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The Impact of Supplemental Instruction on Low-Achieving Adolescents' Reading Engagement

Abstract

This study examines the impact of a supplemental reading course on 462 sixth-grade students' reading engagement and performance as compared to 389 students in a control group. The study further explores students' cognitive strategy use through think aloud processes with a subset of students who participated in the intervention. Participating students reported significantly higher levels of strategy use, intrinsic motivation, extrinsic motivation, and self-efficacy as compared to the control group. Think aloud measures indicated students who participated in supplemental instruction exhibited higher levels of cognitive engagement at the end of the intervention than they exhibited at the start of the intervention. There was no significant impact on students' reading performance as measured by a standardized test.

Key words: adolescent literacy; reading strategy use; reading motivation

Introduction

Students' performance in reading is strongly related to their engagement in literacy tasks (Morgan & Fuchs, 2007; Organisation for Economic Co-operation and Development [OECD], 2009). When students are engaged, they are motivated to read for a variety of purposes, and they employ strategic behaviors to achieve their personal reading goals. They seek levels of conceptual understanding that meet their specific purposes, and they use intentional mental and behavioral processes that deepen their comprehension. As readers develop toward proficiency, they increase their use of cognitive strategies, which allows for deeper meaning construction. However, if students experience repeated failure in reading, they increasingly disengage as they fall behind their peers and are faced with increasingly complex texts (Alexander, 2005/2006).

These motivational and cognitive dimensions of reading engagement are particularly important for adolescent students, especially given reports of adolescents' poor reading performance in the United States (ACT, 2006; National Assessment of Educational Progress [NAEP], 2009). Recommendations for improving adolescents' reading achievement place particular emphasis on addressing issues of student engagement in programs and instructional practices (Biancarosa & Snow, 2004; Alvermann, 2001; Kamil et al., 2008). These recommendations suggest that adolescents need explicit instruction in cognitive strategies for comprehending text. Further, they suggest that classroom instruction should build students' confidence, self-determination, and motivation to read for a variety of relevant purposes.

Recommendations for improving adolescents' reading also include providing targeted reading interventions for struggling adolescent readers (Biancarosa & Snow, 2004; Kamil et al.,

2008). Because research suggests that struggling adolescent readers do not employ the higher order cognitive strategies efficiently, many interventions for adolescent readers focus on developing students' use of cognitive reading strategies. These interventions provide guided practice in using these strategies and employ teacher scaffolding with a gradual release of responsibility until students reach a level of independent strategy use. There is evidence that strategy-based supplemental interventions focused on students' individual needs can lead to improved reading comprehension (Cantrell, Almasi, Carter, Rintamaa, & Madden, 2010; Edmonds et al., 2009; Kamil et al., 2008; Slavin, Cheung, Groff, & Lake, 2008). However, measurement of reading comprehension in such studies is often limited to narrow and constrained product measures rather than assessment of cognition during the reading process (Fletcher, 2006).

The purpose of this study was to investigate the impact of a strategy-based intervention on two dimensions of reading engagement for adolescents as well as students' reading achievement. It examines the impact of the Learning Strategies Curriculum (Tralli, Colombo, Deshler, & Schumaker, 1996) on sixth-grade students' motivation and cognitive strategy use, including students' cognition during the reading process. It investigates outcomes for three cohorts of students over 3 years in 12 middle schools and suggests the extent to which strategy-based interventions might support students' reading engagement.

Review of Literature

An engagement model of reading suggests that reading comprehension depends on the combined functioning of a reader's motivational and cognitive processes (Guthrie, 2004; Guthrie

& Wigfield, 2000; Wigfield et al., 2008). From this perspective, successful readers have the motivation to derive meaning from the text they are reading, and they know and employ cognitive strategies to achieve their personal goals and intentions for reading. The cognitive component of reading engagement suggests that effective readers make strategic choices within the reading context and use procedural and conditional knowledge to determine how and when to apply comprehension strategies as they read. The motivational component of engagement consists of the reader's goals, values, and beliefs related to the reading task, text, and context. The extent to which a reader is motivated to read influences the extent to which they are engaged in constructing meaning from the text. Further, an engagement model of reading suggests the cognitive and motivational components of reading engagement are supported by a social component. Readers interact socially with peers and others to seek deeper understandings of texts.

Reading engagement theory is consistent with more general theories of school engagement that suggest engagement is a multifaceted construct with behavioral (what students do), emotional (how students feel), and cognitive (what students think) dimensions (Fredricks, Blumenfeld, & Paris, 2004). Studies have found these dimensions malleable and interrelated. Change in one dimension can predict change in another (Skinner, Furrer, Marchand, & Kindermann, 2008). However, engagement studies have not regularly considered if interventions focused on one aspect of engagement, which might yield positive outcomes in other aspects as well, though the dimensions' interrelationships might suggest such results.

Cognitive and Motivational Engagement in Reading

Cognitive engagement in reading is particularly relevant to adolescents who have difficulty with reading. Theories of metacognition, which undergird conceptual understanding of reading comprehension processes, center on engaged efforts toward goal achievement. Flavell's (1979) model of cognitive monitoring focuses on the conscious and intentional use of strategies to achieve a task or goal. Effective cognitive processes depend on knowledge about the factors that can affect cognition, knowledge about the task demands, and knowledge about the strategies that are most likely to be effective in meeting the demands of the task. However, adolescents who struggle with reading often do not possess these dimensions of knowledge. Research examining the cognitive strategy use of proficient and less proficient readers has indicated that less proficient readers do not employ strategies to achieve their reading goals. In fact, many struggling readers are not even aware that cognitive strategies might help them to make sense of text (Flavell & Wellman, 1977). Studies of novice and proficient readers indicate that struggling readers are less likely than poor readers to detect errors in their reading or understanding (Cross & Paris, 1988). Struggling readers are less likely to initiate cognitive processes before they begin to read, are less likely to monitor their understanding of the text, and might not employ problem-solving strategies when comprehension is disrupted (Baker & Brown, 1984; Pressley & Afflerbach, 1995).

In addition to diminished cognitive engagement, adolescents who have difficulty with reading are often characterized by lower levels of reading motivation (Harter, Whitesell, & Kowalski, 1992). In an examination of nine-year-olds' performance on the NAEP, Guthrie and

colleagues (2001) found engaged reading held higher correlation to students' reading comprehension achievement than demographic characteristics such as gender, income, family educational background, or ethnicity. Other research yielded similar findings for older adolescents (Kirsch et al., 2002). While motivational engagement in reading has received much less attention in the literature than cognitive engagement, some studies have linked students' motivation with their reading performance (Wigfield et al., 2008) and with the amount of reading in which students' engage (Cox & Guthrie, 2001; Guthrie, Wigfield, Metsala, & Cox, 1999). Most of the research in reading motivation has been conducted with elementary-age students; however, some research has examined adolescents' motivation with respect to their reading achievement and has found significant relationships between motivation and reading achievement (Mucherah & Yoder, 2008).

Researchers who have studied the impact of various motivational conditions on students' learning outcomes have found that students' motivational dispositions toward a reading task influences their levels of literacy learning (Graham & Golan, 1991). Guthrie and Humenick (2004) conducted a meta-analysis on experimental and quasi-experimental studies of different learning contexts in terms of their impact on students' reading motivation and found that students' motivation and reading comprehension is positively influenced by the ability to make choices, exposure to interesting texts, a focus on content goals, and collaboration among students. In this review, the authors pointed to limitations for classroom implications since few studies were long term, teacher delivered, or classroom based. Thus, more research is needed to identify school-based practices that influence reading engagement, particularly the engagement of students who struggle to read well in school.

The motivation literature focuses on three primary dimensions that influence motivation for learning: the learners' sense of efficacy for the learning task, their orientation or goals for accomplishing the learning, and social aspects related to the task. A sense of efficacy relates to the learner's beliefs about his abilities to be successful. Bandura (1977) proposed that one's expectations for success with a task directly relates to one's effort and persistence in achievement. Individuals with high levels of self-efficacy are more likely to persist with challenging tasks while individuals with lower self-efficacy may avoid tasks perceived as challenging. Research suggests that reading achievement can be enhanced by supporting students' sense of efficacy and that providing students with strategy information can influence students' self-efficacy and reading achievement (Schunk, 2003; Schunk & Rice, 1987; 1989; 1992). Another important aspect of motivation is the orientation of that motivation, or the underlying attitudes and goals that propel one to engage in particular actions (Ryan & Deci, 2000). Self-determination theory suggests that individuals can be motivated to achieve a goal for inherent interest or enjoyment (intrinsic motivation) or that motivation can emerge from anticipation of an external reward (extrinsic motivation; Deci & Ryan, 1985). Intrinsic motivation to read might result from the reader's interest in the text topic or their perception about a topic's utility or importance, while extrinsic motivation to read might develop from concern about grades, desire for recognition, or competition to outperform others (Wigfield & Guthrie, 1997). The social context influences students' motivation, as well, particularly as it relates to students' relationships with teachers and peers (Ryan & Patrick, 2001; Wentzel, 1998; Wentzel, Battle, Russell, & Looney, 2010). Research in the area of reading engagement suggests

that social interaction among students influences reading engagement in positive ways (Almasi, McKeown, & Beck, 1996; Guthrie, Schafer, Wang, & Afflerbach, 1995)

Strategy-Based Interventions

Integrated strategy-based programs comprised of cohesive sets of reading strategies have demonstrated effectiveness in improving students' reading comprehension (Anderson, 1992; Brown, Pressley, Van Meter, & Schuder, 1996; Dole et al., 2009; Palinscar & Brown, 1984; Paris, Cross, & Lipson, 1984; Paris & Jacobs, 1984; Paris & Oka, 1986; Pressley, et al., 1992; Rosenshine & Meister, 1994; Westra & Moore, 1995; Wilkinson & Son, 2011); however, research on these strategy programs has not focused specifically on measuring motivational outcomes. An exception to this is Concept Oriented Reading Instruction (CORI), an engagement-focused program that integrates strategy instruction with instructional techniques to improve students' reading motivation (Guthrie, Wigfield, & Perencevich, 2004). A number of studies have demonstrated CORI's effects on reading achievement, reading strategy use, and reading motivation (Guthrie et al., 2004; Guthrie, McRae, & Klauda, 2007; Guthrie, Wigfield, & VonSecker, 2000; Wigfield, Guthrie, Tonks, & Perencevich, 2004). These findings suggest that targeted instructional programs can improve both reading cognition and reading motivation and suggest promise for enhancing these dimensions of engagement for adolescents.

The strategy-based intervention that is the focus of this study is the Learning Strategies Curriculum, developed by the University of Kansas Center for Research on Learning (Tralli, Colombo, Deshler, & Schumaker, 1996) as part of the Strategies Intervention Model (SIM). The Learning Strategies Curriculum is divided into three strands: Acquisition, Storage, and

Expression. Each strand includes a number of strategies designed to help students derive information from texts, identify and remember important information, or develop writing or academic competence. Each strategy is taught through eight instructional stages: pretest and commitments, describe, model, verbal practice, controlled practice and feedback, posttest and commitments, and generalization.

The Learning Strategies Curriculum, as implemented in this study, included strategies from all three strands, including Word Identification, Visual Imagery, Self-Questioning, Paraphrasing, Sentence Writing, Vocabulary, and Inferencing. Each of these Learning Strategies Curriculum components has been studied individually and has demonstrated effectiveness individually or paired (Beals, 1993; Clark, Deshler, Schumaker, Alley, & Warner, 1984; Lee & Van Collin, 2003; Lenz & Hughes, 1990; Kline, Schumaker, & Deshler, 1991; Schumaker & Deshler, 1992; Woodruff, Schumaker, & Deshler, 2002); however, these studies were burdened with methodological limitations such as small sample size and inadequate measures (Lidgus & Vassos, 1996; Reuter & Erickson, 1995; Tralli et al., 1996). The effects of the Learning Strategies Curriculum on motivation as a dimension of student reading engagement have not been examined. The present study expands the research base on supplemental programs for struggling adolescent readers by examining the effect of teaching a comprehensive set of strategies in the Learning Strategies Curriculum on sixth-grade students' engagement as well as their reading performance.

Prior work examining the effects of the Learning Strategies Curriculum has relied on self-report measures of strategy use (Cantrell, et al., 2010). However, self-report data is often

unreliable because respondents often provide socially desirable responses (Schraw, 2000) and leave investigators unable to contextualize the learner's estimation of their ability (Dinsmore, Alexander & Loughlin, 2008). Self-report measures can be corroborated by measures in which individuals actually perform or provide traces of thought or behavior—in this case of the strategic processes they engage in while reading. Concurrent verbal reports, or think alouds, offer insight into the way readers process text while they are reading (Ericsson & Simon, 1993) and are generally accepted as a reliable data source related to the cognitive and strategic processing that occurs during reading (Afflerbach, 2000; Berkowitz & Cicchelli, 2004; Efklides, 2011, 2008; Fox, 2009; Greene & Azevedo, 2009; Hofer, 2004; Kucan & Beck, 1997; Pressley & Afflerbach, 1995). In the present study, think alouds were used as a method of inquiry aimed at shedding light upon the strategic processes that struggling adolescents use as they read.

In her review of research focused on the reader characteristics used while processing informational texts during think alouds, Fox (2009) developed a theoretical framework for examining the processes and products of reading. In her theoretical framework, she noted that the way readers process text involves three elements: (a) what a reader's attention is focused on while reading (e.g., comprehension, monitoring, evaluation); (b) the behaviors engaged in while processing text (e.g., strategies used, metacognition, monitoring, setting goals, using prior knowledge); and (c) differential levels of processing that occur as a result of level of engagement, knowledge, interest, goals, and ability. This theoretical framework relates to the purpose of this study, which is aimed at examining the cognitive and affective processes that influence struggling readers as they read.

Methods

This article describes a two-component study of reading engagement conducted with participants in a 3-year investigation of a supplemental Learning Strategies Curriculum reading class. The first component employs a multiple cohort, randomized-controlled, pretest-posttest research design including the full sample of eligible students in 12 schools. Student surveys were used to measure changes in students' cognitive and motivational engagement as a result of their participation in the supplemental reading class. The secondary analysis uses a causal-comparative design involving a subsample of treatment students from the larger project and a randomly-selected sample of students who did not qualify for the reading intervention. Think alouds address limitations associated with self-report measures of cognitive strategy use (Hadwin, Winne, Stockley, Nesit, & Woszczyna, 2001) and provide insight into the cognitive processes often missed by product measures (Kucan & Beck, 1997; Pressley & Afflerbach, 1995).

Description of the Intervention

This investigation was implemented in 12 middle schools across a rural state. This initiative was comprised of two primary components: (a) a school-wide model that involved professional development for all content teachers in content area literacy and (b) a targeted intervention (Learning Strategies Curriculum). All students were provided the whole-school model, but only a randomly-selected group of struggling readers received the Learning Strategies Curriculum. Although it was expected that students in both the treatment and control groups would benefit similarly from the whole-school model, the randomized-controlled research design

enabled us to ascertain the effectiveness of the targeted intervention over-and-above the whole-school model.

Sixth-grade students who scored two grade levels or more below grade level in reading received a minimum of 250 minutes per week of supplemental reading instruction in the Learning Strategies Curriculum. Students were placed in this course in addition to their regular reading/language arts classes for an entire school year. During the classes, teachers used eight instructional stages to teach the Learning Strategies Curriculum strategies. Teachers were free to select the strategies they taught based on their assessment of students' needs. In the first year, teachers focused on the following strategies from the Learning Strategies Curriculum: Word Identification, Self-Questioning, Visual Imagery, Vocabulary, Paraphrasing, and Sentence Writing. In years 2 and 3, teachers had three additional strategies in their repertoire from which to draw: Fundamentals of Paraphrasing and Summarizing, and Inferencing. In these years, teachers also incorporated Possible Selves, which involves Learning Strategies Curriculum activities for building students' motivation. These strategies were selected for focus because, as a group, they represented each strand of the model (acquisition, storage, and expression) and provided students with tools for word recognition, comprehension, vocabulary, and writing.

Each year of the project, 11 teachers participated in training led by a certified Learning Strategies Curriculum professional development specialist. Training for teachers included summer and follow-up meetings along with regular on-site and distance coaching support each year. Teachers participated in five half-day workshops in the summer and six half-day workshops spread across the school year in year 1. In year 2, teachers participated in a 2-day

summer workshop with six half-day follow-up workshops during the school year. In year 3, teachers participated in a 2-day workshop during the summer and five half-day follow-up workshops during the school year.

Each strategy of the Learning Strategies Curriculum had a corresponding instructional manual giving detailed instructions for how to teach it using the eight critical instructional procedures common across the strategies: pretest and make commitments, describe, model, verbal practice, controlled practice and feedback, advanced practice and feedback, posttest and make commitments, and generalization. Before each strategy was introduced for the first time, students took a pretest in which they read from grade level passages and performed tasks related to the strategy. Then, they made a verbal commitment to improve their skills, while the teacher made a verbal commitment to the student as to how they would help them accomplish this. In the Describe and Model stages, the teacher provided explicit instruction and demonstrations related to the strategy. Teachers explained the purpose of the strategy, reviewed the advantages of using it, and described each stage of the strategy. Then, the teacher demonstrated how to use the strategy by thinking aloud as he or she worked through each step. Teachers often modeled using the strategy multiple times to show the students when to use the strategy and how to use it effectively. During the Verbal Practice stage, the teacher guided the students in learning to explain and name each step of the strategy through repeated practice. The Controlled Practice and Feedback stage involved having the students practice using the strategy with materials at their instructional level. In the Advanced Practice and Feedback stage, students progressed to practicing the strategy with grade-level texts rather than texts at their instructional levels. During the Posttest and Make Commitments Stage, students were administered a posttest and made a

commitment to use the strategy in other settings. In the Generalization stage, students were guided through instruction designed to help them use the strategy in other settings

Consistent with the Learning Strategies Curriculum guidelines, teachers made decisions about which strategies to teach based on their assessment of students' needs. They continually reviewed previously taught strategies and encouraged students to apply strategies flexibly during practice stages. Lessons often included explicit focus on integrating two or more strategies. For instance, while students were reading their self-selected texts during silent reading time, they were instructed to find an unknown word and use the Word Identification Strategy as well as to use the Visual Imagery Strategy. In addition, teachers also scaffolded students' flexible use by prompting them to use the appropriate strategies when problems arose during reading.

Teachers were expected to implement each strategy according to the eight critical instructional procedures and instructions detailed in the manuals; however, the amount of time devoted to each stage and strategy differed from classroom to classroom. Teachers were expected to cater to the needs of their students and were encouraged to use their professional judgment and evidence from their own documentation of student progress to determine the length of time spent on each stage and strategy. The texts used to teach the strategies also differed from classroom to classroom in that teachers were encouraged to select their own texts to fit the needs of their students. Teachers used both instructional-level and grade-level texts including novels, newspapers, textbooks, content area trade books, plays, magazines, and a variety of book series. Students engaged in some written activities to reinforce their strategy knowledge but did not compose extended texts.

Students were encouraged to integrate the strategies, once they were introduced, with strategies they had previously learned, a practice consistent with research and recommendations on multiple strategy instruction (Brown et al., 1996; Palinscar & Brown, 1984; Pressley et al., 1992; Rosenshine & Meister, 1994). Thus, this study did not set out to determine the effectiveness of the individual strategies that comprised the Learning Strategies Curriculum; instead it set out to ascertain the impact of the set of strategies as a whole.

Intervention Implementation

Characteristics of teachers. Each of the middle schools in this study employed one reading intervention teacher to serve struggling sixth-grade readers in the supplemental classes. Due to teacher turnover, seventeen teachers filled the twelve positions over the course of the three years. Nine of the teachers (53%) had a master's degree and 8 (47%) had Rank I (30 hours above master's degree). Teachers had an average of 15.4 years of experience. In years 1 and 3, all of the teachers were European American; in year 2, one teacher was Asian American and 11 teachers were European American. In year 1, all of the teachers were female; in years 2 and 3, one teacher was male and 12 were female.

Treatment fidelity. Each teacher was observed two times each year during years 1, 2, and 3 by trained research assistants. During the spring of 2007, all teachers were observed for at least one class period on two different occasions. During the 2007-2008 and 2008-2009 academic years, teachers were again observed twice each year, once in the fall and again in the spring. The purpose of these observations was to determine the extent to which teachers adhered

to the key elements of the Learning Strategies Curriculum (the strategies and the eight instructional stages).

Research assistants were trained to take detailed fieldnotes at five-minute intervals, documenting as much of the instruction and dialogue as possible. Four members of the evaluation team used the field notes to identify the number of minutes spent engaged in the Learning Strategies Curriculum, Other Literacy Activities, Non-Literacy Activities, and Behavior Management. These four researchers sought reliability for coding the observation protocols using 10.5% of the data (n = 4 observations) during year 1. Inter-rater reliability was 89.8% among all four coders. Two of the coders then coded all remaining intervention observations for year 1. In year 2, the same four team members achieved 92% percent agreement using five of 46 observations (10.9% of the data). Two coders then coded the remainder of the year 2 and year 3 observations. To compute treatment fidelity, codes were used to determine the proportion of time during each observation that was spent on the Learning Strategies Curriculum (as opposed to Other Literacy Activities, Non-Literacy Activities, and Behavior Management) in relation to the 50-minute minimum.

Teacher fidelity of implementation increased each year over the 3 years. The overall mean fidelity to the Learning Strategies Curriculum for intervention teachers in year 1 was 58.5%, meaning that intervention teachers spent over half of the 50 to 60 minute intervention class time focused on the Learning Strategies Curriculum strategies. The remaining 41.5% of class time was spent on other literacy or non-literacy activities. In year 1, fidelity ranged from 36% of time to 100% of time, with an overall median of 60%. In year 2, the mean fidelity to the

Learning Strategies Curriculum for intervention teachers increased to 80.0%. Fidelity ranged from 30% of time (during one observation) to 100% of time (during four observations), with an overall median of 85%. The overall mean fidelity to the Learning Strategies Curriculum for intervention teachers in year 3 increased to 87.2%. Fidelity ranged from 39% of time (during one observation) to 100% of time (during six observations), with an overall median of 100%.

Student Engagement Survey and Reading Achievement Test

The first component of this investigation involves all sixth-grade students in the 12 participating schools who were eligible for the Learning Strategies Curriculum supplemental class. Pre-data were gathered to ascertain the impact of the class on students' cognitive and motivational engagement and reading achievement.

Participants. All sixth-grade students in participating schools who scored at least two grade levels below grade level on the Group Reading Assessment and Diagnostic Evaluation (GRADE) test were randomly assigned to a condition. Five hundred-twenty three students were assigned to the intervention and 481 were assigned to the control group. There were 13 intervention and 29 control students who did not take the spring test and an additional 48 intervention and 63 control students who transferred or withdrew from school. Thus, outcome results are provided for 462 intervention students, including 18 students whose parents opted out of the program, and 389 control students.

Sample Size and Power. The empirical minimal detectible effects were derived after the third year of the study using Optimal Design Software developed by Spybrook, Raudenbush, Congdon, and Martinez (2006). The specific design used was person randomized trials at multi-

site trials. The minimal detectable effects calculated is 0.15. The estimates used in this calculation are as follows: 60 intervention and control students per school; 12 schools; 80% minimum power; alpha level .05. The proportion of variance expected to be explained by blocking variables is .05. The proportion of variance expected to be explained by student-level covariates is .04.

Sample selection process. To maximize power and increase precision, a within-school iterative random sampling process was used. Every sixth-grade student in participating schools completed the GRADE at the beginning of the fall semester, with the exception of students placed in self-contained special education classrooms full time. Every student with an NCE of 33 or lower was assigned to the intervention or control group. Within each school, a stratified random sampling procedure was implemented using four demographic variables: special education status, free/reduced lunch status, ethnicity, and gender. The students were systematically assigned to the intervention or control group by sorting the students by demographic group and GRADE score within each subgroup. A random number generator was used to assign the first student into either the intervention or control group. Each subsequent student was alternately assigned to intervention or control. This sampling procedure ensured proportional representation and increased the precision of the estimation (Black, 1999).

Characteristics of students. Demographics of students in the intervention and control conditions with outcome data were similar in terms of gender, ethnicity, and socioeconomic status (Table 1). The sample consisted of more males than females. In terms of ethnicity, approximately 87% of students in the sample were white and approximately 13% of the students were in an ethnic minority group. About 65% of the sample received free/reduced lunch, an

indicator of low socioeconomic status. Slightly more intervention students were in special education than control students.

Pearson's Chi-Square was used to test the hypotheses that students in intervention and control groups were similar for each demographic group, and no group was significantly different at the .05 level. The test of equality of the proportion of boys and girls in the intervention versus control group yields X^2 (1, N=851)=0.013, with p=.944. The test of equality of the ethnic group representation (proportion of whites and minorities) in the intervention versus control group yields X^2 (1, N=851)=0.617, with p=.480. The test of equality of SES group representation (proportion of students qualifying for the free/reduced lunch program) in the intervention versus control group yields X^2 (1, N=851)=0.555, with p=.466. Finally, the test of equality of special education designation (proportion of students qualifying for special education for reading/writing or for another designation) in the intervention versus control group yields X^2 (2, N=851) =4.811, with p=.090.

Measures and data collection. Students' awareness and reported use of reading strategies was measured by the Metacognitive Awareness of Reading Strategies Inventory (MARSI). The MARSI is a self-report measure designed specifically to assess adolescents' perceived use of reading strategies during academic reading (Mokhtari & Reichard, 2002). The MARSI includes items related to three strategy domains: Global, Problem-Solving, and Support Strategies. Global Reading Strategies represent a set of reading strategies oriented toward a global analysis of text. Problem-Solving Strategies include items oriented around strategies for solving problems when the text becomes difficult to read. Support Reading Strategies involve

use of outside reference materials, taking notes, and other functional or support strategies. The survey items are presented on a scale of 1 to 5, where 1 is equal to "I never or almost never do this" and 5 is equal to "I always or almost always do this." Mohktari and Reichard (2002) used standard criteria to ensure the validity of the MARSI. The items were selected after reviewing the reading strategies literature and methods textbooks, consulting experts in teaching and assessing reading strategies, and examining other published reading strategy instruments. Construct validity was addressed by exploring the relationship between self-reported reading ability and strategy use for a large sample of students. Results of this validity study were consistent with prior research (Alexander & Jetton, 2000; Baker & Brown, 1984; Garner, 1987; Paris & Winograd, 1990). In the current study, Cronbach's alphas were calculated from sixth-grade students in the first year of this study to determine reliability of the measure. The alpha for the entire scale is .901. The alpha for the 13-item global subscale is .808. The alpha for the eight-item problem-solving subscale is .745. The alpha for the nine-item support subscale is .773.

Students' motivation for reading was measured by a modified version of the Motivation to Read Questionnaire (MRQ; Wigfield & Guthrie, 1997). This survey is designed to measure four aspects of motivation for reading (a) self-efficacy (i.e., reading efficacy, reading challenge), (b) intrinsic motivation (i.e., reading curiosity, reading involvement, importance of reading, and reading work avoidance), (c) extrinsic motivation (i.e., competition in reading, recognition for reading, and reading for grades), and (d) social motivation in reading (i.e., social reasons for reading, compliance). The MRQ consists of 48 items and uses a 4-point Likert response scale. Although Wigfield and Guthrie reported 11 subscales for the MRQ, which included the

subcomponents of the four motivation components listed above, we collapsed the subcomponents into four major motivation components. Thus, we report outcomes for four motivation scales. As was the case with the MARSI scales, the reliability of the motivation scales was calculated during the first year of the current study. The Cronbach's alpha for the 10-item self-efficacy subscale is .842. The Cronbach's alpha for the 17-item intrinsic subscale is .677. The Cronbach's alpha for the 11-item extrinsic subscale is .796. The Cronbach's alpha for the 10-item social subscale is .768. These values confirm prior studies suggesting the stability of these constructs (e.g. Baker & Wigfield, 1999). For this study, the original MRQ was adapted for adolescents. References to "reading" as a separate subject were changed since most middle and high school students do not have a separate reading class. For example, the original item "In comparison to my other school subjects I am best at reading" became "In comparison to my other school work I am best at reading." Another similar example was this original item "I like to help my friends with their schoolwork in reading" which became "I like to help my friends with the reading we do for school." Some items referenced activities with family members. Since adolescents may also choose to do activities solely with friends, the authors added "friends" to those items. For example, the original item "I visit the library often with my family" became "I visit the library often with friends or family." Each year, research assistants administered the MARSI and MRQ during the first few weeks of the school year in the fall and during the last few weeks of school in the spring. Because the students in this study were struggling readers, the research assistants read the survey aloud to students as it was administered. In year 1, we observed a large proportion of students who did not complete the student questionnaire (approximately 25%), possibly due to the length of the survey (82 items).

An Item Response model indicated that the questionnaire could be divided without excessive loss of precision. In the fall of year 2, we randomly divided the items into two survey forms of 40 items, and our completion response was higher. In the spring of year 2 and at both administrations in year 3, we included all of the MARSI items and half of the MRQ items for a total of 60 items.

Students' reading comprehension was measured through the GRADE, a norm-referenced, standardized test of reading achievement which yields standard Normal Curve Equivalent scores and scale scores labeled Growth Scale Value (GSV) scores. The GRADE components include vocabulary, sentence comprehension, passage comprehension, and listening comprehension (Williams, 2000). Fugate and Waterman (2004) found the GRADE's reliability adequate for educational decision making. Reliability coefficients across test levels, test forms, and subject grade levels are consistently .90 or better for the total test score, including subtests of vocabulary, sentence comprehension, and passage comprehension. Alternate forms reliability ranged from .81 to .93, while test-retest reliability coefficients ranged from .88 to .93.

Analytic model for survey data. Hierarchical Linear Models (HLMs) were used to estimate the impact of the Learning Strategies Curriculum on students' reading strategy use, reading motivation, and reading achievement. The average scores for each measure were used to estimate the impact on the constructs being measured. A two-level HLM model (students assigned to intervention or control group within schools) was used to determine the impact of the Learning Strategies Curriculum. At the student level, each spring outcome variable was modeled as a function of fall outcome variables, intervention/control status, and four demographic variables: gender, ethnicity, free/reduced lunch status, and special education. Variance

component estimates were made using restricted maximum likelihood (REML) to test random components of the model. A 3-level HLM was not used because all schools had only one intervention teacher, and the control students were not similarly nested.

Level-1 Model: Student Outcomes

The HLM model assessed the impact of the Learning Strategies Curriculum on the spring outcomes for the MARSI, MRQ, and GRADE. The student variables include the spring scores as a function of the student's fall score centered at the school mean, whether a student was in the intervention, and four demographic variables: gender, ethnicity, free/reduced lunch status, and special education.

$$Y_{ij} = \beta_{0j} + \beta_{1j}(Y^*_{ij}) + \beta_{2j}(T_{ij}) + \sum_{m=3}^{M} \beta_{mj}\alpha_{mij} + \varepsilon_{ij}$$

where

Y_{ij} is the spring student outcome (posttest) score for student i at school j;

β_{0j} is the mean student outcome (posttest) score for control students at school j;

Y^*_{ij} is the fall student outcome (pretest) score for student i centered at school j;

β_{1j} is the centered average student outcome (pretest) slope for students at school j;

T_{ij} = 1 if student i is assigned to Learning Strategies Curriculum intervention at school j, and 0 if control;

β_{2j} is the mean difference of student outcome pre-post gain between intervention and control students at school j;

α_{mij} are additional covariates representing demographic characteristics of student i at school j (gender, ethnicity, free/reduced lunch, and special education);

β_{mj} are coefficients corresponding to student demographic covariates (gender, ethnicity, free/reduced lunch, special education status), and

ε_{ij} is the random effect representing the difference between student ij's score and the predicted mean score for school j. These residual effects are assumed normally distributed with mean 0 and variance σ^2.

Level-2 Model: Student Achievement – School Level

This analysis was performed on data collected from sixth-grade students over multiple years. The covariates in this model pertain to the concurrent year the student was in the intervention or control group with the exception of the Reading Kentucky Core Content Test (KCCT) score, for which the score for the base year, spring 2006, was used. In addition to the base year Reading KCCT score, other school level covariates included the concurrent year school percent of students qualifying for free or reduced lunch fees, concurrent year school percent of white students in the school, and concurrent year school percent of African-American students. The school level variables were centered at the grand mean for all middle schools (or high schools).

$$\beta_{0j} = \gamma_{00} + \sum_{q}^{Q} \gamma_{oq} W_{qj} + \mu_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

$\beta_{mj} = \gamma_{m0}$

Where:

γ_{00} is the mean student outcome (posttest) score of sixth grade control students in participating middle schools);

W_{qj} are four school level covariates including base year Reading KCCT (spring 2006), and concurrent year school percent free/reduced lunch, school percent white students, school percent black students, and school percent disability centered at grand mean for all middle schools (or high schools);

γ_{oq} are coefficients corresponding to school-level covariates;

μ_{0j} is the unique effect of school j on mean student outcome, holding W_{qj} constant (or conditioning on W_{qj}) - this effect is assumed normally distributed with mean 0 and variance τ^2;

γ_{10} is the average centered fall student outcome (pretest) slope;

γ_{20} is the overall target intervention treatment effect on spring student outcome (posttest) scores;

γ_{m0} is the fixed m^{th} student covariate effect (gender, ethnicity, free/reduced lunch, special education status) on the spring outcome variable, centered at the school mean.

Selection of Covariates. Decisions about inclusion of the variables as covariates were made based on a $p<.20$ criterion, with the exception of the intervention variable, which was included regardless of p-value. In a randomized control trial (RCT) with no attrition, covariates can serve the purpose of explaining residual variation, which has the effect of increasing the

precision of the treatment estimate. In an RCT with attrition, the use of covariates can both reduce bias due to missing data (i.e., to control for confounding that can arise in the presence of missing data) and increase precision (Puma et. al, 2009). Maldonado and Greenland (1993), and Budtz-Jorgensen et. al, (2007) have shown that using a $p<.20$ criterion for confounder selection performs well relative to other methods, especially as compared to a method the uses a lower p-value criterion (e.g. $p<0.05$). Results shown Price et. al (2009) demonstrate that dropping covariates with p-values greater than 0.20 resulted in increased precision on key predictor variables, but that dropping covariates with p-values lower the 0.20 resulted in decreased precision. Of the school-level covariates, either the percent of white students or percent of African-American students was removed at the beginning of the model fitting process (the less significant). Interaction effects were not considered.

Student Think Aloud Interviews

In the second and third years of Learning Strategies Curriculum implementation, think aloud procedures were conducted with a sample of intervention students and proficient readers (students who did not qualify for the intervention based on their screening test scores). These think aloud data sources were used as a secondary data source to lend additional insight into students' use of reading strategies, particularly related to reading processes rather than products.

Participants. One hundred seventy-seven 6th-grade students were assigned to the Learning Strategies Curriculum intervention in year 2, and 152 were assigned to the intervention in year 3. Consent forms to participate in think aloud interviews were sent home with all intervention students in both years, and 136 intervention students returned signed forms. From

that pool, 33 students were randomly selected to participate in the think alouds, and of that random sample, 28 intervention students had complete data sets. That is, they had fall and spring GRADE data and fall and spring think aloud data.

In addition, proficient readers in each school were selected to participate in the think aloud interviews. One English/Language Arts teacher in each of the 12 schools was randomly selected to send consent forms home with all students in each of his or her sixth-grade English/Language Arts classes. Of that pool, 513 proficient readers, or students who did not qualify for the reading intervention based on their GRADE test scores, returned consent forms. Twenty-nine students were randomly selected to participate in the think aloud interviews, and of that random sample, 19 students had complete data sets.

Think aloud protocol. Expository passages and procedures from the Qualitative Reading Inventory-4 (QRI; Leslie & Caldwell, 2006) were used to elicit responses from students about what they were thinking as they read the selected passages. In order for struggling readers to participate meaningfully, sixth graders read a fourth-grade passage from the QRI. Consistent with QRI procedures, the passages were marked with "stops" in six designated places in the text. At those points in the text, students were asked to tell the examiner what s/he was thinking. The examiner then wrote the students' response verbatim. The procedure was altered slightly during the spring administration as the alternate fourth-grade expository text did not lend itself to six "stops". Therefore, only four "stops" were designated during the spring protocols. This complicated the analytic procedure in that the raw numbers of strategies used would be artificially inflated in the fall protocols because students had been asked to think aloud more

frequently. Thus, we used a rate of strategies used per stop metric to standardize across protocols.

Data analysis. To analyze the think alouds, the first two authors coded each student response using the strategies measured by the MARSI as the code list. For example, a response of, "I saw a show about that just the other day," was coded as the MARSI strategy "I think about what I know to help me understand my reading." Of the 30 reading strategies included on the MARSI, 14 were visibly used by students when we asked students what they were thinking at the designated "stops" Most of the remaining strategies, including a high proportion of problem-solving strategies, were considered invisible in that students would not have been likely to express that they used the strategies when asked what they were thinking (i.e., "I adjust my reading speed."). To establish coding agreement, the two coders independently coded 10 think aloud protocols and compared them (86.3% agreement). Disagreements were discussed and 100% consensus was attained. Coders then divided the remaining protocols and coded them individually.

After the protocols were coded, descriptive statistics were tallied to determine the number of strategies used per "stop" and the number of times students did not use any strategies per "stop" (i.e., the rate of non-use). Repeated measures analysis of variance (ANOVA) procedures were used to determine whether there were differences in the rate of use or non-use over time. Descriptive statistics were used to examine the types of strategies students used over time.

Results

This study examined the impact of the Learning Strategies Curriculum on two dimensions of students' reading engagement: motivational engagement and cognitive engagement as well as on students' reading achievement. Analysis of the student survey results provides insight into students' reading motivation and their perceptions of their reading strategy use. Intervention student think alouds provide a secondary data source to illuminate intervention students' strategy use during the process of reading, over time.

Reading Comprehension, Strategy Use, and Motivation

Table 2.1 indicates no significant impacts of the Learning Strategies Curriculum on students' reading achievement; although the treatment group demonstrated higher HLM-adjusted mean GRADE scores than the control group. Significant school-level variables used as co-variates were school-level achievement, disability percentages, and ethnicity. At the student-level, special education status was significant. The estimated impact increases for students who were not in special education. Table 2.1 shows a summary of model results when significant variables were used as covariates. An intra-class correlation (ICC) of .067 indicates very little explained variance in student achievement due to school effects.

Table 2.2 indicates the impact of the Learning Strategies Curriculum on students' motivation to read as measured by the MRQ. The unadjusted and HLM-adjusted means for the full MRQ scale and for each subscale are greater for the intervention group than for the control group. The table illustrates significant impacts for the full motivation scale, the efficacy subscale, the extrinsic subscale, and the intrinsic subscale. For the social subscale, the estimated impact is .088, but this impact is not significant at the $p < .05$ level.

Table 2.3 shows a summary of model results for the full MRQ scale when the significant variables were used as covariates. The significant school-level variable for the full motivation scale was the percentage of students in the school with low socioeconomic status. The estimated impact increases slightly as a school's percentage of students with low socioeconomic status increases. The significant student-level variables for the full MRQ scales were intervention status and sex. The estimate increases for students in the intervention group, and decreases for males. The low intra-class correlation (.032) indicates very little variance across schools.

Table 2.4 shows the significant school-level variables for the motivation subscales. The percentage of students in the school with low socioeconomic status was significant at the school level for the social and extrinsic subscales. The estimated impact increases for these subscales as the percentage of students with low socioeconomic status increases. The percentage of students with disabilities was a significant school-level variable for the efficacy and extrinsic subscales, with decreases in the estimated impact as the percentage of students with disabilities increases. There were no significant school-level variables for the intrinsic subscale. The low ICC for each motivation subscale indicates little variance due to school effects.

The significant student-level variables for the motivation subscales are presented in Tables 2.5 – 2.7. For the extrinsic subscales, the significant student-level variables are intervention status, gender, and socioeconomic status with increases in the estimate for students in the intervention group and decreases for males and students with low socioeconomic status. For the intrinsic subscale, the significant student-level variables are intervention status, ethnicity, and socioeconomic status with increases for students in the intervention group, decreases for

white students, and increases for students with low socioeconomic status. For the efficacy subscale, the significant variables are intervention status and gender with increases for intervention and decreases for male. The significant variables for social are intervention status, special education status with increases for students in the intervention group and decreases for students in special education.

Table 3.1 indicates the impact of the Learning Strategies Curriculum intervention on sixth-grade students' strategy use. The unadjusted means and HLM-adjusted means for the full spring MARSI scale and for each subscale were greater for the treatment group than for the control group. The table shows significant differences for the full MARSI scale, the global subscale, the problem-solving subscale, and the support subscale.

Tables 3.2 shows a summary of model results for the overall MARSI scale when significant variables were used as covariates. The significant school-level variables were the schools' state reading scores and the percentage of students with disabilities at the school. The estimated impact increases in schools with higher state reading scores and decreases in schools with higher percentages of students with disabilities. The significant student-level variables for the overall MARSI scale were gender, socioeconomic status, and intervention status. The estimated impact increases for students in the intervention group and the estimated impact decreases for males and for students with low socioeconomic status. An ICC of .000 indicates vary low variance across schools.

Tables 3.3-3.4 show the model results for the MARSI subscales. For each strategy subscale, the state reading scores were significant at the school-level, with increases in the

estimated impact in schools with higher state reading scores. For both the global and support subscales, the percent of disabled students at the school was also significant at the school-level, with decreases in the estimated impact in schools with higher percentages of students with disabilities. For the problem-solving subscale, the other significant school level variables were the percentage of students with low socioeconomic status and the percentage of African-American students in the school. The problem-solving estimate increases in schools with low socioeconomic status and decreases in schools with higher percentages of African-American students.

The significant student-level variables for the MARSI subscales are shown in Table 3.5 as well. For all three subscales, intervention status is significant, with increases in the estimated impact for students in the intervention group. For both the global and support subscales, the additional significant student-level variables were gender, ethnicity, and socioeconomic status. For both subscales, the estimated impact decreases for males, decreases for European-American students, and increases for students with low socioeconomic status. For the problem-solving subscale, gender and socioeconomic status were significant as well, but unlike the global and support subscales, ethnicity was not a significant student-level variable. Analyses for problem-solving and support subscales yielded low ICCs indicating minimal variance across schools. There was more variance across schools for the global subscale with an ICC showing 28 percent of the variance was among schools.

Student Think Alouds

To provide insight into the processes used by students in the Learning Strategies Curriculum class as compared to their more proficient peers, think aloud procedures were used with a subset of intervention students and proficient readers during years 2 and 3 of the study. The first analysis of student think aloud responses focused on the number of reading strategies that were evident during students' responses. Table 3.6 shows that sixth graders in the intervention used more strategies per "stop" over time. Repeated measures ANOVA procedures indicated no significant time effect [F (1,45) = 0.016, p = .899]. However, there was a significant time x treatment interaction [F (1, 45) = 4.282, p = .044], meaning the difference between intervention and proficient students' rate of strategy use decreased significantly between fall and spring time periods. The difference between intervention and proficient students' rate at which they did not use any strategies also decreased; however, the Repeated Measures ANOVA was not significant in terms of a time effect [F (1, 45) = 1.44, p = .236] or a time x treatment interaction [F (1, 45) = 0.795, p = .377].

Figure 1 depicts the significant time x treatment interaction in which proficient sixth-grade readers' rate of strategy use decreased slightly over time while struggling sixth-grade readers' rate of strategy use increased over time. The significant decrease in the difference between proficient and struggling sixth graders' rate of strategy use suggests that these struggling sixth-grade readers were becoming more like their proficient counterparts.

Figure 2 highlights the decrease in struggling sixth-grade readers' rate of not using strategies. The fact that their rate of not using strategies was decreasing suggests that these

struggling readers were becoming more like proficient readers. While this difference is not statistically significant, this pattern emerging from the small sample size is worth noting here.

To examine the nature of strategy use, the coded think alouds were used to determine whether the types of strategies used by these struggling sixth graders changed over time or began to resemble the types of strategies used by proficient sixth-grade readers (see Table 3.7 and Figure 3). The proportion of global strategies used by struggling readers (e.g., critical evaluation, linking to prior knowledge, making predictions) increased slightly over time (from 26.9% to 29.2%), while support strategies (e.g., questioning, paraphrasing, summarizing) decreased (from 67.7% to 60.7%). Proficient readers, on the other hand, showed decreases in the proportion of global strategies used (from 43.5% to 37.5%) and an increase in support strategies used (from 44.9% to 54.5%). In terms of strategy use, this suggests that by spring, the struggling readers were using strategies more similar to, and in more similar proportion to, that of their more proficient counterparts.

As the table indicates, the intervention students in this study most frequently used support strategies, such as questioning oneself, paraphrasing, and summarizing, both in the fall and spring. Figure 3 shows that intervention students tended to use questioning and paraphrasing most frequently. Table 3.8 shows examples of student responses reflecting the use of these support strategies.

Although the struggling readers continued to use support strategies as their primary means of strategically processing text, by spring, they were using more global strategies such as critical evaluation, prior knowledge, and prediction. Examples of student responses coded as global

reading strategies are presented in Table 3.7. In the fall, the difference between the percentages of total global strategies used by proficient (43.5%) and struggling readers (26.9%) was 16.6 and by spring, the difference was 8.8. Likewise, the difference between the percentages of total support strategies used by proficient (44.9%) and struggling readers (67.7%) was 22.8 in the fall and 6.3 by spring. This suggests that the types of strategies these struggling readers used began to mirror the types of strategies used by proficient readers over time. Problem-solving strategies (i.e., visualization) were much less visible than other types of strategies for both proficient and intervention students. During the think alouds, students tended not to share their processes for solving problems they encountered as they read. However, students did report visualizing as they read. Proficient readers tended to use visualization more in the fall, whereas intervention students tended to use it more in the spring.

Summary of Findings and Limitations

The purpose of this study was to examine the impact of the Learning Strategies Curriculum on two dimensions of reading engagement: cognitive strategy use and reading motivation, in addition to reading achievement. Based on the HLM analyses of pretest to posttest gains in reading strategy use, and motivation, the supplemental Learning Strategies Curriculum class had a significant impact on students' reading engagement as measured by students' self-reports of their reading strategy use and reading motivation. Think aloud interviews supported the finding that intervention students' cognitive strategy use changed over the course of the year. However, results from the GRADE assessment indicated no significant impacts of the intervention on students' performance on a standardized reading test.

Students who participated in the supplemental course reported significantly greater use of global, problem-solving, and support reading strategies than did students who participated in the control group, and intervention student think alouds reflected higher levels of cognitive engagement more closely matching that of proficient readers at the end of the school year. In addition, intervention students exhibited higher levels of reading motivation overall. Significant impacts of the intervention were evident for reading efficacy, intrinsic motivation, and extrinsic motivation, but there were no apparent impacts of the Learning Strategies Curriculum intervention on students' social motivation for reading.

Although we attempted to use a variety of measures and triangulate the findings related to strategy use across a self-report survey and think alouds, the findings from this study are limited by several factors. First, any study that uses student self-report data is limited by the credibility of those data sources. It may be that students did not accurately report the degree to which they used strategies on the MARSI or the degree to which they were motivated on the MRQ. This could have led to response bias in that students may have over- or underreported strategy use or motivation. We attempted to mitigate these effects, particularly in terms of the MARSI, by triangulating the findings with think aloud data. Although think aloud data by itself is subject to several limitations as mentioned earlier, when coupled with another data source such as the MARSI, it provides a more credible and more robust picture of strategy use.

As well, our study does not provide insights into cognitive processing that is unconscious. That is, we were only able to report on those strategies that students were aware of and could verbalize or self-report having used them. The limitations of using think aloud

procedures or verbal reports are well known (Afflerbach, 2000; Afflerbach & Johnston, 1984; Bereiter & Bird, 1985; Fox, 2009; Garner, 1987; Pressley & Afferbach, 1995). The dual task of reading and verbalizing one's cognitive processing concurrently involves an extensive amount of effort that relies on language and inferential processes (Efklides, 2008; Schraw, 2000). As well, the think aloud procedure itself might interfere with the cognitive processing it takes to read a text (Schraw, 2000). That is, by asking an individual to read the text and verbalize every thought that occurs to them while reading adds to their cognitive processing load and stresses working memory. This cognitive load may be too disruptive or may slow the reading process unnaturally (Bereiter & Bird, 1985). It is also possible that the think aloud task differed for the struggling and proficient readers in the study. We elected to use passages from the QRI that were of a lower readability so that they would be at the struggling readers' instructional reading levels. This decision most likely made the reading process less frustrating for the struggling readers; however, it made it easier for the proficient readers. Thus, it is possible that the proficient readers were not actually using as many strategies (or the types of strategies) that they would be with more challenging text.

Although the study utilized multiple measures of students' reading engagement, it relied on just a single measure of students' reading achievement. Standardized reading achievement measures, such as GRADE, are limited in the extent to which they capture the ways in which students' process texts and identify students' abilities and growth (Cross & Paris, 1987; Ozuru, Rowe, O'Reilly, & McNamara, 2008). Constraints related to test sensitivity may have underestimated the extent to which the intervention affected students' abilities to read. Students' reported using reading strategies more effectively, and think alouds confirmed their use of

effective reading processes. The intervention focused on helping students be more strategic, and the proximal measures indicated desired changes in students' reading. It is likely the skills measured by the GRADE did not align closely to the strategies for cognitive engagement that were the focus of the LSC intervention.

Cantrell, S. C., **Almasi, J. F.**, Carter, J. C., Rintamaa, M., & Buckman, M. (in press). The impact of supplemental instruction on low-achieving adolescents' reading engagement. *Journal of Educational Research*.

Discussion

Reviews of research examining ability-related differences in processing expository text have shown that less proficient readers tend to use text-focused strategies (e.g., paraphrasing) aimed at constructing a textbase and resolving comprehension problems, whereas more proficient readers tend to use strategies that enable them to build deeper understandings of text (e.g., evaluating text, integrating information; Fox, 2009). Findings from this study show that a strategy intervention aimed at helping adolescent struggling readers learn to use more and varied strategies while reading a range of texts has promise for improving strategy use and motivation. By using process-oriented measures of comprehension, such as think aloud protocols, this study lends some insight into how struggling readers' cognitive processing changed over time as they participated in a strategy-based intervention. Findings revealed that sixth-grade struggling readers in the intervention used significantly more strategies over time and used proportionately more strategies that enable deeper levels of comprehension. Both of these issues, the amount of strategy use and the use of strategies that reflect deeper processing, are aspects of strategic processing that differentiate more and less proficient adolescent readers as they read expository text (Fox, 2009) and narrative text (Janssen, Braaksma, & Rijlaarsdam, 2006). The fact that these struggling adolescent readers exhibited more varied strategy use more closely matching that of proficient readers is a promising sign that they were becoming more active, engaged readers.

In addition to increased strategy use, the supplemental Learning Strategies Curriculum course had positive effects on students' reading motivation. Participating students exhibited more

confidence in their reading abilities and a higher willingness to engage in challenging reading tasks. This increase in reading efficacy is important for students who struggle with reading in that higher levels of efficacy may translate into greater persistence with reading, even when it is difficult (Bandura, 1977). Given research that suggests links between self-efficacy and reading achievement (Schunk, 2003; Schunk & Rice, 1987; 1989; 1992), increasing adolescents' self-efficacy may serve as a step toward greater reading proficiency.

In addition to reading efficacy, the intervention had a significant impact on students' intrinsic and extrinsic motivation to read. The participating students exhibited significant increases in their intrinsic motivations for reading, including for interest, curiosity, and perceptions of importance, as well as higher levels of motivation as it related to extrinsic goal orientations, such as for grades or competition. Both extrinsic and intrinsic forms of motivation can support individuals in achieving their goals (Deci & Ryan, 1985), and it appears that a yearlong course in the Learning Strategies Curriculum can positively influence both types of motivation for struggling middle school readers.

Reading engagement theory identifies ways in which social relationships with adults and peers can influence students' engagement with reading tasks (Guthrie & Wigfield, 2000). The results of this study suggest participation in the supplemental Learning Strategies Curriculum course did not have an impact on students' social motivation for reading. Research suggests that promoting interaction and discussion among students during reading instruction influences reading engagement in positive ways (Almasi, McKeown, & Beck, 1996; Guthrie et al., 1995). Such discussion and interaction was not a regular and systematic part of the Learning Strategies

Curriculum as it was implemented in this project. This might explain why there were no significant impacts on students' social motivation for reading.

The obvious questions raised by this study center on (a) why the Learning Strategies Curriculum class improved students' strategy use and motivation but did not improve students' reading performance and (b) why improvements in cognitive strategy use and motivation did not immediately translate into improved reading performance. Reading engagement theory posits that the extent to which students are cognitively, motivationally, and socially engaged in reading tasks and contexts will influence the extent to which they develop reading proficiency (Guthrie, 2004; Guthrie & Wigfield, 2000). Although it is clear that the dimensions of students' reading engagement are closely related to their performance on reading achievement measures, this relationship is bi-directional and reciprocal (Morgan & Fuchs, 2007). However, it may be that increases in engagement and achievement do not occur simultaneously.

Development of demonstrable improvements in reading performance may require greater lengths of time to gain comfort with flexible strategy use and to reap benefits of increased motivation to read and employ strategic behaviors. In the case of reading strategies, proficient reading involves declarative, procedural, and conditional knowledge of what the relevant strategy is, how to employ the strategy, and under what conditions the strategy works best (Paris, et al, 1991). While it seems the students in this study were more aware of strategies and used them more frequently, they may not have internalized their use to a sufficient enough extent to achieve purposeful, flexible use under a wide range of conditions. Similarly, whereas studies have linked reading motivation and achievement (Morgan & Fuchs, 2007; OECD, 2009;

Wigfield et al., 2008), it may be that increased performance is a bi-product of increased motivation that occurs of time with exposure to increased reading (Cox & Guthrie, 2001; Guthrie, Wigfield, Metsala, & Cox, 1999).

Research suggests that students who struggle with reading experience lower levels of reading motivation and strategy use (OECD, 2009), and recommendations for improving struggling adolescent readers' performance focus on addressing both cognitive and affective aspects of reading (Biancarosa & Snow, 2006; Kamil, et al., 2008). Like other studies focused on teaching students comprehensive sets of strategies (e.g., Brown et al., 1996; Dole, Brown, & Trathen, 1996; Palincsar & Brown, 1984; Paris et al., 1984; Paris & Jacobs, 1984; Paris & Oka, 1986), these findings suggest that the metacognitive and self-regulatory aspects of strategies instruction had a positive effect on students' awareness and use of cognitive reading strategies as well as on their motivation to read. Future intervention studies focusing on the long-term impacts of strategy-based supplemental instruction might illuminate the extent to which increased strategy use and motivation lead to improvements in reading performance.

The literature on engagement suggests that the dimensions of engagement are interrelated (Skinner et al., 2008). Studies have suggested an integrated focus on cognitive strategy use and reading motivation can improve students' strategy use and motivation (Guthrie et al., 2000), but the research is limited on the extent to which a heavy focus on one dimension of engagement, such as reading strategy use, influences students' reading motivation. This study suggests that a supplemental reading course that focuses specifically on the explicit teaching and subsequent learning of cognitive reading strategies can have positive impacts on reading motivation,

particularly for adolescents who do not read well. These results lend support to the inter-relationships between the cognitive and motivational dimensions of reading engagement and further suggest that strategy instruction can help struggling students become more engaged with reading.

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