							
8.	.07***	.01	1						
Genre-rel	ated Stude	ent Variab	oles						
9.	.25***	.04*	.27	1					
10.	.52***	.22***	.10	.22	1				
Reading F	Performan	ce							
11.	.28	.39	*** 12	*** 16	.32	1			
12.	.29	.39	*** 13	*** 17	.32	.93	1		
13.	.28	.39	*** 13	*** 17	.32	.95	.95	1	
14.	.07***	.04*	03*	04**	.04**	.01	.24	.12	1
15.	*** 06	*** 09	.04**	.04**	*** 05	07 ***	*** 26	*** 18	*** 11

Table 1.6 Continued

(1.05), p 1.01, p 1.001

	······································	Model 1			Model	2	
Level	В	S.E.	t	В	S.E.	t	
	Intracla	ss Correl	ation from the	one-way ANO	VA mod	el = .26	
Fixed Effect							
Class mean score							
Intercept	529.81	3.25	163.18	533.76	4.09	130.42	
Class mean SES				28.47	4.31	6.60	
Class reading difficulties				-39.03	9.99	-3.91	
Informational reading Instruction				3.66	1.75	2.10*	
Literary reading Instruction				89	1.76	51	
Gender							
Intercept	2.55	2.32	1.10	4.27	2.38	1.79	
Class mean SES				-7.37	4.02	-1.83 [†]	
Books at home	8.29	2.10	3.95	7.66	2.08	3.68**	
Amount of reading outside of school – No reading	-6.22	2.03	-3.06	-6.07	2.02	-3.01**	
Amount of reading outside of school – A great deal of reading	-15.25	3.41	-4.48	-14.94	3.39	- 4.41	
SES	7.18	1.23	5.83	6.42	1.24	5.18	
(SES) ²	-2.67	.44	-6.08	-2.60	.44	-5.96	
Attitudes toward reading	6.42	1.25	5.16	6.50	1.25	5.19	
Reading self-concept	12.52	.64	19.48	12.45	.64	19.39 ***	
Computer use	-6.14	.78	-7.88	-6.19	.78	-7.94	
(Computer use) ²	-1.89	.33	-5.70	-1.88	.33	-5.69	
Informational reading	-7.48	.90	-8.30	-7.22	.90	-8.04	
Literary reading	4.57	.63	7.23	4.45	.63	7.02	
Random Effect	Variance	df	χ ²	Variance	df	χ^2	
Class mean	855.60	246	952.81	579.63	242	740.18	
Gender slope	151.63	246	307.41**	142.64	245	304.19**	
Student-level effect	2566.73			2562.61			
Variance explained (R ²)	At stu	ident-lev	el: .26	In c	lass mea	n: .32	
Conditional ICC		.25 .18					

U.S. Results from HLM Analyses Predicting Informational Reading Performance

Note. The square terms in SES and computer use denote the curvilinear relationships between these variables and the outcome.

[†] p < .10; ^{*} p < .05; ^{**} p < .01; ^{***} p < .001

	·	Model	1		Model 2	
Level	В	S.E.	t	В	S.E.	t
	Intrac	lass Corr	elation from the	one-way ANO	VA mod	el = .22
Fixed Effect						
Class mean score			***			
Intercept	531.51	3.07	173.28	535.54	3.99	134.30
Class mean SES				28.54	4.82	5.92
Class reading Difficulties				-39.29	10.78	-3.64**
Informational Reading Instruction				3.12	1.89	1.65
Literary reading Instruction				-1.37	1.87	73
Intercept	4.45	2.32	1.92 [†]	6.37	2.83	2.25*
Class mean SES				-7.86	5.21	-1.51
Books at home	7.96	2.31	3.44	7.17	2.30	3.12**
Amount of reading outside of school – No reading	-4.16	3.14	-1.32	-3.95	3.10	-1.27
Amount of reading outside of school – A great deal of reading	-19.76	3.58	-5.52	-19.29	3.56	-5.42***
SES	7.17	1.21	5.93	6.24	1.20	5.22
(SES) ²	-2.43	.54	-4.53	-2.35	.53	-4.42
Attitudes toward reading	8.20	1.17	7.03	8.30	1.16	7.13
Reading self-concept	14.04	.69	20.28	13.95	.69	20.29
Computer use	-6.98	.95	-7.34	-7.05	.95	-7.40
(Computer use) ²	-2.30	.38	*** -6.06	-2.28	.38	-6.06
Informational reading	-8.98	1.02	-8.76	-8.65	1.03	-8.41
Literary reading	5.56	.69	8.07***	5.40	.69	7.84
Random Effect	Variance	df	χ ²	Variance	df	χ ²
Class mean	853.42	246	787.15	584.45	242	627.61
Gender slope	135.98	246	285.21	126.67	245	282.29 [†]
Student-level effect	3301.11			3294.93		
Variance explained (R ²)	R²) At student-level: .27 In class mean: .31					: .31
Conditional ICC		.21			.15	

U.S. Results from HLM Analyses Predicting Literary Reading Performance

Note. The square terms in SES and computer use denote the curvilinear relationships between these variables and the outcome.

[†] p < .10; ^{*} p < .05; ^{**} p < .01; ^{***} p < .001

Means and Standard Deviations of U.S. Average Raw Responses in Reading Amount and Reading Instruction Amount Related Variables

Reading amount related variables	Mean	S.D.	Min.	Max.
Class-level	4. * <u>*</u> *** <u>* - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - </u>	- 1		
Informational reading instruction	1.60	.60	.33	3.00
Literary reading instruction	1.45	.45	.00	2.75
Student-level				
Amount of out-of-school reading	1.38	1.26	.00	4.00
Out-of-school informational reading	1.53	.61	.00	3.00
Out-of-school literary reading	1.72	.99	.00	3.00
Computer use in and outside of school	1.62	.66	.00	3.00

Note. Except the 'amount of out-of-school reading' variable, the items in each variable above were coded as 0 - Never or almost never, 1 - Once or twice a month, 2 - Once or twice a week, and 3 - Everyday or almost everyday. For the 'amount of out-of-school reading' variable, one question was given to students regarding the daily amount of book or magazine reading and it was coded as 0 - No time, 1 - Up to an hour, 2 - One to three hours, 3 - Three to five hours, 4 - Five hours or more.

Country-level and Within-U.S. Classroom/Student-level Predictors of Reading

Performance in Informational Reading and Literary Reading

Variables	Relationships to reading performance				
	Informational reading	Literary reading			
Country-level predictor					
Infant mortality rate	-	-			
Hours of formal reading instruction	-	-			
Average class size	n.s.	-			
% of students receiving informational text instruction at least weekly	n.s	n.s.			
% of students receiving literary text instruction at least weekly	+	+			
% of students receiving instruction on text style and structure at least weekly	n.s.	n.s.			
% of students receiving major emphasis to text style and structure before 4 th grade	+	+			
Classroom-level predictor (U.S.)					
Class mean SES	+	+			
% of students with reading difficulties	-	-			
Frequency of Informational text instruction	+	n .s.			
Frequency of literary text instruction	n.s .	n.s.			
Student-level predictor (U.S.)					
Gender (Girls)	+ (- in high SES classes)	+			
Books at home	+	+			
No reading outside of school	-	n.s.			
A great deal of reading outside of school	-	-			
SES	+	+			
Attitudes toward reading	+	+			
Reading self-concept	+	+			
Frequency of home/school computer use	-	-			
Informational reading outside of school	-	-			
Literary reading outside of school	+	+			

+ Positive predictor; - Negative predictor; n.s. Not significant

Descriptive Comparisons of Country-level Characteristics in the Selected Countries

from PIRLS 2006

	Selected countries					
Country-level variables -	Denmark	U.S.	England	Taiwan		
Average Reading Performance						
Overall reading score	546.03	539.92	537.04	535.37		
Informational reading score	541.39	537.16	534.82	538.26		
Literary reading score	547.09	540.66	536.11	530.44		
Difference (Informational – Literary)	-5.70	-3.50	-1.29	7.82		
Students with large score gap favoring literary reading (%)	16.89	13.55	16.76	7.53		
Students with large score gap favoring informational reading (%)	7.89	7.69	13.68	17.43		
General National Variables						
Infant mortality rate	4	7	5	5		
Net enrollment rate	100	93	100	99		
Hours of formal reading Instruction	1.70	4.80	1.80	1.00		
Average class size	20.40	23.00	27.40	31.70		
Students in poverty schools (%)	9.60	62.40	39.00	9.10		
Achievement gap between students in low and high poverty schools	22.76	38.78	57.63	24.77		
Genre-related Variables						
Teaching informational texts at least weekly (%)	36.80	85.80	54.90	30.10		
Teaching literary texts at least weekly (%)	89.50	91.60	74.70	66.90		
Teaching text style or structure at least weekly (%)	39.10	71.40	74.50	55.20		
Major emphasis on text style and structure before 4 th grade (%)	35.80	75.58	82.77	12.78		
Degree of emphasis on various reading purpose in curriculum	52	.56	.56	.56		
Curriculum emphasis on informational reading purpose at 4 th grade	Some emphasis	Major emphasis	Major emphasis	Major emphasis		
Curriculum emphasis on literary reading purpose at 4th grade	Some emphasis	Major emphasis	Major emphasis	Major emphasis		

Note. The national average reading performance scores in this table are the population estimates with the original samples in PIRLS.

Average Reading Performance Scores by Informational-Literary Reading Performance

Countries	Informational-literary reading performance gap	n	%	Average reading performance			
(N)				Informational reading score	Literary reading score	Overall reading score	
	Large gap with higher literary reading score	619	16	506 .87	553.11	532.60 ^{**}	
Denmark (3,786)	Small gap	2,897	77	552.10	553.71	554.57	
	Large gap with higher informational reading score	270	7	568.84	523.44	545.62	
	Large gap with higher literary reading score	609	14	539.51	583.02***	560.79***	
U.S. (4,508)	Small gap	3,579	79	538.60	539.86	540.66	
	Large gap with higher informational reading score	320	7	524.03**	478.84	500.02***	
	Large gap with higher literary reading score	632	17	528.56 [*]	577.07***	554.32***	
England (3,829)	Small gap	2681	70	537.83	537.65	539.55	
	Large gap with higher informational reading score	516	13	545.42 [*]	493.74	521.60***	
	Large gap with higher literary reading score	305	7	543.66	587.15 ^{****}	562.70****	
Taiwan (4,207)	Small gap	3,193	76	543.54	540.03	543.19	
	Large gap with higher informational reading score	709	17	527.40****	479.24***	504.75	

Gap Size in Selected Countries

Note. Mean differences were statistically analyzed in comparison with the means of the small gap groups. Shaded scores are the lowest scores among the scores of the three groups by information-literary reading performance gap size for each of informational, literary, and overall reading performance scores.

* p < .05; ** p < .01; *** p < .001

	Coefficient for				Coefficient for			
Variables	informational rea		ding performance		Literary reading performance			
	Den mark	U.S.	Eng land	Tai wan	Den mark	U.S.	Eng land	Tai wan
Class-level predictor								
for Class mean score								
Class mean SES	8.90	28.47	15.61	21.79	8.62	28.54	17.83	26.52
Class reading difficulties	-66.94	-39.03	-91.58	n.s.	-63.21	-39.29	-100.54	n.s.
Informational reading instruction	n.s.	3.66	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Literary reading instruction	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Student-level predictor								
Gender	6.68	4.27 ^a	n.s.	n.s.	8.33	6.37	n.s.	4.49
Books at home	19.88	7.66	19.03	20.60	16.62	7.17	20.39	21.12
Amount of reading outside of school - No reading	-10.62	-6.07	-15.98	-14.63	-9.10	n.s.	-13.73	-11.79
Amount of reading outside of school - A great deal of reading	-15.56	-14.94	-19.75	-8.99	-10.79	-19.29	-10.85	n.s
SES	5.55	6.42	6.40	2.52	6.82	6.24	3.96	3.65
(SES) ²	-1.42	-2.60	-1.66	-3.15	-1.45	-2.35	-1.22	-2.16
Attitudes toward reading	5.27	6.50	3.92	5.26	2.98	8.30	4.97	4.72
Reading self-concept	22.88	12.45	20.42	8.54	19.57	13.95	21.62	9.42
Computer use	-1.15	-6.19	-5.52	-1.60	-2.15	-7.05	-6.28	.43
(Computer use) ²	n.s.	-1.88	-3.05	-3.07	n.s.	-2.28	-3.43	-3.11
Informational reading outside of school	-8.93	-7.22	-10.66	-8.01	-10.05	-8.65	-13.49	-8.90
Literary reading outside of school	2.08	4.45	7.48	3.22	2.79	5.40	8.73	5.00
Intraclass correlation	.14	.26	.22	.09	.14	.22	.21	.09

HLM Coefficients for Major Predictors of Reading Performance in Selected Countries

Note. The square terms in SES and computer use denote the curvilinear relationships between these variables and the outcome.

^a This coefficient assumes that class mean SES is zero because of interaction between gender and class

mean SES.

n.s. p > .10

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STUDY TWO

HOW MOTIVATIONAL CONSTRUCTS INTERACT TO PREDICT READING PERFORMANCE

Abstract

The purposes of this study were to explore underlying factors in reading motivation measured in the Progress in International Reading Literacy Study (PIRLS) and to investigate the relationships between those motivational factors and students' reading performance. A special focus was given to interactions between different motivational facets in predicting reading performance. The study analyzed the U.S. data from PIRLS 2006 using factor analysis and hierarchical linear modeling. Result revealed first that PIRLS motivation items clustered under two motivational dimensions: student attitudes toward reading and student self-concept as readers. Within each of these dimensions, there were two contrasting facets based on their internal or external orientation: student attitudes toward reading consisted of extrinsic motivation and intrinsic motivation, while student reading self-concept was composed of self-referenced perceived competence and peer-referenced perceived competence. Second, different facets under the same motivational dimensions interacted with each other when predicting students' reading performance. Although the relationships of one motivational facet to reading performance were different depending on the levels of its contrasting facet, this study found that internally-oriented motivational facets were always more positive predictors of students' reading performance than externally-oriented motivational facets. Extrinsic motivation under the dimension of attitudes toward reading, for example,

positively related to reading performance if a student had high intrinsic motivation. However, it was a negative predictor of reading performance for those students with low intrinsic motivation. Third, reading motivation was a strong predictor of reading performance even when other literacy-related variables were controlled. Four motivational facets constructed in this study explained 17% of the student-level variance in reading performance. The results of this study confirm the multidimensional and multifaceted nature of reading motivation with emphasis on the predictive power of internally-oriented motivation. The study suggests that researchers consider interacting relationships of different motivational constructs.

Introduction

Educational researchers agree that learning involves not only various cognitive/metacognitive processes for knowledge construction and application, but also motivational/emotional aspects of human nature. This has been supported by the fact that struggling students with low academic performance usually display maladaptive patterns of motivation to learn, for instance, low interest, less persistence, and negative competence beliefs (e.g., Chapman, 1988; Gans, Kenny, & Ghany, 2003). Teachers have also expressed great concern about how to stimulate and maintain their students' motivation to learn (O'Flahavan, Gambrell, Guthrie, Stahl, Baumann, & Alvermann, 1992). In the classroom context, they have been especially interested in how to make instruction more attractive to students, how to build individual and collaborative learning goals, and how to teach things that are worth learning (Brophy, 2004).

Reading researchers and educators have also paid attention to the role of motivation in improving students' reading abilities over the past couple of decades, concomitantly with the rising issue of subject-specificity in academic motivation (Eccles, Wigfield, & Schiefele, 1998; Pintrich, 1994). Nevertheless, motivation has been neglected in several studies and reviews that have significantly influenced reading policy and the field of reading research (e.g., Gough & Tunmer, 1986; NICHD, 2000). This is unfortunate, because motivation certainly plays an important role in the development of reading. For example, motivation often distinguishes between reading that is superficial and shallow and reading that is deep and internalized (Schiefele, 1999). In addition, motivated students read more books and spend more time reading, which is likely to result in better reading performance (Wigfield & Guthrie, 1997).

According to a report from *the Progress in International Reading Literacy Study* (PIRLS) conducted in 2006 (Mullis, Martin, Kennedy, & Foy, 2007), U.S. fourth-grade students have relatively lower reading motivation than students in other countries. Only 6 out of 45 countries or jurisdictions participating in PIRLS had lower percentages of students with high attitudes toward reading than the United States. Also, there were only four countries or jurisdictions which had higher percentages of students with low reading self-concept than the U.S.

This and other evidence provides a solid basis for the necessity of more research on motivation in the field of reading in the U.S. Thus, this study focuses on the motivational predictors of children's reading performance using the data from PIRLS 2006, and explores an alternative perspective on the complex association between motivation and reading performance. In particular, drawing on the multidimensional and multifaceted characteristics of subject-specific motivation, this study investigates the interactive relationships among different facets under different motivational dimensions and reading performance of U.S. students.

Theoretical & Empirical Background

In this section, I first will review various definitions of motivation and some key issues in motivation research. Then, because this study is based on motivation data from the Progress in International Reading Study (PIRLS) in which extrinsic/intrinsic motivation and self-concept were the main motivation variables among multiple motivation dimensions, it will briefly explore those two dimensions generally and also in relation to reading. Finally, this section will present an introduction to PIRLS and how it assessed students' reading motivation.

Motivation

Motivation is a set of complex constructs, and therefore it has many slightly different definitions from different perspectives. Wittrock (1986) defined motivation as the process of initiating, sustaining, and directing human behaviors. Maehr and Meyer (1997) expressed it as the investment of personal resources such as time, energy, knowledge, and skills toward a certain direction with a certain degree of intensity, persistence, and quality for resulting outcomes. Guthrie and Wigfield (1999) also described motivation as a multifaceted set of goals and beliefs that guide behavior. What is consistent in different definitions is that motivation broadly refers to something that initiates and guides a person's inclination toward goal-directed behaviors. Several key issues regarding the conceptualization of motivation have appeared in the field of motivation research: multidimensionality, contrasting multifacets, subject-specificity, developmental change, and directionality.

Multidimensionality. Because there are different aspects of human motivation to learn, no single concept can fully explain its complex dynamics (Bong, 1996). Thus, motivation should be understood as a multidimensional concept with multiple constituents. In their extensive review of motivation literature, for instance, Murphy and Alexander (2000) summarized many different motivational terms into four representative dimensions based on their conceptual association: *goal* or what learners want to achieve (Wentzel, 1989), *intrinsic/extrinsic motivation* or whether a learner performs a task because of the task itself or because of something outside of the task (Whang & Hancock, 1994), *interest* or the processes by which the underlying needs of learners are energized (Alexander, Murphy, Woods, Duhon, & Parker, 1997), and *self-schema* or personal

knowledge about oneself (Pintrich & Schunk, 1996). Given this, understanding motivation requires multidimensional models.

Contrasting multifacets. Under any one of the motivational dimensions, different people may not only have different amounts of that motivation, but also different types of motivation (Ryan & Deci, 2000). Therefore, one motivational dimension can be constructed by different facets that share a central concept but are contrasted in a certain aspect of the quality. For example, the goal dimension of motivation can be dichotomized into mastery goals and performance goals as a function of how competence is defined: learners with a mastery goal orientation value the process of learning itself and aim to develop new skill or knowledge, whereas learners with a performance goal orientation concern outperforming others and showing the evidence of their abilities (Ames & Archer, 1988). The goal dimension can also be differentiated into *approach* and *avoidance* as a function of valence: learning through an approach goal is directed by a positive outcome or expectancy, while learning activities through an avoidance goal are directed by a negative outcome or expectancy (Elliot, 1999). Interest as a motivational dimension, for another instance, is often categorized into individual interest as engagement led by a person's relatively enduring predisposition and situational interest as focused attention triggered by environmental stimuli, according to what triggers the affective reaction to learn (Ainley, Hidi, & Berndorff, 2002; Hidi & Renninger, 2006). Other motivational dimensions also involve several contrasting facets as will be seen later.

Subject-specificity. It is now regarded as highly important to examine the separate dimensions of academic motivation in different domains or subject areas, because students' motivation develops with different patterns in different subject areas

(e.g., Wigfield et al., 1997). In research on competence belief or self-concept, Shavelson and his associates modeled the structure of self-concept as a multidimensional and hierarchical structure (e.g., Shavelson, Hubner, & Stanton, 1976; Byrne & Shavelson, 1986). That is, students have subject-specific self-concepts for different subject-matters under a more comprehensive academic self-concept. Further, academic self-concept together with a non-academic self-concept composes a general self-concept. Using this model, Byrne and Worth Gavin (1996) exhibited empirical evidence that students in Grades 3, 7, and 11 had subject-specific self-concepts for English and math. These studies suggest that research on motivation should approach the topic in a subject-specific manner.

Developmental change. Research has shown that children's learning motivation changes over time. Unfortunately, positive motivations such as intrinsic motivation, mastery goal orientation, and perceived competence are known to significantly decrease as children get older (e.g., Eccles, Wigfield, & Schiefele, 1998; Leeper, Corpus, & Iyengar, 2005; Unrau & Schlackman, 2006). Wigfield (2000) provided two possible explanations about this negative development of motivation. First, as children get older and experience more social comparison in and outside of school, they become much better at understanding and interpreting evaluative feedback about themselves and their performance. Second, the classroom environment changes significantly in that evaluation and competition become more conspicuous to students.

Directionality. Although there is little experimental research on the causality between motivation and achievement, several correlational studies have proposed a bidirectional reciprocal relationship between the two (e.g., Guay, Marsh, & Boivin, 2003;

Marsh, Trautwein, Lüdke, Köller, & Baumert, 2005). Morgan and Fuchs (2007) reviewed 15 studies which tested a relationship between students' reading motivation and their reading abilities in primary grades and found support for the hypothesis that children's early reading difficulties and low motivation interact to undermine their later reading growth. This also provides a testimony of negative "Matthew effects" in the development of reading abilities (Stanovich, 1986, p. 381). The early reading difficulty children experience discourages them from reading and this again leads to poorer reading ability. *Intrinsic/Extrinsic Motivation*

The intrinsic/extrinsic dimension has received the most empirical and theoretical attention among various dimensions of academic motivation (Ryan & Deci, 2000; Vansteenkiste, Timmermans, Lens, Soenens, & Van den Broeck, 2008). The two facets of this dimension concern different loci of causality about what leads someone to be engaged in learning (deCharm, 1968): internal vs. external locus of causality. Intrinsic motivation refers to the activities in which a learner gets involved because of the activity itself, whereas extrinsic motivation refers to the activities that are pursued for something that comes from outside the learner.

In the past, researchers conceived of motivation as falling on a continuum between intrinsic motivation on one end and extrinsic motivation on the other end, suggesting that those two are negatively correlated (e.g., Harter & Jackson, 1992). From this perspective, a person is either extrinsically or intrinsically motivated toward an object by a bipolar dichotomy. Recent studies, however, propose that intrinsic and extrinsic tendencies can be better understood as two independent motivation facets and thus should be represented on separate continua (e.g., Covington & Müeller, 2001; Lin,

McKeachie, & Kim, 2003). This perspective assumes that a person may possess multiple motivations, that is, both intrinsic and extrinsic motivation, at the same time.

Although learners can be motivated for both extrinsic and intrinsic reasons, many motivation researchers argue that intrinsic motivation is more beneficial to learning than is extrinsic motivation (Deci & Ryan, 1985). This is because intrinsically motivated learners are more likely to be deeply engaged in their work and also make use of various effective strategies for learning than extrinsically motivated students. As noted earlier, many researchers have reported that there is a significant shift in students' motivation from intrinsic motivation to extrinsic motivation toward school learning, especially during early adolescence (e.g., Eccles & Midgley, 1990; Harter, 1981). Thus, study of motivation at different ages should consider both intrinsic & extrinsic motivation. *Self-Concept*

Learners who hold different beliefs about themselves demonstrate different levels of cognitive, affective, and social engagement in learning (Bong & Skaalvik, 2003). In motivation research, these beliefs are often referred to as self-concept, but are sometimes mentioned as perceived competence, ability beliefs, and so on. Self-concept is broadly defined as the totality of the individual's thoughts and feelings, having reference to oneself as an object particularly in relation to one's ability (Rosenberg, 1979). This perceived competence is formed through one's experience with his or her environment, and it is influenced especially by evaluations from significant others, reinforcements, and attribution (Shavelson, Hubner, & Stanton, 1976).

Self-concept sometimes has been confused in motivation research with selfefficacy, but those two constructs should be distinguished. Self-efficacy refers to beliefs

in one's abilities to organize and execute a series of actions required to attain one's goal in a given situation (Bandura, 1977). In their review of research on self-concept and selfefficacy, Bong and Skaalvik (2003) showed how those two constructs could be systematically differentiated. According to their study, self-concept represents relatively stable perceptions of the self that are past oriented, whereas self-efficacy denotes malleable and future-oriented conceptions of the self and one's potential.

Similarly to the distinction between intrinsic and extrinsic motivation by different loci of causality, self-concept can be decomposed depending on different loci of comparison, that is, different frames of reference: external comparison and internal comparison (Marsh, 1986). By external comparison, people compare their perceptions of their own competence in a certain domain with the perceived abilities of other people and use this comparison as a basis of their self-concept in that domain. This is contrasted with internal comparison by which people compare their perceived competence in one domain with their perceived abilities in other domains. Studies have shown that these two facets work together to build one's academic self-concept through different processes (Bong, 1998; Marsh, 1986).

Relationships between Motivation and Achievement

Although reciprocal relationships are assumed between motivation and achievement as mentioned above, many motivation researchers have been especially interested in motivation as a predictor of academic achievement in reading and other subject matters. This might be because the evidence of that causality direction can provide more useful implications to educators for the development of motivationally more desirable classroom instruction and environments.

There have been numerous studies about how various motivational dimensions facilitate learners' academic performance and achievement. In reading research, for instance, Guthrie, Wigfield, Metsala, and Cox (1999) studied the relationships among reading comprehension, intrinsic motivation, and reading amount with elementary through high school students. They found that reading motivation significantly predicted students' reading amount and the reading amount predicted reading comprehension significantly when other related variables were controlled. Chapman, Tunmer, and Prochnow (2000) also showed that children's reading-related skills and performance at school in early grades were strongly predictive of their academic self-concept and this self-concept significantly predicted subsequent reading performance.

Most studies have examined a single motivation variable regarding the relationship between motivation and achievement. There has been relatively little research on how different motivational dimensions and facets work together to predict academic performance. Moreover, when available studies on the motivation-achievement relationship are reviewed, results have been mixed. For example, researchers have long reported interactive relationships of intrinsic motivation and extrinsic motivation to achievement saying that offering people extrinsic rewards for performing an intrinsically motivated activity tends to decrease their intrinsic motivation for the activity and thus results in a negative relationship with performance (e.g., Lepper, Green, & Nisbett, 1973; Vansteenkiste et al., 2008). In their meta-analytic study, Deci, Koestner, and Ryan (1999) concluded that extrinsic motivation has a substantial and reliable undermining effect on intrinsic motivation. On the contrary, several studies have argued that extrinsic motivation can enhance intrinsic motivation under certain circumstances and, in fact, it is

positively related to performance (e.g., Cameron & Pierce, 1994; Covington, 2000; Eisenberger & Cameron, 1996). The meta-analysis by Cameron and Pierce (1994), for example, indicated that the detrimental effects of extrinsic rewards occur only under highly restricted, easily avoidable situations and the positive effects of extrinsic motivation are easily observed when extrinsic rewards such as verbal rewards and tangible rewards depending on performance quality are used in appropriate ways. Thus, this issue of the relationship of extrinsic versus intrinsic motivation to performance is still controversial. For the self-concept related facets, Marsh (1986, 1990) proposed that students' achievement in one domain was related positively with both external and internal comparison based self-concepts in that domain, while self-concepts in different domains are uncorrelated with each other (but see Bong, 1998). Still, there is not enough research about the mechanism by which different facets under the same motivation dimensions are interactively related to achievement.

Progress in International Reading Literacy Study (PIRLS)

The Progress in International Reading Literacy Study (PIRLS) is an international comparative reading assessment which has been conducted every five years since 2001 under the supervision of the International Association for the Evaluation of Educational Achievement (IEA). It assesses the reading performance of students in the upper grade of the two adjacent grades that contains the largest portion of 9-year-olds at the time of testing. These students were typically in the fourth grade and their average age was around 10 in most countries including the United States (Mullis, Martin, Kennedy, & Foy, 2007). The first PIRLS assessment took place in 2001 with students from 35 countries or jurisdictions, and the second assessment had students from 45 countries or jurisdictions in
2006.

PIRLS not only assessed students' reading performance but also obtained a variety of literacy-related information from children, parents, teachers, school administrators, and national coordinators of the assessment. Reading motivation is one of the important areas in which PIRLS collected information from students. It constructed two dimensions of reading motivation: student reading attitudes toward reading and student reading self-concept. In student questionnaires, six questions were asked to assess student attitudes toward reading, and four questions were asked for student reading selfconcept (see Table 2.1). Attitude is generally defined as "a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (Fishbein & Ajzen, 1975). In research on academic learning, it has been often used as a general motivation variable which represents a composite of several motivational dimensions (e.g., McKenna, Kear, & Ellsworth, 1995; Wallbrown, Levine, & Engin, 1981), but there has been no clear consensus about which motivational dimensions should be included in the attitude construct. In PIRLS, student attitudes toward reading involved the questions related to reasons for reading and enjoyment of reading. The questions concerning student reading self-concept asked about how students perceived their reading abilities.

Table 2.2 displays the means and standard deviations of the motivation variables in PIRLS and the zero-order correlations between those variables and some other PIRLS variables including reading performance scores and background information. In this correlation matrix, it is noticeable that different motivation variables under the same dimensions show somewhat different patterns in their correlations with other variables.

Under student attitudes toward reading, for example, ATR1, ATR4, and ATR6 have higher correlations with reading performance scores than do other attitude variables, while those variables have lower correlations with students' informational reading outside of school than others. Under student reading self-concept, RSC1 and RSC3 have positive correlations with students' informational reading outside of school, whereas RSC2 and RSC4 have negative correlations with the variable. This provides a possibility that those motivation dimensions in PIRLS can be broken down into smaller factors. A closer look at each question of the motivation variables also confirms this possibility. For instance, 'I enjoy reading' and 'I need to well for my future' under student attitudes toward reading can be regarded as very different motivational orientations: one as intrinsic motivation and the other as extrinsic motivation.

Purposes of the Study

The present study aimed to clarify underlying factors within reading motivation data from PIRLS and to explore the relationships between those factors and students' reading performance. A special focus was given to the interactions between contrasting motivational facets in predicting reading performance. To do this, I analyzed the relevant U.S. data from PIRLS 2006 and asked the following questions: First, what factors constitute reading motivation in the PIRLS motivational variables which were originally constructed as student attitudes toward reading and student reading self-concept? Second, are there any interactions between different motivational factors or facets in relation to reading performance? Third, how does reading motivation predict students' reading performance after other background variables are controlled?

Methods

The design of the present study is a secondary analysis, the reanalysis of existing data (Sales, Lichtenwalter, & Fevola, 2006), using the U.S. data collected for the Progress in International Reading Literacy Study (PIRLS) in 2006. The dimensions and facets underlying the motivation items of PIRLS were constructed and confirmed using factor analysis. In addition, the relationships between different motivational facets and reading performance were investigated using a multilevel modeling technique.

Participants

In PIRLS, the U.S. sample was designed to be representative of all fourth-grade students in the 50 states and the District of Columbia (Baer, Baldi, Ayotte, & Green, 2007). The representative sample of students was selected using a two-stage stratified cluster sample design, with schools sampled in the first stage and one or two classes within each sampled school in the second. In the U.S., a total of 5,190 fourth-grade students from 253 classrooms in 183 schools were included in the final sample for 2006.

The current study only included the data from U.S. students who provided their responses to all the motivational variables in the PIRLS questionnaires. This sample consisted of 4,826 students (2,421 females, 2,402 males, 3 unreported) from the same number of classrooms and schools. SES of the students in the sample is reported in Tables 2.2 and 2.5; no information about student racial/ethnic background is provided in PIRLS.

Measures and Variables

PIRLS had two different sources of information: one from the reading assessment and the other from the background questionnaires. The PIRLS reading assessment tested students' reading performance on two different types of reading, that is,

informational reading and literary reading. Thus, students' reading performance scores were separately scaled for overall reading, literary reading, and informational reading, with an international mean of 500 and standard deviation of 100 (Mullis, Martin, Kennedy, & Foy, 2007). In addition to the reading assessment, PIRLS administered five background questionnaires: a student questionnaire for participating students, a home survey for one of the student's parents, a teacher questionnaire for their reading teachers, a school questionnaire for students' school principals, and a curriculum questionnaire for the national research coordinators. All these questionnaires asked the respondents about literacy related activities and resources that students experienced in and outside of school as well as basic demographic information (Mullis, Kennedy, Martin, & Sainsbury, 2006).

In order to explore the relationships between motivation and reading performance, the present study only used the data from the reading assessment, student questionnaire, and teacher questionnaire. In particular, it focused on the motivational variables from the student questionnaire, originally constructed into two dimensions by PIRLS as shown in Table 2.1. The items for other background variables included in the analysis of this study were presented in *Appendix A*. These background variables were chosen because they are known to be associated with students' reading performance according to the previous studies. At a student-level, those variables included gender (e.g., Klecker, 2006), SES (e.g., Bowey, 1995), and the amount of literary and informational reading outside of school (e.g., Anderson, Wilson, & Fielding, 1988). At a classroomlevel, the variables were class mean SES (e.g., NCES, 2002) and proportion of students with reading difficulties.

Analysis

Factor analysis and multilevel regression were two main analytical methods for this study. In order to address Factor analysis was used to derive more meaningful factors for reading motivation in PIRLS. Both exploratory and confirmatory factor analytic methods were applied. In general, exploratory factor analysis deals with the question like "what are the underlying processes that could have produced correlations among the variables?" while confirmatory factor analysis is related to questions like "are the correlations among variables consistent with a hypothesized factor structure?" (Tabachnick & Fidell, 2001, p. 585). Factor scores were obtained for each motivational construct and then were used for further analyses.

Multilevel regression based on the Hierarchical Linear Modeling (Raudenbush & Bryk, 2002) was a main statistical method to test the relationship between reading motivation and reading performance. The PIRLS data inherently had a multilevel structure with students nested within classes, for which the hierarchical linear modeling is recommended as a more adequate statistical method. The study first explored the interacting relationships between different motivational facets and then looked into the role of motivation in predicting reading performance when other background variables were controlled. SPSS 15.0, AMOS 6.0 and HLM 6.0 were the statistical software packages used in this study. Additional information about analyses procedures is presented in the Results section.

Results

Results of this study identified a two-by-two four-factor model for reading motivation by analyzing the data from the motivational items in the PIRLS student questionnaire, and demonstrated that all these four factors were well-predictive of reading

performance even after controlling other literacy-related factors. In addition, this study found that internally-oriented motivational factors were more predictive than externallyoriented factors. These results are reported below in three sections – the first on factor structure of reading motivation in PIRLS, the second on the interaction between motivational factors when predicting reading performance, and the third on the prediction of reading performance by reading motivation and other literacy-related background information.

What Factors Constitute Reading Motivation in PIRLS?

Exploratory factor analysis. The present study first performed exploratory factor analysis in order to examine the underlying constructs of reading motivation in PIRLS. Principal axis factoring was used as an extraction method with oblique rotation, because multivariate normality is not assumed due to several negatively skewed variables and also some correlations were assumed between different motivation constructs (Fabrigar, Wegener, MacCallum, & Strahan, 1999). Four factors were assumed, drawing on the scree plot which showed the four factors on the steep line before it meets the gradual trailing line.

Two basic assumptions were tested by the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's test of sphericity. The KMO measure should be greater than at least .50 to be grouped into a smaller set of latent factors, and the Bartlett test should be statistically significant to support the assumption that the variables are correlated highly enough to provide a reasonable basis for factor analysis (Leech, Barrett, & Morgan, 2005). In this study, the KMO measure was .75 and the Bartlett test was statistically significant (chi-square=10050.95, df=45, p<.001), which satisfies both

assumptions. In addition, 65.9% of the total variance was reported to be explained by the first four factors. The internal consistency reliability coefficient of 10 motivational variables in PIRLS was .71 by Cronbach's alpha.

Table 2.3 displays the extracted four motivational constructs in addition to the factor loadings of each variable. The first factor was composed of the three variables in column 1: ATR4 (I think reading is boring), ATR6 (I enjoy reading), and ATR1 (I read only if I have to). The second factor comprised the two variables in column 2: RSC2 (I do not read as well as other students in my class) and RSC4 (I read slower than other students in my class). The third factor was composed of the two variables in column 3: RSC3 (When I am reading myself, I understand almost everything I read) and RSC1 (Reading is very easy for me). Finally, the fourth factor consisted of the three variables in column 4: ATR2 (I like talking about books with other people), ATR3 (I would be happy if someone gave me a book as a present), and ATR5 (I need to read well for my future). Thus, these results suggested that each of the two PIRLS motivation dimensions, reading attitudes and reading self-concept, comprised two components each. Inspection of the items in each factor disclosed that those components formed the contrasting motivational facets of each dimension. For example, factor 1 and factor 4 under the reading attitude dimension represented *intrinsic motivation* and *extrinsic motivation* respectively. The items of factor 1 asked students about their individual interest in reading, while those of factor 4 were related to the external reasons for reading, namely socialization and utilization. Factor 2 and factor 3 under the reading self-concept dimension also could be labeled as peer-referenced perceived competence and self-referenced perceived competence respectively. The concept of peer-referenced perceived competence for factor

2 was almost the same as that of self-concept based on external comparison which Marsh (1986) described, in that the items asked students to rate their reading abilities normatively in comparison with their peers. However, self-referenced perceived competence for factor 3 was rather different from Marsh's internal-comparison-based self-concept. Internal-comparison-based self-concept was defined as students' perceived competence in one domain compared with their competence in other domains, whereas self-referenced perceived competence in this study is viewed more generally as students' perception of their own reading abilities independently of normative comparison with others. In sum, this study found two contrasting motivational facets under each of two reading motivation dimensions in PIRLS, as shown as tow-by-two reading motivational constructs in Table 2.4. One of the two facets under each dimension represented the internally-oriented construct (i.e., intrinsic motivation and self-referenced perceived competence), while the other facet implied the externally-oriented construct (i.e., extrinsic motivation and peer-referenced perceived competence).

Factor scores and their correlations. From the exploratory factor analysis above, this study derived factor score estimates using the Bartlett method for further analysis. The Bartlett method uses least squares procedures to minimize the sum of squares of the unique factors over the range of variables and it ensures unbiased factor score estimates (Bartlett, 1937). As Marsh (1986) did, the current study planned to use factor score estimates for analytical purposes rather than to use unweighted scale scores such as sums or means of the variable values. Table 2.5 displays the zero-order correlations between factor score estimates of each derived factor and other related variables in PIRLS. Contrasting facets with different internal or external orientations under the same

motivational dimensions had moderately positive correlations with each other (.21 between intrinsic and extrinsic motivation, while .20 between self-referenced and peerreferenced perceived competence). Interestingly, the facets with the same internal or external orientation under different motivational dimensions also had moderately positive correlations (.25 between intrinsic motivation and self-referenced perceived competence, while .21 between extrinsic motivation and peer-referenced perceived competence). However, very small correlations were found between different facets with different orientations under different dimensions (.08 between intrinsic motivation and peer-referenced perceived competence). However, very small correlations (.08 between extrinsic motivation and peer-referenced perceived competence). However, very small correlations (.08 between intrinsic motivation and peer-referenced perceived competence). This supports the conceptual organization of the motivational facets and dimensions as given in Table 2.4.

Table 2.5 also shows that students' performance scores correlated positively with intrinsic motivation, self-referenced perceived competence, and peer-referenced perceived competence, and the scores had no significant correlations with extrinsic motivation. In relation to background variables, student gender had positive correlations with intrinsic/extrinsic motivation but not with self-referenced/peer-referenced perceived competence. That is, girls had relatively higher intrinsic and extrinsic motivation than boys, but there were no differences between girls and boys in their self-referenced and peer-referenced perceived competence on average. Under the reading attitude dimension, both intrinsic and extrinsic motivation had moderately positive correlations with students' literary reading outside of school. Extrinsic motivation was, however, more positively related to student SES and informational reading outside of school than intrinsic motivation. Under the dimension of student reading self-concept, peer-referenced

perceived competence correlated more positively with students' background variables than self-referenced perceived competence. For instance, students' informational reading outside of school correlated positively with peer-referenced perceived competence but negatively with self-referenced perceived competence.

Confirmatory factor analysis. Confirmatory factor analysis was conducted to assess the adequacy of the new factor structure for reading motivation constructed from exploratory factor analysis in the present study. The new factor structure (2X2 factor model: extrinsic/intrinsic motivation under one dimension and self-referenced/peerreferenced perceived competence under the other dimension of reading motivation) was compared with the original two factor model (reading attitudes and self-concept) of reading motivation in PIRLS, using several fit statistics. Table 2.6 shows this comparison of the competing models by the chi-square/degrees of freedom ratio, the Root-Mean-Square Error of Approximation (RMSEA), the Goodness-of-Fit Index (GFI), the Normed Fit Index (NFI), the Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI).

According to suggestions from prior research on confirmatory factor analysis (e.g., Hu & Bentler, 1999; Kline, 2005), smaller rather than larger values indicate a good fit for the chi-square tests. For RMSEA, values less than .05 indicate a close approximate fit, values between .05 and .08 are a reasonable error of approximation, and values over .10 suggest a poor fit. The remaining indices such as GFI, NFI, CFI, and TLI are also considered as a reasonable good fit if values are greater than roughly .90. In sum, the fit of the new 2X2 factor model of reading motivation was improved in comparison with that of the original two factor model -- the new model proved to be superior to the old model by these criteria.

Interaction Effects of Motivational Facets

After the 2X2 factors for the PIRLS motivational variables were constructed and confirmed, this study explored how these factors work together in order to predict students' reading performance. In particular, the current study focused on the interactions between the contrasting facets that comprised the same motivational dimensions, because recent studies on academic motivation have suggested that motivation is a construct with multidimensions and multifacets and that people have different motivational dimensions and facets concomitantly toward an object or an activity (e.g., Bong, 1996; Ryan & Deci, 2000). It should be first noticed that preliminary analysis indicated that extrinsic motivation had a curvilinear relationship with reading performance scores showing an inverted U-shaped function. That is, more extrinsic motivation predicted higher reading performance until a certain point of extrinsic motivation, but it predicted lower reading performance after that point. This curvilinear relationship was included as a square term in following analyses (Aiken & West, 1991).

Table 2.7 demonstrates how intrinsic motivation and extrinsic motivation interact to predict students' reading performance scores from the multilevel regression output. Model 2 showed an improved level-1 variance explained from 10% to 12% by adding the interaction terms (IM*EM and IM * EM²) to model 1, and the coefficient of one of the interaction terms (IM*EM) was statistically significant (t=7.95, p<.001). This confirmed the assumed interactions between intrinsic and extrinsic motivation, indicating that the prediction of students' reading performance by one of these motivational facets would depend on the level of the other motivational facet. *Figure 2.1* displays this relationship graphically. The levels of motivation were divided into high (factor scores = +1SD),

medium (factor scores = 0), and low (factor scores = -1SD). As seen in this graph, extrinsic motivation had a generally negative relationship with reading performance for students with low intrinsic motivation, whereas it had a positive relationship for students with high intrinsic motivation. However, the high level of extrinsic motivation was negatively related to reading performance for all levels of intrinsic motivation. Also, students with higher levels of intrinsic motivation had better reading performance on average regardless of their levels of extrinsic motivation. In summary, although extrinsic motivation predicted reading performance for some students with high or medium levels of intrinsic motivation, the results suggests that intrinsic motivation is important for all students for better reading performance. Of special concern are students with low intrinsic motivation, as any levels of extrinsic motivation always predicted reading performance negatively for them.

Similarly to the interaction between intrinsic and extrinsic motivation, Table 2.8 demonstrates how self-referenced perceived competence and peer-referenced perceived competence interact to predict students' reading performance. By adding an interaction term (SPC*PPC), model 2 explained slightly more variance in student' reading performance than did model 1 (from 16% to 17%), and this interaction was confirmed by the statistically significant coefficient of the interaction term (t=6.79, p<.001). *Figure 2.2* displays this interactional relationship between self-referenced and peer-referenced perceived competence in predicting students' reading performance. According to this graph, although peer-referenced perceived competence positively predicted reading performance on the whole, this positive prediction was more salient for those students with higher levels of self-referenced perceived competence. This suggests that how

students perceive their reading abilities not only in relation to others but especially in relation to themselves is very important for reading performance.

Reading Motivation as a Predictor of Reading Performance

The last analysis was conducted to see how the four motivation variables and interaction terms contribute, in concert with other various literacy related variables, to the prediction of students' reading performance. As explained in *Methods* above, literacy related variables were chosen from the information in the student questionnaire and the teacher questionnaire, and they include classroom SES, proportion of students with reading difficulties in the classroom, student gender, student SES, students' informational reading outside of school, students' literary reading outside of school. After the listwise deletion of missing data, the data from 4,668 students in 249 classrooms were analyzed for this purpose, using Hierarchical Linear Modeling.

Table 2.9 shows the analysis results from three models. In the first model, the information only from classrooms was included in the analysis. The class mean SES and the proportion of students with reading difficulties in the classroom together accounted for 41% of the between-class variance in students' overall reading performance scores. In the second model, the analysis added individual variables such as gender, SES, student's informational reading outside of school, and student's literary reading outside of school. Thirteen percent of the within-class variance in students' overall reading performance was explained by these student-level variables. Finally, the third model entered students' four reading motivation facets into the analysis with their interaction terms, and these motivation variables explained 17 % more of the within-class variance in students' reading motivation, measured by

intrinsic/extrinsic motivation, self-referenced/peer-referenced perceived competence, and their interaction terms, accounts for quite a large portion of the variance in students' reading performance in PIRLS. In this model, other statistically significant predictors of students' reading performance were classroom mean SES, student SES, and student's literary reading outside of school (positive predictors), and the proportion of students with reading difficulties in class and student's informational reading outside of school (negative predictors) when the other variables were held constant. Gender, however, did not predict reading performance significantly when the other variables were considered in this analysis. This contradicted the wide-spread belief in girls' superiority over boys in reading performance on average (e.g., Gates, 1961), which suggested that some variables possibly mediated the relationship between student gender and reading performance.

Discussion

The present study investigated the multidimensional multifaceted nature of reading motivation using the motivational variables from PIRLS. It also tested the interactions between different motivational facets in predicting reading performance, and how motivational variables hold up when other common predictors of reading performance are entered into the model. The main findings are as follows:

First, this study found from exploratory factor analysis that each of the two motivational dimensions hypothesized by PIRLS, reading attitudes and self-concept, can bee divided into two contrasting but related facets by their internal or external orientations. This brought intrinsic and extrinsic motivation facets under the reading attitude dimension and self-referenced and peer-referenced perceived competence facets under the reading self-concept dimension. Confirmatory factor analysis validated the fit

of this newly constructed reading motivation structure. This result is consistent with the argument of recent studies that motivation is a multifaceted construct with multiple constituents (e.g., Guthrie et al, 2007; Murphy & Alexander, 2000). Thus, reading motivation is not a simple construct but should be understood in the multidimensional multifaceted context.

Second, the study demonstrated the interacting relationships of different motivational facets with reading performance. Self-referenced perceived competence and peer-referenced perceived competence interacted with each other when predicting students' reading performance. Peer-referenced perceived competence predicted reading performance more positively when students had higher self-referenced perceived competence in reading. The study also found an interaction between intrinsic motivation and extrinsic motivation and a curvilinear relation between extrinsic motivation and reading performance. Extrinsic motivation was positively related to students' reading performance only when their intrinsic motivation was high but extrinsic motivation was not so high. Extrinsic motivation always had a negative relationship with reading performance if students had low intrinsic motivation. This result is consistent with the finding of Lin, McKeachie, and Kim (2003) which showed that college students in two countries achieved better when they had medium extrinsic motivation coupled with higher intrinsic motivation. These results also affirm recommendations that educational attention should be paid more to internally-oriented motivation such as intrinsic motivation and self-referenced perceived competence than to externally-oriented motivation (e.g., Cameron & Pierce, 1994; Deci & Ryan, 1985; Wigfield & Guthrie, 1997).

The above mentioned findings also offer one alternative explanation about extrinsic motivation. In the field of motivation research, the role of extrinsic motivation has long been controversial (e.g., Reiss, 2005), especially concerning the undermining effect of extrinsic motivation on intrinsic motivation. The current study suggests that this undermining effect of extrinsic motivation depends on the levels of intrinsic motivation and extrinsic motivation that students have toward an activity or an object. When students had higher intrinsic motivation, moderate extrinsic motivation did not have a negative relation but a positive relation with reading performance.

Finally, the study showed how motivation predicts students' reading performance when all four motivational constructs of this study and their interaction terms are present in the model with other common predictors of reading performance. Specifically, the background variables controlled in the analysis are student SES, student's literary reading outside of school, student's informational reading outside of school, class mean SES, and the proportion of students with reading difficulties in classroom. The four motivational facets and the interactions between contrasting motivational facets accounted for 17% of the within-class variance in students' reading performance scores above and beyond those background variables. Similarly, Guthrie et al. (2007) also showed that reading motivation of fourth-grade students explained between 3% and 22% of the variance in their reading comprehension when prior reading performance was controlled. These suggest that motivation may be a very important component of reading performance.

The motivational dimensions and facets of this study were constructed only from the data available in PIRLS 2006. PIRLS originally collected the information about students' reading motivation within two dimensions, attitudes toward reading and reading

self-concept, and the current study confirmed these two dimensions. However, motivation in reading also concerns many other dimensions and factors such as goal orientation, social goal, and interest, as Murphy and Alexander (2000) argued. Thus, the small number of items and the narrow breadth in assessing reading motivation are the limitations of this study as well as PIRLS. Nevertheless, this study offers important implications for PIRLS and other reading studies by showing that even a simple motivational dimension can be decomposed into different facets. Future studies will have to include broader dimensions of reading motivation while paying attention to their underlying facets at the same time.

Among the motivational factors constructed in this study, the items under extrinsic motivation may be controversial. In this study, the extrinsic motivation factor was composed of three items associated with socialization and utilization in reading (ATR2 – I like talking about books with other people; ATR3 – I would be happy if someone gave me a book as a present; ATR5 – I need to read well for my future). The item ATR2 is related to socialization in reading, while ATR5 is close to utilization. The item ATR3 involves both utilization (present) and socialization (someone gave me). These three items are viewed as extrinsic in this study because they concern something outside of reading itself as of the motivator for reading and the source of reading enjoyment. Although utilization can be easily regarded as extrinsic motivation, there would be less agreement about whether socialization is intrinsic or extrinsic in motivation. Social motivation has been sometimes considered as a positive and intrinsic predictor of learning (e.g., Anderman & Anderman, 1999). Some researchers have also conceptualized social motivation as a separate motivational dimension which is distinct

from academic motivation but is related to academic achievement (e.g., Urdan & Maehr, 1995; Wentzel, 1999). However, many researchers still categorize social motivation as extrinsic motivation. In reading research, for example, Unrau and Schlackman (2006) and Wang and Guthrie (2004) have included social motivation into extrinsic motivation in their structural modeling of motivation and have shown their negative or null relationships with reading achievement. Drawing on these studies, socialization in this study was considered as a component of extrinsic motivation. More research will be necessary to clarify the extrinsic or intrinsic role of social motivation in learning, however. It was the limitation of this study as a secondary analysis that we are limited to the items as written, without the modification or addition of items.

This study also raised a question about the relation between gender and motivation as a topic for future research. When the motivational variables were entered in the multilevel regression model, the coefficient of student gender in predicting reading performance diminished from 4.05 (p<.10) to 2.39 (n.s.). This suggests that motivation might mediate the relationships between gender and reading performance. However, this issue goes beyond the scope of the current study and more research is needed to clarify these relationships.

In conclusion, the present study supported the important role of reading motivation in relation to students' reading performance. It also supported the multidimensional and multifaceted nature of reading motivation. Those different motivational facets interacted together to predict students' reading performance. It implies that reading motivation should be understood not as a simple direct predictor of reading performance but as a complex system in which various motivational components

work reciprocally. The final implication of this study is that internally-oriented motivational facets should be emphasized in the development of reading. Although externally-oriented motivational facets, such as extrinsic motivation and peer-referenced perceived competence, positively predicted students' reading motivation in some cases in this study, their positive contribution depended on the level of students' internallyoriented motivational facets. Internally-oriented motivational facets, such as intrinsic motivation and self-referenced perceived competence, were solid predictors of better reading performance. These interacting relationships between motivational constructs have been rarely studied because it brings about analytical difficulties to include interaction variables in a statistical model. As this study showed, however, those neglected interaction effects of motivation provide us with alternative and very important interpretations about the role of different motivational constructs.

Motivational Variables in PIRLS

Statement in the PIRLS questionnaire	Variable name
Student attitudes toward reading	SATR ^a
I read only if I have to.	ATR1®
I like talking about books with other people.	ATR2
I would be happy if someone gave me a book as a present.	ATR3
I think reading is boring.	ATR4®
I need to read well for my future.	ATR5
I enjoy reading.	ATR6
Student reading self-concept	SRSC ^a
Reading is very easy for me.	RSC1
I do not read as well as other students in my class.	RSC2 [®]
When I am reading by myself, I understand almost everything I read.	RSC3
I read slower than other students in my class.	RSC4®

Note. The ATR5 variable was eliminated when PIRLS constructed the SATR variable.

Reverse coded for the analysis

^a These derived variables were coded as 0-Low, 1-Medium, 2-High based on the responses to the questions under each dimension. All other variables were coded as 0-Disagree a lot, 1-Disagree a little, 2-Agree a little, 3-Agree a lot with the exception of reverse-coded variables, in which the variables were coded as 3-Disagree a lot, 2-Disagree a little, 1-Agree a little, 0-Agree a lot.

Descriptive Statistics and Intercorrelations of Motivational Variables, Background

Variables & Reading Scores (N=5,190 studer	ıts)
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			Zero-order correlations						
Variables	М	SD		St	udent atti	tudes tow	vard readi	ng	
			ATR1	ATR2	ATR3	ATR4	ATR5	ATR6	SATR
Motivation variables									
ATR1®	1.39	1.18	1						
ATR2	1.33	1.09	.10	1					
ATR3	2.03	1.05	.19	.32*	1				
ATR4®	2.08	1.11	.38	.23*	.42*	1			
ATR5	2.45	.90	.02	.20	.21	.18	1		
ATR6	2.21	1.02	.31	.34	.52*	.65*	.26*	1	
SATR	1.26	.68	.55*	.51	.64	.73*	.22*	.75*	1
RSC1	2.41	.79	.10	.10	.14	.16	.07*	.23	.18
RSC2®	1.67	1.14	.20	01	.06	.17*	.00	.12	.15*
RSC3	2.45	.81	.09*	.14	.15	.16	.14	.25*	.20*
RSC4®	1.86	1.10	.19	01	.01	.16	.00	.09*	.12*
SRSC	1.46	.58	.19	.05	.10	.20*	.06	.20*	.20*
Background variables									
Gender (0-boys, 1-girls)	.50	.50	.11	.06*	.11	.13*	.05	.18	.16
SES	.22	1.22	.10	.07	.03	.01	.08	.06	.07
Informational reading outside of school	09	1.25	04 [*]	.30*	.23*	.10*	.18*	.21*	.19*
Literary reading outside of school	.24	1.82	.32*	.29*	.37*	.38*	.16*	.47*	.49*
Reading scores									
Informational	534.06	64.89	.33*	03	.12*	.28*	.10*	.22*	.26*
Literary	537.29	71.98	.38*	04*	.10*	.30*	.09*	.23*	.27*
Overall	536.62	70.04	.35*	03*	.11*	.29*	.10*	.22*	.26

	Zero-order correlations								
Variables		Studen	nt reading self-c	oncept					
	RSC1	RSC2	RSC3	RSC4	SRSC				
Motivation variables									
ATR1®									
ATR2									
ATR3									
ATR4 [®]									
ATR5									
ATR6									
SATR									
RSC1	1								
RSC2®	.35*	1							
RSC3	.36*	.12*	1						
RSC4®	.31*	.52*	.16*	1					
SRSC	.60*	.71*	.49	.68*	1				
Background variables									
Gender	.01	.03*	.02	.01	.03				
(0-boys, 1-girls)		*	,, *	07 *	*				
262	.11	.09	.11	.07	.15				
Informational reading outside of school	.06*	04*	.12*	02	.02				
Literary reading outside of school	.19*	.13*	.20*	.10*	.19*				
Reading scores									
Informational	.27*	.33*	.24*	.26*	.36*				
Literary	.28*	.33*	.23*	.25*	.36*				
Overall	.28*	.33*	.24*	.25*	.36				

Table 2.2 Continued

Note. Pairwise deletion was used for missing data.

* Statistically significant (p < .05)

[®] Reverse coded for the analysis

Variable	Mean	SD	Fa)	Cronbach		
			1	2	3	4	α
ATR4®	2.09	1.11	.825				.71
ATR6	2.21	1.02	.561			.341	
ATR1®	1.40	1.18	.457				
RSC2 [®]	1.68	1.14		.727			
RSC4®	1.87	1.10		.668			
RSC3	2.45	.81			.577		
RSC1	2.41	.79			.568		
ATR2	1.33	1.09				.547	
ATR3	2.04	1.04	.204			.545	
ATR5	2.45	.90				.358	
Eigenvalues	s (Rotated)		1.941	1.374	1.360	1.659	

Extracted Factors	from Exp	loratory	Factor Anal	ysis	(N=4,826))
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Note. Loadings < .20 were omitted.

 $^{\ensuremath{\mathbb{R}}}$ Reverse coded for the analysis

2X2 Reading Motivational Constructs of PIRLS Derived from Factor Analysis

	Facets under motiv	ivational dimensions			
Motivational dimensions	Internally-oriented	Externally-oriented			
Attitudes toward reading	Intrinsic motivation	Extrinsic motivation			
Reading self-concept	Self-referenced perceived competence	Peer-referenced perceived competence			

Descriptive Statistics and Intercorrelations among New Motivational Factors,

Background Variables, & Overall Reading Scores (N=4,826 students)

				Zero-order	correlations	
Variables	М	SD -	IM	ЕМ	SPC	PPC
Factor scores estimates		<u> </u>				
Intrinsic motivation (IM)	0	1.15	1			
Extrinsic motivation (EM	() 0	1.34	.21*	1		
Self-referenced perceived competence (SPC)	I 0	1.21	.25*	06*	1	
Peer-referenced perceived competence (PPC)	^d 0	1.38	.08*	.21*	.20*	1
Background variables						
Gender (0-boys, 1-girls)	.50	.50	.16*	.11*	.02	.02
SES	.25	1.19	.01	.07*	.09*	.13*
Informational reading outside of school	09	1.25	.05*	.35*	07*	.12*
Literary reading outside of School	of .26	1.82	.41	.39*	.11	.22*
Reading scores						
Informational	536.44	64.19	.32*	.03	.33*	.27*
Literary	539.76	71.21	.35*	.01	.34*	.27*
Overall	539.15	69.18	.33*	.01	.34	.27*

Note. Pairwise deletion was used for missing data.

* Statistically significant (p < .05)

Comparisons of the Fit Statistics between the 2 Factor Model and the 2X2 Factor Model from Confirmatory Factor Analysis

Model	Chi-square	RMSEA	GFI	NFI	CFI	TLI
2 factor model	1289.96 (df=34)	.09	.94	.87	.88	.83
2X2 factor model	655.32 (df=32)	.06	.97	.94	.94	.91

Interactions between Intrinsic Motivation (IM) and Extrinsic Motivation (EM) in Predicting Overall Reading Score

	Model 1			Model 2		
Level	В	S.E.	t	В	S.E.	t
Fixed Effect						
Intercept	545.81	2.38	229.27***	543.87	2.34	232.33***
Intrinsic motivation (IM)	15.57	.85	18.35	18.19	1.11	*** 16.46
Extrinsic motivation (EM)	-3.14	.76	-4.12	-1.37	.82	-1.68
EM ²	-3.97	.38	-10.36	-3.96	.43	-9.26 ***
IM * EM				4.77	.60	7.95
IM * EM ²				61	.36	-1.73
Random Effect	Variance	df	χ ²	Variance	df	χ ²
Intercept	1092.31	252	1657.05	1032.74	252	1607.68
Student-level	3614.11			3553.44		
Level-1 variance explained		.10			.12	

Interactions between Self-referenced Perceived Competence (SPC) and Peer-referenced Perceived Competence (PPC) in Predicting Overall Reading Score

		Model 1			Model	2
Level	В	S.E.	t	В	S.E.	t
Fixed Effect						
Intercept	538.42	2.44	220.57***	537.15	2.41	222.61***
Self-referenced Perceived Competence (SPC)	10.30	.66	*** 15.54	11.05	.66	**** 16.65
Peer-referenced Perceived Competence (PPC)	15.87	.81	**** 19.53	15.84	.80	19.59****
SPC * PPC				3.86	.57	6.79****
Random Effect	Variance	df	χ ²	Variance	df	x ²
Intercept	1273.54	252	1983.13	1227.60	252	1941.31 ***
Student-level	3371.67			3331.64		
Level-1 variance explain	ned	.16			.17	

*** p < .001

Results from HLM Analyses Predicting Overall Reading Performance (249 classes 4,668

students)

	Model 1							
Level	В	S.E.	t					
Intracla	ass Correlation (ICC	C) from the one-w	ay ANOVA model = .26					
Fixed Effect								
(Classroom variables)								
Intercept	547.10	4.02	*** 135.94					
Class mean SES	39.20	4.66	*** 8.41					
Class reading difficulties	-67.59	12.42	*** -5.44					
(Individual variables)								
Gender								
SES								
Informational reading								
Literary reading								
(Motivation variables)								
IM								
EM								
EM ²								
IM * EM								
$IM + EM^2$								
SPC								
PPC								
SPC * PPC								
Random Effect	Variance	df	χ ²					
Classroom-level	800.67	246	1164.81					
Gender slope								
SES slope								
Informational reading slope								
Literary reading slope								
Student-level	3964.56							
Variance explained (R ²)		At classroom mea	n: .41					
Conditional ICC		.17						

Table 2.9 Continued

Level	Model 2			Model 3		
	В	S.E.	t	В	S.E.	t
Fixed Effect						
(Classroom variables)						
Intercept	539.92	3.66	*** 147.51	543.09	3.44	157.77
Class mean SES	24.46	4.09	5.98	25.09	3.83	6.56
Class reading difficulties	-53.48	10.67	-5.01	-43.25	9.92	-4.36
(Individual variables)						
Gender	4.05	2.23	1.81 [†]	2.39	2.13	1.12
SES	5.52	1.03	5.38	4.06	.95	4.27
Informational reading	-11.30	.95	-11.90	-9.28	.90	-10.35
Literary reading	10.14	.65	15.61	5.14	.67	7.67***
(Motivation variables)						
IM				9.94	1.11	8.94
EM				-2.21	.84	-2.63
EM ²				-2.87	.40	-7.20
IM * EM				3.05	.54	5.62
$IM * EM^2$.21	.33	.65
SPC				9.69	.65	14.81
PPC				10.81	.82	13.19
SPC * PPC				2.70	.57	4.71
Random Effect	Variance	df	χ^2	Variance	df	χ ²
Classroom-level	733.36	243	606.73	604.19	243	639.41
Gender slope	169.67	245	281.70 [†]	179.16	245	296.00*
SES slope	41.51	245	297.81*	22.72	245	290.49*
Informational reading slope	30.21	245	*** 329.15	16.04	245	316.91**
Literary reading slope	7.58	245	266.17	7.28	245	280.24 [†]
Student-level	3429.95			2789.06		
Variance explained (R ²)	At student-level: .13			At student-level: .30		
Conditional ICC	.18			.18		

[†] p < .10; ^{*} p < .05; ^{***} p < .01; ^{****} p < .001



Figure 2.1. Interaction of extrinsic and intrinsic motivation



Figure 2.2. Interaction of self-referenced and peer-referenced perceived competence

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APPENDICES

APPENDIX A

Description of the Variables used for the Study

A1. Country-level variables

- 1. Infant mortality rate: The number of infants who die before reaching on year of age per 1,000 live births in a given year.
- 2. Net enrollment rate (%): Percentage of children of official school age who are enrolled in school to the population of the corresponding official school age based on the national education system.
- 3. *Hours of formal reading instruction*: Average hours per week spent on formal reading instruction, which was answered by teachers.
- 4. Average class size: National average class size answered by teachers.
- Students in poverty schools (%): Percentage of students who attend the schools with more than 25% of economically disadvantaged children, which was answered by school principals.
- 6. Achievement gap between students in low and high poverty schools: Average score difference in overall reading performance between the students attending schools with 25% or less of economically disadvantaged children and the students attending schools with over 25% of economically disadvantaged children.
- 7. Teaching informational texts weekly (%): Percentage of students whose teachers answered they taught informational texts at least weekly. (Description and explanations about things, people, or events; instructions or manuals about how things work; and charts, diagrams, or graphs)

- Teaching literary texts weekly (%): Percentage of students whose teachers answered they taught literary texts at least weekly. (Short stories; longer books with chapters; poems; and plays)
- Teaching text style or structure weekly (%): Percentage of students whose teachers answered they asked them to describe text style or structure at least weekly.
- 10. Major emphasis on text style and structure before 4th grade (%): Percentage of students attending schools whose reading curriculum gives a major emphasis on text style and structure before fourth grade according to school principals' response
- 11. *Emphasis on various reading purpose*: Rasch score of the responses from national research coordinators to the following five questions.

How much emphasis does the reading curriculum place on the following purposes for reading?

- a. Reading to improve reading
- b. Reading for literary experience
- c. Reading to acquire information
- d. Reading for social awareness/civic duty
- e. Reading for enjoyment

A2. Classroom-level variables

1. Class mean SES: Average SES of the students in the same class (from the students questionnaire).

- 2. *Weekly instructional time for reading*: Hours for reading instruction per week according to teacher responses.
- 3. *Proportion of students with reading difficulties*: The number of students who need remedial reading instruction in a class divided by the number of all students in that class according to teacher responses.
- 4. *Reading comprehension strategy instruction*: Rasch score of the responses from teachers to the following seven questions.

How often do you ask the students to do the following things to help develop reading comprehension skills or strategies?

- a. Identify the main ideas of what they have read
- b. Explain or support their understanding of what they have read
- c. Compare what they have read with experiences they have had
- d. Compare what they have read with other things they have read
- e. Make predictions about what will happen next in the text they are reading
- f. Make generalizations and draw inferences based on what they have read
- g. Describe the style or structure of the text they have read
- 5. Computer use for reading instruction: Rasch score of the responses from teachers to the following three questions.

How often do you have students do the following computer activities?

- a. Look up information on the internet
- b. Read stories or other texts on the computer
- c. Use the computer to write stories or other texts

- 6. Autonomy support in reading instruction: Rasch score of the responses from teachers to the following two questions.
 - a. When you have reading instruction and/or do reading activities, how often do students work independently on a goal they choose themselves?
 - b. When do have reading instruction and/or do reading activities with the students, how often do you give students time to read books of their own choosing?
- 7. Social activities in reading instruction: Rasch score of the responses from teachers to the following five questions.
 - a. When you have reading instruction and/or do reading activities with the students, how often do you ask students to read aloud in small groups or pairs?
 - b. When you have reading instruction and/or do reading activities, how often do you create same-ability group?
 - c. When you have reading instruction and/or do reading activities, how often do you create mixed-ability group?
 - d. As students have read something, how often do you ask them to talk with each other about what they have read?
 - e. How often do you have students use computers to email or chat with other students about what they are learning?
- 8. *Homework for reading*: Rasch score of the responses from teachers to the following two questions.
 - a. How often do you assign reading as part of homework (for any subject)?

- b. In general, how much time do you expect students to spend on homework involving reading each time you assign it?
- 9. *Instruction for informational reading*: Rasch score of the responses from teachers to the following six questions.

When you have reading instruction and/or do reading activities with the students, how often do you have the students read the following types of text?

- a. Descriptions and explanations about things, people, or events (nonfiction)
- b. Instructions or manuals about how things work
- c. Charts, diagrams, graphs

When you have reading instruction and/or do reading activities with the students, how often do you use the following resources?

- d. Children's newspapers and/or magazines
- e. Reading material on the Internet (Web pages)
- f. Materials from other subjects
- 10. Instruction for literary reading: Rasch score of the responses from teachers to the following four questions.

When you have reading instruction and/or do reading activities with the students, how often do you have the students read the following types of text?

- a. Short stories (e.g., fables, fairy tales, action stories, science fiction, detective stories)
- b. Longer books with chapters (fiction)
- c. Poems

- d. Plays
- A3. Students-level variables
 - 1. Gender: Dichotomous variable on gender (0 boys, 1 girls)
 - Books at home: Dichotomous variable on the quantity of books at students' home (0 - 25 or fewer books, 1 - more than 25 books)
 - Amount of reading outside of school 1: Dichotomous variable on students' daily amount of book or magazine reading outside of school (0 – Others, 1 – No reading)
 - Amount of reading outside of school 2: Dichotomous variable on students' daily amount of book or magazine reading outside of school (0 – Others, 1 – A great deal of reading(5 hours and more))
 - 5. SES: Rasch score of the responses from students to the following nine questions. Do you have any of these things at your home?
 - a. Computer (do not include TV/video game stations)
 - b. Study desk/table for your use
 - c. Books of your very own (do not count your school books)
 - d. Daily newspaper
 - e. Your own room
 - f. Your own mobile phone
 - g. Video or digital Camera (U.S), automatic dishwasher (Denmark), your own television (England), parent's car for private use (Taiwan)
 - h. More than one car (U.S), reference books (Denmark), any musical instruments (England), private teacher (Taiwan)

- More than one bathroom (U.S), Internet connection (Denmark), your own CD and/or DVD player (England), place to read with no disturbances (Taiwan)
- 6. *Attitudes toward reading*: Rasch score of the responses from students to the following six questions.

What do you think about reading? Tell me how much you agree with each of these statements?

- a. I read only if I have to
- b. I like talking about books with other people
- c. I would be happy if someone gave me a book as a present
- d. I think reading is boring
- e. I need to read well for my future
- f. I enjoy reading
- 7. Reading self-concept: Rasch score of the responses from students to the

following four questions.

How well do you read? Tell me how much you agree with each of these statements?

- a. Reading is very easy for me
- b. I do not read as well as other students in my class
- c. When I am reading by myself, I understand almost everything I read
- d. I read slower than other students in my class
- 8. *Computer use*: Rasch score of the responses from students to the following three questions.

- a. How often do you use a computer at home?
- b. How often do you use a computer at school?
- c. How often do you use the Internet to look up information for school?
- 9. Informational reading outside of school: Rasch score of the responses from students to the following six questions.

How often do you do these things outside of school?

- a. I read to find out things I want to learn
- b. I read books that explain things
- c. I read magazines
- d. I read newspapers
- e. I read directions or instructions
- f. I read brochures and catalogues
- 10. Literary reading outside of school: Rasch score of the responses from students to

the following two questions.

How often do you do these things outside of school?

- a. I read stories or novels
- b. I read for fun outside of school

APPENDIX B

Analysis Results of the Data from Denmark

Table B.1

Means, Standard Deviations, and Intercorrelations of Classroom-level Variables and

Reading Performance	(205	classrooms	in	Denmark))
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Class-level	Maan	6 D		Zero-order	correlations	
variables (Denmark)	Mean	S.D.	1	2	3	4
General Classroom Variables						
1. Class mean SES	.91	.53	1			
2. Weekly instructional time for reading	4.57	2.94	.02	1		
3. Proportion of students with reading difficulties	.15	.08	30	10	1	
4. Reading comprehension strategy instruction	.12	1.18	.03	.09	10	1
5. Computer use for reading instruction	.02	1.09	04	.27***	08	.10
6. Autonomy support in reading instruction	02	1.09	.09	.15*	13	.20**
7. Social activities in reading	.00	1.00	.00	.26	17*	.39
8. Homework for reading	02	1.09	09	09 19**		.18
Genre-related Classroom Varia	bles					
9. Instruction for Informational reading	07	1.07	.06	.22***	07	.18
10. Instruction for literary reading	.00	.10	.14	.12	- .14	.35
Reading Performance						
11. Class informational reading score	544.11	30.10	.46	.05	37***	05
12. Class literary reading score	550.06	28.11	*** .48	.04	*** 37	05
13. Class overall reading score	548.76	29.01	.47	.06	*** 37	05
14. % of students in class with large score gap favoring literary reading	16.83	9.02	12	05	.09	.02
15. % of students in class with large score gap favoring informational reading	7.15	6.22	13	.05	.00	03

Table B.1	Continued

Class-		Zero-order correlations										
variab	oles	5	6	7	8	9	10	11	12	13	14	
Gene	ral Cla	ssro	om Var	iables								
1.											•	
2.												
3.												
4.												
5.	1											
6.	.35**	*	1									
7.	.18**	*	.18	1								
8.	.04		.05	.09	1							
Genre	e-relat	ed C	lassroo	m Variab	les							
9.	.39**	*	.28	.25	.01	1						
10.	.14		.33	.24**	.13	.15*	1					
Read	ing Pe	rfori	mance									
11.	03		.04	12	08	01	.07	1				
12.	04		.04	13	08	02	.05	.97	1			
13.	04		.04	12	08	02	.06	*** .98	.99	1		
14.	02		.03	.03	.07	.00	12	42***	25 ^{****}	33	1	
15.	.00		12	02	01	.00	.02	.06	09	02	30****	

* p < .05; ** p < .01; *** p < .001

Table B.2

Means, Standard Deviations, and Intercorrelations of Student-level Variables and

Student-level	Moon	S D	Zero-order correlations						
variables (Denmark.)	Mean	5.D.	1	2	3	4	5		
General Student Variabl	es								
1. Gender (0-Boy, 1-Girl)	.52	.50	1						
2. Books at home (0-Few books, 1-Many books)	.75	.43	.02	1					
3. Amount of reading outside of school 1 – No reading (0-No, 1-Yes)	.20	.40	*** 16	*** 11	1				
4. Amount of reading outside of school 2 – A great deal of reading (0- No, 1-Yes)	.03	.18	.03	.00	**** 09	1			
5. SES	.95	1.41	.03	.30	*** 08	03	1		
6. Attitudes toward reading	.08	1.12	.17***	.15	*** 31	*** .14	*** .11		
7. Reading self-concept	.58	1.40	01	.16	10 ^{***}	.03*	.15		
8. Computer use	27	1.29	*** 08	.01	05***	.02	.05**		
Genre-related Student V	ariables								
9. Informational reading outside of school	37	1.34	01	03	20***	*** .14	.00		
10. Literary reading outside of school	.40	1.63	*** .19	.13	33	.13	.12		
Reading Performance									
11. Informational reading score	546.94	66.07	.08	*** .30	*** 15	04*	.26***		
12. Literary reading score	552.39	62.48	.10	.28	•••• 13	04*	.28		
13. Overall reading score	551.38	64.78	.10	.30	*** 14	04**	.27***		
14. Large score gap favoring literary reading (0-No, 1-Yes)	.16	.37	.01	*** 06	.05**	.01	02		
15. Large score gap favoring informational reading (0-No, 1-Yes)	.07	.26	03	.00	.03	.04	06**		

Reading Performance (3,786 students in Denmark)

Student-		Zero-order correlations												
variables	6	7	8	9	10	11	12	13	14					
General S	tudent Va	riables												
1.														
2.														
3.														
4.														
5.														
6.	1													
7.	.28	1												
8.	.01	.05	1											
Genre-rel	ated Stude	ent Variab	les											
9.	.26	.03*	*** .18	1										
10.	.55	.23***	.06	.27***	1									
Reading F	Performan	ce												
11.	.26	.57***	02	*** 15	.23***	1								
12.	.22	*** .51	04**	*** 19	.21	*** .91	1							
13.	*** .24	*** .54	02	*** 18	.22	*** .94	.95	1						
14.	*** 08	*** 15	05**	04*	** 05	28***	01	*** 14	1					
15.	.05**	*** .06	.05**	*** .08	.01	.09	*** 13	03	•••• 12					

Table B.2 Continued

p < .05; p < .01; p < .001

Table B.3

	Model 1				Model 2	2	
Level	В	S.E.	t	B	S.E.	t	
	Intracl	ass Corre	lation from the c	one-way ANOV	A mode	1 = .14	
Fixed Effect							
Class mean score							
Intercept	510.32	3.65	139.82***	513.06	5.80	*** 88.44	
Class mean SES				8.90	3.33	2.67**	
Class reading difficulties				-66.94	21.36	-3.13	
Informational reading Instruction				46	1.59	29	
Literary reading Instruction				.90	1.73	.52	
Gender	6.63	2.05	3.23**	6.68	2.05	3.25**	
Books at home	20.23	2.41	*** 8.41	19.88	2.40	8.27***	
Amount of reading outside of school – No reading	-10.59	3.09	-3.43**	-10.62	3.08	-3.45	
Amount of reading outside of school – A great deal of reading	-15.54	6.22	-2.50*	-15.56	6.23	-2.50*	
SES	5.95	.86	*** 6.94	5.55	.86	*** 6.44	
(SES) ²	-1.40	.42	-3.37**	-1.42	.42	-3.41**	
Attitudes toward reading	5.24	1.14	4.60***	5.27	1.14	4.63***	
Reading self-concept	22.91	.89	25.72***	22.88	.89	25.68	
Computer use	-1.13	.77	-1.46	-1.15	.77	-1.49	
Informational reading	-9.04	.83	-10.85	-8.93	.83	-10.74	
Literary reading	2.13	.98	2.17*	2.08	.98	2.13 [†]	
Random Effect	Variance	df	χ^2	Variance	df	χ ²	
Class mean	439.35	204	832.83	370.26	200	728.85***	
Student-level effect	2653.77			2653.65			
Variance explained (R ²)	At s	tudent-lev	/el: .38	In c	lass mear	n: .16	
Conditional ICC		.14		.12			

Results from HLM Analyses Predicting Informational Reading Performance (Denmark)

Note. The square term in SES denotes the curvilinear relationship between these variables and the outcome. [†] p < .10; ^{*} p < .05; ^{***} p < .01; ^{***} p < .001

Table B.4

	Model 1				Model 2		
Level	В	S.E.	t	В	S.E.	t	
	Intracl	ass Corre	elation from the	e one-way ANO	VA mode	1 = .14	
Fixed Effect							
Class mean score							
Intercept	517.03	3.67	140.73	519.49	5.55	93.55	
Class mean SES				8.62	3.20	2.69**	
Class reading difficulties				-63.21	20.80	-3.04**	
Informational reading Instruction				40	1.53	26	
Literary reading Instruction				.25	1.60	.16	
Gender	8.28	2.00	*** 4.14	8.33	2.00	*** 4.16	
Books at home	17.00	2.66	6.38	16.62	2.66	6.25 ^{***}	
Amount of reading outside of school – No reading	-9.08	2.78	-3.27**	-9.10	2.77	-3.28	
Amount of reading outside of school – A great deal of reading	-10.77	5.92	-1.82 [†]	-10.79	5.91	-1.83 [†]	
SES	7.23	.96	*** 7.57	6.82	.96	7.11	
(SES) ²	-1.44	.39	-3.71	-1.45	.39	-3.75	
Attitudes toward reading	2.94	1.17	2.51*	2.98	1.17	2.55*	
Reading self-concept	19.61	.88	22.26***	19.57	.88	22.13***	
Computer use	-2.14	1.14	-1.87 [†]	-2.15	1.14	-1.90 [†]	
Informational reading	-10.17	.88	-11.54	-10.05	.88	-11.38	
Literary reading	2.83	.80	3.53**	2.79	.80	3.49**	
Random Effect	Variance	df	χ ²	Variance	df	χ ²	
Class mean	378.29	204	759.02	316.42	200	663.64	
Student-level effect	2593.10			2593.23			
Variance explained (R ²)	At stu	ident-lev	el: .34	In class mean: .16			
Conditional ICC		.13			.11		

Results from HLM Analyses Predicting Literary Reading Performance (Denmark)

Note. The square term in SES denotes the curvilinear relationship between these variables and the outcome.

[†] p < .10; ^{*} p < .05; ^{**} p < .01; ^{***} p < .001

APPENDIX C

Analysis Results of the Data from England

.

Means, Standard Deviations, and Intercorrelations of Classroom-level Variables and

Class-level	Mean	<u>م</u> ع		Zero-order	correlations	
variables (England)	MCall	5.D.	1	2	3	4
General Classroom Variables						
1. Class mean SES	.43	.46	1			
2. Weekly instructional time for reading	3.55	2.98	.17*	1		
3. Proportion of students with reading difficulties	.19	.17	22**	.05	1	
4. Reading comprehension strategy instruction	.38	1.34	03	.24**	.01	1
5. Computer use for reading instruction	.03	1.06	.09	.33	02	.36
6. Autonomy support in reading instruction	08	1.14	.00	.13	22**	.13
7. Social activities in reading	.00	1.00	17*	.28	03	.35
8. Homework for reading	33	1.43	.00	.04	05	07
Genre-related Classroom Varia	ables					
9. Instruction for Informational reading	.01	1.01	.04	.35	.00	.32***
10. Instruction for literary reading	.03	1.04	05	.22**	.00	.22
Reading Performance						
11. Class informational reading score	534.43	44.18	.41	09	*** 51	09
12. Class literary reading score	535.60	45.81	.40***	09	53***	09
13. Class overall reading score	536.60	45.62	*** .41	09	52	09
14. % of students in class with large score gap favoring literary reading	16.66	9.32	.04	01	09	05
15. % of students in class with large score gap favoring informational reading	13.26	8.52	10	.01	.20**	07

Reading Performance (167 classrooms in England)

T-1		Continued
Ta	ble C.I	Continued

Class-			Zero-order correlations												
Ievel variab	les	5	6	7	8	9	10	11	12	13	14				
Gener	al Cla	assro	oom Var	iables											
1.															
2.															
3.															
4.															
5.	1														
6.	.16		1												
7.	.35**	*	.27***	1											
8.	.13		.04	.02	1										
Genre	e-relat	ted (Classroo	m Variabl	es										
9.	.51**	- 1	.33	*** .40	.10	1									
10.	.18	ı	.08	.05	.00	*** .44	1								
Readi	ing Pe	rfor	mance												
11.	03		.16*	21**	.00	11	01	1							
12.	02		.14	21**	01	10	01	*** .98	1						
13.	02		.15	21**	.00	11	01	*** .99	.99	1					
14.	.02		12	07	11	11	07	.09	.20***	.15	1				
15.	03		.02	.01	.01	04	.08	.03	09	04	13				

* p < .05 ; ** p < .01 ; *** p < .001

Means, Standard Deviations, and Intercorrelations of Student-level Variables and

Student-level	Maan	<u>م ک</u>		Zero-	order correl	ations	
variables (England)	wiean	5.D.	1	2	3	4	5
General Student Variabl	les						
1. Gender (0-Boy, 1-Girl)	.50	.50	1				
2. Books at home (0-Few books, 1-Many books)	.74	.44	.08	1			
3. Amount of reading outside of school 1 – No reading (0-No, 1-Yes)	.23	.42	21	• *** 13	1		
4. Amount of reading outside of school 2 – A great deal of reading (0- No, 1-Yes)	.06	.24	*** .06	.00	*** 14	1	
5. SES	.46	1.31	.07	*** .18	*** 13	.01	1
6. Attitudes toward reading	.14	1.19	.23***	.22	28***	** .11	.07
7. Reading self-concept	.30	1.37	.08	.19***	*** 12	.05**	.10
8. Computer use	05	1.13	.06**	.01	*** 07	.07	.20***
Genre-related Student V	ariables						
9. Informational reading outside of school	19	1.22	.05**	02	22****	.20***	.11
10. Literary reading outside of school	.28	1.69	.25	.26	29***	.12	.08***
Reading Performance							
11. Informational reading score	538.73	77.75	.09	.33	*** 18	07 ^{****}	.18
12. Literary reading score	539.59	83.10	.12	.32***	*** 17	04*	*** .14
13. Overall reading score	534.50	83.93	*** .11	.33	*** 16	*** 08	.15
14. Large score gap favoring literary reading (0-No, 1-Yes)	.17	.37	.07***	.05**	03	*** .07	05**
15. Large score gap favoring informational reading (0-No, 1-Yes)	.13	.34	05**	02	04*	03	.05**

Reading Performance (3,829 students in England)

Student-	It- Zero-order correlations									
variables	6	7	8	9	10	11	12	13	14	
General S	tudent Va	riables								
1.										
2.										
3.										
4.										
5.										
6.	1									
7.	.29***	1								
8.	.06***	.04*	1							
Genre-rel	ated Stude	nt Variab	les							
9.	.21	.06**	.25**	1						
10.	.62***	.28	06***	.17	1					
Reading F	erforman	ce								
11.	.31	*** .46	*** 07	*** 17	.36	1				
12.	.32	*** .46	*** 09	*** 19	.37	.92***	1			
13.	.31	.45	*** 09	*** 19	.36	.94	.94 .94	1		
14.	.05**	.04*	02	04**	.09	04**	.22***	.08***	1	
15.	02	04*	.04*	.07***	01	.04*	22***	10	18	
* p < .05 ; *	• p < .01 ;	*** p < .00	1							

Table C.2 Continued

	Model 1				Model 2			
Level	В	S.E.	t	В	S.E.	t		
	Intracl	ass Corre	elation from the	e one-way AN	OVA mod	lel = .22		
Fixed Effect								
Class mean score						***		
Intercept	521.35	3.48	149.89	531.88	4.82	110.32		
Class mean SES				15.61	4.89	3.19		
Class reading difficulties				-91.58	13.75	*** -6.66		
Informational reading Instruction				-3.37	2.20	-1.53		
Literary reading Instruction				1.25	2.17	0.58		
Gender	.07	2.66	.03	20	2.64	07		
Books at home	19.07	2.70	7.07	19.03	2.69	7.08		
Amount of reading outside of school – No reading	-16.30	3.96	-4.11	-15.98	3.97	-4.02**		
Amount of reading outside of school – A great deal of reading	-19.57	5.27	-3.72**	-19.75	5.26	-3.75***		
SES	6.83	1.08	6.33	6.40	1.08	5.95		
(SES) ²	-1.65	.44	-3.75	-1.66	.44	-3.79		
Attitudes toward reading	3.86	1.40	2.75*	3.92	1.40	2.80**		
Reading self-concept	20.61	.90	23.00	20.42	.89	22.95		
Computer use	-5.40	1.72	-3.14*	-5.52	1.72	-3.22*		
(Computer use) ²	-2.99	.63	-4.74	-3.05	.63	-4.83		
Informational reading	-10.62	1.45	-7.34	-10.66	1.44	-7.38		
Literary reading	7.41	1.04	7.14	7.48	1.04	7.22***		
Random Effect	Variance	df	χ^2	Variance	df	χ^2		
Class mean	791.09	166	*** 918.61	459.36	162	624.13 ^{***}		
Student-level effect	3671.33			3670.75				
Variance explained (R ²)	At stu	ident-lev	el: .32	In	class mea	n: .42		
Conditional ICC	.18 .11							

Results from HLM Analyses Predicting Informational Reading Performance (England)

Note. The square terms in SES and computer use denote the curvilinear relationships between these

variables and the outcome.

* p < .05 ; ** p < .01 ; *** p < .001

		Model 1			Model 2	
Level	В	S.E.	t	В	S.E.	t
	Intracl	ass Corre	elation from the	one-way ANC	VA mode	el = .21
Fixed Effect						
Class mean score			***			***
Intercept	517.68	3.93	131.82	528.86	4.80	110.14
Class mean SES				17.83	5.03	3.54
Class reading difficulties				-100.54	13.95	-7.21***
Informational reading Instruction				-3.01	2.31	-1.30
Literary reading Instruction				.88	2.26	.39
Gender	4.09	2.65	1.55	3.86	2.64	1.46
Books at home	20.42	2.85	7.17***	20.39	2.84	7.19
Amount of reading outside of school – No reading	-14.11	3.14	-4.49	-13.73	3.14	-4.37
Amount of reading outside of school – A great deal of reading	-10.74	5.04	-2.13*	-10.85	5.02	-2.16*
SES	4.46	1.11	4.01	3.96	1.13	3.51**
(SES) ²	-1.20	.49	-2.46	-1.22	.48	-2.52*
Attitudes toward reading	4.91	1.38	3.56**	4.97	1.37	3.63**
Reading self-concept	21.84	1.01	21.67	21.62	.99	21.74
Computer use	-6.14	1.05	-5.83	-6.28	1.05	-6.00
(Computer use) ²	-3.38	.72	-4.71	-3.43	.71	-4.81
Informational reading	-13.40	1.43	-9.34	-13.49	1.44	-9.38
Literary reading	8.67	1.02	8.48	8.73	1.02	*** 8.56
Random Effect	Variance	df	χ^2	Variance	df	χ ²
Class mean	844.85	166	862.56	445.71	162	558.64 ***
Student-level effect	4212.88			4211.29		
Variance explained (R ²)	At stu	ident-lev	el: .33	In c	lass mean	: .47
Conditional ICC		.17			.10	

Results from HLM Analyses Predicting Literary Reading Performance (England)

Note. The square terms in SES and computer use denote the curvilinear relationships between these variables and the outcome.

* p < .05 ; ** p < .01 ; *** p < .001

APPENDIX D

Analysis Results of the Data from Taiwan

.

.

Means, Standard Deviations, and Intercorrelations of Classroom-level Variables and

Class-level	Meen	۶D		Zero-order	correlations	3
variables (Taiwan)	Mean	3.D.	1	2	3	4
General Classroom Variables						
1. Class mean SES	.02	.33	1			
2. Weekly instructional time for reading	2.10	1.56	.20*	1		
3. Proportion of students with reading difficulties	.12	.10	22*	.10	1	
4. Reading comprehension strategy instruction	.07	1.10	.12	.11	09	1
5. Computer use for reading instruction	15	1.03	09	09	04	.31
6. Autonomy support in reading instruction	.07	1.15	.17*	.03	08	.22**
7. Social activities in reading	04	1.06	01	.10	.03	.43***
8. Homework for reading	07	1.23	.08	.07	04	.12
Genre-related Classroom Varia	ables					
9. Instruction for Informational reading	10	1.13	.06	.10	.03	.38
10. Instruction for literary reading	04	1.06	.20*	.11	08	*** .40
Reading Performance						
11. Class informational reading score	537.80	20.59	*** .59	.12	- .21	.00
12. Class literary reading score	529.98	23.88	•••• .61	.10	17*	.03
13. Class overall reading score	534.95	22.84	.60***	.10	20*	.00
14. % of students in class with large score gap favoring literary reading	7.45	5.09	.17*	05	03	.22**
15. % of students in class with large score gap favoring informational reading	17.49	7.91	30	.04	09	11

Reading Performance (150 classrooms in Taiwan)

Г	ahl	e	D.	1	Con	tin	ued
	avi	.	ν.		COL	Lerry.	uvu

Class	-	Zero-order correlations										
level varial	oles 5	6	7	8	9	10	11	12	13	14		
Gene	ral Classi	room Vai	riables									
1.												
2.												
3.												
4.												
5.	1											
6.	04	1										
7.	*** .34	.06	1									
8.	.05	.03	.04	1								
Genr	e-related	Classroo	m Variab	les								
9.	.37	.24	.39	.17*	1							
10.	*** .41	.21**	.35	.19*	.42***	1						
Read	ing Perfo	rmance										
11.	10	.08	.05	.13	.04	.06	1					
12.	12	.05	.05	.13	.05	.06	*** .97	1				
13.	10	.07	.05	.13	.05	.07	.98	.98	1			
14.	.03	05	.05	01	.09	.05	.18	.31	.24**	1		
15.	.04	.07	09	14	.01	09	*** 45	*** 59	*** 52	36		

p < .05; p < .01; p < .01

Means, Standard Deviations, and Intercorrelations of Student-level Variables and

Student-level	Maar	<u>م</u> ک	Zero-order correlations						
variables (Taiwan)	Mean	3.D.	1	2	3	4	5		
General Student Variabl	les								
1. Gender (0-Boy, 1-Girl)	.49	.50	1						
2. Books at home (0-Few books, 1-Many books)	.60	.49	.04*	1					
3. Amount of reading outside of school 1 – No reading (0-No, 1-Yes)	.24	.43	*** 18	20****	1				
4. Amount of reading outside of school 2 – A great deal of reading (0- No, 1-Yes)	.05	.22	.03	.08	*** 13	1			
5. SES	.06	1.08	.05	.23	*** 15	.08	1		
6. Attitudes toward reading	.21	1.28	.20****	.25***	*** 34	*** .17	.21		
7. Reading self-concept	.40	1.46	.10***	.27***	23***	.13	.23***		
8. Computer use	03	1.04	01	.06	*** 11	.03	.19***		
Genre-related Student V	ariables								
9. Informational reading outside of school	20	1.26	.02	.15	25***	.18	.21		
10. Literary reading outside of school	.19	1.51	.17	.26***	33	.17***	.21***		
Reading Performance									
11. Informational reading score	541.78	52.10	.08	.35	*** 26	.02	.17		
12. Literary reading score	534.12	61.80	.12	.32***	22***	.04*	.19***		
13. Overall reading score	539.07	58.12	.10	.34	25	.04*	.18		
14. Large score gap favoring literary reading (0-No, 1-Yes)	.07	.26	.07***	.04*	.00	.05**	.07***		
15. Large score gap favoring informational reading (0-No, 1-Yes)	.17	.37	09	04	.03	.00	07		

Reading Performance (4,207 students in Taiwan)

Student-	Zero-order correlations											
variables	6	7	8	9	10	11	12	13	14			
General S	tudent Va	riables										
1.												
2.												
3.												
4.												
5.												
6.	1											
7.	.45	1										
8.	.06***	.04**	1									
Genre-rela	ated Stude	ent Variab	les									
9.	.31	*** .19	.20***	1								
10.	*** .46	*** .36	*** .11	.41	1							
Reading P	erforman	ce										
11.	.32	.40	.04	02	.26	1						
12.	.29	.37	.05**	.00	.27	.90	1					
13.	.31**	.40	.04**	01	.27***	.94	.94	1				
14.	.03	.03*	.03	.07***	*** .08	.03	.26	.13	1			
15.	01	*** 07	** 04	.01	*** 06	*** 14	*** 41	*** 28	13***			

Table D.2 Continued

]	Model 1		Model 2				
Level	В	S.E.	t	В	S.E.	t		
	Intraclass Correlation from the one-way ANOVA model $= .09$							
Fixed Effect								
Class mean score								
Intercept	533.63	2.54	210.47***	533.32	2.94	181.70***		
Class mean SES				21.79	4.08	5.34***		
Class reading difficulties				-1.05	12.79	08		
Informational reading Instruction				.56	1.21	.47		
Literary reading Instruction				-1.62	1.24	-1.30		
Gender	-1.52	1.92	80	-1.39	1.92	-0.73		
Books at home	21.10	1.91	11.06***	20.60	1.93	10.68***		
Amount of reading outside of school – No reading	-14.82	3.10	-4.78**	-14.63	3.09	-4.74**		
Amount of reading outside of school – A great deal of reading	-9.25	4.92	-1.88†	-8.99	4.91	-1.83 [†]		
SES	3.11	.82	3.77***	2.52	.82	3.07**		
(SES) ²	-3.13	.48	-6.49***	-3.15	.48	-6.55***		
Attitudes toward reading	5.21	.83	6.27***	5.26	.83	6.35***		
Reading self-concept	8.51	.85	10.01***	8.54	.85	10.09***		
Computer use	-1.63	.79	-2.06*	-1.60	.79	-2.02*		
(Computer use) ²	-3.05	.53	-5.73***	-3.07	.53	-5.74***		
Informational reading	-8.00	.87	-9.25***	-8.01	.86	-9.29***		
Literary reading	3.34	.94	3.54**	3.22	.94	3.43**		
Random Effect	Variance	df	χ ²	Variance	df	χ ²		
Class mean	153.19	149	442.39***	113.22	145	366.84***		
Student-level effect	2205.03			2203.15				
Variance explained (R ²)	At student-lev	/el: .24		In class me	an: .26			
Conditional ICC		.06			.05			

Results from HLM Analyses Predicting Informational Reading Performance (Taiwan)

Note. The square terms in SES and computer use denote the curvilinear relationships between these variables and the outcome.

[†] p < .10; ^{*} p < .05; ^{**} p < .01; ^{***} p < .001

		Model 1			Model 2	2	
Level	В	S.E.	t	В	S.E.	t	
•••••••••••••••••••••••••••••••••••••••	Intraclass Correlation from the one-way ANOVA model $= .09$						
Fixed Effect							
Class mean score			***			***	
Intercept	520.16	2.56	203.56	518.99	3.11	167.11	
Class mean SES				26.52	5.13	5.17	
Class reading difficulties				5.37	15.94	.34	
Informational reading Instruction				.75	1.55	.48	
Literary reading Instruction				-2.08	1.59	-1.31	
Gender	4.34	1.96	2.21*	4.49	1.96	2.29*	
Books at home	21.71	2.43	8.95	21.12	2.44	8.66	
Amount of reading outside of school – No reading	-12.02	2.79	-4.32	-11.79	2.81	-4.20****	
Amount of reading outside of school – A great deal of reading	-5.90	4.54	-1.30	-5.61	4.55	-1.23	
SES	4.34	1.11	3.93	3.65	1.12	3.25**	
(SES) ²	-2.13	.61	-3.48	-2.16	.61	-3.52**	
Attitudes toward reading	4.67	1.09	4.29***	4.72	1.09	4.34	
Reading self-concept	9.38	1.24	7.59***	9.42	1.24	7.60***	
Computer use	.40	1.04	.39	.45	1.04	.43	
(Computer use) ²	-3.09	.66	-4.71	-3.11	.65	-4 .75	
Informational reading	-8.90	1.10	-8.10	-8.90	1.10	-8.12	
Literary reading	5.14	.81	6.35	5.00	.81	6.20***	
Random Effect	Variance	df	χ^2	Variance	df	χ^2	
Class mean	233.65	149	445.43	173.48	145	369.84***	
Student-level effect	3320.19			3318.31			
Variance explained (R ²)	At student-l	evel: .20		In class mean: .26			
Conditional ICC		.07			.05		

Results from HLM Analyses Predicting Literary Reading Performance (Taiwan)

Note. The square terms in SES and computer use denote the curvilinear relationships between these variables and the outcome.

* p < .05; ** p < .01; *** p < .001

