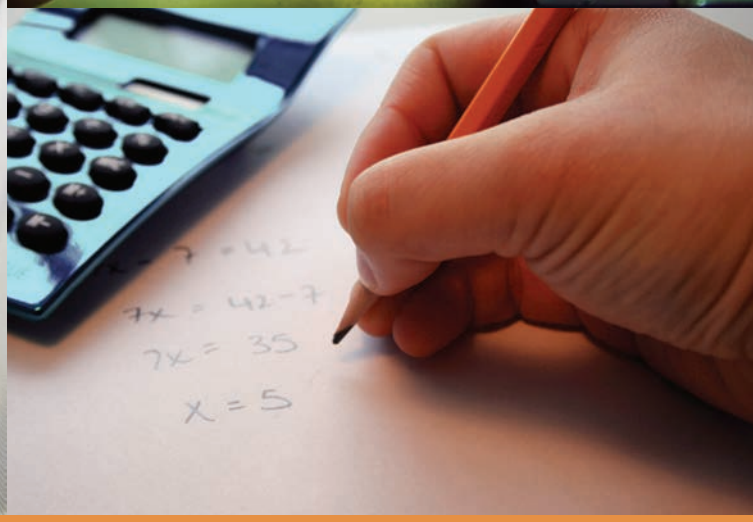
Pan-Canadian Assessment Program

PCAP-13 2007

Report on Reading Strategies and Reading Achievement



cmec
Council of Ministers of Education, Canada
Conseil des ministres de l'Éducation (Canada)

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PCAP-13 2007

Report on Reading Strategies and Reading Achievement

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The Council of Ministers of Education, Canada (CMEC) was formed in 1967 by the jurisdictional ministers responsible for education to provide a forum in which they could discuss matters of mutual interest, undertake educational initiatives cooperatively, and represent the interests of the provinces and territories with national educational organizations, the federal government, foreign governments, and international organizations. CMEC is the national voice for education in Canada and, through CMEC, the provinces and territories work collectively on common objectives in a broad range of activities at the elementary, secondary, and postsecondary levels.

Through the CMEC Secretariat, the Council serves as the organization in which ministries and departments of education undertake cooperatively the activities, projects, and initiatives of particular interest to all jurisdictions[1]. One of the activities on which they cooperate is the development and implementation of pan-Canadian testing based on contemporary research and best practices in the assessment of student achievement in core subjects.

Note of appreciation

The Council of Ministers of Education (Canada) would like to thank the students, teachers, and administrators whose participation in the Pan-Canadian Assessment Program ensured its success. The quality of your commitment has made this study possible. We are truly grateful for your contribution to a pan-Canadian understanding of educational policy and practices in reading, mathematics, and science among 13-year-olds.

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[1] In this report, "ministry" includes "department" and "jurisdictions" includes participating "provinces" and "territories."

EXECUTIVE SUMMARY

This report presents evidence on teaching and learning strategies for reading that emerges from the PCAP-13 2007 assessment in reading. The report will be useful for education policy-makers and other stakeholders concerned with reading achievement and the study of teaching and learning. The main messages from the findings are as follows:

The strategies Canadian students use in their reading and the attitudes students have toward reading and toward school are consistently related to reading competency.

There is a set of consistent relationships of reading strategies to reading achievement for 13-year-old Canadian students. The relationships are consistent across female and male students, across English- and French-speaking students, and across educational jurisdictions in Canada.

However, the relationships of different strategies to reading competence do not work in a consistent manner; they vary in direction between different strategies: some are negative and some are positive. Higher-order reading strategies that involve more cognitively complex engagement with rereading — for example, making connections, thinking about word meaning, and rereading difficult parts of the text — are positively related to reading achievement. Lower-order reading strategies that involve simpler, rote-like engagement — for example, highlighting and making notes, asking for help, and sounding out words — are negatively related to reading achievement.

In addition, student attitudes toward reading are also strongly related to reading achievement. Together with reading strategies, they account for over 25 per cent of the variance in reading achievement scores.

The relationships of reading strategies to reading achievement do not vary widely across Canada's educational systems.

Teaching and learning strategies are an important area of educational policy and practice. A pan-Canadian perspective on these issues informs students, parents, teachers, policy-makers, and other stakeholders about the most common patterns in their system. All jurisdictions in Canada show the same patterns of relationships of reading strategies and attitudes to reading proficiency.

Teaching strategies that are more cognitively complex have a positive relationship to reading achievement, whereas simpler strategies are negatively related.

Analyzing text structure, analyzing critically, and using narrative text are positively related to reading achievement, whereas summarizing, re-teaching the basics, and using procedural text are negatively related to reading achievement.

Teacher perceptions of increased levels of noise and disruption have a negative relationship to reading achievement, while the analysis based on student perceptions results in no significant relationship.

Teaching and learning reading strategies are complex processes that interact with one another, suggesting that in-depth, context-specific survey design and analyses are necessary to fully understand each teaching and learning strategy's role in enhancing student performance.

With a few interesting exceptions, only a few teaching and learning strategies have a direct, robust, and consistent relationship with student performance across Canada. The relationship between reading strategies and performance tends to be moderated by student attitudes, suggesting that these issues cannot be analyzed separately.

The value of PCAP derives primarily from both the sample coverage and the evidence generated by the questionnaires, resulting in the capacity to examine in a comprehensive way the relationships of various antecedent and process variables to student performance on the reading-achievement measures.

In light of the stability of the relationship of reading-strategies to reading achievement, future student questionnaires should be re-evaluated to ensure that all significant reading strategies are targeted by the questionnaire and that the items describe the targeted strategies in clear language and terms the responding students can understand.

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1 OVERVIEW OF THE REPORT'S APPROACH

The Pan-Canadian Assessment Program (PCAP) is an important Council of Ministers of Education, Canada (CMEC) initiative to inform Canadians about how well their education systems are meeting the needs of students and society. Information gained from the pan-Canadian assessment gives ministers of education a basis that informs the management of curriculum and other aspects of their school systems. PCAP tests the achievement of 13-year-old students in reading, mathematics, and science.

In spring 2007, PCAP was administered for the first time. The primary domain for this assessment was reading, and the minor domains were mathematics and science. The accompanying questionnaires for students, teachers, and school administrators were designed to provide jurisdictions with contextual information that would contribute to the interpretation of performance results. A questionnaire-development group composed of educators and research experts from selected jurisdictions throughout Canada developed a framework to ensure that the questions asked of students, teachers, and school administrators were consistent with predetermined theoretical constructs or important research questions. Given that reading strategies and instructional activities should help students comprehend and remember what they read, items were developed to collect information on these aspects from students, teachers, and schools in Canada. In light of the interactive process of reader, text, purpose, and context, the PCAP reading assessment maintained a focus on the reader's engagement with text and response to it. This focus fits with curricula across Canada that identify comprehension, interpretation, and response and reflection as major organizing aspects of reading literacy. In the 2007 assessment, three subdomains of the integrated process of reading were assessed: comprehension, interpretation, and response to text (includes response and reflection).

Section 2 of the report surveys the selected research literature around three areas: reading strategies, reading attitudes, and reading instruction. Researchers have found that good readers are active or strategic readers who use a variety of comprehension strategies before, during, and after reading a text. Reading achievement is also seen by researchers to be affected by student attitudes toward reading.

Section 3 of the report presents the analyses that resulted in a 28-predictor regression model (28PM) of student reading strategies, attitudes, and activities in relation to reading achievement. The relationships identified by this modelling were then compared across various student aggregations and jurisdictions in Canada. Finally, further analyses were conducted that included teacher- and school-level traits.

Section 4 summarizes the report's main findings, identifies relevant educational policy and practice issues, and examines the extent to which the available results respond to these issues. This section also considers the design of PCAP in light of methodological issues encountered in this study.

[2] A more detailed technical report to support this research is available from CMEC upon request.

2 LITERATURE REVIEW

Teaching children to read has long been the subject of "great debate" (Chall, 1967). Literacy teaching and learning are complex tasks for both teachers and students. The PCAP-13 2007 reading assessment framework was informed by the models of the questionnaire design found in three large-scale assessments — the School Achievement Indicators Program (SAIP), the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Achievement (PISA). PCAP also reflects Canadian curricula that identify comprehension, interpretation, and response and reflection as major organizing aspects of reading literacy. The PCAP framework mirrors constructivist instruction research that is based on the belief that learning occurs as students are actively involved in a process of constructing meaning and knowledge rather than passively receiving information, and where students are the makers of meaning and knowledge.

There is an extensive body of research on meta-cognition and the reading comprehension of school-aged children. Reading-strategy research refers to cognitive and meta-cognitive processes employed by students as they attempt to learn something new (Flavell, 1979; Lipman, 1988; Paris & Winograd, 1990; Schneider, 2008; Schraw, Crippen, & Hartley, 2006; Shanahan & Neuman, 1997; Sperling, Howard, Miller, & Murphy, 2002; Whitebread et al., 2009; Willingham, 2007). Good readers know how to use cognitive and meta-cognitive strategies together to develop deeper understanding. Attitude toward learning and reading is another important element in the literature, both in the theoretical literature and the literature pertaining to large-scale assessments.

For ease of reporting and in light of the data analysis to follow, the selected literature review is organized around three areas: reading strategies, reading attitudes, and reading instruction. Instructional strategies refer to a broad range of processes, from the organization of classrooms and resources to the moment-by-moment activities engaged in by teachers and students to facilitate learning. An emphasis is placed on summarizing the literature.

One of the many challenges in conducting such a review is that the definitions of the key concepts (for example, reading strategies and literacy) vary somewhat within the literature and from one major assessment to another. For this reason, we have provided a short description of the development/status of the key concepts, as well as a description of how each of the major large-scale assessments defines its respective key concepts where that has seemed relevant to our task. These descriptions are offered in light of the way in which PCAP defines its major concepts; there are some differences, and these are worth keeping in mind in making observations about potential new directions for data gathering.

Reading strategies

Theoretical framework

Reading strategies reveal the way readers manage their interaction with written text and find the path to text comprehension. Research underlines that reading strategies are dependent on context, the task, the learning situation, who is taking part, and so on (Darling-Hammond & Snyder, 2000; Street, 2001). Cognitive theory also plays a central role in reading research. Reading strategies have been generally classified as cognitive, meta-cognitive, or self-regulatory in nature (Mullis, Kennedy, Martin, & Sainsbury, 2006).

Duke and Pearson (2002) argue that there is considerable agreement among researchers that students with reading difficulties are missing strategies of effective readers such as setting goals, making predictions, and monitoring their understanding of the text as they read. Reading strategies can be understood as processes used by the learner to enhance reading comprehension and overcome comprehension failures.

The good news is that researchers believe that all students can acquire effective strategies and processes — those that are used by good readers. Reading research (Cunningham & Stanovich, 1998; Guthrie et al., 1996; Medwell, Wray, Poulson, & Fox, 1998; Pressley et al., 2001; Taylor & Pearson, 2002) consistently shows that high-achieving students are characterized by word-recognition and comprehension skills.

Researchers (Carroll, 1989; Garner, 1992; Pressley & Afflerbach, 1995) have also found that the strategies that readers use when interacting with printed materials play an important role in reading comprehension in both first and second languages.

Awareness of meaning: The pathway to fluent reading

The aim of employing reading strategies is to achieve fluent reading. Two essential skills in reading are: getting meaning from a written message (Carroll, 1970), and reading for remembering (Baker & Brown, 1984). Fluent reading involves understanding the meaning of a text beyond simple decoding and word recognition, which requires practice with a variety of texts (Pressley, 2006).

Student learning strategies include cognitive and meta-cognitive processes. Meta-cognitive processes and strategies allow readers to examine their own understanding and adjust their approach (Kintsch & Kintsch, 2005; Paris, Wasik, & Turner, 1996; van Dijk & Kintsch, 1983).

Researchers report that awareness and monitoring of one's comprehension processes are critically important aspects of skilled reading. This finding has led to an increasing emphasis on the role of cognitive and motivational processes in reading (Alexander & Jetton, 2000; Guthrie & Wigfield, 1999; Pressley, 2000; Pressley & Afflerbach, 1995). The process of meta-cognition is one of the building blocks of learning. Ultimately, learners

internalize the process of learning itself: by understanding and encoding the process, by practising the process, by adjusting the process using feedback from other sources outside themselves, and by transferring the process to new situations. With time, this whole process unfolds automatically (Pressley, Borkowski, & Schneider, 1987).

Reading and large-scale assessments

Large-scale international assessment programs provide useful student-level information regarding the correlates of academic performance. These surveys assess some of the major components of reading that contribute to reading comprehension.

These assessments have found evidence that learner attitudes exert influence over the level of student performance (Haahr et al., 2005). PISA studies show that there is a positive association between students' performance and their approaches to learning, such as their motivation to learn, their beliefs about their own abilities, and their learning strategies (OECD, 2001, 2003).

PIRLS

The theoretical underpinnings and findings of the Progress in International Reading Literacy Study (PIRLS), a program conducted under the auspices of the International Association for the Evaluation of Educational Achievement (IEA), is worth examining in more detail. PIRLS is a survey that has incorporated many of the emerging concepts associated with recent understanding of reading, reading literacy, and the importance of strategies for learning and students' approaches to learning, including motivation, self-efficacy, and engagement. Importantly, the teachers teach in the schools that the students attend, which permits researchers to create linkages in the data and increase the predictive value of their findings.

PIRLS examines students' reading literacy behaviours and attitudes. It assesses a range of reading comprehension strategies for two major reading purposes — literary and informational in a curricular setting. In PIRLS 2001, Grade 4 students in 35 countries were tested in reading literacy, or "the ability to understand and use those written language forms required by society and/or valued by the individual" (Mullis, Martin, Gonzales, & Kennedy, 2003, p. 33).

PIRLS asks students questions on home resources, languages spoken in the home, reading habits in and out of school, and attitudes toward reading. Teachers of those students respond to questions on reading instruction and reading assessment as well as their training and experience teaching reading. In PIRLS, reading strategies are dependent on context — the task, the learning situation, who is taking part, and so on. The strategies can be thought of as tactics used by students to enhance their performance on a given task or tasks.

The findings of PIRLS 2006 show that participants with the highest average achievement overall also tended to have the highest average achievement when the results were

examined separately for literary and informational reading and for the comprehension processes (Mullis, Martin, Kennedy, & Foy, 2007). This report also confirmed that home activities, reading for enjoyment, and parental modelling of reading and involvement in students' reading activities worked positively to foster reading literacy and contributed to positive reading outcomes (Mullis et al.). Furthermore, students with the most positive attitudes toward reading had the highest reading outcomes (Mullis et al.). The concept of reading for enjoyment and the strategies adopted by teachers to develop students' reading literacy are the predominant factors in the students' performance on the PIRLS reading test. Reading for fun is the prerogative of students, while reading instruction strategies and means of developing reading comprehension are the purview of teachers; a combination of the two can foster increased student achievement in reading.

PISA

In the Organisation for Economic Co-operation and Development's (OECD) PISA survey, the notion of reading literacy goes beyond the measurement of a student's capacity to decode and comprehend literal information. PISA defines reading literacy as "understanding, using, and reflecting on written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society" (OECD, 2003, p. 108).

PISA assesses the reading literacy of 15-year-old students and does not explicitly focus on curricular outcomes; rather, it focuses on cognitive skills and the application of reading to problems within a real-life context. PISA assesses reading processes and categorizes its assessment tasks by the type of cognitive skill demanded by the test item. For example, it presents students with a range of texts, such as excerpts from government forms, brochures, newspaper articles, instruction manuals, books, and magazines.

To capture information on this wider concept of reading literacy, PISA collects data on three kinds of learning strategies: the extent to which students controlled their learning, for example, by setting goals and priorities; the extent to which they used elaboration strategies, for example, by making the effort to integrate new learning with things they already knew; and the extent to which they learned by memorizing.

NAEP

The United States' National Assessment of Educational Progress (NAEP) 2009 reading framework focuses on grade-level "cognitive targets." It defines these as "the mental processes or kinds of thinking that underlie reading comprehension; the cognitive targets serve to guide the test-development process in that item writers 'target' these processes or kinds of thinking as they write items" (National Assessment Governing Board, 2009, p. 39). NAEP draws on the research literature that suggests that readers pay attention to different aspects of text as they seek to comprehend different text types (Pearson & Camperell, 1994; Pressley, 2000; Purves, 1973).

In summary, for PIRLS, reading strategies are thought of as tactics used by students to enhance their performance on a given task or tasks. The PISA reference point is learning strategies — the extent to which students controlled their learning, the extent to which they use elaboration strategies, and the extent to which they learn by memorizing. NAEP's framework looks to the foundational components of reading: phonemic awareness, phonics knowledge, fluency, vocabulary, and cognitive targets, rather than strategies per se.

Reading Attitudes

This subsection examines what the research literature, including that based on large-scale assessments, tells us about the relationship between attitudes toward reading, including motivation, and self-related beliefs.

Motivational preferences and volition

Motivation can be regarded as the driving force behind learning. Proficient reading requires readers to autonomously start and persist in reading tasks, activities that require motivation. One can distinguish motives deriving from external rewards for good performance, such as praise or future prospects, from internally generated motives such as interest in subject areas (Deci & Ryan, 1985; Schiefele, Krapp, & Winteler, 1992). Distinct from motivation is volition, shown at the time that learning takes place and leading to effort and persistence (O'Neil & Herl, 1998).

Self-related beliefs

Learners form views about their own competence and learning characteristics. These views have been shown to have considerable impact on the way they set goals, the strategies they use, and their achievement (Zimmerman, 1999). These findings are borne out in the gender-related research, for boys in general and in relation to disadvantaged boys in particular.

Two ways of defining these beliefs are in terms of how well students think that they can handle even difficult tasks — self-efficacy (Bandura, 1994); and in terms of their belief in their own abilities — self-concept (Marsh, 1993).

Reading Instruction

Reading research supports a number of approaches to reading instruction: the teaching of foundational reading skills via phonemic awareness and systematic phonics instruction; a whole-language approach that provides individualized strategy instruction (Purdie & Ellis, 2005); and a mix of the above two approaches. The following attempts a synthesis of the selected literature on teaching and instructional strategies.

Teaching reading comprehension

The benefits of explicit reading comprehension instruction in elementary grades are well documented (Pressley et al., 1992; Pearson & Camperell, 1994; Cunningham & Stanovich, 1998). To build students' understanding of text through explicit instruction of reading comprehension strategies, teachers teach students to "use specific cognitive strategies or to reason strategically when they encounter barriers to comprehension" (National Institute of Child Health and Human Development, National Reading Panel, 2000, chap. 4, p. 5). The National Reading Panel (NRP) recommends a comprehension curriculum structured around seven component strategies that identify expert and less skilled readers: making connections, asking questions, visualizing, inferring, determining importance, summarizing, and monitoring comprehension.

The more reading students do, the more they become strong readers. Walberg and Tsai (1985) found that the frequency and amount of reading had a strong relationship to reading achievement. Anderson, Fielding, and Wilson (1988) report that the amount of time children spend reading books is related to the child's reading level in Grade 5 and the growth of reading proficiency from Grades 2 through 5.

Reading at home contributes to overall reading competency. When schools encourage children to practise reading at home with parents, the children make significant gains in reading achievement compared to those who only practise at school (Henderson & Berla, 1994).

Varied approach to reading instruction

NRP determined that no single reading method, used in isolation, works best for all children. Their recommendations encourage teachers to use a mix of phonics and language experiences to support the development of a wide range of learners.

NRP reported that phonemic-awareness (PA) instruction is effective in teaching children to attend to and manipulate speech sounds in words. Findings of their meta-analysis revealed not only that PA can be taught, but also that PA instruction is effective under a variety of teaching conditions with a variety of learners (National Institute of Child Health and Human Development, NRP, 2000).

Classroom practices, including the whole-language approach, that encourage repeated oral reading (fluency) with feedback and guidance lead to meaningful improvements in reading expertise for good readers as well as those who are experiencing difficulties (National Institute of Child Health and Human Development, NRP, 2000).

Scaffolding

Scaffolding is a form of meta-cognition that can be taught directly. Children often require concentrated instructional support when they need to learn important skills and strategies that they would have difficulty discovering on their own. Using a scaffolding of instruction,

readers and writers better understand the task required. Supports or scaffolds are gradually removed as students demonstrate greater degrees of proficiency (Mazzoni & Gambrel, 2003; Wood, Bruner, & Ross, 1976).

There are numerous scaffolding strategies, but they share the following characteristics: temporary support is offered, including clues, modelling behaviour, and practice; feedback is given; student responsibility is increased; removal of support is gradual; simple tasks assigned at the beginning move to more complex tasks; once students demonstrate mastery, the scaffolding is removed (Vockell, 2001, chap. 12).

Quality of the learning environment

Research shows teaching to be the most important school-based factor influencing student performance (Aaronson, Barrow, & Sander, 2007; Rivkin, Hanushek, & Kain, 2005; Wright, Horn, & Sanders, 1997). What happens in classrooms through quality teaching and through the quality of the learning environment generated by the teacher and the students is described by researchers as a key variable in explaining student scores (Cuttance, 1998, 2001; Hanushek, Kain, & Rivkin, 1998; Hill & Rowe, 1996; Rowe & Rowe, 2002; Kyriades, Campbell, & Gagatsis, 2000; Rowe, Turner, & Lane, 1999; Scheerens, Vermeulen, & Pelgrum, 1989; Willms, 2000).

Teacher characteristics such as training, certification, experience, and their attitudes toward teaching are particularly important to a student's academic success (Clotfelter, Ladd, & Vigdor, 2007; Croninger, Rice, Rathbun, & Nishio, 2007; Palardy & Rumberger, 2008). When teachers have strong knowledge of the discipline they teach, student achievement is higher (Goldhaber & Brewer, 1999; Monk, 1994). *The PCAP-13 2007 Contextual Report on Student Achievement in Reading* indicated that teachers with more years of teaching experience (20+) tend to be associated with students with higher levels of achievement than those of teachers with less than 20 years of teaching experience (CMEC, 2009, p.26), and teachers who report having had specialized language-arts training during their teacher-preparation program tended to have students with higher levels of achievement than teachers without the language-arts specialization (CMEC, 2009, p. 30).

Disciplinary school climate/classroom climate

School climate, as represented by students' perceptions of the classroom community, their sense of well-being, and their concern for others, has been shown to be strongly related to reading proficiency (Sherblom, Marshall, & Sherblom, 2006).

Research also shows that school climate can affect many areas and individuals within schools. A positive school climate has been associated with fewer behavioural and emotional problems for students (Kuperminc, Leadbeater, Emmons, & Blatt, 1997). The research also suggests that positive interpersonal relationships and optimal learning opportunities for students in all demographic environments can increase achievement levels and reduce maladaptive behaviour (McEvoy & Welker, 2000).

Data from large-scale surveys support these findings. The quality of the classroom environment positively related to the school's mean student achievement in many participating countries in PISA (OECD, 2010, vol. IV). Also, PIRLS research has shown that students have lower achievement in schools where principals report having attendance problems (Mullis et al., 2007).

Testing and standardized testing

There are different levels of testing in Canada, and not all of it is standardized:

- international (e.g., PISA, PIRLS)
- national (e.g., PCAP)
- jurisdictional (e.g., the Ontario Secondary School Literacy Test, the British Columbia Foundation Skills Assessment)
- classroom (classroom testing is not always standardized)

Most Canadian jurisdictions have policies for regular reporting of student progress to the students themselves and to their parents, and a number of jurisdictions require students to pass an examination. Within their own classroom environment, teachers conduct assessment of students' reading achievement and learning progress.

OECD argues that increased use of standardized tests is positively related to increased levels of student achievement and also to reducing the effects of socioeconomic status (SES) variation across students; moreover, results from PISA show higher levels of socioeconomic equity in school systems that use achievement data to make decisions about the curriculum and track achievement data over time (OECD, 2010, vol. IV, p. 27).

Instructional effectiveness

There are a number of instructional effectiveness models — Carroll's (1963) model of teaching and learning, and the offspring of his model, Bloom's (1976) models of mastery learning; and Doyle's (1985) direct teaching. The research results have been quantitatively synthesized in meta-analyses by Fraser, Walberg, Welch, and Hattie (1987); Walberg (1984); and Wang, Haertel, and Walberg (1993).

A major task of teaching-strategy research is to show which process factors "work." For example, Wang and Walberg (2001) set out 12 principles for "instructional effectiveness" at the teacher and classroom levels. These are:

1. supportive classroom climate where teacher functions as model and socializer;
2. opportunity to learn where most of the available time is allocated to engaging students in curriculum-related activities;
3. curricular alignment and cohesive program to accomplish instructional goals;
4. establishing learning orientations, that is, structure to clarify intended outcomes and cue desired learning strategies;
5. coherent, connected content to facilitate meaningful learning and retention;

6. thoughtful discourse around powerful ideas;
7. practice, application, and feedback activities;
8. scaffolding students' task engagement;
9. strategy teaching, where the teacher models and instructs students in learning and self-regulation strategies;
10. cooperative learning to construct understandings or help one another master skills;
11. learning goal-oriented assessment in which a variety of formal and informal assessment methods are used to monitor progress;
12. follow-through on learning-outcome achievement expectations.

According to Scheerens's (2004, p. 13) thematic review of school and instructional effectiveness research, three major factors have been the focus: effective learning time; structured teaching; and opportunity to learn, that is, a close alignment between items taught and items tested.

Instruction is also influenced by constructivism, an offshoot of the cognitive revolution in learning theory. Learning is seen as self-regulated, with opportunities for discovery and students' own interpretation of occurrences. Terms like "active learning" (Cohen, 1988), "situated cognition" (Resnick, 1987), and "cognitive apprenticeship" (Collins, Brown, & Newman, 1989) are used to describe self-regulated student learning.

Regardless of the type of educational model that is used, good instruction is associated with higher levels of achievement with respect to learning outcomes (Levine & Lezotte, 1995; Marzano, 2003; Wenglinsky, 2000). Motivation to read is the essential element for actively engaging children in the reading process (Ontario Ministry of Education, 2003, p. 13).

Teaching strategies that increase motivation include activating prior knowledge through pre-reading exercises, teaching students to look for information while reading, and modelling self-monitoring techniques during reading (Guthrie & Wigfield, 2000).

Diversity in education

Diversity in education includes educationally significant differences such as gender; racial, ethnic, or cultural background; socioeconomic status; domestic and international students; learning style; personality profile; religious preference; and sexual orientation. In this context, differentiated instruction is an important foundational concept.

International Association for the Evaluation of Educational Achievement (IEA) studies (Kennedy, Mullis, Martin, & Trong, 2007; Mullis et al., 2007) indicate that students' academic achievement involves, among other things, access to a variety of reading materials. Brown (2000) writes that "by matching text types with their students' reading development… teachers are better able to support students' reading progress" (p. 305). Narrative and expository literature is found to be motivating for students as it captures their attention and engages them in learning (Huck, 1989; Sanders, 1987).

Subban's (2006, pp. 8–9) analysis of diversity literature argues that teachers need to know how to respond to changing diversity by utilizing various curricula, and recognizing multiple learning styles and differences. Callahan (2005) writes that instruction should be organized around "big questions," involve authentic reading and writing experiences, and provide textual choices as well as meaningful content for students.

Instruction to improve literacy

Reading research on literacy (Cunningham & Stanovich, 1998; Guthrie et al., 1996; Medwell et al., 1998; Pressley et al., 2001; Taylor & Pearson, 2002) consistently shows that high-achieving students are characterized by instruction that has the following characteristics:

- a balanced approach in which attention to word-recognition skills is matched by attention to comprehension "with the consistent message that understanding and effective communication — not just word recognition — are what literacy is about" (Taylor & Pearson, p. 365);
- attention to individual children's literacy skills, experiences, and interests through high-quality interaction and close monitoring of individual progress;
- high levels of engagement in reading.

Observations

The research literature presented above underscores the PCAP reading assessment framework's foundational ideas, in which comprehension and interpretation are active processes that require an intentional and thoughtful interaction between the reader and the text. Children make better progress in their reading when teachers provide direct instruction and design and implement activities that support understanding, and when the importance of meta-cognition in learning to read is clearly recognized.

The research suggests that students who are good readers are:

- actively engaging with the text to create meaning;
- acquiring strategies at the same time as being engaged in authentic reading;
- applying cognitive, interpretive, and problem-solving strategies;
- engaging in school, which is important in promoting success and learning.

The research suggests that educators of students who are good readers are:

- developing teaching models and a range of strategies to support differences in students experience;
- recognizing differences in the students' experience (including gender) and in their wider sociocultural context.
- designing and implementing activities that support understanding and reflection.

In light of the evidence on teaching and learning strategies for reading that emerges from the PCAP-13 2007 Assessment in Reading, this section of the report has surveyed the

selected research literature around three areas: reading strategies, reading attitudes, and reading instruction. We have presented the research findings that we believe will elucidate the detailed findings presented in the analysis that follows. Our review has focused primarily on the literature that pertains to instructional effectiveness as well as pertinent findings from the international surveys on reading.

3 ANALYSIS

Reading, as an essential element of literacy, is fundamental to learning and life success (Anderson, 2011). Reading is a complex human endeavour in which the reader constructs meaning from texts — an interaction of reader, text, purpose, and context before, during, and after reading (CMEC, 2008). A better understanding of the correlates of reading competency could lead to enhanced instructional approaches and environments in Canadian schools. A description of the empirically derived relationships between student-learning activities and attitudes would facilitate the development of pedagogically relevant understandings.

The Pan-Canadian Assessment Program

PCAP is a program developed and administered by the Council of Ministers of Education, Canada (CMEC) to assess the reading, mathematics, and science competencies of 13-year-old Canadian students. A goal of the program is to inform educational policy and improve approaches to learning.

The analysis presented here explores the relationships of reading strategies and attitudes to reading competency of students in Canadian schools using the data generated from PCAP-13 2007. It addresses these relationships by looking at how the individual questionnaire items relate to achievement.

In the PCAP-13 2007 reading assessment student questionnaire, students were asked 15 questions pertaining to their reading behaviours and strategies. In an earlier study reported in the *PCAP-13 2007 Contextual Report on Student Achievement in Reading* (CMEC, 2009), the relationships between student reading strategies and reading achievement was investigated. For this analysis, a factor analysis of the 15 reading-strategy items yielded four factors or groups of reading strategies:

- The first factor, meaning, grouped together the strategies that help students to find meaning in the text read.
- The second factor, decoding, relates to the following strategies: “reading out loud to myself,” “sounding out as many words as I can,” and “asking someone to help me.”
- The third factor, routines, grouped together items that identify a variety of reading routines, such as “thinking about the other words in a sentence to figure out the meaning,” “finding a quiet place to read,” and “rereading the more difficult parts.”
- The fourth factor, external sources, related to the use of external supports such as “looking at charts and pictures” and “using an outside source like a dictionary.”

The results of these analyses were that reading for meaning and reading routines were positively related to reading achievement, reading by decoding was negatively related, and use of external sources in reading showed no significant relationship. The report also raised several questions for future research: Do particular characteristics of schools, teachers, or

students contribute to these indicators of reading ability? Do groups of reading strategies differ across jurisdictions in Canada? And is there a relationship to jurisdictional differences in reading achievement?

Student-level data

CMEC worked with educators across Canada to develop measures of reading that recognized the dynamic, interactive nature of the process whereby readers engage with the text and respond to it. The assessment instruments developed included a range of text types that were consistent with texts commonly found in Canadian language-arts classrooms: short narrative, personal narrative, informational text, short story, editorial, and Web-site types. The formats of the assessment instruments were both selected-response and constructed-response to provide students a range of response opportunities. The items were developed for three domains of reading found in Canadian curricula: comprehension, interpretation, and response to text (CMEC, 2008).

The reading assessment instruments consisted of two forms or sets of test items that were parallel in terms of content, format, and difficulty — and both forms were produced in English- and French-language versions. In addition to completing one of the assessment instruments, students answered a questionnaire designed to elicit information about student characteristics: demographics, attitudes, and perspectives related to their schooling, as well as attitudes about themselves as readers and learners. The questionnaire consisted of more than 130 items. As noted, this study focused on student responses to items related to reading strategies and attitudes.

School-level data

School-level data were derived from questionnaires answered by the principals of schools that participated in PCAP-13 2007. The questionnaires generated information about the participating schools that was linked to both student-level and teacher-level data. These data included information about school size, public/private status, proportions of Aboriginal and ESL/FSL students, time-management practices, student-assessment practices, and instructional context and climate.

Teacher-level data

Teacher-level information was collected via questionnaires that were administered to teachers who taught the 13-year-old students in the schools that participated in PCAP-13 2007. Information about the teachers' background, time management, assessment practices, teaching strategies, and special-needs students was garnered from the responses to this questionnaire.

There was a considerable level of missing information in the teacher-response data, leading to questions about the possible reliability of the findings. Moreover, given that only four or five students were linked to a teacher on average, the multi-level analyses would not be

very representative of data structures of the typical classroom, where 20 to 30 students are linked to a teacher. In future PCAP administrations, it is recommended that the sampling plan for teacher participants be carefully reconsidered to allow for a more reliable analysis of teacher-related variables.

Research approach

The research focus was to explore the relationships of the strategies students use in their reading activities to the level of reading competency they attain. The first stage of the analysis was to explore student-level relationships. Once a final model that was both meaningful and concise was attained, comparisons were made between gender, language, and jurisdiction of students. Further analyses were conducted with the addition of teacher and school variables which might influence the relationships and effects of student traits on reading achievement.

The student questionnaire included 15 items that asked students the frequency with which they used various approaches (strategies) when engaged with reading; these items were the source of reading-strategy variables that were regressed on the reading scores generated by PCAP-13 2007. In addition, we explored many other student variables in the development of models — student attitudes toward school, reading, and their own reading competency; instructional practices they experienced in school; assessment practices they experienced; home-background variables; and recollections of the development of their reading abilities.

The analyses were based on multiple regression to explore the relationships at the student level; multi-level analysis (hierarchical linear modelling, or HLM[3]) was used to investigate teacher and school variables. The analysis in this report includes:

1. Student-level regression analysis: the development of the student-level models — initial analyses to the final models
2. School effects: the multi-level models of school traits
3. Teacher effects: the multi-level models of teacher traits

Summary statistics for the samples of students, teachers, and schools who participated in PCAP-13 2007 and student-level model comparisons were also prepared as part of this research.

A technical report that fully describes all the analyses undertaken was also completed for this study[4].

[3] Hierarchical linear modelling (HLM) is a regression technique that is designed to take into account the hierarchical structure of educational datasets. In this case students were nested within schools and within teachers.

[4] A more detailed technical report to support this research is available from CMEC upon request.

Building the models

Step 1

Reading strategies

The development of the initial model used the PCAP-derived reading-strategy composite variables, which were developed by CMEC and reported in the *PCAP-13 2007 Contextual Report on Student Achievement in Reading* (Table 5.1, p. 59). These variables were composites derived from the factor analysis of the 15 reading-strategy items in the student questionnaire. Four composite variables were created:

- reading for meaning
- decoding
- reading routines
- external sources[5]

Initial analyses using the PCAP composite variables (Table 1[6]) yielded regressions with very low predictivity, accounting for less than 1 per cent of variance in reading achievement ($R^2 = .001$)[7].

Table 1: **Regression with the PCAP reading strategy composite variables ($R^2 = .001$)**

Strategy	B	SE	β	p
Reads for meaning	0.02	0.08	.002	.819
Reads by decoding	-0.36	0.08	-.036	.000
Reading routines	0.16	0.08	.016	.045

To examine this lack of relationship between student use of reading strategies and achievement — where a relationship was expected — a set of subtest scores was derived by simply adding together the item-response values for the items used to derive the composite variables[8]. These subtest scores were more predictive of reading achievement

[5] This composite variable – external sources – was not included in the data set we received for conducting these analyses and so could not be included in this initial regression.

[6] For each regression model predictor the following were calculated: the unstandardized (B) and standardized (β) regression coefficients, the standard error (SE) of the B and the probability (p) of the coefficient being equal to zero (statistically non-significant).

[7] In statistics, a value is often required to determine how closely a certain function fits a particular set of data. In this analysis, we have relied on the R2 value to determine how closely our data conform to a linear relationship. R2 values range from 0 to 1, with 1 representing a perfect fit.

[8] The composition of the reading strategy subtests:
Meaning ST = S6.2C+S6.2D+S6.2E+S6.2H+S6.2J+S6.2O
Decoding ST = S6.2A+S6.2B
Routines ST = S6.2J+S6.2K+S6.2L+S6.2N+S6.2G
External ST = S6.2F+S6.2G+S6.2I+S6.2M
Note that item 2J and 2G are used in two different factors.

(Table 2), accounting for almost 11 per cent of variance in reading scores (R^2 = .106). On the basis of these results — using individual questionnaire items as the predictor variables in the regression models — it was decided to abandon the use of composite variables or subtest scores in further regression analyses and rely solely on individual questionnaire items as our predictor variables. Using all 15 items in a regression model, an R^2 of .167 was obtained, suggesting that the individual items yield greater predictivity than composite variables, with the added value of more meaningful and direct interpretation of relationships.

Table 2: **Regression with the reading strategy subtest scores (R^2 = .106)**

Strategy	B	SE	β	p
Meaning ST	5.64	0.32	.158	.000
Decoding ST	-16.34	0.67	-.184	.000
Routines ST	11.15	0.43	.243	.000
External ST	-10.34	0.44	-.199	.000

To produce a more concise solution while retaining predictivity, a six-item model (Table 3) using the items with the highest values of the standardized regression coefficients (β) was developed that accounted for over 15 per cent of variance in reading scores (R^2 = .152).

Table 3: **Regression with six strategy items (R^2 = .152)**

Questionnaire item	B	SE	β	p
Sounding out words	-29.54	1.08	-.193	.000
Making connections	18.90	1.06	.132	.000
Asking someone to help me	-21.12	0.99	-.149	.000
Thinking about the other words in a sentence to make meaning	21.52	1.06	.153	.000
Rereading the more difficult parts	20.59	1.02	.150	.000
Highlighting or making notes	-12.37	0.94	-.092	.000

This model suggested that utilizing higher-order cognitive strategies such as making connections, thinking about word meaning, and rereading difficult sections is positively related to reading achievement, whereas simple, lower-order techniques such as sounding out words, asking for help, and highlighting are negatively related to reading achievement.

Step 2

The focus of this round of analyses on student use of reading strategies with respect to reading achievement was to establish what relationships existed — not only with reading strategies but also other student traits such as attitudes, perceptions, and instructional experiences. For these analyses, multiple regression was used. To investigate the extent to which school and teacher traits influenced these relationships required the use of a multi-level approach with HLM, and the results are reported in a later section.

To identify key variables that assess the predictivity of student perceptions and attitudes related to reading and schooling, each section of the student questionnaire — one section at a time — was regressed onto reading achievement as measured by PCAP-13 2007 and its R^2 value recorded (Table 4). Both Reading Strategies (Section 6.2, $R^2 = .167$) and Reading Attitudes and Perceptions (Section 2.2, $R^2 = .190$) had relatively high values, indicating that the student variables in these sections of the student questionnaire accounted for a substantial proportion of variance in the PCAP reading scores.

The other student variables entered into the regression analysis were the amount of time students report spending on various outside-of-school activities (Section 3.1), grading practices used in the language-arts classroom (Sections 4.1 and 4.2), in-class reading activities (Section 5.1), amount of homework completed (Sections 3.2 and 3.3) and in-class reading (Section 5.3). All of these variables had instructional relevance and accessibility.

It should be noted that although most students indicated that noise, distraction, and disruption (Section 3.6, Classroom Climate) were present in the class "sometimes" or "often," levels of noise, distraction, and disruption were not significantly predictive of reading achievement.

Step 3

The first set of variables added to the model included out-of-school activity items, grading practice items, and language-arts class reading activities. With these items added, the 28 predictor regression model (Table 5) accounted for 33 per cent of variation in reading scores generated by PCAP-13 2007[9] ($R^2 = .33$).

Adding other items, such as reported level of student absence (Section 3.4), in-class reading (Section 5.3), school attitudes (Section 2.1), absence (Section 3.4), perceptions of attributes of reading well (Section 2.3), or reading poorly (Section 2.4) did not substantially contribute to the predictivity of the model (their impact on the R^2 was .001).

[9] Another set of replicate analyses was conducted on the subdomain reading scores — comprehension, interpretation, and responding to text. This resulted in three 28-predictor models that had the same pattern of association as the final student model using the total PCAP reading score. However, there was variation in the proportion of variance each model accounted for in the outcome measure. The 28-predictor model accounted for 29 per cent ($R^2 = .29$) of the variance in comprehension subdomain scores, 22 per cent ($R^2 = .22$) of the variance in interpretation subdomain scores, and 17 per cent ($R^2 = .17$) of the variance of the response-to-text subdomain scores. Please note: all analysis results in the main body of this report are based on regression of the total PCAP reading score.

Table 4: **The proportion of variance of reading achievement scores accounted for by each section of the student questionnaire**

Questionnaire section	Number of items	R^2
2.1 School attitudes	5	.043
2.2 Attitudes and perceptions	13	.190
2.3 Doing well	6	.048
2.4 Doing poorly	6	.040
3.1 Out-of-school activities	9	.161
3.2 Homework	1	.049
3.3 Homework (language arts)	1	.065
3.4 Absence	1	.064
3.5 Field trips, etc.	1	.046
3.6 Class climate (language arts)	3	.001
4.1 Grading	7	.057
4.2 Portfolio	1	.018
4.3 Rubric	1	.010
4.4 Rubric-tests	1	.020
4.5 Rubric-assignment	1	.019
4.6 PCAP performance	1	.056
4.7 PCAP fair	1	.010
5.1 Class activity	9	.077
5.2 Assignments	4	.013
5.3 Read in class	6	.097
6.1 School library	*	*
6.2 Reading strategies	15	.167
6.3 Parents	6	.059
6.4 Parents reading	2	.021
6.5 First read	1	.003
6.6 Remember reading	8	.045
6.7 People help	5	.051
6.8 Difficulties	*	*

* All of the items in the School library and Difficulties sections had no variation across students; all have a response value of 1 and therefore regression analysis could not be run.

Table 5: **The 28-predictor model of student attributes to reading achievement (R^2 = .33)**

Questionnaire item	B	SE	β	p
Reading strategies				
Sounding out words	-18.50	1.04	-.121	.000
Making connections to what I already know	9.25	1.01	.065	.000
Asking someone to help me	-8.24	0.96	-.059	.000
Thinking about the other words in a sentence to make meaning	12.08	1.01	.086	.000
Rereading the more difficult parts	10.61	0.97	.077	.000
Highlighting or making notes	-6.61	0.90	-.050	.000
Reading attitudes				
I enjoy reading.	13.81	0.93	.137	.000
I am confident about reading difficult material.	11.49	0.87	.099	.000
I feel nervous when I have to read aloud in school.	-7.34	0.63	-.076	.000
Language-arts class activities				
Reading novels or short stories (fiction)	4.45	1.05	.029	.000
Reading information or non-fiction material	5.02	1.04	.033	.000
Reading magazines or newspapers	-9.35	1.07	-.059	.000
Reading material found on the Internet	-4.11	1.07	-.028	.000
Using on-line encyclopedias or other e-subscriptions	-8.48	1.23	-.050	.000
Watching videos or DVDs or go to the movies	-6.35	1.00	-.042	.000
Reading books or other material from the public library	-9.25	1.04	-.059	.000
Language-arts class assessment				
Short-answer questions	8.74	1.14	.054	.000
Long-answer questions	4.45	1.07	.030	.000
Essays	5.19	0.92	.038	.000
Portfolio	13.55	1.39	.063	.000
True/false or matching questions	-6.47	1.02	-.043	.000
Fill-in-the-blank questions	-6.35	0.94	-.046	.000

Questionnaire item	B	SE	β	p
Out-of-school activities				
Reading for enjoyment/general interest	7.27	0.57	.115	.000
Using a computer for personal reasons	2.79	0.44	.044	.000
Homework in all of your school subjects	5.72	0.47	.081	.000
Watching TV/movies	5.86	0.50	.083	.000
Playing computer/video/electronic games	-3.14	0.41	-.054	.000
Taking extra school lessons or going to tutors	-7.24	0.72	-.065	.000

The 28-predictor model

The 28-predictor model (Table 5) was organized into five segments as defined by the structure of the PCAP-13 2007 student questionnaire: reading strategies, reading attitudes, language-arts class activities, language-arts class assessment, and out-of-school activities.

Reading strategies

Six reading-strategy variables were included in the final model. The three reading strategies retained in the model that were associated with cognitively complex approaches to reading were: making connections, thinking about word meaning, and rereading difficult parts of the text. Students who reported higher levels of use of these strategies tended to obtain better scores on the reading assessment. The three reading strategies that were associated with lower-order reading strategies were: highlighting and making notes, asking for help, and sounding out words. Students who reported higher levels of use of these strategies tended to obtain lower reading scores, and moreover, these approaches were reported to be used less frequently than other reading strategies by all students.

Reading attitudes

Three questionnaire items related to student attitudes or perceptions toward reading were retained in the final model: “I enjoy reading”; “I am confident about reading difficult material”; and “I feel nervous when I have to read aloud in school.” Students reporting higher levels of positive attitudes about reading, “I enjoy reading” and “I am confident about reading difficult material,” tended to obtain higher scores in reading, whereas students who were nervous about their ability to read aloud tended to obtain lower scores in reading.

Language-arts class activities

Seven questionnaire items related to the kinds of reading students did in the language-arts class were predictive of reading achievement. Students who reported greater use of

traditional reading materials, such as novels and non-fiction text, tended to achieve higher reading scores. Those students reporting greater frequency of in-class reading of magazines and newspapers, digital text, or books from the public library tended to receive lower reading scores. It should be noted that the item related to reading books from the school library (as opposed to the public library) was not predictive of reading achievement.

Language-arts class assessment

Six questionnaire items related to assessment practices in the language-arts classroom were retained in the final model. Students who reported higher levels of use of short-answer questions, long-answer questions, essays, and portfolios were associated with higher levels of reading achievement than student reporting lower levels of use. The increased reported use of true/false or fill-in-the-blank items was associated with lower levels of reading achievement. It should be noted that the variation in the frequency of use of multiple-choice items for assessment in the language-arts classroom as perceived by students was not a significant predictor of reading achievement in PCAP-13 2007.

Out-of-school activities

Six items related to the frequency of various out-of-school activities were retained in the final model. Increased levels of reading for enjoyment, homework, using a computer for personal reasons, and watching television or movies were associated with higher levels of reading achievement. Increased frequency of playing computer games or taking tutorial lessons was associated with lower levels of reading achievement.

Teacher and School Variables

The analyses were extended to include teacher- and school-level data. In order to do this, the hierarchical nature of the data (e.g., students nested within schools) had to be accommodated. This was accomplished by the use of multi-level modelling or HLM. This analysis approach allowed for the simultaneous modelling of student traits and school traits (and teacher traits in another set of analyses).

In all the multi-level analysis undertaken and reported here, the student-level reading strategies were consistently significant in their relationships to reading achievement. This consistency pertained to both the direction and relative magnitude of coefficients[10] — they were basically the same as the values in the final 28-predictor student-level regression model reported earlier (Table 3). Furthermore, these reading-strategy variables showed no variation at the school level (HLM level 2) in any of the models developed. This means that the relationships of student reading strategies to reading achievement were consistent from one school to the next across Canada.

[10] The coefficients reported by HLM are raw regression weights and are reported in the following tables — not the standardized weights that better allow for cross-predictor comparisons. Given that the standard deviation of the reading scores is 100, some comparability can be attained by dividing these coefficients by 100.

Given the lack of variation of reading-strategy variables at the school level, only the mean school reading score (the intercept term) could be modelled with school variables (HLM level 2). These results are reported one school-questionnaire section at a time.

It should also be noted that due to data issues such as missing school identifiers combined with some missing information in questionnaire responses from student, teacher, and school questionnaires, the amount of missing data was substantial. The analyses were conducted with the deletion of student, school, or teacher records that had missing data on the variables for that analysis. This has likely degraded the reliability of the estimates in the reported HLM results, and so caution should be taken in interpreting results.

Teacher strategies and school effects

Teachers were asked about their teaching strategies related to pre-reading, in-class reading, and after-reading for their students in the language-arts classroom. They were asked about the type of texts used, the kinds of assignments students completed, and gender differences in reading materials and teaching approaches.

The results indicate that the pre-reading strategies listed in the teacher questionnaire did not have a significant relationship to student reading achievement and neither did most during-reading and after-reading strategies. The increased use of "Analyzing text structures" and "Analyzing critically" was associated with increased levels of reading achievement, whereas "Summarizing" was associated with decreased levels of reading achievement (see Table 6)[11].

Most of the instructional strategies listed in the teacher questionnaire did not have a significant relationship to reading achievement (Table 6). However, the increased reported use of both "Reading aloud to students" and "Silent reading" was negatively related to reading achievement, and "Student reading aloud" and "Graphic organizers" both had a positive association. In terms of instructional activities, the increased reported use of "Re-teaching basic reading skills" and "Adapting coursework to learning styles and interests" was negatively associated with reading achievement, and "Providing enrichment for advanced readers" had no statistically significant relationship to reading achievement.

[11] In all of the following tables, predictors are reported at the $\alpha = .05$ level.

Table 6: **HLM results – Effects of teaching strategies and reading strategies on reading achievement**

Effects	Coefficient	SE	p
Level-2 predictor – Teaching strategies			
Intercept	428.85	9.61	.000
Analyzing text structures	4.59	1.38	.001
Summarizing	-5.10	1.47	.001
Analyzing critically	9.34	1.48	.000
Reading loud to students	-4.87	1.65	.004
Student reading aloud	3.53	1.14	.002
Silent reading	-3.15	1.04	.003
Graphic organizers	3.37	1.05	.002
Re-teaching basics	-6.14	1.53	.000
Adapting coursework	-3.58	1.70	.036
Procedural text	-3.94	1.59	.013
Narrative text	5.66	2.28	.013
Reading outside of class	6.55	1.47	.000
Level-1 predictor – Reading strategies			
Sounding out words	-25.29	1.14	.000
Making connections	17.69	1.16	.000
Asking someone for help	-18.02	1.05	.000
Thinking about other words in a sentence to make meaning	18.56	1.16	.000
Rereading the more difficult parts	20.41	1.06	.000
Highlighting or making notes	-16.15	1.07	.000

Two text types had a significant relationship to reading achievement: increased use of procedural texts was negatively associated with achievement, and narrative text use was positively related to reading achievement. Other text types had no significant relationships to reading achievement of students.

In terms of assigned student tasks, only "Reading to be done outside of class" had a significant relationship to achievement, and it was positive. "Personal responses,"

"Oral presentations," and "Written reports" had no significant relationships to reading achievement.

The extent of teacher-perceived gender differences in reading materials or instructional strategies showed no significant relationship to reading achievement.

Special-needs students

Teachers were asked about the number of special-needs students in their language-arts classes that required modification to their instructional approaches — whether they have had to modify instructional programs, devote special attention, adjust teaching strategies, and accommodate adult teaching assistants in their classrooms (Table 7). The basic query to teachers was: do special-needs students have an impact on the teacher's instructional activities?

Table 7: **HLM results – Effects of special-needs students and reading strategies on reading achievement**

Effects	Coefficient	SE	p
Level-2 predictor – Special-needs students			
Intercept	490.78	4.92	.000
Modifying program	-4.35	1.13	.000
Devoting special attention	-3.18	1.09	.004
Adjusting teaching strategies	-3.18	1.17	.007
Accommodating other adult in classroom	-5.61	0.84	.000
Level-1 predictor – Reading strategies			
Sounding out words	-25.66	1.14	.000
Making connections	18.32	1.15	.000
Asking someone to help me	-18.35	1.04	.000
Thinking about the other words in a sentence to make meaning	18.61	1.15	.000
Rereading the more difficult parts	20.42	1.06	.000
Highlighting or making notes	-15.60	1.07	.000

The significant relationships were all negative, suggesting that increasing levels of accommodation made for special-needs students tended to be associated with lower levels of reading achievement for students of that classroom. These results indicate that modifying programs of instruction and devoting special attention to reduce disruption are related to

decreased levels of student reading achievement. Similar negative relationships were found for instructional modifications to teaching strategies to accommodate special-needs students and the increased time of another adult (teaching assistant) present in the classroom.

School questionnaires

School questionnaires were also administered to the principals of participating schools in order to obtain information about school characteristics that may be related to reading achievement. To explore these relationships, a series of models were developed for each of the five sections of the school questionnaire: Background, Time management, Assessment, Instructional climate, and Context for instruction. For this set of analyses, the student-level model was confined to a focus on the reading strategies used by students, which was the focus of this research. Student reading achievement was the outcome measure, and the six reading-strategy variables for the final student-level regression model (Table 3) were used as the level-one predictors of the models. The items within each section of the school questionnaire served as the level-two variables. The analyses were conducted using HLM. The amount of variance in student reading achievement that can be attributed to schools was estimated to be 14 per cent.

Background

The background questions on the school questionnaire asked about student enrolment, public/private status, percentage of ESL/FSL and Aboriginal students in the school, and size of the community in which the school is located. For this analysis, 23 per cent of student records had missing data and were removed from the analysis, and 13 per cent of school-level data were missing and not included in the analysis.

As with all of the multi-level analyses using school and teacher variables, we can see that all reading-strategy variables are significantly related to reading achievement, with the higher-order reading strategies being positively related and the lower-order strategies having a negative relationship — the same pattern as that of the student-level regression model (Table 3). The reading-strategy relationships to reading achievement have no significant variance at the school level (HLM level 2).

Table 8: **HLM results – Effects of school background and reading strategies on reading achievement**

Effects	Coefficient	SE	p
Level-2 predictor – School background			
Intercept	429.52	6.95	.000
School level			
Total student enrolment	7.00	1.61	.000
Grade 8 enrolment	2.08	0.75	.006
Public/Private	36.37	3.87	.000
ESL/FSL %	-6.85	1.58	.000
Aboriginal %	-6.33	1.19	.000
Community size	2.04	0.73	.006
Level-1 predictor – Reading strategies			
Sounding out words	-24.62	1.14	.000
Making connections	17.08	1.13	.000
Asking someone to help me	-18.61	1.04	.000
Thinking about the other words in a sentence to make meaning	18.29	1.13	.000
Rereading the more difficult parts	19.59	1.05	.000
Highlighting or making notes	-14.70	1.02	.000

In terms of school variables and relationships to reading achievement (Table 8), school enrolment is predictive of school mean reading achievement in that schools with larger enrolments tend to obtain higher reading scores. Private schools tend to outperform public schools. Schools with higher proportions of ESL/FSL and Aboriginal students tend to obtain lower mean reading scores. Schools in larger communities tend to obtain higher mean reading scores.

Time management

Principals were asked about the length of class periods in general and in language-arts classes specifically, and the level of student absences in the school. The length of classes was not a significant predictor of reading scores and is therefore not reported in Table 9. However, as the level of student absence increased, the predicted level of school mean

reading scores decreased. Neither differences in the length of classes nor the amount of time devoted to language arts had an association to average school reading scores.

And as with all other school traits, the level of student absence and the time devoted to language arts during the week did not influence the relationships of student reading strategies to reading achievement. Moreover, there was no significant variation in these relationships across Canadian schools.

Table 9: **HLM results – Effects of time management and reading strategies on reading achievement**

Effects	Coefficient	SE	p
Level-2 predictor – Time Management			
Intercept	455.51	3.44	.000
School level			
Per cent absent	-2.10	0.93	.024
Level-1 predictor – Reading strategies			
Sounding out words	-25.68	1.07	.000
Making connections	17.67	1.06	.000
Asking someone to help me	-18.48	0.94	.000
Thinking about the other words in a sentence to make meaning	18.23	1.08	.000
Rereading the more difficult parts	20.31	0.95	.000
Highlighting or making notes	-15.13	0.95	.000

Assessment

Principals were asked about the extent of their use of external assessments. The model again included student reading strategies at HLM level 1, and again there was no variation in reading-strategy relationships to reading achievement at the school level; relationships were consistent across Canadian schools. At the student level, 23 per cent of the records were missing data and were removed from analysis, whereas at the school level, 14 per cent of the records had missing data and were removed from analysis.

There were some relationships of mean school reading achievement to the use of external assessment by the school but no clear message about its use in general (Table 10). For example, schools that reported using a lot of TIMSS, PIRLS, and provincial assessment results tended to obtain higher reading results, whereas schools that reported using higher levels of SAIP and district assessment results tended to have lower mean reading scores.

Table 10: **HLM results – Effects of school assessment use and reading strategies on reading achievement**

Effects	Coefficient	SE	p
Level-2 predictor – School assessment use			
Intercept	462.57	5.55	.000
Assessments that count	0.13	0.05	.012
TIMSS/PIRLS	3.58	1.58	.023
SAIP	-7.29	1.46	.000
Provincial	3.03	1.32	.022
District	-3.89	1.13	.001
Level-1 predictor – Reading strategies			
Sounding out words	-25.04	1.17	.000
Making connections	16.95	1.13	.000
Asking someone to help me	-18.42	1.03	.000
Thinking about the other words in a sentence to make meaning	17.89	1.16	.000
Rereading the more difficult parts	20.42	1.05	.000
Highlighting or making notes	-14.02	1.02	.000

Instructional climate

Principals were asked to respond to five statements about different aspects of instructional climate within the language-arts classes in the school. The model again included student reading strategies at HLM level 1, and again there was no variation in reading-strategy relationships to reading achievement at the school level; relationships were consistent across Canadian schools. Fifteen per cent of student-level data was missing, and at the school-level, only 6 per cent was missing.

Only one of the five items — "Do well on external assessments" — showed a statistically significant relationship to mean school reading scores (Table 11). The coefficient was positive, suggesting that schools that have this focus tend to obtain higher mean scores on reading, but, as can be noted, the magnitude of the coefficient is rather small (2.86), suggesting a small effect of this perceived element of instructional climate.

Table 11: **HLM results – Effects of instructional climate and reading strategies on reading achievement**

Effects	Coefficient	SE	p
Level-2 predictor – Instructional climate			
Intercept	468.49	5.27	.000
Do well on external assessments	2.86	1.33	.031
Level-1 predictor – Reading strategies			
Sounding out words	-25.40	1.11	.000
Making connections	17.10	1.08	.000
Asking someone to help me	-18.19	0.98	.000
Thinking about the other words in a sentence to make meaning	18.07	1.11	.000
Rereading the more difficult parts	19.86	0.99	.000
Highlighting or making notes	-14.82	0.97	.000

Context for instruction

Principals were asked about the effect of special-needs students on instructional practices in the school, the presence of a school library, and access to and use of computers by students. The level of missing data in this section was 26 per cent for students and 19 per cent for principals.

The results of this analysis are reported in Table 12. As the impact of special-needs students was perceived to increase, there is a predicted decrease in the mean school reading scores. The presence of a school library was not significantly related to school mean reading performance, but the number of computers in the library that provide Internet access was positively related to reading. Variation in the instructional climate of the school had no significant association with the relationships of reading strategies and student reading achievement.

Table 12: **HLM results – Effects of context of instruction and reading strategies on reading achievement**

Effects	Coefficient	SE	p
Level-2 predictor – Context of instruction			
Intercept	481.76	7.33	.000
Special-needs affects	-5.47	1.22	.000
Special-needs intervention	-2.42	0.85	.005
Computers with Internet	3.09	0.86	.001
Level-1 predictor – Reading strategies			
Sounding out words	-25.87	1.19	.000
Making connections	17.21	1.17	.000
Asking someone for help	-18.04	1.03	.000
Thinking about the other words in a sentence to make meaning	17.87	1.20	.000
Rereading difficult parts	19.72	1.06	.000
Highlighting or making notes	-14.64	1.03	.000

In summary

Section 3 has presented the results of multi-level modelling that investigated the relationships of selected elements of teaching and learning to student performance in reading after adjusting for other characteristics of students and schools. The main findings of these analyses are:

Reading strategies

- Reading strategies that require higher-order cognition (for example: "Making connections to what I already know" and "Thinking about the other words in a sentence to figure out the meaning") have positive relationships to reading achievement — as the reported frequency of use of these strategies increased, reading scores also tended to increase.
- Reading strategies that are lower-order (for example: "Sounding out as many words as I can" and "Highlighting or making notes") have negative relationships to reading achievement — as the reported frequency of use of these strategies increased, the reading scores tended to decrease.

- The multi-level analyses showed that the relationships of student reading strategies to reading achievement are consistent across teachers and schools in Canada. In addition, the technical report which supports this report includes a section comparing regression models across student gender, language of testing, and jurisdictions. The results show that the relationships for the reading strategies are consistent in terms of magnitude, significance, and direction in their relationship to reading achievement for English and French students, for females and males, and across jurisdictions.

Reading attitudes

- Students who report higher levels of enjoying reading or feeling confident about their reading ability tend to do better on the PCAP reading test.

- Relationships between attitudes toward reading and schools and reading achievement are consistent across the two language groupings tested, across gender, and across jurisdictions.

- Positive views about reading and confidence in reading competence are associated with higher levels of reading achievement, whereas doubt about reading competence is associated with lower levels of reading achievement.

- From the technical report we find that 13-year-old students report that they are generally well disposed to reading, schools, and their teachers. Most students report that they like school, that their teachers treat them fairly and care about them, and that they feel they belong to school and make friends easily. Students are generally positive about reading — most report that they enjoy reading and that being a good reader makes a difference to the world. Most students report that they do not perceive a gender bias in the reading they do in school — materials are not more appropriate for boys or for girls.

- Students at lower levels of reading proficiency are more negatively disposed toward schooling and reading than students at higher levels of reading proficiency. Students at the lowest level of reading proficiency are four times more likely to strongly disagree with the statement "I like school." than students at the highest level, and they are more than seven times more likely to "strongly disagree" with the statement "I enjoy reading."

Reading instruction

- The proportion of variance in student reading achievement that can be attributed to schools is 14 per cent; however, caution is urged in interpreting these results. Due to data issues, such as missing school identifiers combined with some missing data in questionnaire responses from student, teacher, and school questionnaires, levels of missing data are substantial. This has likely degraded the reliability of the estimates in the reported models.

- Private schools tend to outperform public schools. Schools with higher proportions of ESL/FSL students, Aboriginal students, or special-needs students tend to obtain lower average reading scores than schools with lower proportions of these students.

- There is no significant variation in the relationships of reading strategies and attitudes to reading achievement among schools.
- The relationships of reading strategies and attitudes to reading achievement are consistent across Canadian teachers.
- Teaching strategies that are more cognitively complex have a positive relationship to reading achievement, whereas simpler strategies are negatively related. For example, higher frequency of use of "Analyzing text structure", "Analyzing critically", and using narrative text are positively related to reading achievement, whereas "Summarizing", "Re-teaching the basics", and using procedural text are negatively related to reading achievement. And, to an extent, this positive influence of more cognitively demanding teaching strategies is also reflected in assessment practice: increased use of simpler formats such "Fill-in-the-blank" and "Short-answer" is negatively related to reading achievement, whereas more cognitively demanding formats such as essays are positively related to student reading achievement.
- The amount of homework students report doing is positively related to reading achievement.
- Teacher gender, years of teaching experience, and teacher training in language arts or increased participation in professional development in student assessment are not significantly related to the mean reading achievement scores of their students.
- The current level of language-arts teaching engagement (as indexed by the proportion of language arts in the teaching assignment) is positively related to reading achievement. Students of those teachers who report that a high proportion of their teaching is in the area of language arts tend to attain higher reading scores than students of teachers with a lower proportion of language arts in their teaching assignment.
- Teacher perceptions of increased levels of noise and disruption (classroom climate) have a negative relationship to reading achievement, whereas the analysis based on student perceptions of increased levels of noise and disruption (classroom climate) results in no significant relationship.

4 CONCLUSIONS AND IMPLICATIONS FOR POLICY AND PRACTICE ANALYSIS

This section offers an overview of the findings and a discussion of implications arising. It summarizes the main results, identifies relevant issues of policy and practice, and examines the extent to which the results available address these issues. It also considers the design of PCAP in light of methodological issues encountered in this study.

Main Findings

Reading strategies are related to reading achievement

The reading strategies that students report using in their reading are related to their reading achievement but not in a unitary manner. Strategies that require some higher order functions (for example: "Making connections to what I already know" and "Thinking about the other words in a sentence to figure out the meaning") have positive relationships to reading achievement: as the reported frequency of use of these strategies increase, reading scores also tend to increase. Lower-order strategies that are more technical or rote-like (for example: "Sounding out as many words as I can" and "Highlighting or making notes") have negative relationships to reading achievement. As the reported frequency of use of these strategies increase, the reading scores tend to decrease. These findings support the recommendations of the National Reading Panel (National Institute of Child Health and Human Development, NRP, 2000).

Students are positively disposed to reading and schooling

Thirteen-year-old students report that they are generally well-disposed to schools and their teachers. Most students report that they like school, that their teachers treat them fairly and care about them, and that they feel they belong to school and make friends easily. Most students report that they do not perceive that the reading they do in school has a gender bias — materials are not more appropriate for boys or for girls. Students are generally positive about reading in that most report that they enjoy reading and that being a good reader makes a difference in the world.

Although the students responding to PCAP-13 2007 appear to be positively disposed to school, and to reading in general, there are differences when the results are considered in relation to the reading proficiency of the students. The general trend is that students at lower levels of reading proficiency are more negatively disposed toward schooling and reading than students at higher levels of reading proficiency. For example, students at the lowest level of reading proficiency are four times more likely to strongly disagree with the statement "I like school" than students at the highest level, and they are more than seven times more likely to strongly disagree with the statement "I enjoy reading."

Attitudes and perceptions about reading are also related to reading achievement. Students who report higher levels of reading enjoyment, reading for enjoyment, or feeling confident about their reading ability tend to do better on the PCAP reading test. These findings are in accord with those of previous research (Guthrie & Wigfield, 1999; Mullis et al., 2007).

The relationships of student reading strategies and attitudes to reading achievement are consistent across the two language groupings tested, and across gender — in other words, the relationships are significant and have the same pattern of relationship of English to French students and of female to male students. This consistency of relationships is a striking characteristic of the 13-year-old Canadian student.

Teacher and school characteristics are related to reading achievement but do not influence the relationships of reading strategies to reading achievement

Schools influence the levels of reading achievement of their students. School size, in terms of reported student enrolments, is positively related to the mean reading achievement of a school's 13-year-old students — larger schools tend to have higher school mean reading results. Private schools tend to outperform public schools. And schools with higher proportions of ESL/FSL students, Aboriginal students, or special-needs students tend to obtain lower average reading scores than schools with lower proportions of these students.

The relationships of student reading strategies and attitudes to reading achievement are consistent across schools in Canada. When school characteristics are entered into the model along with student reading strategies and attitudes, there is no significant variation in the relationships of reading strategies and attitudes among schools — these relationships remain consistent. The situation is the same when the analysis is conducted with teacher-level data — the relationships of reading strategies and attitudes to reading achievement are consistent across Canadian teachers.

How teachers teach is more influential than their experience and background

In terms of what teachers do, the teaching strategies that teachers reported using are related to their students' reading achievement in a fashion similar to the reading strategies students reported using. That is to say, teaching strategies that are more cognitively complex have a positive relationship to reading achievement whereas simpler strategies are negatively related. For example, higher frequency of use of "Analyzing text structure," "Analyzing critically," and using narrative text are positively related to reading achievement, whereas "Summarizing," "Re-teaching the basics," and using procedural text are negatively related to reading achievement. And to an extent, this positive influence of more cognitively demanding teaching strategies is also reflected in assessment practice: increased use of simpler formats such "Fill-in-the-blank" and "Short-answer" is negatively related to reading achievement, whereas more cognitively demanding formats such as essays are positively related to student reading achievement. As well, the amount of homework is positively related to reading achievement.

These results clearly indicate the importance of teaching and what happens in the language-arts classroom in relation to reading achievement. Although specific to the Canadian classrooms that participated in PCAP-13 2007, the results are consistent with previous research on the quality of the classroom environment scores (Cuttance, 1998, 2001; Hanushek et al., 1998; Hill & Rowe, 1996; Rowe & Rowe, 2002; Kyriades et al., 2000; Rowe et al., 1999; Scheerens et al., 1989; Willms, 2000). In addition, for PCAP-13 2007 teachers, the current level of language-arts teaching engagement (as indexed by the proportion of language arts in the teaching assignment) is positively related to reading achievement.

Teaching is a complex practice, and a large number of variables, many of which are outside the control of schools or teachers, influence reading. Even the most carefully designed studies, such as PCAP, cannot be expected to identify a few simple school or classroom practices that, if implemented, would make a major difference to student learning. Estimates of school and teaching effects in a cross-sectional study are, at best, a one-time snapshot. At the same time, many school, teaching, and learning factors are likely to interact with each other and can yield different impacts in different jurisdictions or regions. We have found that several of the teaching and learning factors measured in PCAP have significant relationship to reading achievement. It is equally clear that these effects are frequently in the same direction or of similar magnitude across all jurisdictions.

In Closing

The main finding of this study is the identification of the importance of the reading strategies and attitudes of students in relation to reading proficiency — higher levels of reading proficiency are associated with enhanced student use of cognitively engaging reading strategies and higher levels of reading enjoyment and perceptions of reading competence by students. This pattern holds for the national sample, females and male students, English and French students, and across jurisdictions.

Implications

The PCAP-13 2007 reading assessment addressed cognitive strategies such as predicting, summarizing, and reflecting strategies that are used by experienced readers and writers and are seen as very important for student success. The test design of the reading component of the assessment focused on the more specific reading subdomains of comprehension, interpretation, and response to text. Items and specific mean scores were assigned to these subdomains.

Given the consistencies in the relationships of student reading strategies and attitudes to reading competency, and the potential for further research based on PCAP data, steps should be taken to strengthen the quality of the data generated by the Pan-Canadian Assessment Program — both the assessment data and the data derived from the student, teacher, and school questionnaires. Although the analyses suggested below are already conducted as part of the PCAP project, the work should be specifically linked to providing

a sound evidence base for further research into the intricacies of student learning, instructional practices, and learning environments. The three areas of suggested attention are: instrumentation, student sampling, and teacher sampling.

Instrumentation

The development of instrumentation to collect information about human performance, perceptions, and experiences constitutes a complex and difficult set of tasks. To better inform policy and practice, information needs have to be clearly and fully articulated, evaluated, and refined. Instrumentation developed will be designed to meet these needs with validity and reliability. The formulation of test and questionnaire items has to result in text that is fully understandable to the intended respondent, with meanings common across all respondents and directly linked to the identified information needs of PCAP — a demanding task indeed. Moreover, parallel instruments have to be developed in Canada's two official languages. To this end we suggest the following:

- Item development for the reading tests should be based on a clearly defined and described framework that is fully articulated in the reports of PCAP reading competencies. The components of the framework should be clearly described in terms of task demands and linked to illustrative test items that students are responding to in PCAP. The structure of the instruments should be analyzed to evaluate the fit of the response data to the framework.

  Research should be conducted on the reading assessment items in relation to the proposed structure of reading performance — comprehension, interpretation, and response to text — to evaluate the validity of this structure. The extant research literature should be analyzed to ensure this structure is supported by empirical research and best practice.

- Statistical analysis of the assessment-response data should be conducted (factor analysis/ structural equation modelling) to assess the dimensionality of the items used to compose the reading instruments — both the assessment and questionnaire instruments — and in both English- and French-language versions. In addition, analyses should be conducted to ensure that the items are appropriate for the wide variation in student levels of achievement.

  This work should be conducted in the form of a pilot-test study to inform the construction of the final instruments to be used in future administrations of PCAP. Items should be empirically evaluated before use in the national administration of PCAP. This evaluation should include the analysis of the standard indices of difficulty and discrimination, and the link of item performance to the structural framework of reading competency. This pilot testing would facilitate the creation of high-quality measures of reading.

- We suggest that, in light of the stability of the reading-strategies relationship to reading achievement, the student questionnaires should be evaluated to ensure that all significant

reading strategies are targeted by the questionnaire and the items clearly describe the targeted strategies in language and terms the responding students clearly and uniformly understand.

Student sampling

The PCAP program, and the SAIP project before it, administered tests to a broader age spectrum of students. It may be worthwhile to consider the participation of younger students in the reading assessment, since it has been shown that reading strategies and attitudes are significantly related to reading proficiency, and attitudes and habits of learning once they are acquired tend to be fairly stable. If the relationships hold for younger students, and the instruments provide reliable information on strategy, attitude, and achievement, then early intervention in the acquisition of good strategy use and attitudes toward reading and school could have a substantial positive learning payoff.

For the 13-year-old Canadian students who participated in PCAP-13 2007, it was shown that more complex reading strategies had a positive relationship to reading proficiency, whereas simpler strategies had a negative relationship — and this pattern was remarkably consistent. However, it may be that for younger students who are still in the earlier stages of developing proficiency in reading, simpler reading strategies may be more positively related to reading. The data generated from PCAP-13 2007 do not allow analysis that could answer this pedagogically important question.

So, in the interest of future research, we suggest that CMEC consider broadening the age span of the assessment to include students of a younger age. This direction would allow for investigating the nature of the relationships of reading strategies to reading competency at earlier stages of reading-proficiency development. It may identify those strategies that are most in play when reading skills and attitudes are more amenable to instructional intervention. The forthcoming report on the PIRLS 2011 national and international results may help to fill in this knowledge gap.

Teacher sampling

Given the likely importance of information related to teaching strategies and their association with reading competency, the sampling of participating teachers should be reconsidered. From this study, it was found that there was a considerable level of missing information in the teacher-response data, leading to suspicion about the reliability of the findings. Furthermore, given that, on average, only four or five students were linked to a teacher, the multi-level analyses would not be very representative of data structures of the typical classroom, where 20 to 30 students are linked to a teacher (this kind of sampling would result in different and more representative levels of variation in reading scores at the classroom — HLM level 2.) PCAP-2010 addressed this issue by sampling whole classrooms.

Other steps

The literature reviewed and our analyses reflect a broad, shared understanding in Canada and internationally of the complex and often linked factors that affect reading achievement. Based on the research undertaken for this report, we suggest the following research initiatives for future pan-Canadian assessment programs: a) focus on examining instructional antecedents in more detail in relation to reading achievement would be a challenging but important initiative based on the research literature and the analysis underpinning this report; and b) at the jurisdictional level, consideration should be given to undertaking applied research and evaluation — case studies of current reading-instruction programs and initiatives in schools and teacher education programs, and research on how to enhance the capacity to scale up effective reading-instruction techniques and interventions.

The research knowledge base about reading is rich and sometimes contested. With this in mind, we need to understand what instruction and reading strategies are at work and work well in the classroom for all learners, including those who need support and remediation.

REFERENCES

Aaronson, D., Barrow, L., & Sander, W. (2007). Teachers and student achievement in the Chicago public high schools. *Journal of Labor Economics, 25*(1), 95–135.

Alexander, P. A., & Jetton, T. L. (2000). Learning from text: A multidimensional and developmental perspective. In M. Kamil, P. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. 3, pp. 285–310). Mahwah, NJ: Erlbaum.

Anderson, J.O. (2011). Student and school characteristics related to student achievement: A methodological approach. In C. F. Webber, & J. L. Lupart (Eds.) *Leading student assessment, studies in educational leadership* (pp. 151–174). Dordrecht, the Netherlands: Springer Science & Business Media.

Anderson, R., Fielding, L., & Wilson, P. (1988). Growth in reading and how children spend their time outside of school. *Reading Research Quarterly, 23*(3), 285–303.

Baker, L., & Brown, A. L. (1984). Metacognitive Skills of Reading. In P. D. Pearson, R. Barr, M. Kami, & P. B. Mosenthal (Eds.), *Handbook of reading research* (Vol. 1 pp. 353–394). New York: Longman.

Bandura, A. (1994). *Self-efficacy: The exercise of control.* New York: Freeman.

Bloom, B. (1976). *Human characteristics and school learning*. New York: McGraw-Hill.

Brown, K. J. (2000). What kind of text—For whom and when? Textual scaffolding for beginning readers. *The Reading Teacher, 53*(4), 292–307.

Callahan, R. (2005). Tracking and high school English learners: Limiting opportunities to learn. *American Educational Research Journal, 42*(2), 305–328.

Carroll, J. B. (1963). A model for school learning. *Teachers College Record, 64*(8), 723–733.

Carroll, J. B. (1989). The Carroll model: A 25-year retrospective and prospective view. *Educational Researcher, 18*(1), 26–31.

Carroll, J. B. (1970). The Nature of the Reading Process. In D. Gunderson (Ed.), *Language and Reading: An Interdisciplinary Approach (pp. 28–36)*. Washington, DC: Center for Applied Linguistics.

Chall, J.S. (1967). *Learning to read: The great debate.* New York: McGraw Hill.

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (January, 2007). *How and why do teacher credentials matter for student achievement?* (NBER Working Paper No. 12828) Cambridge, MA: National Bureau of Economic Research.

Cohen, D.K. (1988). Teaching practice ... Plus ça change ... In P. Jackson (Ed.), *Contributing to educational change: Perspectives on research and practice.* Berkeley, CA: McCutchan.

Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. In L.B. Resnick (Ed.), *Knowing, learning and instruction: Essays in honour of Robert Glaser (pp. 453–494).* Hillsdale, NJ: LEA.

Council of Ministers of Education Canada. (2008). *Pan-Canadian Assessment Program, PCAP-13 2007: Report on the assessment of 13-year-olds in reading, mathematics, and science.* Toronto, ON: Author.

Council of Ministers of Education Canada. (2009). *Pan-Canadian Assessment Program, PCAP-13 2007 Contextual Report*. Toronto, ON: Author.

Croninger, R.G., Rice, J.K., Rathbun, A., & Nishio, M. (2007). Teacher qualifications and early learning: Effects of certification, degree, and experience on first-grade student achievement. *Economics of Education Review, 26*, 312–324.

Cunningham, A.E., & Stanovich, K.E. (1998). What reading does for the mind. *American Educator, 22*(1&2), 8–15.

Cuttance, P. (1998). Quality assurance reviews as a catalyst for school improvement in Australia. In A. Hargreaves, A. Lieberman, M. Fullan, & D. Hopkins. (1998). *International Handbook of Educational Change* (Part Two, pp. 1135–1162). Dordrecht, the Netherlands: Kluwer Publishers.

Cuttance, P. (2001). The impact of teaching on student learning. *Australian College of Education Yearbook 2000*. Canberra, AU: Australian College of Education.

Darling-Hammond, L., & Snyder, B. (2000). Authentic assessment of teaching in context. *Teaching and Teacher Education, 5-6*(16), 523–545.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self- determination in human behavior.* New York: Plenum.

Doyle, W. (1985). Effective secondary classroom practices. In M.J. Kyle (Ed.), *Reaching for excellence. An effective schools sourcebook*. Washington DC: US Government Printing Office.

Duke, N.K., & Pearson, P.D. (2002). Effective practices for developing reading comprehension. In A.E. Farstrup & S.J. Samuels (Eds.), *What research has to say about reading instruction* (3rd ed., pp. 205–243). Newark, DE: International Reading Association.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34*(10), 906–911.

Fraser, B. J., Walberg, H. J., Welch, W. W., & Hattie, J. A. (1987). Synthesis of educational productivity research. *International Journal of Educational Research, 11*(2)*,* 145–252.

Garner, R. (1992). Metacognition and self-monitoring strategies. In S. J. Samuels & A. E. Farstrup (Eds.), *What research has to say about reading instruction* (pp. 236–252). New York: International Reading Association.

Goldhaber, D. D., & Brewer, D. J. (1999). Teacher licensing and student achievement. In M. Kanstoroom & C. E. Finn, Jr. (Eds.), *Better teachers, better schools* (pp. 83–102). Washington, DC: Thomas B. Fordham Foundation.

Guthrie, J.T., Van Meter, P., Dacey-McCann, A., Wigfield, A., Bennett, L., Poundstone, C. C., et al. (1996). Growth in literacy engagement: Changes in motivations and strategies during concept-oriented reading instruction. *Reading Research Quarterly 31*(3), 306–332.

Guthrie, J. T., & Wigfield, A. (1999). How motivation fits into a science of reading. *Scientific Studies of Reading*, 3, 199–205.

Guthrie, J. T., & Wigfield, A. (2000). Engagement and motivation in reading. In: Kamil, M. L., Mosenthal, P. B., Pearson, P. D., & Barr, R. (Eds.), *Handbook of reading research: Volume III*. Mahwah, NJ: Lawrence Erlbaum Associates.

Haahr. J. H., Nielsen, T. K., Hansen, M. E., & Jakobsen, S. T. (2005, November). *Explaining student performance Evidence from the international PISA, TIMSS and PIRLS surveys*. Danish Technological Institute.

Hanushek, E.A., Kain, J. F., & Rivkin, S.G. (1998). *Teachers, schools and academic achievement* (Working Paper No. w6691). Cambridge, MA: National Bureau of Economic Research.

Henderson, A., & Berla, N. (1994). *A new generation of evidence: The family is critical to student achievement*. Washington, DC: The Center for Law and Education.

Hill, P., & Rowe, K. (1996). Multilevel modelling in school effectiveness research. *School Effectiveness and School Improvement, 7*(1), 1–34.

Huck, C. S. (1989). No wider than the heart is wide. In J. Hickman & B. E. Cullinan (Eds.), *Children's literature in the classroom: Weaving Charlotte's Web* (pp. 252–262). Needham Heights, MA: Christopher-Gordon Publishers, Inc.

Kennedy, A.M., Mullis, I.V.S., Martin, M.O., & Trong, K.L. (2007). *A Guide to Reading Education in the Forty PIRLS 2006 Countries*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Kintsch, W., & Kintsch, E. (2005). Comprehension. In S. G. Paris & S. A. Stahl (Eds.), *Current issues in reading comprehension and assessment* (pp. 71–92). Mahwah, NJ: Lawrence Erlbaum Associates.

Kuperminc, G. P., Leadbeater, B. J., Emmons, C., & Blatt, S. J. (1997). Perceived school climate and difficulties in the social adjustment of middle school students. *Applied Developmental Science, 1*(2), 76–88.

Kyriades, L., Campbell, R.J., Gagatsis, A. (2000). The significance of the classroom effect in primary schools: An application of Creemers' comprehensive model of educational effectiveness. *School Effectiveness and School Improvement, 11*(4), 501–529.

Levine, D.U., & Lezotte, L.W. (1995). Effective schools research. In J.A. Banks & C.A. Mcgee Banks (Eds.), *Handbook of research on multicultural education* (pp. 525–547). New York: Macmillan.

Lipman, M. (1988). *Philosophy goes to school*. Philadelphia, PA: Temple University Press.

Marsh, H.W. (1993). The multidimensional structure of academic self-concept: Invariance over gender and age. *American Educational Research Journal, 30*(4), 841–860.

Marzano, R. J. (2003). *What works in schools: Translating research into action.* Alexandria, VA: Association for Supervision and Curriculum Development.

Mazzoni, S. A., & Gambrell, L. B. (2003). Principles of best practice: Finding the common ground. In L.M. Morrow, L.B. Gambrell, & M. Pressley (Eds.), *Best practices in literacy instruction* (2nd ed., pp. 9–22). New York: Guilford Press.

McEvoy, A., & Welker, R. (2000). Antisocial behavior, academic failure, and school climate: A critical review. *Journal of Emotional and Behavioral Disorders, 8*(3), 130–140.

Medwell, J., Wray, D., Poulson, L., & Fox, R. (1998). *Effective teachers of literacy: A report of a research project commissioned by the Teacher Training Agency*. Exeter, UK: University of Exeter.

Monk, D. H. (1994). Subject area preparation of secondary mathematics and science teachers and student achievement. *Economics of Education Review, 13*(2), 125–145.

Mullis, I. V. S., Kennedy, A. M., Martin, M. O., & Sainsbury, M. (2006). *PIRLS 2006 Assessment framework and specifications, 2nd Edition*. Chestnut Hill, MA: Boston College.

Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., & Kennedy, A.M. (2003). *PIRLS 2001 international report: IEA's study of reading literacy achievement in primary schools in 35 countries*. Chestnut Hill, MA: Boston College.

Mullis, I. V. S., Martin, M.O., Kennedy, A. M., & Foy, P. (2007). *PIRLS 2006 International Report: IEA's progress in international reading literacy study in primary school in 40 countries*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

National Assessment Governing Board, US Department of Education. (2009). *Reading framework for the 2009 National Assessment of Educational Progress*. Washington, DC: Author.

National Institute of Child Health and Human Development. (2000). *Report of the National Reading Panel. Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction* (NIH Publication No. 00-4769). Washington, DC: U.S. Government Printing Office.

O'Neil, H. F., & Herl, H. E. (1998). *Reliability and validity of a trait measure of self-regulation*. Los Angeles, CA: UCLA/CRESST.

Ontario Ministry of Education. (2003). *Early reading strategy: The report of the expert panel on early reading in Ontario*. Toronto, ON: Author.

Organisation for Economic Co-operation and Development. (2001). *Knowledge and skills for life. First results from the OECD Programme for International Student Assessment*. Paris: Author.

Organisation for Economic Co-operation and Development. (2003). *PISA 2003 assessment framework. Mathematics, reading, science and problem solving knowledge and skills*. Paris: Author.

Organisation for Economic Co-operation and Development. (2010). *PISA 2009 results: What makes a school successful? Resources, polices and practices* (Vol. IV). Paris: Author.

Palardy, G. J., & Rumberger, R. W. (2008). Teacher effectiveness in the first grade: The importance of background qualifications, attitudes, and instructional practices for student learning. *Educational Evaluation and Policy Analysis, 30*, 111–140.

Paris, S. G., & Winograd, P. (1990). Promoting metacognition and motivation of exceptional children. *Remedial and Special Education*, *11*(6), 7–15.

Paris, S.G., Wasik, B.A. & Turner, J.C. (1996). The development of strategic readers. In R. Barr, M.L. Kamil, P. Mosenthal & P.D. Pearson (Eds.), *Handbook of reading research* (pp. 609–640). New York: Longman.

Pearson, P.D., & Camperell, K. (1994). Comprehension of Text Structures. In R.B. Ruddell, M.R. Ruddell, and H. Singer (Eds.), *Theoretical models and processes of reading* (4th ed., 448–468). Newark, DE: International Reading Association.

Pressley, M. (2000). What should comprehension instruction be the instruction of? In M. Kamil, P. Mosenthal, P. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. 3, 545–561). Mahwah, NJ: Erlbaum.

Pressley, M. (2006, April 29). What the future of reading research could be. Paper presented at the International Reading Association's Reading Research 2006, Chicago, Illinois. Retrieved February 22, 2012, from http://www.reading.org/downloads/publications/videos/rrc-06-pressley_paper.pdf

Pressley, M., & Afflerbach, P. (1995). *Verbal protocols of reading: The nature of constructively responsive reading*. Hillsdale, NJ: Erlbaum & Associates.

Pressley, M., Borkowski, J. G., & Schneider, W. (1987). Cognitive strategies: Good strategy users coordinate metacognition and knowledge. In R. Vasta, & G. Whilehurst (Eds.), *Annals of child development* (Vol.4, pp. 80–129). Greenwich, CT: JAI Press.

Pressley, M., Wharton-McDonald, R., Allington, R., Block, C.C., Morrow, L., Tracey, D., et al. (2001). A study of effective first grade literacy instruction. *Scientific Studies of Reading 5*(1), 35–58.

Pressley, M., Wood, E., Woloshyn, V., Martin, V., King, A., & Menke, D. (1992). Encouraging mindful use of prior knowledge: Attempting to construct explanatory answers facilitates learning. *Educational Psychologist, 27*, 91–109.

Purdie, N., & Ellis, L. (2005). *Literature Review: A review of the empirical evidence identifying effective interventions and teaching practices for students with learning difficulties in Years 4, 5 and 6.* Camberwell, VIC: Australian Council for Educational Research.

Purves, A.C. (1973). *Literature education in ten countries*. New York: John Wiley & Sons.

Resnick, L. (1987). Learning in school and out. *Educational Researcher, 16*(9), 13–20.

Rivkin, S.G., Hanushek, E.A., & Kain, J.F. (2005). Teacher, schools, and academic achievement. *Econometrica, 73*(2), 417–458.

Rowe, K.J., Turner, R., & Lane, K. (1999, November 29–December 2). *The 'myth' of school effectiveness: Locating and estimating the magnitudes of major sources of variation in students' Year 12 achievements within and between schools over five years.* Paper presented at the 1999 AARE-NZARE Joint Conference of the Australian and New Zealand Associations for Research in Education, Melbourne, Australia.

Rowe, K.J., & Rowe, K. S. (2002). *What matters most: Evidence-based findings of key factors affecting the educational experiences and outcomes for girls and boys throughout their primary and secondary schooling*. Supplementary submission to House of Representatives Standing Committee on Education and Training: Inquiry into the Education of Boys. Canberra: AGPS.

Sanders, M. (1987). Literacy as "passionate attention." *Language Arts, 64,* 619–633.

Scheerens, J. (2004). *The Quality Imperative*. *Review of school and instructional effectiveness research*. Paper commissioned for the *EFA Global Monitoring Report 2005.* Paris: UNESCO.

Scheerens, J, Vermeulen, C., & Pelgrum, W.J. (1989). Generalizability of instructional and school effectiveness indicators across nations. *International Journal of Educational Research, 13*(7), 789–799.

Schiefele, U., Krapp, A., & Winteler, A. (1992). Interest as a predictor of academic achievement: A meta-analysis of research. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 183–212). Hillsdale, NJ: Erlbaum.

Schneider, W. (2008). The development of metacognitive knowledge in children and adolescents: Major trends and implications for education. *Mind, Brain, and Education, 2*(3), 114–121.

Schraw, G., Crippen, K. J., & Hartley, K. (2006). Promoting self-regulation in science education: Metacognition as part of a broader perspective on learning. *Research in Science Education*, *36*, 111–139.

Shanahan, T. & Neuman, S.B. (1997). Literacy research that makes a difference. *Reading Research Quarterly, 32*, 202–210.

Sherblom, S.A., Marshall, J.C., & Sherblom, J.C. (2006). The relationship between school climate and math and reading achievement. *Journal of Research in Character Education, 4*(1&2), 19–31.

Sperling, R. A., Howard, B. C., Miller, L. A., & Murphy, C. (2002). Measures of children's knowledge and regulation of cognition. *Contemporary Educational Psychology*, *27*, 51–79.

Street, B. (2001). Literacy empowerment in developing societies. In L. Verhoeven & C. E. Snow, *Literacy and motivation*. Mahwah, NJ: Lawrence Erlbaum Associates.

Subban, P. (2006). Differentiated instruction: A research basis. *International Education Journal, 7*(7), 935–947.

Taylor, B.M., & Pearson, P.D. (Eds.). (2002) *Teaching reading: Effective schools, accomplished teachers.* Mahwah, NJ: Lawrence Erlbaum Associates.

van Dijk, T.A., & Kintsch, W. (1983). *Strategies of discourse comprehension*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Vockell, E. (2001). *Educational psychology: A practical approach.* Retrieved August 1, 2011, from http://education.purduecal.edu/Vockell/edPsybook/index.html

Walberg, H.J. (1984). Improving the productivity of America's schools. *Educational leadership, 41*(8), 19–27.

Walberg, H.J., & Tsai, S.L. (1985). Correlates of reading achievement and attitude: A national assessment study. *Journal of Educational Research, 78,* 159–167.

Wang, M. C., Haertel, G. D., & Walberg, H. J. (1993). Toward a knowledge base for school learning. *Review of Educational Research*, *63*(3), 249–294.

Wang, M.C., & Walberg, H.J. (Eds.) (2001). *Tomorrow's teachers.* Richmond, CA: McCutchan Publishing Corp.

Wenglinsky, H. (2000, October). *How teaching matters: Bringing the classroom back into discussions of teacher quality.* Princeton, NJ: The Milken Family Foundation and Educational Testing Service.

Whitebread, D., Coltman, P., Pasternak, D. P., Sangster, C., Grau, V., Bingham, S., et al. (2009). The development of two observational tools for assessing metacognition and self-regulated learning in young children. *Metacognition and Learning*, *4*(1), 63–85.

Willingham, D. T. (2007). Critical thinking: Why is it so hard to teach? *American Educator*, 8–19.

Willms, J. D. (2000). Monitoring school performance for standards based reform. *Evaluation and research in education, 14*, 237–253.

Wood, D., Bruner. J., & Ross, G. (1976). The role of tutoring in problem-solving. *Journal of Child Psychology and Psychiatry 17*(2), 89–100.

Wright, S.P., Horn, S.P., & Sanders, W.L. (1997). Teacher and classroom context effects on student achievement: Implications for teacher evaluation. *Journal of Personnel Evaluation in Education, 1*(1), 57–67.

Zimmerman, B.J. (1999). Commentary: Toward a cyclically interactive view of self-regulated learning. *International Journal of Educational Research, 31*, 545–551.