Impacts of Supplemental Reading Strategy Instruction for Adolescents: Results from a Randomized Trial and Follow-up Study

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Abstract

In this study, we examine the impact of a yearlong supplemental reading course involving daily instruction in the Learning Strategies Curriculum on lower achieving adolescent students' reading achievement and motivation. Using a multiple cohort randomized treatment-control group design over four years, we compared achievement and motivation outcomes for 605 sixth grade students who participated in the intervention with 530 students who did not participate and 593 ninth-grade students who participated in the intervention with 535 students who did not participate. Results indicated significant impacts of the intervention on reading achievement for ninth-grade students but not for sixth-grade students. Significant impacts on reading motivation were found for both sixth- and ninth-grade students. An exploratory follow-up study indicated potential benefits of a second year of intervention for sixth-grade students who are still low achieving after one year of intervention.

Keywords: adolescent literacy, reading interventions, reading strategies

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In the United States, many youth still struggle with the demands of school reading, despite heightened efforts among educators, business leaders, and policy makers to bring the issue of adolescent literacy to the forefront (Theroux, 2010). The most recent results on the National Assessment of Academic Progress ([NAEP] U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics [NCES], 2011) indicated eighth-grade students had improved, overall, in reading since 2009, but the percentage of students who were reading at or below the basic level had not changed significantly. According to the NCES, students who score below the proficient level on the NAEP reading assessment do not demonstrate that they can read challenging subject matter material competently, and thus are less likely to be successful in academic coursework. These difficulties that some students experience with reading are reflected on international assessments such as Programme for International Student Assessment (PISA) (Organisation for Economic Cooperation and Development ([OECD], 2010), in which the U.S. ranked 14th in reading out of 34 countries, far behind countries such as South Korea, Finland and Singapore, Hong Kong and Shanghai in China and Canada. Perhaps more disconcerting than these national comparisons, however, is the finding that approximately one quarter of U.S. students failed to achieve baseline levels of competency on each aspect or subscale of reading assessed on PISA: access and retrieve, integrate and interpret, reflect and evaluate, continuous text, and non-continuous text. The PISA report lamented that students who do not reach baseline competency levels on the assessment have not achieved proficiencies that "will enable them to participate effectively and productively in life" (p. 57) and noted these students are less likely to participate in and

complete postsecondary studies. Within this context, secondary schools are facing intensified pressure to improve students' literacy and to pay particular attention to students who have difficulty with meeting the challenging demands of high school level reading.

Correspondingly in the last decade, secondary schools have taken on the challenge of implementing multi-tiered systems of reading interventions in response to revised special education legislation that enables districts to abandon traditional models for identifying students for special education in favor of models that use students' lack of response to increasingly intensive, evidence-based interventions (Individuals with Disabilities in Education Act, 2004). Such systems, known as Response to Intervention (RTI), are intended as comprehensive approaches designed to prevent and address literacy problems through the provision of differentiated and increasingly intensive assessment and instruction (International Reading Association [IRA] Commission on RTI, 2009). Structures for RTI are varied, but typical systems are conceptualized to include 3 or more tiers, with differentiated instruction to meet students' needs in the regular classroom at the first tier, specialized small group instruction for students having difficulty or at risk of having difficulty at the second tier, individualized instruction for a small percentage of students with more intense needs or for those who fail to respond to less intensive instruction at the third tier (Mellard, McKnight, & Jordan, 2010).

Whereas multi-tiered systems including universal screening, regular progress monitoring, high-quality regular classroom reading instruction, and interventions varying in intensity for students failing to meet benchmarks have been widely embraced in elementary schools (Bradley et al. 2011; Jenkins, Schiller, Blackorby, Thayer, & Tilly, 2013), such systems are more challenging to implement and often seemed less appropriate for students in secondary

settings (Brozo, 2009/2010; Fuchs, Fuchs, & Compton, 2010; King, Lemons, & Hill, 2012). Fuchs and colleagues contend clear distinctions exist between elementary and secondary schools that may require a modified approach to implementing RTI models. Students' more serious reading difficulties in the middle and high school grades may make shorter-term, less intensive interventions typical at secondary prevention levels in elementary schools less appropriate for older struggling readers. Adolescents may need more immediate and intensive interventions that supplement regular instruction and address students' specific learning needs. Another distinct difference between elementary and secondary interventions is the initial intensity and duration with which the interventions may need to occur for such learning and transfer of learning to take place. Secondary students may be many years behind their peers in terms of reading proficiencies, and these difficulties often present themselves immediately in terms of students' classroom performance. Whereas elementary students can progress to the level of their peers in as short a time as a few weeks (Schwartz, 2005), older students may require daily supplemental instruction for multiple years to achieve marked gains in reading proficiency (Vaughn, et al., 2008; Pyle & Vaughn, 2012).

Fuchs and colleagues (2010) also point out that it is incorrect to assume that the nature of effective intervention is the same across grade levels. Students at different ages may require different instructional emphases and strategies. For instance, whereas effective interventions for elementary students have strong phonics components (Ehri, Dreyer, Flugman, & Gross, 2007; Schwartz, 2005; Vadasy, Sanders, & Peyton, 2005; Vaughn, et al., 2006), whereas the most effective interventions for adolescents are comprehension based (Edmonds, Vaughn, Wexler, et al., 2009). Further, effective interventions for adolescents must be within the context of a delivery model that is motivating for adolescents and engages older students in learning. As

middle and high schools strive to implement targeted interventions as part of systematic RTI processes, it is important to know which interventions are most effective for which students and how those interventions affect outcomes for students.

Research on the effectiveness of targeted reading interventions for adolescents has shown promise for improving students' comprehension abilities. Recent research syntheses suggest the potential of reading interventions for improving comprehension for low-achieving adolescents. Slavin, Cheung, Groff, and Lake's (2008) synthesis of effective reading programs for struggling adolescent readers suggested that studies of mixed-method models, which include large-group, small-group, and computer-assisted individualized learning, had positive effects, as did instructional-process programs that used cooperative learning. The effects of studies of Computer Assisted Instruction and reading strategy programs that did not emphasize cooperative learning were more modest. Edmonds, et al. (2009) reviewed the effects of reading interventions on the reading comprehension of older struggling readers and found that comprehension-based interventions were effective, particularly for students in special education. However, Edmonds and colleagues noted that interventions were more effective when implemented by researchers than when implemented by teachers under less controlled conditions. Also, they acknowledged that the effects of some interventions were slow to transfer to more general comprehension measures suggesting the need for added opportunities for older readers to apply new learning. Nevertheless, these syntheses suggest that older students' reading difficulties can be beneficially addressed through intensive interventions that teach reading comprehension in ways that extend what students would normally receive as part of their regular school program. Although secondary schools face particular challenges in addressing the needs of students who do not read well in school, positive findings from reading

intervention research have suggested secondary students can make substantial improvements in reading with effective instruction and practice (Edmonds, et al, 2009; Vaughn, et al, 2008; Pyle & Vaughn, 2012).

The purpose of this study is to add to knowledge about interventions for adolescents who have difficulty with reading so that decision makers in districts and schools can be better informed as they implement systems that address the varied literacy needs of secondary students given the limited research on systems in secondary schools (Fuchs & Vaughn, 2012). As such, this study details results from a randomized controlled field trial of one intervention conducted in a small southeastern state. It focuses on the reading comprehension and motivation of sixth- and ninth-grade students who participated in the Learning Strategies Curriculum, an intensive supplemental reading intervention program emphasizing comprehension strategy acquisition (Deshler & Schumaker, 2005). Specifically, this study examines the impact of the Learning Strategies Curriculum on reading comprehension and motivation of adolescents after one year and explores the potential benefits of an additional year of intervention for students who do not reach proficiency after just one year.

Review of Literature

A Theory of Reading Comprehension

Reading comprehension has been defined by the Rand Reading Study Group as a long-term, developmental process in which a reader engages in "simultaneously *extracting* and *constructing* meaning through interaction and involvement with written language" (Snow & Sweet, 2003, p. 10). This perspective recognizes the importance of decoding to reading comprehension, but notes that decoding is insufficient by itself to facilitate understanding (Pressley, 2000; Snow & Sweet, 2003). This definition purports comprehension is driven by a

reader's interaction with the text and the context. When considering the manner in which struggling readers learn to become strategic readers and successful comprehenders, context is imperative in that strategic readers are successful because they are cognizant of the conditions in which they are reading. Such awareness includes attentiveness to the cognitive demands warranted by particular conditions to yield successful comprehension.

Information processing perspectives provide a theoretical explanation of the reading process that is consistent with the philosophical framework underlying strategy-based reading interventions. In particular, Stanovich's (1980) Interactive-Compensatory Model describes the reading process as a combination of both "top-down" and "bottom-up" processes in which the reader uses both processes simultaneously. "Top-down" processing involves the reader's use of background knowledge of the topic, text structure, genre, word meaning, and letter-sound correspondences to make predictions and hypotheses about upcoming text (Samuels & Kamil, 1984; Stanovich, 1980). In contrast, during "bottom-up" processing the reader relies on incoming visual data in the form of letters first. The reader then attaches sound correspondences to the letters and strings the sounds together to form words. After all of the words are strung together to form sentences, meaning is attached (LaBerge & Samuels, 1984). Stanovich's (1980) notion suggested that comprehension is a compensatory process in which readers are able to compensate for any difficulties with the text by fluidly applying both top-down and bottom-up processes as needed. That is, readers use the clues contained in the text (i.e., letters, words, sentences) and their background knowledge (e.g., content knowledge, knowledge of text structure, genre knowledge) to actively construct meaning from text. For example, if an individual has a great deal of background knowledge about the topic and the nature of the text, but has difficulty decoding particular words in the text, the individual might

use top-down processing to comprehend the text successfully. On the other hand, a reader might need to rely on bottom-up processing if they lacked sufficient background knowledge. Good readers are able to actively adjust their reading to meet the demands of the text and the context (Author, 2012), though sometimes limited background knowledge is difficult to overcome even for good readers, particularly when the text is complex (Graesser, 2007). In order to make such adjustments while reading, however, individuals must be metacognitive, meaning that successful readers must be able to monitor their cognitive processing and must maintain control over it (Flavell, 1979; Flavell & Wellman, 1977). Thus, the process of reading comprehension is a constructive one that requires readers to be active participants (Garner, 1987).

The cognitive, metacognitive, and behavioral processes that are deliberately and consciously employed as a means of constructing meaning from text are referred to as reading strategies (Author, 2012; Graesser, 2007; Hacker, 2004; Paris, Lipson, & Wixson, 1983; Pressley, Borkowski, & Schneider, 1989). Cognitive reading strategies (e.g. summarizing, questioning) and behavioral reading strategies (e.g. using a dictionary to clarify the meaning of a word) are used to make progress toward meaning construction and metacognitive reading strategies (e.g., comprehension monitoring, rereading) are used to monitor or assess the extent to which the text makes sense to the reader (Garner, 1987). Thus, in fostering reading comprehension, it is imperative that instruction focuses on preparing readers not simply to use strategies, but to become strategic. This means (a) building readers' knowledge base regarding the declarative, procedural, and conditional knowledge associated with particular strategies; (b) teaching readers how to analyze reading tasks so that they can set goals, plan their actions, and select appropriate strategies; (c) building a reader's repertoire of strategies so they have access

to a variety of strategies to use flexibly to accomplish their goals and overcome any challenges; (d) teaching readers to monitor and regulate their comprehension; and (e) motivating readers to use cognitive and metacognitive strategies (Pressley, Symons, Snyder, & Cariglia-Bull, 1989). In short, teaching readers to become strategic involves teaching students how to be responsive to the shifting demands of the reading context and to continually monitor and evaluate one's progress toward the ultimate goal of constructing meaning from the text.

However, prior research has shown that learning to monitor comprehension is difficult, particularly for younger and less proficient readers (Alexander & Jetton, 2000; Baker & Anderson, 1982; Baker & Brown, 1984; Garner, 1987; Paris, Wasik, & Turner, 1991; Pressley, 2000). Younger readers lack: (a) a complete and consistent knowledge base, (b) organizational skills, and (c) inferential reasoning skills that are essential for successful comprehension monitoring. Prior research has shown that younger readers are less able to recognize incomplete information and fail to recognize problems in their comprehension (Markman, 1977). As well, they are less likely to monitor their comprehension and use external sources to resolve discrepancies rather than relying on internal strategies such as rereading (Myers & Paris, 1978). Compounding these difficulties is that some younger readers continue to struggle with word-level decoding, which diminishes their capacity for deep-level information processing (Perfetti, 1985). As children approach adolescence, word-level processing, domain-specific knowledge and understanding of text structures increase, making deep-level processing and metacognition more achievable (Cross & Paris, 1988; Oakhill & Cain, 2007).

Like younger readers, less proficient readers are less accurate at monitoring their comprehension (Baker & Anderson, 1982; Paris & Myers, 1981). They are also less able to attend to incoming inconsistencies in the text, are unable to adjust their strategies to adequately

process new textual information encountered while reading, and are unable to provide a rationale for any textual misunderstandings they are able to identify (Garner & Ries, 1981; Garner & Kraus, 1981-1982). Research has shown that, with instruction, younger and less proficient readers can become adept at monitoring their comprehension and using comprehension strategies deliberately to enhance their understanding of text (Paris, Wixson, & Lipson, 1991).

In a landmark study, Durkin (1978-1979) indicated that little comprehension instruction actually occurred in classrooms. Soon following, researchers began examining the processes proficient readers used to comprehend text rather than simply examining the end products of comprehension. This emphasis led to expert/novice research studies that examined what proficient and less proficient readers do while reading (e.g., August, Flavell, & Clift, 1984; Davey, 1988; Gambrell, Wilson, & Gantt, 1981; Garner & Kraus, 1981-1982; Garner & Reis, 1981; Paris & Myers, 1981; Recht & Leslie, 1988). In these studies, researchers found that less proficient readers were: unaware of alternative strategies for enhancing comprehension, not adept at monitoring their comprehension, and unable to adjust their reading rate as needed. As well, these researchers identified a number of comprehension processes and strategies that proficient readers use while reading. As a result, researchers began to focus on teaching less proficient readers to use these strategies. Typically these studies were short-term in duration and used a pretest-posttest control group design in which students in the treatment condition were taught to use a given comprehension strategy while reading and control conditions were untreated (Pressley, 2000).

In reviews of this research, scholars have identified a number of strategies that have proven effective in improving reading comprehension in experimental studies including:

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comprehension monitoring, constructing mental images, identifying story grammar components, question generation while reading, and summarization (e.g., Author, 2011; Gersten, Fuchs, Williams, & Baker, 2001; Mastropieri, Scruggs, Bakken, & Whedon, 1996; National Reading Panel, 2000; Paris, Wasik, & Turner, 1991; Pearson & Dole, 1987; Pearson & Fielding, 1991; Pressley, 2000; Pressley, Johnson, Symons, McGoldrick & Kurita, 1989). However, although students were able to learn apply these strategies in the short-term and in specific contexts, they tended not to transfer their use to varied contexts or across longer periods of time (Author, 2011; Pressley, 2000). Thus, researchers began developing interventions that taught readers to flexibly use a variety of strategies as needed by particular texts at particular moments (Author, 2011; National Reading Panel, 2000; Paris, Wasik, & Turner, 1991; Pressley, 2000). Rather than teachers prompting students to use individual strategies, this instruction required teaching students a cohesive set of strategies and helping students know when and how to use particular strategies.

Intervention studies suggest that students who struggle with reading can benefit from strategy instruction in terms of increased cognitive strategy use and achievement (Alfassi, 2004; Dole, Brown, & Trathen, 1996; Edmonds et al., 2009; Gersten, Fuchs, Williams, & Baker, 2001; Lysynchuk, Pressley, & Vye, 1990). In their synthesis of research on interventions for adolescents who struggle with school reading, Edmonds and colleagues' (2009) concluded that comprehension strategy interventions were the most effective for this population of students. The researchers further confirmed how difficult it can be to achieve transfer of strategy use to more general comprehension measures, particularly for single-strategy interventions. The authors suggest adolescents "may need additional opportunities to

apply newly learned strategies to novel text or may need to learn other practices related to text reflection, self-questioning, and engagement." (p. 293)

Motivational Dimensions of Reading

A dimension of reading that is closely tied to the cognitive processes that readers employ as they endeavor to construct meaning from text, is the motivation to read and to enact the strategies to comprehend successfully (Flavell & Wellman, 1979; Guthrie & Wigfield, 2000). In a number of studies, researchers have linked students' motivation with their reading achievement (Becker, McElvany, & Kortenbruck, 2010; Guthrie, et al., 2013; Morgan & Fuchs, 2007; Mucherah & Yoder, 2008; OECD, 2009) and with the amount of reading in which students' engage (Cox & Guthrie, 2001; Guthrie, Wigfield, Metsala, & Cox, 1999). Schiefele, Schaffner, Moller, and Wigfield (2012) conducted a comprehensive review of the literature on reading motivation and concluded that reading motivation is related to reading for enjoyment and that intrinsic reading motivation is strongly related to reading competence. These relationships are inter-woven and reciprocal. Motivation to read leads to more frequent reading, and more frequent reading leads to increased competence. Competence fuels motivation, which in turn influences reading behavior.

Reading motivation encompasses the thoughts and beliefs that compel individuals to engage in reading. The literature focuses on several constructs that comprise reading motivation, including intrinsic motivation, extrinsic motivation, and reading self-beliefs. The constructs of intrinsic and extrinsic motivation are rooted in self-determination theory (Deci & Ryan, 1985), which suggests that individuals are primarily motivated by the need for automony, relatedness, and competence. Distinctions between intrinsic and extrinsic motivation refer to the specific perceived benefits that propel an individual to act as they seek those more

general needs. Intrinsic motivation refers to an individual's willingness to engage in an activity or behavior for its perceived inherent benefit, whereas extrinsic motivation refers to willingness to engage in an activity for some external reward or incentive. In terms of reading, intrinsic motivation generally refers to an individual's willingness to read for the satisfaction of reading in its own right (Schiefele, et al., 2012). Extrinsic reading motivation generally refers to reading in response to a desire for a reward (i.e. recognition) or to avoid a negative consequence (i.e. poor grades) (Wigfield & Guthrie, 1997).

In addition to intrinsic and extrinsic aspects of motivation, a reader's self-beliefs are important components of motivation that can influence behaviors, motivation, and achievement (Linnenbrink & Pintrich, 2003). 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 (Bandura, 1993; 1995; 1997) and these relationships between beliefs and performance hold true in reading as well (Schunk, 2003; Shell, Colvin, & Bruning, 1995). Reading self-efficacy, or the extent to which an individual perceives s/he can perform a reading task successfully, and the more general construct of reading self-concept are developed primarily through previous experiences with similar tasks and feedback and modeling from others (Usher & Pajares, 2008; Shavelson, Hubner, & Stanton, 1976).

The issue of reading motivation is particularly important for adolescents who struggle with reading in school. Students' motivation for reading tends to decrease in later years generally, and students who have reading difficulties experience the strongest declines in motivation (Gottfried, 1985; Harter, Whitesell, and Kowalski, 1992). The combined effects of reading difficulty and low motivation can present as heightened disengagement and apathy that interferes with growing competence through the remainder of schooling (Alexander

2005/2006). As a result, recommendations for improving adolescents' literacy often urge teachers to employ specific techniques for enhancing students' motivation to read (Kamil et al., 2008). Studies have shown strategies such as building students' confidence for reading, providing a supportive environment, and connecting students' literacy experiences to their lives and real-world issues can increase students' motivation (Graham & Golan, 1991; Grolnick & Ryan, 1987; Guthrie et al., 1999; Guthrie, Wigfield, & VonSecker, 2000; Mueller & Dweck, 1998).

Despite the importance of motivation for struggling adolescents (Fuchs, et al., 2010; Kamil, et al., 2008), little research has investigated the impact of strategy-based interventions on adolescents' motivation to read. One strategy-based intervention that has demonstrated both cognitive and affective benefits for adolescents, in general, 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, but CORI has not been studied as a targeted intervention for adolescents who struggle with reading in school (Guthrie et al., 2004; Guthrie, Wigfield, Barbosa, et al., 2004; Guthrie, McRae, & Klauda, 2007; Guthrie, Wigfield, & VonSecker, 2000; Wigfield, Guthrie, Tonks, & Perencevich, 2004; Wigfield, Guthrie, Perencevich, et al., 2008). Although much of the research on CORI's effectiveness has been conducted with elementary students, recent work has indicated CORI's efficacy in improving the reading comprehension and motivation of middle school students. Guthrie, Mason-Singh, and Coddington (2012) implemented CORI with sixth-grade students for six weeks and found significantly positive effects for information text comprehension, intrinsic motivation, self-

efficacy, valuing, and peer valuing. Researchers documented significant decreases in undermining motivations that detract from achievement. CORI research has illustrated the ways in which motivation mediates reading achievement and the ways in which instruction can improve motivation and comprehension (Guthrie, Klauda, & Ho, 2013; Wigfield, Guthrie, Perencevich et al., 2008). Whereas intervention studies have indicated impacts of instruction on struggling adolescents' reading achievement, few have focused extensively on adolescents' reading engagement as an outcome.

Theoretical Rationale for and Description of the Intervention Model

The intervention in this study was the Learning Strategies Curriculum, developed by the University of Kansas Center for Research on Learning (KU-CRL) as one component of the Strategic Instruction Model (SIM; Tralli, Colombo, Deshler, & Schumaker, 1996). The Learning Strategies Curriculum was developed to assist adolescents with learning disabilities in the general education classroom and is divided into three strands: (a) Acquisition, (b) Storage, and (c) Expression. Each strand included 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 was taught through eight instructional stages: pretest and commitments; describe; model; verbal practice; controlled practice; feedback; posttest and commitments; and generalization.

The acquisition strand was geared toward helping students gain information from text. This strand included strategies such as Word Identification, Visual Imagery, Self-Questioning, and Paraphrasing. In general, previous research has examined the Learning Strategies Curriculum strategies for acquiring information from text and has shown positive results when used for students with learning disabilities in grades 7 through 12 (Clark, Deshler, Schumaker,

Alley, & Warner, 1984; Lee & Von Colln, 2003; Lenz & Hughes, 1990; Schumaker & Deshler, 1992; Woodruff, Schumaker, & Deshler, 2002).

The strategies in the storage strand are designed to help students identify, organize, and store important information. The storage strand included the following strategies: FIRST-letter Mnemonic, Paired-Associates, and the LINCS Vocabulary Learning Strategy. Previous studies have suggested the effectiveness of the FIRST-Letter Mnemonic and Paired Associates strategies, which are designed to help students remember information (Bulgren, Hock, Schumaker, & Deshler, 1995; Nagel, 1982). In this project, the LINCS strategy was part of the targeted intervention. This strategy, which involved using a mnemonic to memorize word meanings, has yielded positive results in previous research studies (see Ellis, 1992).

The Expression Strand included strategies for assisting students with writing and academic competence. It included the Sentence Writing Strategy, the Paragraph Writing Strategy, the Error Monitoring Strategy, the InSPECT strategy, the Theme Writing Strategy, the Assignment Completion Strategy, and the Test-Taking Strategy. Studies of individual Expression Strand strategies have demonstrated improved sentence writing (Kline, Schumaker, & Deshler, 1991), paragraph organization (Moran, Schumaker, & Vetter, 1981), revising and editing (McNaughton, Hughes, & Ofiesh, 1997), and theme writing (Hock, 1998). The targeted intervention in this project included Sentence Writing and Paragraph Writing.

Theoretically, the pedagogical tenets underlying the Learning Strategies Curriculum are grounded in notions related to self-regulated learning, generalization, and motivation. The primary goal is teaching students "how to learn" (Schumaker & Deshler, 1992; Schumaker & Deshler, 2006). This is accomplished by teaching students a variety of task-specific learning strategies that enable them to deal with the immediate demands of the school curriculum and

the self-regulatory processes needed to successfully transfer these skills to other contexts (Deshler & Schumaker, 1986; Schumaker & Deshler, 2006). Thus, students are taught metacognitive skills that enable them to monitor progress made toward achieving goals (Deshler, Warner, Schumaker, & Alley, 1983; Flavell, 1979) and that enable them to control their own learning and thinking (Baker & Brown, 1984; Deshler et al., 1983). Personal attributions are important to this process in that students must accept responsibility for their own learning (Deshler & Schumaker, 1986) and develop the intrinsic motivation necessary to transfer their knowledge of strategies and how to use them in new situations and settings (Garner, 1990; Schumaker & Deshler, 1992).

Methods

Context of the Study

In the study described in this article, sixth- and ninth-grade students who scored two grade levels or more below grade level in reading on a standardized assessment received a minimum of 250 minutes per week of supplemental reading instruction in a targeted intervention class taught by a Learning Strategies Curriculum teacher. Students were placed in this course in addition to their regular reading/language arts classes for an entire school year. It is important to note that, due to scheduling necessities, some intervention classes met for longer than 250 minutes per week. In those classes, teachers were instructed to provide no more than 300 minutes of Learning Strategies Curriculum instruction and to utilize the remaining time on other literacy activities. Sixth-grade classes ranged from 50 to 90 minutes daily (250 to 450 minutes weekly). Ninth-grade classes ranged from 50 to 84 minutes daily (250 to 420 minutes weekly).

Learning Strategies Curriculum Teachers' Training and Implementation

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Intervention training. Teachers were taught to implement the intervention through face-to-face training sessions and in-school coaching. In all, 26 full day training sessions were conducted, with 7 days in year one, 7.5 days in year two, 7 days in year three, and 4.5 days in year four. All teachers participated full in the training each year of the project. If teachers missed any of the training due to illness, school responsibilities, or other factors, the Learning Strategies Curriculum trainer and mentor coaches met individually with the teacher to provide missed training content. In addition to face-to-face training, teachers' implementation was supported by coaches who visited teachers' classrooms to observe, model, and help teachers problem solve. Visits decreased in frequency each year of the project, ranging from monthly in year one to once or twice a year in year four. Coaches further supported teachers' implementation through telephone calls, email correspondence, and more formal distance support. When teachers entered the study in later years due to teacher turnover, coaches worked individually with teachers to ensure they had adequate knowledge to implement the intervention.

Measurement of classroom implementation. Each Learning Strategies Curriculum teacher was observed two times each year during the 4 years of the program. During the spring of 2007, all Learning Strategies Curriculum teachers were observed for at least one class period on two occasions. During the 2007-2008, 2008-2009, and 2009-2010 academic years, Learning Strategies Curriculum teachers were again observed twice each year, once in the fall and again in the spring. The purpose of these observations was twofold: (a) to determine treatment fidelity, and (b) to determine the extent to which LSC teachers implemented aspects of the Learning Strategies Curriculum in their instruction.

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In the fall of 2006, research assistants attended a training session conducted by the Learning Strategies Curriculum intervention trainer. The investigators then met with the research assistants on two occasions to provide training related to taking field notes. The research assistants were trained to organize their field notes using 5-minute time intervals to capture the nature of instruction throughout the entire lesson. Four codes were developed to characterize the range of instructional behaviors observed in the intervention classrooms. Those codes included: (a) Learning Strategies Curriculum, (b) Other Literacy Activities, (c) Non-Literacy Activities, and (d) Behavior Management.

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. Overall, a total of 2,414 minutes of intervention instruction was observed and coded. In year 2, the same four team members achieved 92% percent agreement using 5 of 46 observations (10.9% of the data). Two coders then coded the remainder of the year 2 observations. For the purposes of this paper, only the number of minutes teachers and students were engaged in Learning Strategies Curriculum are reported. Time spent in Other Literacy Activities, Non-Literacy Activities, and Behavior Management is not disaggregated.

Classroom implementation results. Table 1 shows the mean percentage of time that Learning Strategies Curriculum teachers spent on the intervention. In year 1 of the project, fidelity to the Learning Strategies Curriculum model was higher for ninth-grade teachers than

for sixth-grade teachers. In years 2 and 3, implementation increased for both sixth- and ninth-grade teachers. In year 4, implementation for sixth-grade teachers continued to increase, but implementation for ninth-grade teachers decreased slightly. This represents a large increase in implementation fidelity for middle school teachers particularly.

Study Design

Sampling plan. The sampling plan for this evaluation was a two-stage sampling design wherein a purposively selected sample of 21 schools was selected in stage 1. Stage sampling occurred each year of the study. In stage 2, all sixth- and ninth-grade students who met eligibility criteria of scoring two grade levels below grade level (with the exception of students placed in self-contained special education classrooms full time) were randomly assigned to intervention and control groups within each of the 21 schools. Students could opt out of the intervention only with a written request by the parent or guardian. School administration strongly encouraged participation for qualified students, however.

The study combined cohorts of sixth and ninth graders from multiple years. At the beginning of each academic year, a cohort of sixth-grade students and a cohort of ninth-grade students were randomized to intervention and control groups. The four cohorts of sixth-grade students were combined for analysis of impacts on sixth-grade students, and the four cohorts of ninth-grade students were combined for analysis of impacts on ninth-grade students.

Sample size and power. The empirical minimal detectible effects were derived at the completion of the study using Optimal Design Software developed by Spybrook, Raudenbush, Congdon, and Martinez (Optimal Design Software). The specific design used was person randomized at multisite trials. The minimal detectable effects calculated for sixth and ninth grades for this study were 0.13 and 0.11, respectively, with a power of .80.

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Sample selection process. Every sixth- and ninth-grade student in the participating schools completed the Group Reading and Diagnostic Evaluation (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 a Normal Curve Equivalent (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.

Counterfactual. Students who were selected for the control group received a regular elective as part of their sixth- or ninth-grade program. A wide range of electives were taken, including band, chorus, civics, and physical education. In general, it was not expected that the electives included sufficient literacy content to influence the literacy achievement of students in the control group. Reading intervention teachers did not interact with or teach students in the control group, and intervention teachers did not share teaching or learning strategies with other teachers who may have influenced the performance of students in the control group.

Missing Data. Case-wise deletion was used for missing data, with the exception of the state reading assessment in the base year (2006). Two schools did not have data that year, so estimates from other years were averaged and substituted.

Participants

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Characteristics of teachers. In the 21 participating schools, one teacher was employed in each of 18 schools, and two coaches were employed in three larger schools. In total, 38 teachers participated in the study over the course of the four years. Of these 38 teachers, 15 participated one year, 24 participated two years, 16 participated three years, and 12 participated for all four years. Eighteen of the teachers (56.3%) had a master's degree and 14 (43.8%) had a Rank I (30 hours above masters degree), although just 6 had certification specific to reading. Teachers had an average of 12.9 years of experience. All but one of the 38 teachers was white, and all but 4 teachers were female.

Characteristics of students. Table 2 shows the number of eligible students assigned to the intervention and control by year and by grade. The number of students with outcome data is shown, including students whose parents opted out of the program. Aside from those students who opted out of the program, all students who were randomly assigned to the intervention group were successfully placed in intervention classes. However, as depicted by the table, some students are not included in the analysis because they did not take the spring test or they transferred or withdrew from the school.

The participation rate for sixth grade for the intervention in the study was 530 of the 640 intended students, or 82.8%. The intervention participation rate for ninth grade was 535 of the 734 intended students, or 72.9%. There were no cross over students; no control student was placed in an intervention class. Also, no Learning Strategies Curriculum teacher had an opportunity to teach the Learning Strategies Curriculum to a control student.

Demographics of students in the intervention and control conditions with outcome data were similar for both sixth and ninth grades in terms of gender, ethnicity, and socioeconomic status (SES; Table 3). The sample consisted of more males than females. In terms of ethnicity,

most students in the sample were white, and over half of the sample received free/reduced lunch, an indicator of low SES. Slightly more intervention students were in special education than control students.

Measures and Data Collection

Group reading assessment and diagnostic evaluation (GRADE). The GRADE is a norm- referenced, standardized test of reading achievement which yields standard NCE scores, normalized standard scores with a mean of 50 and a standard deviation of 21.06. NCEs range from 1-99. The GRADE components and subtests for sixth and ninth grades include vocabulary, sentence comprehension, passage comprehension, and listening comprehension (Williams, 2001). Word-level skills are not measured on the GRADE. 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 0.81 to 0.93, and test-retest reliability coefficients ranged from 0.88 to 0.93. The GRADE technical manual (Williams, 2001) shows the NCE distribution to be identical to the standard scores distribution. Further, the manual states that, although NCEs are based on percentiles, they have been converted to an equal-interval scale, making arithmetical manipulation appropriate. Each year, all students took the GRADE assessment (Form A) during the first 2 weeks of the school year. Consistent with GRADE norming procedures, the GRADE was administered in classrooms by teachers. Prior to September 1 of the school year, schools administered make-up tests to any sixth- or ninth-grade student who missed the first administration. In the spring, students took the GRADE assessment (Form B) during the first 2 weeks of May, except in year 3, when students took the

GRADE during the last 2 weeks of April. Research assistants scanned the answer sheets for scoring.

Motivation to Read Questionnaire (MRQ). The MRQ (Wigfield & Guthrie, 1997) 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 55 items and uses a 4-point Likert response scale. The MRQ was normed for students through grade 6, so the measure was field tested and modified for grades 6 through 12. For this study, a composite motivation scale was comprised of all survey items. The composite scale had a Cronbach's alpha of 0.93 in the fall and spring (50 items). Each year, students completed the MRQ during the fall and spring of the school year. Research assistants administered and collected the student surveys during the weeks of September 1 through October 30 in fall and during the weeks of May 14 through June 1 in spring.

Summary of Analytic Approach

Hierarchical Linear Models (HLM) were used to estimate the impact of the LSC on student achievement, motivation, and reading strategies outcomes. The GRADE NCEs were used to estimate the impact of the LSC intervention on achievement. The average MARSI scores were used to estimate the impact on reading strategy use, and the MRQ averages were used to estimate the impact on motivation.

A two-level HLM model (students assigned to intervention or control group within schools) was used to determine the impact of the targeted intervention. At the student level, the

spring outcome variable (achievement, strategy use, or motivation) 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.

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

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 average student outcome (pretest) slope for students at school j;

T_{ij} = 1 if student i is assigned to LSC 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 status);

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 from sixth-grade students and ninth-grade students collected 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 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 enrollment, percent of white students in the school, percent of African American students, percent of students qualifying for free or reduced lunch fees and percent of students with disabilities, averaged over the 4 years of the study.

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

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

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

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

where

γ_{00} is the mean student outcome (posttest) score of sixth-grade control students in Kentucky Striving Readers middle schools (note: or ninth grade in high schools);

W_{qj} are school level covariates including base year Reading KCCT (spring 2006), and average school percent free/reduced lunch, percent white students, percent black students, and percent disability;

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 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.

Selection of Covariates. The random assignment procedure included all student demographic variables in the HLM model, so were included regardless of significance. Interaction effects were not considered.

Tests of Equivalence of Intervention and Comparison Students

The null hypothesis that sixth-grade intervention students' pretest scores did not differ significantly from control students' pretest scores on the GRADE was evaluated. As shown in Table 4, sixth graders in the intervention and control conditions were equivalent at the time of the pretest in terms of their reading achievement. The null hypothesis that ninth-grade intervention students' pretest scores did not differ significantly from control students' pretest scores on the GRADE was also evaluated. Ninth graders in the intervention and control conditions did not differ significantly at the time of the pretest.

The null hypothesis that sixth-grade intervention students' pretest scores did not differ significantly from control students' pretest scores on the MRQ was evaluated. As shown in Table 5, sixth graders in the intervention and control conditions were equivalent at the time of the pretest in terms of their reported motivation. The null hypothesis that ninth-grade intervention students' pretest scores did not differ significantly from control students' pretest scores on the MRQ was also evaluated. Results showed that ninth graders in the intervention and control conditions did not differ significantly at the time of the pretest.

Impacts on Student Outcomes

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Sixth-grade Students' Achievement and Motivation

Achievement. Table 6 shows the impact of the targeted intervention on sixth-grade students' reading achievement overall. The HLM results indicate no significant difference in overall achievement between students in the intervention and control groups (*ES* = 0.077, *p* = .137) for all sixth-grade students. Table A1 in Appendix A shows a summary of the full model achievement results for all intervention and control students in the sixth grade. A closer look at model results indicates that special education status is significant in the model, indicating lower achievement for students in special education classes than other students. The estimate decreases by 4.26 NCE for students in special education. There is very little explained variance in student achievement due to the effect of the school, as shown by the low intra-class correlation (ICC).

Motivation. Table 7 shows the overall impact of the intervention on sixth grade students' reading motivation as measured by the MRQ. The HLM results indicate a significant difference in reading motivation for students in the intervention and control groups (*ES* = 0.159, *p* = .016). Table A2 shows a summary of the full model motivation results for all intervention and control students in the sixth grade. There are no significant student variables in this model and little explained variance in student motivation due to the effect of the school, as evidenced by a low ICC.

Ninth-grade Students' Achievement and Motivation

Achievement. Table 8 shows the overall impact of the targeted intervention on ninth-grade students' reading achievement. The HLM results indicate a significantly larger average achievement score for all students in the intervention group than for students in the control group (*ES* = 0.122, *p* = .032). Table A3 shows a summary of the full achievement model

results for ninth grade. Special education status is a significant student-level variable, indicating lower achievement for students in special education classes. The estimate decreases by 4.44 NCE for students in special education. The low ICC indicates very little explained variance in student achievement due to the effect of the school.

Motivation. Table 8 shows the impact of the LSC targeted intervention on students' reading motivation as measured by the MRQ. The HLM yields a significant difference between the motivation for intervention students and students in the control group ($ES = 0.230$, $p = .001$). Table A4 shows a summary of the full model motivation results for all intervention and control students in the ninth grade. The significant student level variables in the model were gender and ethnicity. Males exhibited lower motivation than females in the model with the estimate decreasing by .12 for males. Minority students exhibited higher motivation than white students with the estimate increasing by .13 for minority students. The ICC indicates very little explained variance in student achievement due to the effect of the school.

Discussion

This study examined the impact of a year-long, supplemental, strategy-based course for sixth- and ninth-grade students who struggle with reading in school. The course utilized the Learning Strategies Curriculum, which focused on teaching students a cohesive set of cognitive strategies for comprehending text. The study investigated the effects of the intervention on students' reading achievement and motivation, and the statistical models considered the extent to which student-level characteristics contributed to overall results. In terms of reading achievement, results were mixed for sixth and ninth grades. Results indicated significant impacts on reading achievement for ninth-grade students who participated in the intervention and on reading motivation for both sixth- and ninth-grade participants. However, significant

impacts on reading achievement were not found for sixth-grade students. To that end, we concluded the intervention was beneficial for ninth-grade students in terms of achievement and for both sixth- and ninth-grade students in terms of motivation. However, the differential achievement results for sixth and ninth grades raised new questions that prompted us to conduct an exploratory follow-up study.

The positive achievement results for ninth-grade students suggest that a supplemental reading course focused on the Learning Strategies Curriculum is a viable approach to improving the reading performance of students in their first year of high school who are struggling with reading. This is an important finding given the political and practical contexts in which secondary schools are currently situated (Theroux, 2010). Secondary educators face increased pressure to address students' literacy needs, and secondary schools are seeking to put in place tiered systems of reading interventions to comply with state and district RTI policies (King, Lemons, & Hill, 2012). For secondary school decision makers who may be wrestling with ways to implement RTI models including tiered interventions for students who experience difficulty even with supports in the regular classroom, the findings of this study suggest a year-long Learning Strategies Curriculum course could serve as a good option for consideration.

More broadly considered, the results of the study corroborate existing research synthesized by Edmonds et al. (2009) that concludes comprehension-based interventions are most effective in improving literacy for lower-achieving adolescents. The design of this study adds to knowledge about adolescent reading interventions, in general, and the Learning Strategies Curriculum, in particular. Whereas intervention studies suggest interventions for struggling adolescents tend to be more effective when implemented by researchers than by teachers (Edmonds et al., 2009), the large-scale, field-based nature of this study suggests

teachers can learn to implement a complex strategy-based intervention with fidelity with adequate support. In terms of the Learning Strategies Curriculum specifically, this study examines the intervention as a set of coherent strategies rather than studying each component individually, as was done in prior research (Bulgren, Hock, Schumaker, & Deshler, 1995; Clark, Deshler, Schumaker, Alley, & Warner, 1984; Lee & Von Colln, 2003; Lenz & Hughes, 1990; Nagel, 1982; Schumaker & Deshler, 1992; Woodruff, Schumaker, & Deshler, 2002). In addition, this study provides evidence of the effectiveness of the Learning Strategies Curriculum as a supplemental intervention for ninth-grade students using a randomized pretest-posttest control group design and larger numbers of students than had been available in previous studies.

A strong and consistent finding of this study, for both sixth- and ninth-grade students, is the significant impact of the Learning Strategies Curriculum class on students' reading motivation, overall. Recommendations for improving adolescents' literacy performance tend to include some focus on reading motivation (Biancarosa & Snow, 2004; Alvermann, 2001; Kamil et al., 2008), so it is important to note the effectiveness of the supplemental Learning Strategies Curriculum class in influencing middle and high school students' reading motivation in positive ways. Research suggests that more motivated readers read more and reach higher levels of achievement (OECD, 2009), but the increase in reading motivation did not necessarily result in improved reading achievement, at least for sixth grade, in the short term. However, it is possible that sixth-grade students' increased motivation will pay off in terms of improved reading achievement over time given the bi-directional and reciprocal nature of motivation and achievement (Guthrie, et. al, 2013; Morgan & Fuchs, 2007).

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The lack of significant impacts on sixth-grade students' reading achievement in this study raises interesting questions about differential impacts of targeted reading interventions for students at different ages and at different phases of reading development. From an interactive-compensatory perspective, gaining competence with reading means flexibly integrating word-level knowledge with background and metacognitive knowledge to construct meaning from text (Stanovich, 1980). Often, younger and less proficient readers are hampered by difficulties with decoding (Perfetti, 1985) and are limited in their abilities to process metacognitively (Brown, 1984). As children move into adolescence, increased word-level processing and background knowledge enable readers to achieve deeper levels of comprehension (Cross & Paris, 1988; Oakhill & Cain, 2007). Based on the differential results for sixth- and ninth-grade students in this study, it appears younger adolescents who struggle with school reading require instruction that acknowledges a different level of development in terms of word-level, background, and metacognitive knowledge. Struggling sixth-grade students lack development in all three areas critical to strategy development and learning, and therefore likely need instruction that is more intensive and for longer duration than that for older adolescents. Studies of interventions for struggling adolescent readers indicate difficulty of strategy instruction's transfer to broad comprehension measures (Edmonds, et al., 2009). It is possible that younger adolescents need additional instruction, time, and development to achieve such transfer. Researchers have studied the benefits of providing interventions for extended times over multiple years and have found it beneficial for struggling students who do not respond to interventions initially (Pyle and Vaughn, 2012).

A Postscript Follow-up to the Study: Exploring the Potential Benefits of a Second Year

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To explore the possibility that younger adolescents may need more time in a strategy-based intervention like the Learning Strategies Curriculum to gain a facility with higher-level processes that translates to higher reading achievement, an exploratory follow-up study was conducted with a subset of schools that participated in the larger study described above. In the follow-up study, the Learning Strategies Curriculum was implemented in seven middle schools for an additional year. During the 2010-2011 school year, students who had received the intervention as sixth-grade students and were still reading two or more grade levels below grade level at the end of sixth grade were assigned to the intervention for a second year in seventh grade. This provided an opportunity to examine the impact of a second year of the Learning Strategies Curriculum on students' reading achievement and motivation as compared to just one year of intervention. As such, the following research question was explored in the follow-up study: What are differences in reading achievement and motivation for students who participate in the Learning Strategies Curriculum intervention for two years as compared to students who participate for just one year, when the students still are struggling with reading after one year of intervention?

Characteristics of schools and teachers. Students in seven middle schools participated in the follow-up study. Average student enrollment in the schools was 497 students (range = 246 to 809). At the school level, 89% of students were white, 57% received free or reduced lunch, and 14% participated in special education for a literacy-related disability. Of the 7 teachers who taught the Learning Strategies Curriculum intervention, all were white, 6 were female, and 4 had certification in teaching reading.

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LSC classroom implementation. Fidelity to the classroom model was measured through two observations in each teacher's classroom on two different days[1]. Data were collected and analyzed using the same process used for the full four year study. For seventh grade, observers documented that Learning Strategies Curriculum teachers adhered to the Learning Strategies Curriculum 76.1% of the supplemental class time overall. One seventh-grade teacher exhibited very low implementation during one visit, diminishing the overall average.

Selection of students. Students who had been randomly assigned to the supplemental class in the previous year (sixth grade) were placed in the supplemental class for a second year in seventh grade. Further, students who were randomly assigned to the control group as sixth graders during the previous year were placed in the supplemental intervention class for one year. Exceptions occurred when students' spring GRADE scores during the previous year's post-test indicated the student was no longer reading two or more grade levels below grade level. Students whose scores were better than two grade levels below grade level were not placed in the intervention during the follow-up year. Additional exceptions occurred if parents requested, in writing, that their students not be placed in the supplemental class.

In the follow-up study, students who participated in either the intervention or control groups during the previous year were not assigned to the extension year intervention if their post-test NCE scores were 40 or higher. The analyses presented below reflect results for students who actually participated in either their first or second year of intervention during the follow-up year. Analysis of variance (ANOVA) is used to ascertain differences between

[1] In the follow-up year, every 7th grade teacher was observed once in the fall and once in the spring. In one middle school the teacher changed midyear due to turnover. There were two 10th grade teachers who were each observed once in the fall and once in the spring.

groups since numbers of schools were too few to conduct HLM analyses as in the full study and since the analyses were exploratory. To address the fact that students who no longer qualified to participate in the intervention for a second year did not actually participate in a second year of intervention, those students were removed from the ANOVAs. To make the analysis between groups comparable, students who received the intervention for the first time during the extension year and scored above 40 NCE on the post-test were removed.

Student Outcomes after Two Years

Table 10 shows results from the ANOVA for seventh-grade students' achievement as measured by the GRADE. The ANOVA indicates significant impacts at the $p<.10$ level for students who still needed help and received a second year of intervention as compared to students who received just one year of intervention and still needed additional help after that one year. Also, the ANOVA shows significant differences at the $p<.05$ level between white and minority students and between students who were and were not in special education. Tables 11-12 present descriptive statistics for groups within the intervention. Minority students made greater gains than white students overall and within intervention groups. Minority students who participated in two years of intervention made greater gains than minority students who participated for just one year. Students who were not in special education made greater gains than students in special education, overall and within intervention group. Special education students who participated in a second year of intervention made more gains than students who participated for just one year.

Limitations and Directions for Future Research

The design and methods of the follow-up study were constrained by several limitations. The numbers of students in the analyses included in the follow-up study are too small for

definitive conclusions about the effects of a second year of intervention. The study is further limited by the disruption of randomization that occurred when students were not placed in the intervention during the follow-up study if their full study post-test scores showed they were reading at or above 40 NCE on the GRADE. The decision to provide the opportunity for a second year of intervention was not made until the end of the full study, and sixth-grade students who participated in the intervention group in the full study in the final year had not expected to take the intervention class during their seventh-grade intervention year. Similarly, students in the control group in the full study did not expect to take the intervention in seventh grade if they scored at or above 40 NCE at the end of 6th grade, since that had been the precedent in the full study. Based on these factors, it was decided that students who were reading at or above 40 NCE would not be assigned to the intervention for either their first or second year during the follow-up study. Students who had their first year of intervention during their 6th grade year (2009-2010) but no longer needed the intervention during 2010-2011 did not participate in the intervention for a second year. Students who were in the control group during 6th grade in the full study but no longer needed the intervention did not participate in the intervention for a first year during the follow-up study. To control for the fact that students placed in the intervention who were reading at the highest levels at the 2010 spring test were not placed in second year intervention, we removed the similar group of students (those who scored at or above 40 NCE on the follow-up study post-test) from the analyses. Doing so results in more comparable groups; however, resultant analyses are relevant only to students who still exhibited difficulty after one year of intervention and cannot be generalized to students who might already be reading at grade level after one year.

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In spite of these limitations, the follow-up study provided an opportunity to explore the effects of participation in a supplemental reading course focused on the Learning Strategies Curriculum for a second year. The data presented here do suggest promise for future research and provide considerations for educators who are creating tiered systems of interventions in middle schools. In the follow-up study, sixth-grade students seemed to benefit from a second year of intervention if they were still having difficulty reading after one year of intervention. The intervention appeared particularly helpful for minority students in this study and for students who were not in special education. Given the fact that the full study failed to identify significant impacts of one year of intervention on sixth-grade students' reading achievement, it is worthwhile to note the potential of a second year of supplemental instruction in the Learning Strategies Curriculum for yielding impacts with students who do not benefit fully after just one year. Although we recognize the limitations inherent in the exploratory follow-up investigation, findings do corroborate those of other researchers who have noted the benefits of providing opportunities for interventions over multiple years for middle school students (Pyle & Vaughn, 2012). Many more studies investigating the impacts of strategy-based interventions across varying levels of intensity and duration in school-based, multi-tiered contexts with adolescents are needed.

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Table 1

Implementation of the LSC Model in Intervention Classrooms as Measured by Percent of Class Time

	Year 1	Year 2	Year 3	Year 4
6th grade	58.5%	80.0%	87.2%	87.7%
Number of teachers observed	11	12	11	11
9th grade	70.4%	78.5%	86.6%	82.9%
Number of teachers observed	13	12	9	10

Note. In year 1, every LSC teacher was observed twice in the spring, with the exception of one 9th grade teacher who was observed once. In years 2 and 3, every LSC teacher was observed once in the fall and once in the spring. In year 4, every LSC teacher was observed once in the fall and once in the spring except for one 6th grade teacher, who was only observed in the spring. The number of LSC teachers differs from year to year due to turnover.

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Table 2

Intended and Actual Number of Students in LSC Intervention and Control Groups

	Intervention					Control				
Treatment condition	Yr 1	Yr 2	Yr 3	Yr 4	Total	Yr 1	Yr 2	Yr 3	Yr 4	Total
Sixth grade										
Actual number of students in study	171[a]	154[b]	137[c]	143[d]	605[e]	131	138	120	141	530
Students without spring GRADE scores	6	4	3	8	21	9	14	6	11	40
Students that transferred or withdrew	15	21	12	9	58	26	22	15	7	70
Total number of intended students	192	179	152	160	683	166	174	141	159	640
Ninth grade										
Actual number of students in study	192[f]	183[g]	141[h]	77[i]	593[j]	165	150	144	76	535
Students without spring GRADE scores	16	10	15	6	47	33	25	17	24	99
Students that transferred or withdrew	42	19	28	15	104	48	27	19	6	100
Total number of intended students	250	212	184	98[k]	744	246	202	180	106[k]	734

[a]Eleven parent opt-outs. [b]Four parent opt-outs. [c]Three parent opt-outs. [d]Eight parent opt-outs. [e]Twenty-six 6th grade parent opt-outs.
[f]Nineteen parent opt-outs. [g]Eleven parent opt-outs. [h]Fourteen parent opt-outs. [i]Ten parent opt-outs. [j]Fifty-four9th grade parent opt-outs.
[k] In year 4, 9th grade students that attended participating middle schools could have taken the intervention class in 6th or 7th grade. These students were not eligible to be in the evaluation in year 4, decreasing the number of eligible high school students.

Table 3

Intervention and Control Student Demographics (and Proportions)

	Gender		Ethnicity		Lunch		Special Education		
Group	Male	Female	White	Minority	Reg Pay	Free/ Red	Not In	Read/ Write	Other
				6th grade					
Interv.	360 (.60)	245 (.40)	526 (.87)	79 (.13)	187 (.31)	418 (.69)	404 (.67)	126 (.21)	75 (.12)
Control	309 (.58)	221 (.42)	456 (.86)	74 (.14)	172 (.32)	358 (.68)	379 (.72)	96 (.18)	55 (.10)
Total	669 (.59)	466 (.41)	982 (.87)	513 (.13)	359 (.32)	776 (.68)	783 (.69)	222 (.20)	130 (.11)
				9th grade					
Interv.	348 (.59)	245 (.41)	524 (.88)	69 (.12)	222 (.37)	371 (.63)	417 (.70)	110 (.19)	66 (.11)
Control	295 (.55)	240 (.45)	464 (.87)	71 (.13)	208 (.39)	327 (.61)	411 (.77)	73 (.14)	51 (.10)
Total	643 (.57)	485 (.43)	988 (.88)	140 (.12)	430 (.38)	698 (.62)	828 (.73)	183 (.16)	117 (.10)

Note. Pearson's Chi-Square was used to test the hypothesis that students in intervention and control groups were similar for each demographic group, and no groups were significantly different.

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Table 4

Equivalence of Groups on GRADE Pretest

Condition	*n*	*M*	*SD*	*t*	*df*	*p*	95% CI Lower	95% CI Upper
				6th grade				
Intervention	605	21.11	9.49	0.990	1133	0.464	-0.544	1.653
Control	530	21.66	9.32					
				9th grade				
Intervention	593	23.59	8.05	-0.074	1126	0.180	-0.994	0.922
Control	535	23.56	8.34					

Note. CI = confidence interval.

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Table 5

Equivalence of Groups on MRQ Pretest

Condition	*n*	*M*	*SD*	*t*	*df*	*p*	95% CI Lower	95% CI Upper
6th grade								
Intervention	439	2.78	0.45	0.183	825	0.903	-0.056	0.068
Control	388	2.79	0.46					
9th grade								
Intervention	366	2.45	0.48	-0.527	706	0.463	-0.086	0.050
Control	342	2.44	0.44					

Note. CI = confidence interval. There are fewer students that completed the MARSI than completed the GRADE because MARSI scores are only included if the student also completed the GRADE.

Table 6

Overall Impact of the Learning Strategies Curriculum on Student Achievement, Sixth Grade

	Unadjusted Means		HLM-adjusted Means		Estimated	Effect	*p*
	Control	Tx	Control	Tx	Impact	Size	
6th Grade Spring NCE	30.7 (13.86)	32.3 (13.92)	29.3	30.4	1.07	0.077	.137
6th Grade Students	530	605					
No. of Schools = 12							

Note. Standard deviations are presented in parenthesis. Effect size calculated as the impact divided by the full sample control group standard deviation.

Table 7

Overall Impact of the Learning Strategies Curriculum on Student Motivation, Sixth Grade

	Unadjusted Means		HLM-adjusted Means		Estimated	Effect	*p*
	Control	Tx	Control	Tx	Impact	Size	
6th grade spring MRQ score	2.65 (0.466)	2.71 (0.490)	2.65	2.73	0.075	0.159	.016
6th grade students	390	439					
No. of Schools = 12							

Cantrell, S. C., Almasi, J. F., Carter, J. C., & Rintamaa, M. (in review). The impact of supplemental reading instruction on struggling adolescents' reading achievement, motivation, and strategy use. *Unpublished manuscript*.

Table 8

Overall Impact of the Learning Strategies Curriculum on Student Achievement, Ninth Grade

	Unadjusted Means		HLM-adjusted Means		Estimated	Effect	*p*
	Control	Tx	Control	Tx	Impact	Size	
9th Grade Spring NCE	32.3 (13.83)	33.7 (14.87)	30.2	31.9	1.69	0.122	.032
9th Grade Students	535	593					
No. of Schools = 11							

Note. Standard deviations are presented in parenthesis. Effect size calculated as the impact divided by the full sample control group standard deviation.

Cantrell, S. C., Almasi, J. F., Carter, J. C., & Rintamaa, M. (in review). The impact of supplemental reading instruction on struggling adolescents' reading achievement, motivation, and strategy use. *Unpublished manuscript*.

Table 9

Overall Impact of the Learning Strategies Curriculum on Student Motivation, Ninth Grade

	Unadjusted Means		HLM-adjusted Means		Estimated	Effect	*p*
	Control	Tx	Control	Tx	Impact	Size	
9th grade spring MRQ score	2.38 (0.517)	2.50 (0.534)	2.42	2.54	0.119	0.230	.001
9th grade students	342	368					

Note. Standard deviations are presented in parenthesis. Effect size calculated as estimated impact divided by control group standard deviation.

Cantrell, S. C., Almasi, J. F., Carter, J. C., & Rintamaa, M. (in review). The impact of supplemental reading instruction on struggling adolescents' reading achievement, motivation, and strategy use. *Unpublished manuscript*.

Table 10

Middle School Student Demographics by Intervention Group

Variable	1st Year Intervention (*N*, %)	2nd Year Intervention (*N*, %)
Gender		
Male	*26* (61.9)	*36* (73.5)
Female	*16* (38.1)	*13* (26.5)
Ethnicity		
White	*36* (85.7)	*42* (85.7)
Minority	*6* (14.3)	*7* (14.3)
Lunch Designation		
Standard Pay	*8* (19.0)	*12* (24.5)
Free/Reduced	*34* (81.0)	*37* (75.5)
Special Education Status		
Non-special Education	*22* (52.4)	*29* (59.2)
Special Education	*20* (47.6)	*20* (40.8)

Table 11

Middle School Student Achievement Scores (GRADE NCE), ANOVA Results

Variable	N	*M (SD)*	F	Significance
Post-Test by Intervention Group			2.90	.09*
1st Year Intervention	42	22.60 (10.2)		
2nd Year Intervention	49	26.53 (12.9)		
Covariate: Intervention Group Pre-Test Scores			19.96	.00**
1st Year Intervention	42	17.90 (12.3)		
2nd Year Intervention	49	18.33 (9.7)		
Post-Test by Gender			.02	.90
Male	62	24.56 (12.5)		
Female	29	25.07 (10.3)		
Post-Test by Ethnicity			6.02	.02**
White	78	23.51 (11.6)		
Minority	13	32.00 (10.5)		
Post-Test by Lunch Designation			2.41	.13
Standard Pay	20	25.10 (12.2)		
Free/Reduced	71	24.62 (11.8)		
Post-Test by Special Ed. Status			3.89	.05**
Non-Special Ed. Status	51	28.16 (10.9)		
Special Ed. Status	40	20.35 (11.6)		

*$p<.10$
**$p < .05$

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Table 12

Middle School Student Achievement Scores (NCE) by Intervention Group and Ethnicity

Variable	N	Min	Max	NCE *M* (SD)	Gains
1st Year Intervention					
White					
Pre-Test	36	1.00	33.00	17.81 (10.3)	
Post-Test	36	1.00	40.00	21.69 (9.9)	3.88
Minority					
Pre-Test	6	5.00	30.00	18.50 (10.8)	
Post-Test	6	16.00	40.00	28.17 (10.2)	9.67
2nd Year Intervention					
White					
Pre-Test	42	1.00	33.00	17.95 (9.7)	
Post-Test	42	2.00	51.00	25.07 (12.8)	7.12
Minority					
Pre-Test	7	1.00	32.00	20.57 (10.1)	
Post-Test	7	25.00	56.00	35.29 (10.4)	14.72

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Table 13

Middle School Student Achievement Scores (NCE) by Intervention Group and Special Education Status

Variable	N	Min	Max	NCE *M* (SD)	Gains
1st Year Intervention					
Non-Special Education:					
Pre-Test	22	1.00	33.00	21.66 (10.1)	
Post-Test	22	11.00	40.00	26.91 (8.4)	5.25
Special Education					
Pre-Test	20	1.00	33.00	13.80 (9.0)	
Post-Test	20	1.00	36	17.90 (9.9)	4.10
2nd Year Intervention					
Non-Special Education:					
Pre-Test	29	1.00	33.00	20.41 (9.3)	
Post-Test	29	9.00	56.00	29.10 (12.5)	8.69
Special Education					
Pre-Test	20	1.00	32.00	15.30 (9.7)	
Post-Test	20	2.00	47.00	22.80 (12.8)	7.50

Appendix A
Summary of HLM Model Results for Student Achievement

Table A1

6th Grade Student Achievement, NCE Score:-Summary of Model Results

Fixed Effects					
Effect	Estimate	Standard Error	df	t value	Pr>|t|
Intercept	25.612	25.7484	6	0.99	0.3583
School: KCCT reading scores, base year (spring 2006)	0.00283	0.0843	1116	0.03	0.9732
School: Percent white students	-0.1301	0.1975	1116	-0.66	0.5103
School: Percent black students	-0.3111	0.2891	1116	-1.08	0.2821
School: Percent free/reduced	-0.6492	0.0785	1116	-0.83	0.4086
School: Percent with disabilities	0.3325	0.2936	1116	1.13	0.2576
School: Average enrollment	-0.0003	0.0036	1116	-0.08	0.9346
Student: Fall GRADE score	0.6232	0.0416	1116	14.98	<.0001
Student: Intervention class	1.0669	0.7162	1116	1.49	0.1366
Student: Gender, male	-0.1270	0.7336	1116	-0.17	0.8625
Student: Ethnicity, minority	-1.4492	1.1607	1116	-1.25	0.2122
Student: SES, free/reduced lunch	-1.3270	0.7930	1116	-1.67	0.0945
Student: Special Education	-4.2625	0.8483	1116	-5.02	<.0001

Random Effects		
Variance Component	Estimate	ICC
Level 2 – School	1.416	.001
Level 1 – Student	144.09	

Random Effects (From Unconditional Model[a])		
Variance Components	Variance	ICC
Level 2 –School	2.126	.011

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Level 1 – Student	191.23	(24.7% level 1 variance explained by covariates)

a) The unconditional model is a two-level model with students (level-1) nested in schools (level-2) and only an intercept term on the right-hand side of the model.

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Table A2

6th Grade Student Motivation; MRQ Scores: - Summary of Model Results

Fixed Effects					
Effect	Estimate	SE	df	t value	Pr>|t|
Intercept	3.1504	1.305	7	2.41	0.0466
School: KCCT reading scores, base year (spring 2006)	0.0051	0.004	807	1.25	0.2107
School: Percent white students	-0.017	0.010	807	-1.64	0.1009
School: Percent black students	-0.0253	0.015	807	-1.68	0.0938
School: Percent free/reduced lunch	0.0036	0.004	807	0.95	0.3421
School: Percent with disabilities	-0.0232	0.014	807	-1.60	0.1092
School: Average enrollment	8.913	0.0001	807	0.05	0.9607
Student: Fall MRQ scores	0.3571	0.034	807	10.41	<.0001
Student: Intervention class	0.0746	0.030	807	2.42	0.0156
Student: Gender, male	-0.0391	0.031	807	-1.23	0.2181
Student: Ethnicity, minority	0.0530	0.049	807	1.08	0.2827
Student: SES, free/reduced lunch	0.0333	0.0336	807	0.99	0.3221
Student: Special Education	-0.0127	0.035	807	-0.36	0.7207

Random Effects		
Variance Components	Estimate	ICC
Level 2 –School	0.004	0.019
Level 1 – Student	0.195	

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Table A3

9th Grade Student Achievement, NCE Score:-Summary of Model Results

Fixed Effects					
Effect	Estimate	Standard Error	df	t value	Pr>|t|
Intercept	34.3669	48.4645	5	0.71	0.5099
School: KCCT reading scores, base year (spring 2006)	0.0545	0.383	1109	0.14	0.8870
School: Percent white students	-0.3265	0.567	1109	-0.58	0.5653
School: Percent black students	-0.6074	0.503	1109	-1.21	0.2273
School: Percent free/reduced	0.0476	0.249	1109	0.19	0.8488
School: Percent with disabilities	1.0117	1.625	1109	0.62	0.5338
School: Average enrollment	-0.0074	0.017	1109	-0.43	0.6676
Student: Fall NCE scores	0.6283	0.049	1109	12.62	<.0001
Student: Intervention class	1.6852	0.785	1109	2.15	0.0321
Student: Gender, male	-0.1419	0.8032	1109	-0.18	0.8598
Student: Ethnicity, minority	-2.0685	1.375	1109	-1.50	0.1328
Student: SES, free/reduced lunch	-0.4319	0.8407	1109	-0.51	0.6075
Student: Special Education	-4.4435	0.932	1109	-4.76	<.0001

Random Effects		
Variance Components	Variance	ICC
Level 2 – School	3.094	.018
Level 1 – Student	171.34	

Random Effects (From Unconditional Model[a])		
Variance Components	Variance	ICC
Level 2 –School	0	0
Level 1 – Student	207.37	(17.4% level 1 variance explained by covariates)

a) The unconditional model is a two-level model with students (level-1) nested in schools (level-2) and only an intercept term on the right-hand side of the model.

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Table A4

9th Grade Student Motivation; MRQ Scores: - Summary of Model Results

Fixed Effects					
Effect	Estimate	SE	df	t value	Pr>|t|
Intercept	2.0876	1.465	5	1.42	0.2137
School: KCCT reading scores, base year (spring 2006)	-0.0155	0.046	689	-0.33	0.7401
School: Percent white students	-0.0078	0.017	689	-0.46	0.6486
School: Percent black students	-0.0041	0.016	689	-0.25	0.8035
School: Percent free/reduced lunch	0.0111	0.007	689	1.60	0.1110
School: Percent with disabilities	-0.0155	0.047	689	-0.33	0.7401
School: Average enrollment	0.0002	0.0004	689	0.40	0.6880
Student: Fall MRQ scores	0.1502	0.038	689	13.34	<.0001
Student: Intervention class	0.1193	0.034	689	3.45	0.0006
Student: Gender, male	-0.1193	0.035	689	-3.35	0.0008
Student: Ethnicity, minority	0.1346	0.057	689	2.36	0.0187
Student: SES, free/reduced lunch	-0.0677	0.036	689	-1.85	0.0642
Student: Special Education	-0.0713	0.041	689	-1.71	0.0869

Random Effects		
Variance Components	Estimate	ICC
Level 2 – School	0.000	0.000
Level 1 – Student	0.209	

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