Running head: FUSION READING INTERVENTION

A Randomized Controlled Trial of the Impact of the Fusion Reading Intervention on Reading Achievement and Motivation for Adolescent Struggling Readers

Ellen Schiller, Xin Wei, Sara Thayer, Jose Blackorby, Harold Javitz, and Cyndi Williamson

SRI International

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Correspondence concerning this article should be addressed to Ellen Schiller, SRI International, 1110 Wilson Boulevard, Suite 2800, Arlington, VA 22209. E-mail: ellen.schiller@sri.com

Abstract

This randomized controlled study examines the effects of an intervention, Fusion Reading, on the reading achievement and motivation of adolescent struggling readers. Fusion Reading was implemented in grades 6 through 10 in four middle schools and three high schools from three districts in the southeast and western Michigan. Eligible struggling readers were assigned randomly to the Fusion Reading intervention or a "business as usual" control condition which did not include additional reading instruction. Intervention students received the multicomponent, strategy-based Fusion reading intervention from trained teachers for one class period, 5 days a week, for a school year. Results indicated a statistically significant impact for the intervention on the Sight Word Efficiency subtest of the Test of Word Reading Efficiency (TOWRE), with an effect size (Glass Δ) of 0.11. Results are discussed in the context of previous reading intervention research findings with adolescents.

Keywords: randomized controlled trials, adolescent struggling readers, reading achievement, Fusion Reading intervention

The need for schools to focus on literacy during the adolescent grades is greater than ever. In 2011, 66% of fourth-grade and 70% of eighth-grade students were reading below proficiency on the National Assessment of Education Progress (NAEP) (National Center for Education Statistics, 2011). As many as one-third of fourth-grade students and nearly a quarter (24%) of eighth-grade students were reading even below the basic level. Low levels of literacy, as demonstrated by the NAEP, are alarming given reading demands inherent in academics and in the workforce (e.g., reading for comprehension, processing text to acquire and use information) (Kamil et al., 2008; Levy & Murnane, 2004). It is imperative that adolescents who struggle to read have access to effective, evidence-based interventions to succeed in school and in life.

Significant research has been conducted to understand and contribute to reading practice in the early grades (e.g., Reading First, No Child Left Behind), and although there are a plethora of reading interventions for adolescents, relatively few interventions have been subjected to rigorous tests (Kamil et al., 2008; Shanahan, 2006). In response, the U.S. Congress authorized funding for Striving Readers in 2006 and in 2009 through discretionary grants administered by the U.S. Department of Education.

The Striving Readers initiative was intended to increase adolescent literacy levels in Title I-eligible schools and to build a strong, scientific research base by identifying and replicating strategies that improve adolescent literacy skills. To participate, students had to be reading at least 2 years below grade level. The current study of the Fusion Reading intervention is one of eight projects funded in 2009 that spanned 2 years—1-year each of planning and of research. Although Fusion Reading was designed as a 2-year reading intervention, the current study

reports on findings for 1 year of Fusion Reading implemented under the Striving Readers initiative.[1]

Research on Adolescent Reading Interventions

Two frameworks on how skilled readers read contribute to the design of Fusion Reading. From the framework of the "Simple View of Reading," skilled reading requires both word-level reading skills and linguistic comprehension (Gough & Tunmer, 1986; Hoover & Gough, 1990). Weakness in either component impairs reading. Hock et al. (2009), for example, found that over 60% of the 8th and 9th grade students reading at or below the 40th percentile struggled with all examined domains of reading, including decoding, word recognition, vocabulary, fluency, and comprehension. From a metacognitive framework, skilled reading is strategic in the sense that proficient readers are purposeful in what and how they read (Baker & Brown, 1984), and enlist a repertoire of strategies to construct meaning from text (Paris, Wasik, & Turner, 1991). Thus, strategy-based interventions targeting multiple outcomes, including comprehension, are likely to be most effective for the adolescent reader.

Two recent meta-analyses provide evidence that strategy interventions targeting multiple outcomes tend to be highly effective. Edmonds and colleagues (2009) conducted a meta-analysis with 17 experimental and quasi-experimental studies for students between 6th and 12th grades and found that the two largest effect sizes were for interventions targeting reading comprehension (1.23) and multiple-component interventions targeting multiple outcomes, including reading comprehension (0.72). Although not as large as the other outcomes, Edmonds also found a moderate effect size for word study interventions (0.34), but not for fluency interventions (-0.03).

[1] The original intent was to fund the projects for 4 years (i.e., 1 planning and 3 implementation years). Funding was not authorized by U.S. Congress to support the remaining years of the study.

Scammacca et al. (2007) examined 16 studies in addition to Edmonds et. al's studies. Whereas Edmonds study weighted standardized measures more heavily than non-standardized outcome measures in their effect size composites, Scammacca was more specific in reporting effect sizes by outcome measure type, and reported them as follows: 1) all outcome measures, 2) standardized outcome measures, 3) all reading comprehension measures, and 4) standardized reading comprehension measures. The largest effects for all standardized outcome measures were found for word study (0.68), comprehension (0.56), and multiple-component interventions (0.41). Fluency had the lowest effect size (0.04). When examining effect sizes for standardized reading comprehension measures (rather than more general standardized reading measures), Multiple-component interventions had the largest effect size (0.59), followed by comprehension (0.54) and word study (0.40) interventions. Again, fluency interventions had a small and negative effect size (-0.07). Additionally, they report that for standardized reading comprehension outcome measures, the strongest effects were found for middle schools students (0.47) versus high school students (0.14). Researcher-implemented interventions also had a comparatively large effect size (1.08) in comparison with teacher-delivered interventions (0.21) on all standardized outcome measures. Edmonds (2009) and Scammacca's (2007) meta-analyses suggest that for adolescents, the most effective interventions are ones that target either comprehension or multiple areas of reading.

Strategy-based interventions. Strategy-based interventions aim to teach students procedures or steps for solving problems while reading and understanding text (e.g., identifying unfamiliar words, decoding words) (Mayer, 1987). Strategies may be cognitive in nature (e.g., paraphrasing, questioning), metacognitive (e.g., comprehension monitoring), or behavioral (e.g., using a dictionary to look up words) (Almasi, 2003). The ultimate goal is not to "teach strategies," but

rather to teach students to be strategic in their reading. That is, they are skilled in making decisions about which procedures should be implemented while reading text. Strategy-based programs differ in the way in which strategies are presented to students, such as the number of strategies or the ways in which strategic knowledge is acquired through direct or indirect teaching methods (Lenz & Hughes, 1990).

Many of the multistrategy interventions available today are founded in single strategy interventions that have been developed and tested throughout the past three decades. One example of such a single-strategy intervention is the Word Identification Strategy, which aims to increase decoding of common, multisyllabic words through a 7-step mnemonic process for identifying words (Lenz & Hughes, 1990). Using a single subject design, Lenz and Hughes found notable decreases in the number of word identification errors. This Word Identification strategy eventually became part of other multistrategy interventions such as found in Xtreme Reading (Schumaker et. al., 2006) and Fusion Reading (Brasseur, Hock, & Deshler, 2010a , 2010b, 2010c; Hock, Brasseur, & Deshler, 2010a, 2010b, 2010c, 2010d, 2010e).

In the aforementioned meta-analysis by Edmonds and colleagues (2009), they note that several of the experimental, single-strategy intervention studies they reviewed yielded large effect sizes, particularly strategies that teach how to use graphic organizers (ES = 1.68 for producing relational statements) and strategies that teach how to find main ideas in text (ES = 2.23 for producing main idea statements). They point out, however, that in many of these studies used outcome measures that were researcher-developed and closely aligned with the very learning strategies they intended to measure. Gersten et al. (2001) also noted in their review of reading comprehension research for students with learning disabilities that, although single-strategy interventions tended to have greater impacts for certain skills (e.g., reorganizing

expository text, self-questioning, using a mapping organizer, and direct instruction for summarizing text), transfer could not be confirmed due to the small number of studies. Thus, the degree to which single-strategy interventions may be generalized is questionable.

Over the last few decades there has been a noticeable movement away from single-strategy approaches (Pressley, Harris, & Marks, 1992) and a movement toward creating and using multistrategy interventions. Often these multistrategy interventions build on single-strategy interventions by combining strategy instruction and taking a more flexible approach to teaching (Gersten et al., 2001). One example of a multistrategy approach is reciprocal teaching, in which a dialogue occurs between teachers and students about the text in the context of summarizing, question generating, clarifying, and predicting (Palinscar & Brown, 1984, 1986). In isolation, summarizing, questioning, clarifying, and predicting likely all are effective; however, in multistrategy interventions, it is the integration of the singular strategies in a meaningful way that distinguishes the intervention as a formal intervention and not a compilation of individual strategies.

Several veins of research have aimed to develop strategy-based interventions to improve reading outcomes. One such example is Deshler et al.'s (2002) Learning Strategies Curriculum (LSC). The LSC aims to improve adolescent reading achievement through strategy use and increased motivation for reading using a standardized eight-step instructional process that covers three strands (Cantrell, Almasi, Carter, & Rintamaa, 2011; Cantrell, Almasi, Carter, & Rintamaa, Madden, 2010; Center for Research on Learning, n.d.). The three strands include information acquisition, studying information once it is acquired, and expression of oneself through writing. A recent randomized control trial study of the LSC with sixth- and ninth-grade students found that in the first year of the study, there was a significant, medium effect size for 6th grade

students (0.22), but not for 9th grade students (0.08) (Cantrell et al., 2010). Across all three years of the study, however, the impacts yielded a small, significant effect (0.08) for sixth-grade students and a small, but significant, effect size (0.15) for ninth-grade students on a standardized measure of reading comprehension (Cantrell et al., 2011). Effects were stronger for students in general education (0.19) than special education (-.07, ns) and a significant effect of the LSC on motivation for reading for both sixth- and ninth-grade students (0.11) across all three years. Unfortunately, evaluations of other similar, strategy-based interventions are scarce.

A Description of Fusion Reading

Fusion Reading is a supplemental reading intervention designed for middle and high school students who score at least 2 years below grade level on standardized reading measures (Brasseur, Hock, & Deshler, 2010a , 2010b, 2010c; Hock, Brasseur, & Deshler, 2010a, 2010b, 2010c, 2010d, 2010e). It builds upon and shares the evidence behind the work of the Strategic Instruction Model's Learning Strategies Curriculum and Xtreme Reading[2] by integrating some of the same strategies, focusing on reading, and extending the time frame from 1 to 2 years in duration.

Fusion is a fully developed instructional package with a specific curricular scope and sequence of high-leverage reading strategies within a framework focused on strategies for teaching comprehension and vocabulary, and for increasing motivation for reading. The 2-year scope and sequence, instructional routines, and materials are described below. The developers (Brasseur, Hock, & Deshler, 2010a , 2010b, 2010c; Hock, Brasseur, & Deshler, 2010a, 2010b, 2010c, 2010d, 2010e) recommend no more than 15 students per class. Struggling students are enrolled in the supplemental intervention for one class period for 5 days a week.

[2] Xtreme Reading is a 1-year, supplemental intervention founded in strategic instruction (Shumaker et al., 2006).

Curriculum scope and sequence. There are nine units and a student project: (1) the *Establish the Course* unit provides students with rationales for the course, an overview of course content, and expectations for classroom management; (2) the *Prediction Strategy* unit explicitly teaches students the first reading comprehension strategy, and students learn how to preview reading selections, link prior knowledge to the subject, make predictions and inferences about content, and evaluate reading to answer student generated questions and predictions; (3) the *Possible Selves* unit surfaces long-term future goals and establishes action plans that link attainment of personal goals to reading proficiency; (4) the *Bridging Strategy* unit provides instruction in advanced phonics, decoding, word recognition, and reading fluency; (5) the *Strategy Integration* unit teaches students how to integrate prediction, bridging, and vocabulary strategies and provides students with opportunities to apply integrated strategies to reading content area textbooks; (6) the *Summarization Strategy* unit teaches students to summarize small sections of books, chapters, and some longer passages; (7) the *Strategy Integration* unit continues teaching and providing opportunities for students to practice integrating strategies and applying them to reading; (8) the *PASS the Test* unit teaches students a reading strategy they can use to do well on standardized tests; (9) the *Advanced Strategy Integration* unit continues teaching and providing opportunities for students to practice integrating strategies and applying them to reading; and (10) students do a final Fusion Reading intervention project to apply the reading strategies they have learned.

Instructional routines. Routines take place as follows. (1)Warm-Ups (3 to 5 minutes): students are engaged in an activity at the beginning of class to provide a connection to class readings and key strategies; (2) Thinking Reading (5 to7 minutes): a structured process in which the teacher demonstrates expert reading behaviors provides an opportunity for students to

participate in the process; (3) Explicit Instruction (30 minutes): for each strategy, teachers describe, explain, and model specific metacognitive steps of the strategy; students verbally practice the steps of the strategy and practice using the strategy first with materials at their instructional level and later with increasingly difficult materials; students receive elaborated feedback from the teacher until they gain proficiency and are able to use the strategy in a generative way and apply the strategy to assignments in a wide variety of materials and settings; (4) Vocabulary (10 minutes): explicit vocabulary instruction follows a seven-step vocabulary process; and (5) Wrap-up (5 minutes): students review the lesson.

Teacher manuals. Fusion lesson formats were provided for either 90-minute block or 54-minute class schedules and include multiple instructional activities such as whole class explicit instruction, guided practice, partner practice, and teacher-led individualized instruction. Each lesson plan comes with a 1-page overview that includes learning objectives; a lesson-at-a-glance chart with approximate time needed for each activity and a short description of activities for the lesson and required materials; an example lesson script for each lesson that consists of a detailed, step-by-step process model of the lesson with both written and visual cues; and the materials necessary to teach the lesson, such as strategy cue cards, reading passages, assessment score sheets, and progress charts and graphs. Progress assessment forms and answer sheets are provided at the beginning and end of each Fusion Book, and formative assessment activities are available during partner and individual practice sessions throughout each unit.

Student workbooks. Workbooks are available for The Bridging Strategy, Prediction Strategy, and Summarization Strategy. Age appropriate trade novels and short stories (e.g., Bluford High School Series from Townsend Press) and over 110 short expository passages (about 400 words each) are included in Fusion materials.

Research Questions and Logic Model

The purpose of the current study was to evaluate the effectiveness of the 2-year Fusion Reading intervention after 1 year of implementation for 6th- through 10th-grade students in three public school districts in Michigan.[3] Specifically, the study addressed the following:

1. What are the intent-to-treat impacts of the Fusion Reading intervention on the reading outcomes and motivation to read of struggling readers after receipt of 1 year of the intervention?
2. For which students are the interventions most and least effective?
3. In what ways are implementation factors associated with impacts (or lack of impacts) on reading and motivation outcomes?

For the evaluation of the Fusion Reading intervention, we created a logic model that frames the research questions and hypotheses and guides the choice of implementation and student outcome measures and analysis approach.

<Figure 1 here>

The model distinguishes between short- and long-term student outcomes, as the model hypothesizes that there are mediating student outcomes (e.g., coverage of the content and attendance-related outcomes) that affect long-term outcomes (e.g., increased motivation to read, increased reading proficiency on standardized outcome reading measures). The intervention inputs include professional development provided to administrators and teachers during face-to-

[3] Although there is some promising evidence that Fusion Reading is effective when used with adolescent students, the studies are limited by the study design (e.g., a pre-post design, nonequivalent groups at baseline for a quasi-experimental design or only one school included in the experimental study).

face workshops, in class coaching and coaching via video chats with the developers,, and student assignment to Fusion classes.

Methods

Study Design

Four middle schools and three high schools from three districts in the southeast and western suburban areas of Michigan participated in the Fusion Reading Intervention Study in the 2010-11 academic year. Blocking on schools and grade level, students in grades 6 through 10 were randomized to either the intervention or control condition. Both Fusion and control students participated in regular English language arts (ELA) classes at their school. However, students in the intervention condition received Fusion Reading as a supplemental reading intervention in the 2010-11 school year, whereas students in the control condition engaged in nonliteracy activities. Both Fusion and control students participated in regular English language arts (ELA) classes. This study examined the intent-to-treat effect of the Fusion Reading intervention on student reading achievement, including performance on the state accountability test and motivation, as well as the treatment-on-the-treated effect of fidelity of implementation on student outcomes.

Participants

Michigan State Department of Education recruited schools for this study by inviting seven schools based on district and school improvement goals, the school need to improve the reading skills of its students, and their willingness to participate in a randomized control study at the student level. The seven participating schools ranged in their enrollment from 400 to 1,400 students. The percentage of students eligible for free or reduced-price lunch ranged from 51% to 96%. Across the seven schools, the percentage of students reading below proficiency on the 2009

Michigan Educational Assessment Program (MEAP) reading test ranged from 26% to 61%, with an average of 42%.

Determining student eligibility. Students in each of the schools had to meet the following criteria to be eligible to participate in this study. They had to score between the 5th to 35th percentiles on the Test of Silent Contextual Reading Fluency (TOSCRF).[4] Students were excluded if they were (a) identified as a student with a severe cognitive disability, or (b) a Level-1 English language learner (ELL),[5] or (c) a recipient of any other reading interventions as required by an IEP. Of the 2,109 students screened, 871 students were found to be eligible for the study (41.2%).

Fusion teachers. Schools followed district procedures to hire nine intervention teachers. Fusion developers from the University of Kansas Center for Research on Learning (KU-CRL) submitted a description of the necessary skills and knowledge most often required by teachers who had been successful implementing the Fusion Reading intervention to each school principal to guide their hiring decision. Two teachers were hired for each of the two large high schools and one teacher was hired for each of the other schools. Throughout the year, the KU-CRL trained the teachers to deliver the intervention via face-to-face professional development and on-site coaching. These nine teachers taught Fusion to the treatment students, and did not provide any

[4] The Test of Silent Contextual Reading Fluency (TOSCRF) is a nationally normed reading fluency test with test-retest reliability ranging from .85 to .88 across four different test forms. Moderate criterion validity has been established for TOSCRF, as the correlations between TOSCRF with Wechsler Intelligence Scale for Children-Third Edition, 1991, Stanford Achievement Test Series-Ninth Edition, 1996, or Woodcock Johnson III, 2001 are reported to be.50, .56, and .68 respectively. It is quick to administer and has been used in a number of research studies (Hammill, Wiederholt, & Allen, 2006).

[5] Level-1 ELLs are ELLs with limited formal schooling who recently arrived in school, have not been assessed with the Michigan English Language Proficiency Tests or other placement tests, or ELLs who have preproduction or early production English skills.

literacy services to control students in the participating schools. The original nine teachers were female, 44 % were white and 56% were African American. Their average years of experience were 9 years. Seven of the nine teachers had certification in ELA, and two had a reading specialist certification; five had master's degrees, and two had bachelor's degrees. All teachers had previous experiences teaching struggling readers. Of the nine teachers hired, one resigned in December, was replaced initially by a substitute teacher, and then replaced by a teacher in February who resigned in early April after the Striving Reader funds for Year 2 were cut.

Teacher training. In Year 1, Fusion trainers provided 9 days of professional development for teachers plus, on average, 40 hours of coaching for teachers; and 2 days for administrators with a 2-day orientation session in late spring of planning year (teachers and administrators using print and video materials. In Year 1, teachers were trained to use the following strategies: Establish the Course, Prediction Strategy, Possible Selves Motivation Strategy; Strategy Integration I, and an introduction to the Summarization Strategy. Students in the intervention condition received daily instruction on these reading strategies. Fusion Reading intervention was scheduled between 48 and 60 minutes daily for schools on a semester schedule and between 70 and 73 minutes daily for schools on a trimester schedule.

Parent consent. Schools informed parents about their student's potential for participation in the study by sending them a passive consent form in both English and Spanish prior to randomization. One student's parents refused participation prior to randomization and four refused participation after randomization.

Random assignment procedure. Eligible struggling readers with parent consent were randomly assigned to either Fusion Reading or a non-literacy, elective course. We constructed strata on the basis of the following two factors: school (seven levels) and grade levels (grade 6,

7, or 8 for middle schools and grade 9 or 10 for high schools). Students within each stratum were randomly assigned to Fusion or control conditions, resulting in 367 students in the treatment condition and 389 in the control condition (see Figure 2). Stratifying techniques can effectively remove 90% of the bias due to the stratifying variables and ensure the number of treatment and control group students are closely balanced within each stratum (Shadish et al., 2002).

<Figure 2>

Random assignment monitoring. Random assignment was monitored in three ways: (1) The Fusion Reading teachers were required to enter attendance data for their students each day. When changes were made to classroom assignment, teachers notified the evaluation team of the change and the reason for the change (e.g., student moved). In instances where the reason was unknown, the principal or school contact was asked to investigate the matter and place the student back in the class when possible. (2) Class rosters were also requested from the Fusion Reading teachers every quarter or trimester so that researchers could follow up on discrepancies from original classroom composition. (3) School rosters and class schedules were obtained at least twice per year for all students to confirm that the control students remained at the school and that neither treatment nor control students were participating in any literacy-related courses. Similar procedures of contacting the school contact were followed for any discrepancies with the treatment or control conditions.

Student Outcome Measures

The researchers hired and trained local data coordinators to collect student outcome data. Local data coordinators were blind to students' experimental condition at the time of assessment. Three tests were administered at pretest and posttest, as described below.

TOWRE. The TOWRE has two subtests: Sight Word Efficiency (SWE) and Phonetic Decoding Efficiency (PDE). SWE measures the number of real printed words that a student accurately reads within 45 seconds (Torgesen, Wagner, & Rashotte, 1999). PDE measures word recognition skills, which count the number of pronounceable, printed nonwords that a student can accurately decode within 45 seconds (Torgesen et al., 1999). The correlations between SWE and PDE with DIBEL nonsense word fluency measure are 0.73 and 0.75, respectively (Hagan-Burke, Burke, & Crowder, 2006). PDE also has a correlation of 0.85 with the Word Attack subtest of the Woodcock Reading mastery Tests-Revised (WRMT-R) and a correlation of 0.89 with the Sight Word efficiency subtest and the Word Identification subtest of the WRMT-R. We used the standard scores for each subtest in the analysis.

GRADE. The Group Reading Assessment and Diagnostic Evaluation (GRADE) is a norm-referenced, standardized diagnostic reading test. The GRADE for secondary students includes sentence comprehension, passage comprehension, vocabulary, and listening comprehension (Williams, 2001). The GRADE is an untimed test, but adolescents usually complete it in about 40 minutes. The Passage Comprehension subtest requires the participant to read graded passages and to respond to comprehension questions. The Sentence Comprehension subtest uses a cloze task in which the student reads a sentence and chooses the appropriate word for a blank space. The Vocabulary subtest assesses decoding and word-level understanding. Students are presented a short phrase or sentence with a target word followed by five choices. This study did not administer the listening comprehension subtest. The GRADE has high internal reliabilities, ranging from 0.95 to 0.99 for each form, level, and grade group. In addition, the GRADE correlates at 0.86 to 0.90 with the Gates-MacGinitie Reading tests, at 0.82 to 0.87 with the

reading tests of the California Achievement Test and at 0.69 to 0.83 with the Iowa Test of Basic Skills. We used the standard scores for each subtest in the analysis.

MEAP reading. Michigan's MEAP reading achievement test is a criterion-referenced high-stakes accountability test administered to students in grades 3 through 8. States set student performance standards, often called annual yearly progress, by which schools are held accountable. The reliability of MEAP reading tests ranges from 0.81 to 0.90 across grades (Chianca & Coryn, 2006). MEAP reading test reports scale scores and performance levels for each student. Since the MEAP reading test is not vertically aligned, different grades cannot be compared directly. Therefore, MEAP reading scores were converted to Z-scores for sixth- and seventh-graders using population mean and standard deviation for each grade level as reported by MDE. Z scores indicate the number of standard deviations above or below the state average for a particular grade (Rivkin, Hanushek, & Kain, 2005). This study used Z-scores as the MEAP reading outcome variable in the analysis.

Motivation measure. Student motivation for reading was assessed with the Children's Academic Intrinsic Motivation Inventory (CAIMI) Reading subtest (Gottfried, 1998). The CAIMI was developed to measure enjoyment of learning in the subject areas of reading, math, social studies, science, and school in general. For older adolescents, the coefficient alphas for the subject area subscales range from 0.93 to 0.95; coefficient alpha for the school in general subscale is 0.91 (Gottfried, 1998). Subject area subscales and the school general subscale are similar for elementary and middle school students. Thus, the instrument has substantial internal consistency. Construct validity of the CAIMI has also been reported throughout the schools years (Gottfried, 1985, 1986, 1990, 1998). CAIMI reports T scores and percentile scores. This study used T scores from the CAIMI reading subtest for the analysis.

Fidelity of Implementation Measures

Curriculum coverage. According to the developers of Fusion Reading, teachers should cover at least 5 of the 10 lessons within two semesters or two trimesters of teaching the curriculum (both of which contain approximately the same amount of allocated classroom time) in Year 1 of the 2-year intervention:[6] (1) Establish the Course, (2) Prediction Strategy, (3) Possible Selves, (4) Strategy Integration I, and (5) Bridging Strategy. Curriculum coverage proportion was calculated as the number of strategies covered by the teacher relative to the total number of lessons teacher should have covered during the first year of Fusion implementation.

Fusion dosage rate. The developers (Brasseur et al., 2010; Hock et al., (2010) suggested that to maximize the full potential of the Fusion Reading intervention, classes need to be scheduled daily, students should attend at least 80% of the allocated class time and class size, schools should on average enroll 15 students per class. In order to better understand whether the amount of exposure to the curriculum influences growth in reading, the researchers developed an online data system for teachers to enter the actual time students attended classes in lieu of school attendance records, which would not capture the time students left class early for various extracurricular activities. Eight of the nine teachers recorded the amount of time each student attended Fusion class each day. Records were not available from the teacher that left midyear. A student's dosage rate was calculated as the proportion of time a student was present in class relative to the total number of allocated class minutes.

Statistical Analysis

[6] The schedules of the schools differed: two schools were on a trimester schedule, and the remaining schools scheduled classes two semesters in a year. Developers adapted the Fusion pacing schedule to accommodate both types of school schedules.

Intent-to-treat analysis (ITT). ITT is the average effect of the treatment based on the initial treatment assignment regardless how many participants actually received the treatment.[7] The ITT analyses present the impact of assignment of Fusion instead of the impact of Fusion on students who received to Fusion. The ITT impact estimate is the expected effect of Fusion when it was implemented in the real world, with less than perfect teacher implementation and student dosage. Hierarchical linear modeling (HLM) was performed to take into account of students nested in schools. Dependent variables were reading achievement measures (TOWRE and GRADE) and reading motivation (CAIMI). Independent variables included a constant, pretest scores, demographic characteristics, and treatment indicator. The HLM model for treatment effects is as follows: $Y_{ik} = \beta_{00} + \beta_{01}Fusion + \beta_{02}(COV_{ik} - COV...) + e_{ik} + \mu_{0k}$, where Y_{ik} is outcome of student *i* in school *k* at posttest. *Fusion* indicates initial random assignment with 1 for intervention and 0 for comparison. The coefficient β_{01} associated with Fusion in the above HLM model indicates the average treatment effect in promoting improved student outcomes. COV_{ik} are the covariates (pretest and demographic characteristics) and they were centered by mean. β_{02} are coefficients associated with each covariate. e_{ik} is student random effect, and μ_{0k} is school random effects.

Sensitivity analyses were conducted to check the robustness of the impact of Fusion across different specifications of the models. HLM was conducted on the data with and without imputed independent variables controlling for demographic characteristics (i.e., gender, race, grade level, and disability status), which leaves four sets of models for each outcome. A dummy variable adjustment imputation approach was used, which sets the missing pretest scores to zero and adds

[7] Although Fusion Reading intervention program is intended as a 2-year intervention, due to funding changes this study only lasted for a single year. The focus of the analysis is on 1-year effect of this intervention

a dummy variable to indicate missing in the impact model (Puma, Robert, Stephen, & Cristofer, 2009).

Effect sizes are reported as Glass's Δ (Glass, 1977) and calculated by dividing the intervention indicator coefficient by the standard deviation of control group. The improvement index (What Works Clearinghouse, 2008) is also reported, which translates the effect size into an improvement in percentile rank. The improvement index indicates the expected change in percentile rank for the median comparison students if that student had received the Fusion Reading intervention.

The analysis of the outcomes is organized by following the WWC beginning reading and adolescent literacy domain classifications (What Works Clearinghouse, 2010). The TOWRE SWE and PDE are two measures within the alphabetics domain. GRADE sentence comprehension, passage comprehension, and vocabulary are in the comprehension domain. MEAP reading belongs to general reading achievement domain. To limit the family-wise false discovery rate, the Benjamini-Hochberg (BH) approach was utilized to correct for multiple comparisons (Benjamini & Hochberg, 1995) across multiple outcomes within the same domain(What Works Clearinghouse, 2008). For example, in the alphabetics domain, which includes two alphabetic measures (TOWRE SWE and PDE), the BH approach was used to control the false discovery rate at 0.05 (Benjamini & Hochberg, 1995).

Since in previous studies, a similar multistrategy-based intervention worked to improve reading skills of sixth-graders but not ninth-graders (Cantrell, Almasi, Carter, Rintamaa, & Madden, 2010). This study conducted exploratory analysis on whether Fusion improved the achievement of students in certain grade levels but not others. HLM models were used to estimate the impact of Fusion for students in sixth through tenth grade.

Treatment-on-the-treated analysis (TOT). Although the ITT analyses suggest the average effect of an intervention, it does not yield the effect of the intervention for those students who actually received the intervention. This study used two approaches to estimate the effect of treatment on the treated. The first is the instrumental variable approach. Because random assignment is correlated with the fidelity of implementation measures (since control students have a value of zero for each implementation measure) but uncorrelated with the error term in the outcome equations, the treatment assignment indicator variable works as an instrument to represent fidelity of implementation (Gennetian, Morris, Bos, & Bloom, 2005). A two-stage, least-square model was executed to estimate the TOT. The first-stage is $Fidelity_{ik} = \beta_{00} + \beta_{01} Fusion + \beta_{02}(COV_{ik} - COV...) + e_{ik}$, where there were three sets of fidelity measures: (1) percentage of curriculum completed, (2) percentage of time a student participated in Fusion classes over the course of a year, or (3) whether a student participated 80% or more of the Fusion classes in a year which is the recommended dosage by developer of Fusion Reading. The second-stage equation is $Y_{ik} = \beta_{00} + \beta_{01} predFidelity_{ik} + \beta_{02}(COV_{ik} - COV...) + e_{ik} + \mu_{0k}$, which regressed student outcome on the predicted value of fidelity from the first stage. β_{01} associated with predicted fidelity is the estimated TOT of Fusion.

The second approach used propensity score methods to select comparison students for the high student dosage group and for the low student dosage group. The logic of the propensity score methods was to select control students that, based on baseline measures of pretest scores, reading motivation, and demographic characteristics, would have had a similar chance of attending Fusion classes 80% or more of the time, but did not (Unlu et al., 2010). Seven parametric and nonparametric propensity score methods (exact, stratified, nearest neighbor, optimal, full, genetic, coarsened exact matching) were executed using an R package, *MatchIt*

(Ho, Imai, King, & Stuart, 2007). We applied multiple quantitative and graphic methods to examine the relative merits of all seven methods and selected the full method because it achieved the best baseline equivalence on covariates and also preserved the largest sample size. See Appendix, Table A-2, for details of the model selection. After the comparison students were selected, the difference between the high curriculum covered group and their matched comparison group was estimated on each of the student outcomes. The same analyses were also conducted for the low student dosage group (< 80%) and their matched comparison students on all outcomes.

Results

Attrition Analysis

Although randomizing students to conditions should result in statistically equivalent groups, higher overall level of attrition and differential attrition between treatment and control groups may jeopardize the initial balance and impact estimate may be biased (What Works Clearinghouse, 2008). Data analysis began with an attrition analysis. Treatment group attrition rate was 24%, control group attrition rate was 25%, and the differential attrition rate was 1%. According to the WWC standards (2008), the overall and differential attrition rate is low for this study.

Baseline Equivalence Analysis

After the attrition analysis, a descriptive analysis was conducted for students in the analytic sample, those who had both pretest and posttest. Table 1 presents the student background characteristics (gender, race, or disabilities), pretest scores, and baseline equivalence test results of the participants in the intervention and comparison groups. For continuous student outcome variables, the statistical significance of the difference between the two groups at baseline was

determined from HLM analysis. For dichotomous demographic variables, statistical significance was determined by using a Chi-square test. Fusion participants were not significantly different from control students on demographics or baseline reading measures; however, a non-significant difference favored control students on CAIMI (t = -1.89, p = .059.

<Table 1>

Intent-To-Treat Analysis Results

Primary estimates of the Fusion impacts were derived from the ITT analyses. Regardless of the level of curriculum coverage and student Fusion dosage rate, these analyses compared all students who were randomly assigned to Fusion (who were intended to receive the treatment) to those who were randomly assigned to the control condition.

Table 2 demonstrates that the Fusion Reading intervention was successful in improving sight word efficiency and sentence comprehension skills of students who were randomly assigned to receive Fusion classes as compared with those who were assigned to control condition. Fusion students had significantly higher TOWRE SWE ($p < 0.05$, effect size = 0.10) and GRADE sentence comprehension ($p < .05$, effect size = 0.15) at posttest than comparison group students under Model D. Fusion students achieved an average percentile ranking that was approximately 4 or 6 percentile points higher than the ranking of the average student in the comparison group on SWE and sentence comprehension, respectively. The effect of Fusion on the TOWRE SWE is the only outcome that remained significant after BH correction. No other student outcomes were found to have a statistically significant effect.

<Table 2>

Sensitivity analyses were conducted to examine whether the effect of the Fusion reading intervention was consistent across different model specification (Model A through D). The

Fusion effect was consistent across four different model specifications. For example, the significant positive effect of Fusion on TOWRE SWE persisted regardless of whether or not we controlled for student background characteristics or whether or not we imputed pretest scores. The positive effect of Fusion on GRADE sentence comprehension was also consistent across the four models.

To understand the overall impact findings, an exploratory subgroup analysis was performed to determine if Fusion had an impact for students in grades that aligned with previous research. Grade-level differences were found.

Table 3 shows the impact of Fusion for each grade on each student outcome. Fusion students in grade 6 had higher SWE scores ($p < .05$, effect size = 0.17, improvement index = 7) and higher MEAP reading scores ($p < .10$, effect size = 0.15, improvement index = 6) than control students in the same grade. Fusion students in grade 8 had higher GRADE sentence comprehension scores ($p < .10$, effect size = 0.72, improvement index = 26) than control students in the same grade. Fusion participants in grade 9 scored higher on their motivation to read ($p < .05$, effect size size = 0.34, improvement index =13) but scored lower on PDE skills ($p < .05$, effect size = -0.20, improvement index = -8), as compared with control students in the same grade. Note that due to the small sample size for the subgroup analyses, these subgroup analyses are underpowered.

<Table 3>

Treatment-On-the Treated Analysis Results

We hypothesized that the impact of Fusion on reading outcome was dependent upon the amount of curriculum covered by the teachers and by the dosage. Table 4 documents Fusion teachers' curriculum coverage and Fusion students' dosage rate. In Year 1, Fusion teachers, on

average, covered 73% of the curriculum and, only 33% of them met the criterion set by the developer— 80% or more of the curriculum should be covered by the teacher. In Year 1, Fusion students attended 73% of the Fusion classes, and only of a 57% of them met the required dosage criteria set by the developer—relative to the allocated time for the class, students attended 80% or more of the class time. For the sample of students who had both MEAP data and fidelity data (n = 229), none of the treatment teachers reached the 80% curriculum coverage criterion, and only 60 Fusion students reached the required 80% dosage rate. Therefore, an insufficient sample was available to conduct the treatment-on-the treated analysis using the MEAP reading outcome.

<Table 4>

Two approaches were used to examine the effect of Fusion on the students who actually received the treatment: (1) instrumental variable and (2) propensity scoring. Both methods are applied in the field, and the results from one method can verify the results from the other method (Table 5). For the instrumental variable approach, the first stage F statistics were all significant at the $p < .001$ level, suggesting that treatment assignment was a valid instrument for the implementation variables. Fusion students whose teachers covered more Fusion curriculum achieved higher scores on TOWRE SWE ($p < .05$) and GRADE sentence comprehension ($p < .05$) than students whose teachers covered less Fusion curriculum. A one standard-deviation increase in the curriculum coverage rate increased the intervention effect on SWE scores by a 0.02 standard deviations and on GRADE sentence comprehension scores by a 0.04 standard deviations. Results also suggested statistically significant effects of students' Fusion dosage rate on GRADE sentence comprehension. A one standard-deviation increase in Fusion dosage resulted in a 0.06 standard deviation increase on GRADE sentence comprehension. Students with an 80% or more dosage rate outperformed those with less than 80% dosage rate by 0.29 standard

deviation on GRADE sentence comprehension ($p < .05$, effect size = 0.29).[8]

<Table 5>

The results using propensity scoring methods to select control students who were similar to students in the high Fusion dosage group indicated a 0.11 standard deviation improvement on TOWRE SWE ($p < .05$, effect size = 0.11, improvement index = 4). As compared with similar students in the control condition, students with less than an 80% dosage rate showed a 0.08 standard deviation increase in TOWRE SWE ($p < .05$, effect size = 0.08, improvement index = 3). Beyond the ITT effects of Fusion Reading intervention, the instrumental variable approach and propensity scoring approach both suggested a substantial mediating effect of student Fusion dosage rate and TOWRE SWE. The results of TOT and ITT results are confirmatory, as both indicated a strong effect of Fusion on improving students' sight word efficiency skills.

Discussion

We designed this randomized controlled trial to rigorously study the effects of the Fusion Reading intervention on adolescent students. Stratifying by school and grade, 581 students who read between the 5th and 35th percentile on a standardized measure and attended four middle and two high schools were randomized to a treatment or non-literacy comparison condition. After implementation of one-year of the two-year reading intervention, students in the treatment condition significantly outperformed students in the comparison classes on a standardized word reading efficiency measure, the TOWRE, with an effect size of 0.11. Effect sizes on the GRADE sentence comprehension outcome were notable, although mean differences between treatment-control groups fell short of significance after adjusting for multiple comparisons.

[8] Mean of 137 Fusion students with an 80% dosage rate was 7.62 with *SD* of 4.05. Mean of 102 Fusion students with less than an 80% dosage rate was 6.91 with *SD* of 3.28.

Considering the rigor of the study design and analysis, the challenge of positively impacting standardized reading outcomes with older struggling students, particularly with a teacher-implemented intervention (versus a researcher-implemented intervention) and in only one year of the two year intervention, the study results are encouraging.

Results align with previous research on grade level effects. First, middle school students are more likely to benefit from one year implementation of multi-strategy reading interventions than students in grades 9 and 10 on a standardized reading outcome measure. Although underpowered and therefore considered an exploratory analysis by grade, 6th grade Fusion students outperformed comparison students on word reading efficiency and Michigan's state accountability measure in reading, and eighth-grade Fusion students outperformed comparison students on a standardized sentence comprehension measure. Similarly, Cantrell et al. (2010) examined the effects of the Learning Strategies Curriculum (LSC) on 6th and 9th grade students reading comprehension after one implementation year, finding impacts for 6th grade students but not the 9th graders on a standardized measure of reading comprehension, as measured by the GRADE. Developed by the University of Kansas' Center for Research on Learning, the LSC is a strategy based curriculum that includes the same strategies to Fusion Reading such as word identification, paraphrasing, vocabulary, and summarizing, but also expands the strategies to assist students with written expression. Our results are also consistent with Scammacca et. al. (2007) who found that interventions (which tended to be mulitstrategy) yielded larger effect sizes for middle school students (0.47) than high school students (0.14) on standardized reading measures. The consistent finding of differential effects of reading interventions that tend to be strategy-based across middle and high school grades suggest that strategy-based interventions might be more helpful in improving reading skills of middle school students than high school

students in the short term. This highlights the challenges in raising the achievement levels in high schools. Future research and policy needs to examine new ways to raise reading skills of high school struggling readers.

Although teacher implemented effect sizes are often smaller than researcher implemented interventions (Scammacca et al., 2007), the magnitude of the effect size for teacher implementation of Fusion on word reading was comparable to Scammacca's et. al findings (0.11 versus 0.21, respectively) for standardized reading outcomes for teacher-delivered interventions. In general, this study aligns with Slavin et. al.'s (2008) study that reports large scale studies produce lower effect sizes than small studies (0.15 versus 0.36).

Finally, this study is one of the first studies that report promising findings on the mediating effect of fidelity of implementation (teacher curriculum coverage and student Fusion dosage), an often a neglected independent or mediating variable from a study design, analysis or report (Faggella-Luby & Deshler, 2009). As hypothesized in the logic model, we examined the extent to which curriculum coverage and dosage would be associated with improved student reading outcomes. The findings suggested that students whose teachers covered 80% or more of the curriculum and received 80% or more dosage scored significantly better on sight word efficiency and sentence comprehension than students who covered less of the curriculum and received less dosage. These results indicated the importance of fidelity of implementation in large-scale evaluation studies: only a high level day-to-day fidelity of implementation by teachers and students is likely to yield desirable student outcomes. These findings also provided empirical evidence of the desired or recommended levels of implementation for schools who are currently implementing Fusion Reading intervention.

Limitations. Despite the encouraging finding of the evaluation of one year effect of Fusion Reading, several study features limit generalization. First, the Fusion Reading intervention was begun as a two year intervention, but the program was terminated after one year due to U.S. Department of Education cuts in funding. Future research will need to examine the impact of this reading intervention as a two-year intervention. Second, Fusion Reading added instructional time in reading for the treatment group. Although we found a significant positive effect of Fusion Reading on improving SWE skills of struggling readers, this increase could be due to the students' opportunity to read more. Third, although the evaluation team made efforts to minimize contamination between treatment and control condition (i.e., Fusion teachers signed confidentiality statement to restrict teaching only to Fusion students; researchers and Fusion teachers closely monitored Fusion classes roster), we were not able to control for the possibility of Fusion students sharing reading strategies with control students outside of Fusion classes.

Conclusion. Stronger research designs with standardized measures typically yield more reliable estimates of a treatments effect and may have greater value for informing practice than less rigorous designs, as designed and implemented in this study of Fusion Reading.

Fusion Reading, was engineered in light of 1) necessary and sufficient conditions for successful reading by focusing on word identification and reading comprehension (Gough & Tunmer, 1986); and 2) research demonstrating the advantages of cognitive and metacognitive strategy instruction (Kamil et al., 2008; Scammacca et al., 2009; Slavin et. al., 2008). After one year of implementation of a two year intervention with adolescent struggling readers, word reading outcomes were significantly improved with an intervention that explicitly taught vocabulary, paraphrasing and word study strategies along with motivation strategies (e.g., setting goals and reading text relevant for the age group). Our analysis on the mediating effects of

fidelity of implementation emphasized the importance of meeting the developer's implementation guidelines in achieving desirable student reading outcomes. Only future research will allow us to fully understand whether the intended two year intervention will improve struggling adolescent's reading comprehension outcomes.

References

Achieve, Inc. (2004). *Reading or not: Creating a high school diploma that counts.* Washington, DC: American Diploma Project. Retrieved from: http://www.achieve.org

Almasi, J. F. (2003). *Teaching strategic processes in reading.* New York, NY: Guilford Press.

Baker, L., & Brown, A. (1984). Metacognitive skills and reading. In P. D. Pearson (Ed.), *Handbook of reading research.* White Plains, NY: Longman.

Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society, 57*(1), 289–300.

Biancarosa, G., & Snow, C. E. (2004.) *Reading Next—A vision for action and research in middle and high school literacy: A report to Carnegie Corporation of New York*. Washington, DC: Alliance for Excellent Education.

Bloom. H. S. (1984). Accounting for no-shows in experimental evaluation designs. *Evaluation Review, 8*(2), 225–246.

Bloom, H. S. (1995). Minimum detectable effects: A simple way to report the statistical power of experimental designs. *Evaluation Review, 19*(5), 547–556.

Bloom, H. S., Hayes, L. R., & Black, A. R. (2007). Using covariates to improve precision for studies that randomize schools to evaluate educational interventions. *Educational Evaluation and Policy Analysis, 29*(1), 30–59.

Brasseur, I., Hock, M., & Deshler, D. (2010a). *Strategy integration.* Lawrence, KS: University of Kansas Center for Research on Learning.

Brasseur, I., Hock, M., & Deshler, D. (2010b). *The bridging strategy.* Lawrence, KS: University of Kansas Center for Research on Learning.

Brasseur, I., Hock, M., & Deshler, D. (2010c). *The vocabulary strategy.* Lawrence, KS: University of Kansas Center for Research on Learning.

Bryant, D. P., Vaughn, S., Linan-Thompson, S., Ugel, N., Hamff, A., & Hougen, M. (2000). Reading outcomes for students with and without reading disabilities in general education middle-school content area classes. Learning Disability Quarterly, 23, 238–252.

Cantrell, S. C., Almasi, J. F., Carter, J. C., & Rintamaa, M. (2011). *Striving Readers final evaluation report: Danville, Kentucky.* Research report prepared for the U.S. Department of Education, Washington, D.C.

Cantrell, S. C., Almasi, J. F., Carter, J. C., Rintamaa, M., & Madden, A. (2010). The impact of a strategy-based intervention on the comprehension and strategy use of struggling adolescent readers. *Journal of Educational Psychology, 102*(2), 257–280.

Center for Research on Learning at the University of Kansas. (n.d.) *Profile of Xtreme Reading.* University of Kansas: Lawrence, KS. Retrieved April 1, 2012, from http://www2.ed.gov/programs/strivingreaders

Chan, L. K. S. (1991). Promoting strategy generalization through self-instructional training in students with reading disabilities. *Journal of Learning Disabilities, 24*, 427–433.

Chianca T., & Coryn, C. (2006). Michigan Educational Assessment Program- MEAP. Kalamazoo, MI: The Evaluation Center, Western Michigan University. Retrieved from http://homepages.wmich.edu/~wlacefie/Papers%20and%20Articles/MEAP-%20Validity%20and%20Reliability_files/frame.htm

Conlon, M., & Anderson, G. C. (1990). Three methods of random assignment: Comparison of balance achieved on potentially confounding variables. *Nursing Research, 39*(6), 379–379.

Deshler, D. D., & Schumaker, J. B. (1986). Learning Strategies: An instructional alternative for low achieving adolescents. *Exceptional Children 52*(6), 583-590.

Deshler, D. D., Schumaker, J. B., Lenz, K. B., Bulgren, J. A., Hock, M. F., Knight, J., & Ehren, B. J. (2002). *The Strategic Intervention Model.* The University of Kansas Center for Research on Learning: Lawrence, KS.

Edmonds, M. S., Vaughn, S., Wexler, J., Reutebuch,C., Cable, A., Tackett, K. K., & Schnakenberg, J. W. (2009). A synthesis of reading interventions and effects on reading comprehension outcomes on older struggling readers. *Review of Educational Research, 79*(1), 262–287.

Faggella-Luby, M., & Deshler, D. (2008). Reading comprehension in adolescents with LD: What we know; What we need to learn. *Learning Disabilities Research & Practice, 23*(2), 70–78.

Fuchs, L. S., Fuchs, D., & Kazdan, S. (1999). Effects of peer-assisted learning strategies on high school students with serious reading problems. *Remedial and Special Education*, *20*, 309–319.

Gennetian, L. A., Morris, P. A., Bos, J., & Bloom, H. (2005). Constructing instrumental variables from experimental data to explore how treatments produce effects. In H. Bloom (Ed.), *Learning more from social experiments: Evolving analytic approaches.* New York, NY: Russell Sage Foundation.

Gersten, R., Fuchs, L. S., Williams, J. P., & Baker, S. (2001). Teaching reading comprehension strategies to students with learning disabilities: A review of the research. *Review of Educational Research*, *71*(2), 279–320.

Glass, G. V. (1977). Integrating findings: The meta-analysis of research. *Review of Research in Education, 5*, 351–379.

Gottfried, A. E. (1985). Academic intrinsic motivation in elementary and junior high school students. *Journal of Educational Psychology, 77*, 631–645.

Gottfried, A. E. (1986). *Children's Academic Intrinsic Motivation Inventory.* Odessa, FL: Psychological Assessment Resources.

Gottfried, A. E. (1990). Academic intrinsic motivation in young elementary school children. *Journal of Educational Psychology, 82*, 525–538.

Gottfried, A. E. (1998, April). *Academic intrinsic motivation in high school students: Relationships with achievement, perception of competence, and academic anxiety.* Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.

Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading and reading disability. *Remedial and Special Education, 7,* 6–10.

Hagan-Burke, S., Burke, M. D., & Crowder, C. (2006). The convergent validity of the dynamic indicators of basic early literacy skills and the test of word reading efficiency for the beginning of first grade. *Assessment for Effective Intervention,31*, 1–15.

Hammill, D., Wiederholt, J. L., & Allen, E. (2006). Test of Silent Contextual Reading Fluency (TOSCRF). Austin, TX: Pro-Ed.

Hasselbring, T. S., & Goin, L. (2004). Literacy instruction for older struggling readers: What is the role of technology? *Reading and Writing Quarterly, 20,* 123–144.

Hock, M. F., Brasseur, I., & Deshler, D. (2010a). *Establish the course.* Lawrence, KS: University of Kansas Center for Research on Learning.

Hock, M. F., Brasseur, I., & Deshler, D. (2010b). *Possible selves.* Lawrence, KS: University of Kansas Center for Research on Learning.

Hock, M. F., Brasseur, I., & Deshler, D. (2010c). *The prediction strategy.* Lawrence, KS: University of Kansas Center for Research on Learning.

Hock, M. F., Brasseur, I., & Deshler, D. (2010d). *The summarization strategy.* Lawrence, KS: University of Kansas Center for Research on Learning.

Hock, M. F., Brasseur, I., & Deshler, D. (2010e). *The pass strategy.* Lawrence, KS: University of Kansas Center for Research on Learning.

Hock, M. F., Brasseur, I. F., Deshler, D. D., Catts, H. W., Marques, J., Mark, C. A., & Wu Stribling, J. (2009). What is the reading component skill profile of adolescent struggling readers in urban schools? *Learning Disability Quarterly*, *32*(1), 21–38.

Ho, D., Imai, K., King, G., & Stuart, E. A. (2007). Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis, 15*, 199–236.

Hoover, W. A., & Gough, P. B. (1990). The simple view of reading. *Reading and writing: An interdisciplinary journal, 2,* 127-160.

Joftus, S., & Maddox-Dolan, B. (April 2003.) *Left out and left behind: NCLB and the American high school*. Washington, DC: Alliance for Excellent Education.

Kamil, M. L., Borman, G. D., Dole, J., Kral, C. C., Salinger, T., & Torgesen, J. (2008). *Improving adolescent literacy: Effective classroom and intervention practices: A practice guide* (NCEE #2008-4027). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc

Kim, A.-H., Vaughn, S., Klingner, J. K., Woodruff, A. L., Klein, C., & Kouzekanani, K. (2006). Improving the reading comprehension of middle school students with disabilities through

computer-assisted collaborative strategic reading (CACSR). *Remedial and Special Education, 27*(4), 235–248.

Klingner, J. K., & Vaughn, S. (1999). Comprehension, content learning, and English acquisition through collaborative strategic reading. *The Reading Teacher, 52*(7), 738–47.

Klingner, J. K., & Vaughn, S. (1998). Using collaborative strategic reading. Teaching Exceptional Children, 30(6), 32–37.

Klingner, J. K., Vaughn, S., & Schumm, J. S. (1998). Collaborative strategic reading in heterogeneous classrooms. *The Elementary School Journal, 99,* 3–21.

Kulik, J. A. (2003). *Effects of using instructional technology in colleges and universities: what controlled evaluation studies say*. Arlington, VA: SRI International, Center for Science, Technology, and Economic Development.

Lenz, B. K., & Hughes, C. A. (1990). A word identification strategy for adolescents with learning disabilities. *Journal of Learning Disabilities, 23(3),* 149-158

Levy, F., & Murnane, R. J. (2004). *The new division of labor: How computers are creating the next job market*. New York, NY: Russell Sage Foundation.

Little, M. E., & Hahs-Vaughn, D. L. (2010). Reading intervention research in secondary schools: Results of comprehensive scale-up implementation. Unpublished Manuscript. University of Central Florida.

Mayer, R. E. (1987). *Educational psychology: A cognitive approach.* Boston, MA: Little, Brown.

National Center for Education Statistics. (2011). *The nation's report card. Reading 2009: National Assessment of Educational Progress at grades 4 and 8* (NCES 2012-459). Washington, DC: Institute of Education Sciences, U.S. Department of Education. Retrieved November 2, 2011, from nces.ed.gov/nationsreportcard/reading

Palincsar, A. S. & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 1* (2), 117-175.

Palincsar, A. S. & Brown, A. L. (1986). Interactive teaching to promote independent learning from text. *The Reading Teacher*, *39* (8), 771-777.

Paris, S. G., Wasik, B. A., & Turner, J. C. (1991). The development of strategic readers. In R. Barr, M. L. Kamil, P. Mosenthal, & P. D. Pearson (Eds.), *Handbook of reading research* (pp. 609–640). White Plains, NY: Longman.

Pressley, M., Harris, K., & Marks, M. B. (1992). But good strategy instructors are constructivists! *Educational Psychology Review, 4,* 3–31.

Puma, M. J., Olsen, R. B., Bell, S. B., & Price, C. (2009). *What to do when data are missing in group randomized controlled trials* (NCEE 2009-0049). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Roberts, G., Torgesen, J. K., Boardman, A., & Scammacca, N. (2008). Evidence-based strategies for reading instruction of older students with learning disabilities. *Learning Disabilities Research & Practice, 23*(2), 63–69

Scammacca, N., Roberts, G., Vaughn. S., Edmonds, M., Wexler, J., Reutebuch, C. K., & Torgesen, J. K. (2007), Interventions for adolescent struggling readers: A meta-analysis with implications for practice. Portsmouth, NH: RMC Research Corporation, Center on Instruction.

Schumaker, J. B., Deshler, D. D., Woodruff, S. K., Hock, M. F., Bulgren, J. A., & Lenz, B. K. (2006). Reading strategy interventions: Can literacy outcomes be enhanced for at-risk adolescents? *Teaching Exceptional Children, 38*(3), 64–68.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* Boston, MA: Houghton-Mifflin.

Shanahan, C. (2005). Adolescent literacy intervention programs: Chart and program review guide. Naperville, IL: North Central Regional Educational Laboratory.

Slavin, R.E., Cheung, A., Groff, C., & Lake, C. (2008). Effective reading programs for middle and high schools: A best evidence synthesis. *Reading Research Quarterly, 43* (3), 290-322.

Somers, M.-A., Corrin, W., Sepanik, S., Salinger T., Levin, J., & Zmach, C. (2010). *The Enhanced Reading Opportunities Study final report: The impact of supplemental literacy courses for struggling ninth-grade readers* (NCEE 2010-4021). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Torgesen, J. K., Wagner, R. K., & Rashotte, C. A. (1999). *Test of word reading efficiency.* Austin, TX: PRO-ED.

Unlu, F., Bozzi, L., Layzer, C., Smith, A., Price, C. & Hurtig, R. (2010). *Using matching methods to analyze RCT impacts on program-related subgroups*. Paper presented at the Association for Public Policy Analysis & Management Annual conference, Boston, MA.

U.S. Department of Education (n.d.). *Summary of 2006 Striving Readers Projects: Implementation and evaluation of targeted interventions for struggling readers and whole school interventions for all readers: Years 1-4*. Washington, DC: Office of Elementary and Secondary Education, U.S. Department of Education. Retrieved from http://www2.ed.gov/programs/strivingreaders/

Vaughn, S., Klingner, J. K., Swanson, E. A., Boardman, A. G., Roberts, G., Mohammed, S. S., & Stillman-Spisak, S. J. (2011). *Journal of American Education Research, 48*(4), 938–964.

Vaughn, S., & Klingner, J. K. (1999). Comprehension through collaborative strategic reading. intervention in school and clinic, *Intervention in School and Clinic, 34*(5), 284-92.

What Works Clearinghouse (2010). *WWC evidence review protocol for adolescent literacy interventions (grades 4–12)* (version 2.0). Washington, D.C.: Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/pdf/reference_resources/adlit_protocol_v2.pdf

What Works Clearinghouse (2009). *Adolescent literacy intervention report: Read 180*. Washington, DC: Institute of Education Sciences, U.S. Department of Education.

What Works Clearinghouse (2008). *What Works Clearinghouse procedures and standards handbook* (version 2.0). Washington, D.C.: Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/ pdf/wwc_procedures_v2_standards_handbook.pdf

Williams, K. T. (2001). *Group reading assessment and diagnostic evaluation.* (2001). Shoreview, MN: Pearson AGS Globe.

Table 1

Baseline Equivalence Tests of Fusion and Control Students on Demographic, Reading Achievement, and Reading Motivation for the Analytic Sample

	Treatment		Control		χ^2 or *t*	*p*
Variable	*M (SD)* or *%*	*N*	*M (SD)* or *%*	*N*		
Male	53.71	152	56.55	164	0.47	0.494
African American	81.27	230	80.34	233	0.08	0.778
Hispanic/Latino	7.07	20	6.21	18	0.17	0.679
White	10.25	29	12.07	35	0.48	0.489
Learning Disabilities	12.37	35	13.79	40	0.26	0.613
Any Disability	9.19	26	8.97	26	0.009	0.926
TOWRE SWE	89.63 (9.50)	279	89.73 (9.90)	290	0.21	0.836
TOWRE PDE	84.54 (14.17)	279	84.84 (14.78)	290	0.21	0.835
GRADE Passage Comprehension	10.33 (4.25)	278	10.54 (4.73)	284	-0.23	0.530
GRADE Vocabulary	88.29 (11.22)	281	87.41 (12.31)	287	1.07	0.287
MEAP Reading	-0.87 (0.67)	117	-0.88 (0.70)	135	0.11	0.913
CAIMI Reading	48.01 (11.13)	267	49.57 (11.04)	275	-1.89	0.059

Note. Standard deviations for continuous variables are in parentheses.

Table 2

Overall Intent-To-Treat Impact Analysis of Fusion on Student Reading Achievement

Outcome Measures	Treatment			Control			Estimated Impact	*Effect Size*	Improvement Index	*p*
	Model-Adjusted M	*SD*	*N*	*M*	*SD*	*N*				
TOWRE SWE										
Model A	90.16	9.64	279	89.06	10.50	290	1.10	0.11	4.38	0.022
Model B	90.17	9.64	279	89.06	10.50	290	1.11	0.11	4.38	0.021
Model C	90.06	9.63	283	89.04	10.46	297	1.02	0.10	3.98	0.035
Model D	90.07	9.63	283	89.04	10.46	297	1.03	0.10	3.98	0.033
TOWRE PDE										
Model A	85.33	14.18	279	85.26	14.23	290	0.07	0.005	0.20	0.909
Model B	85.34	14.18	279	85.26	14.23	290	0.08	0.006	0.24	0.893
Model C	85.27	14.16	283	85.21	14.16	297	0.06	0.004	0.16	0.927
Model D	85.28	14.16	283	85.21	14.16	297	0.07	0.005	0.20	0.915
GRADE Sentence Comprehension										
Model A	7.74	3.83	277	7.26	3.65	284	0.48	0.13	5.17	0.078
Model B	7.75	3.83	277	7.26	3.65	284	0.51	0.14	5.57	0.061
Model C	7.72	3.81	285	7.21	3.63	296	0.51	0.14	5.57	0.055
Model D	7.75	3.81	285	7.21	3.63	296	0.54	0.15	5.96	0.043
GRADE Passage Comprehension										
Model A	11.62	5.18	278	11.56	4.96	284	0.06	0.01	0.40	0.865
Model B	11.61	5.18	278	11.56	4.96	284	0.05	0.01	0.40	0.904
Model C	11.63	5.13	286	11.56	5.05	296	0.07	0.01	0.40	0.851
Model D	11.61	5.13	286	11.56	5.05	296	0.05	0.01	0.40	0.901
GRADE Vocabulary										
Model A	89.19	10.76	281	88.98	11.36	287	0.21	0.02	0.80	0.777
Model B	89.17	10.76	281	88.98	11.36	287	0.19	0.02	0.80	0.795
Model C	89.05	10.78	287	89.12	11.30	296	-0.07	-0.006	-0.24	0.928
Model D	89.02	10.78	287	89.12	11.30	296	-0.10	-0.009	-0.36	0.892

MEAP Reading										
Model A	-0.72	0.70	117	-0.78	0.72	135	0.06	0.08	3.19	0.359
Model B	-0.71	0.70	117	-0.78	0.72	135	0.07	0.10	3.98	0.300
Model C	-0.73	0.69	118	-0.80	0.74	138	0.07	0.09	3.59	0.299
Model D	-0.72	0.69	118	-0.80	0.74	138	0.08	0.11	4.38	0.243
CAIMI Reading										
Model A	49.08	10.85	267	48.96	11.24	275	0.12	0.01	0.40	0.880
Model B	48.98	10.85	267	48.96	11.24	275	0.02	0.002	0.08	0.983
Model C	49.05	10.78	273	48.82	11.33	283	0.23	0.02	0.80	0.777
Model D	48.98	10.78	273	48.82	11.33	283	0.16	0.01	0.40	0.840

Note. There were no missing data on demographic variables. Estimated impact is the coefficient associated with Fusion treatment variable from the HLM model; Effect size = Estimated impact/SD of the control group; Model adjusted treatment group mean = Estimated impact + Mean of the control group; Model A= HLM impact models controlling for pretest without imputation for missing pretests; Model B = HLM impact model controlling for pretest and demographic variables without imputation for missing pretests; Model C = HLM impact model using the dummy variable adjustment approach for imputing missing pretest scores (Puma, Robert, Stephen, & Cristofer, 2009). This approach sets the missing pretest scores to a constant and adds a dummy variable to indicate missing in the impact model. Model D = HLM impact model using imputed pretest scores and control for pretest and demographic variables.

Table 3

Intent-to-Treat Effect Size of Fusion on Student Outcomes Across Grade Levels

Grade Levels	TOWRE SWE	TOWRE PDE	GRADE Sentence Comprehension	GRADE Passage Comprehension	GRADE Vocabulary	MEAP Reading	CAIMI Reading
6th grade	0.17*	0.08	-0.02	-0.11	-0.05	0.15†	0.05
Treatment N/Control N	96/98	96/98	93/92	93/92	95/96	74/79	95/97
7th grade	-0.03	0.06	0.17	0.06	0.02	-0.07	-0.09
Treatment N/Control N	45/63	45/63	44/63	44/63	44/62	43/56	43/62
8th grade	0.05	0.05	0.72†	0.20	0.24	-	-0.37
Treatment N/Control N	12/19	12/19	12/19	12/19	12/19		11/18
9th grade	0.06	-0.20*	0.06	0.08	-0.001	-	0.34*
Treatment N/Control N	79/60	79/60	81/60	82/60	83/60		73/50
10th grade	0.08	0.12	0.31	-0.03	0.01	-	-0.14
Treatment N/Control N	47/50	47/50	47/50	47/50	47/50		45/48

†$p < 0.10$, *$p < .05$. **$p < .01$. ***$p < .001$.

Table 4

Description of Fusion Reading Fidelity of Implementation Measures for Fusion Students in the Analysis Sample

Variables	*Mean (%)*	*SD*	*N*
Teacher Level			
Curriculum Coverage	73.00	18.65	9
Proportion of Teachers with 80%+ Curriculum Coverage	33.00	49.24	9
Student Level			
Fusion dosage rate	72.69	28.31	241
Proportion of Students with 80%+ Dosage	57.26	49.58	241

Table 5

Treatment-on-the-Treated Effect of Fusion on Student Outcomes

Method	Variables	TOWRE SWE	TOWRE PDE	GRADE Sentence Comprehension	GRADE Passage Comprehension	GRADE Vocabulary	CAIMI Reading
IV	Curriculum	0.01*	0.0007	0.008*	0.002	0.0008	0.004
	Coverage Rate	(0.007)	(0.009)	(0.004)	(0.005)	(0.01)	(0.01)
	Effect Size	0.001	0.00005	0.002	0.0004	0.00007	0.0004
	R^2	0.96	0.73	0.30	0.27	0.40	0.33
	Fusion Dosage	0.01	-0.007	0.008*	0.002	-0.002	0.009
	Rate	(0.007)	(0.009)	(0.004)	(0.005)	(0.01)	(0.01)
	Effect Size	0.001	-0.00005	0.002	0.0004	-0.0002	0.0008
	R^2	0.69	0.74	0.32	0.27	0.39	0.34
	80%+Dosage	1.31	-0.92	1.06*	0.28	-0.28	1.13
		(0.88)	(1.16)	(0.49)	(0.68)	(1.37)	(1.40)
	Effect Size	0.12	-0.06	0.29	0.06	-0.02	0.10
	R^2	0.69	0.74	0.31	0.27	0.39	0.34
PS	High Dosage	1.11*	-0.56	0.47	-0.35	-0.23	0.33
	(80%+dosage)	(0.44)	(0.88)	(0.33)	(0.43)	(0.69)	(0.74)
	Effect Size	0.11	-0.04	0.13	0.07	0.02	0.03
	Low Dosage	0.84†	-0.71	0.34	0.19	-0.04	0.27
	(80% - Dosage)	(0.49)	(0.55)	(0.49)	(0.40)	(0.61)	(1.58)
	Effect Size	0.08	-0.05	0.09	0.04	-0.004	0.02

Note. IV = instrumental variable approach; PS = propensity score methods. For the IV model, all first stage F statistics were statistically significant at the 0.001 level. Coefficients and robust standard errors (in parentheses) are presented. All the models controlled for pretest, gender, race, grade level, and disability.
†p< 0.10, *p < .05. **p < .01. ***p < .001.

Appendix A

Table A-1

HLM Analysis of the Impact of Fusion on Student Reading Achievement Using the Analytic Sample

	TOWRE SWE		TOWRE PDE		GRADE Sentence Comprehension		GRADE Passage Comprehension		GRADE Vocabulary		MEAP Reading		CAIMI	
Fixed Effect	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B
Intercept	89.14***	94.58***	84.47***	87.74***	7.03***	5.53***	11.46***	11.01***	89.45***	93.42***	-	-	48.52***	44.56***
	(0.51)	(2.07)	(0.39)	(2.74)	(0.52)	(1.76)	(0.34)	(1.64)	(1.13)	(4.39)	0.78***	3.02***	(0.61)	(2.73)
											(0.05)	(0.48)		
Pretest	0.85***	0.83***	0.83***	0.82	0.38***	0.36***	0.55***	0.52***	0.53***	0.49***	0.66	0.64	0.53***	0.52***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)	(0.05)	(0.05)	(0.04)	(0.04)
Fusion	1.10*	1.11*	0.07	0.08	0.48†	0.51†	0.06	0.05	0.21	0.19	0.06	0.07	0.12	0.02
	(0.48)	(0.48)	(0.63)	(0.63)	(0.27)	(0.27)	(0.37)	(0.37)	(0.75)	(0.74)	(0.07)	(0.07)	(0.80)	(0.80)
Male		0.60		-0.04		0.66*		-0.16		0.74		-0.04		-2.11**
		(0.48)		(0.64)		(0.27)		(0.38)		(0.74)		(0.07)		(0.80)
Black		-0.85		-1.26		-0.22		-0.26		-1.81		0.01		1.645
		(0.76)		(1.01)		(0.44)		(0.60)		(1.20)		(0.12)		(1.23)
Hispanic		-1.42		-3.63***		-0.49		-0.08		-1.71		0.19		-1.70
		(1.15)		(1.52)		(0.65)		(0.89)		(1.78)		(0.18)		(1.90)
Grade		-0.63**		-0.13		0.20		0.13		-0.28		0.11		0.51
Level		(0.24)		(0.32)		(0.20)		(0.19)		(0.51)		(0.07)		(0.31)
Disability		-0.68		-1.91		-1.57		-1.71***		-4.93***		-0.23		0.64
		(0.76)		(0.98)		(0.42)		(0.57)		(1.14)		(0.11)		(1.19)
Random Effect														
School	1.00	0.83	0.82	1.45	1.63†	2.55†	0.30	0.59	6.96†	9.09	-	-	0.34	0.57
	(0.84)	(0.91)	(0.98)	(1.44)	(1.05)	(1.89)	(0.37)	(0.66)	(4.58)	(8.84)			(0.86)	(1.34)
Residual	32.57***	32.29***	56.71***	56.15***	10.31***	9.99***	19.40***	19.17***	78.45***	76.08***	-	-	86.84***	84.99***
	(1.95)	(1.94)	(3.39)	(3.37)	(0.62)	(0.61)	(1.17)	(1.16)	(4.69)	(4.59)			(5.32)	(5.23)

† $p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table A-2

Comparison of Seven Propensity Score Methods on Selecting Comparison Group for the Treatment-on-the-Treated Analysis for Treatment Students with High Implementation on TOWRE SWE Outcome

				Male		Black		Hispanic		Grade Level		Disability		TOWRE Pretest		CAIMI	
PS Methods	*N* of treatment	*N* of control	Total N	Mean Diff	*SD* of control	Mean Diff	*SD* of control	Mean Diff	*SD* of control	Mean Diff	*SD* of control	Mean Diff	*SD* of control	Mean Diff	*SD* of control	Mean Diff	*SD* of control
No matching	133	275	408	0.04	0.50	0.02	0.40	0.01	0.25	0.002	1.54	-0.03	0.35	0.60	9.96	-2.74	11.04
Exact	1	1	2	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA
Subclass	133	275	408	0.03	NA	0.04	NA	0.01	NA	0.11	NA	0.02	NA	1.15	NA	0.31	NA
Nearest	133	133	266	0	0.49	-0.02	0.37	0	0.26	-0.03	1.59	0.008	0.32	1	9.96	-0.07	10.63
Optimal	133	133	266	0.03	0.50	0.02	0.40	-0.008	0.28	-0.03	1.5834	0.03	0.29	-0.02	10.68	-0.008	10.74
Full	133	275	408	0.03	NA	0.01	NA	-0.01	NA	-0.11	NA	0.02	NA	0.65	NA	0.09	NA
Genetic	133	101	234	0	0.49	0	0.39	0	0.27	0	1.54	0	0.33	-0.02	8.54	0	9.90
Kernel	132	274	406	0.01	0.49	-0.004	0.38	0.003	0.26	0.02	1.56	0.002	0.32	0.08	9.81	-0.76	10.02
Coarsened Exact Matching	54	76	130	0	0.47	0	0.26	0	0.19	0	1.54	0	0.26	-0.08	6.91	-0.71	8.61

Note. Gender, race, grade level, disability, pretest scores, and motivation to read scores were used as predictors in the PS model to generate the propensity scores. Kernel method is preferable because it generates a large sample size and achieves better baseline equivalence particularly on TOWRE pretest than other methods.

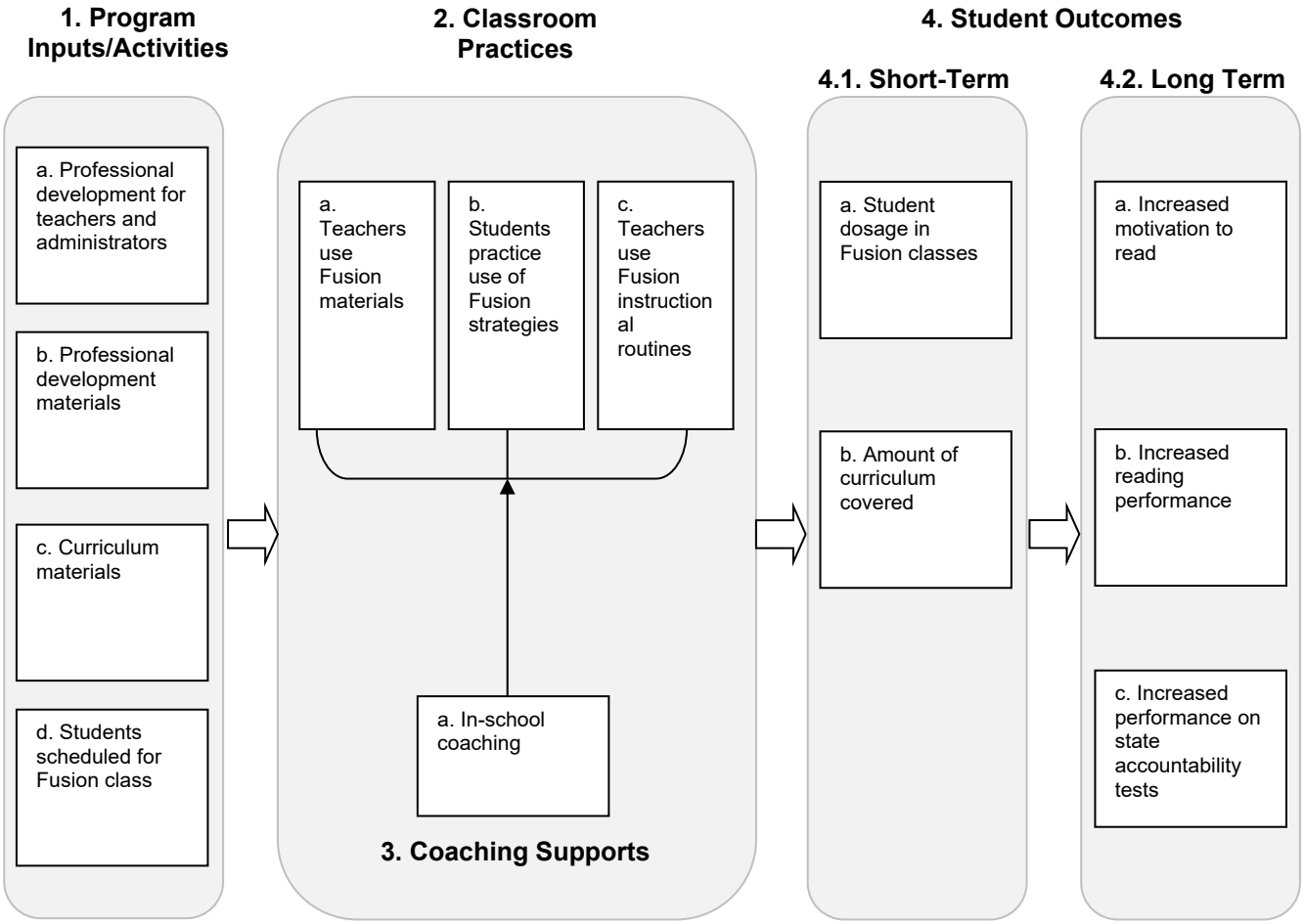
1. Program Inputs/Activities
a. Professional development for teachers and administrators
b. Professional development materials
c. Curriculum materials
d. Students scheduled for Fusion class
2. Classroom Practices
a. Teachers use Fusion materials
b. Students practice use of Fusion strategies
c. Teachers use Fusion instructional routines
a. In-school coaching
3. Coaching Supports
4. Student Outcomes
4.1. Short-Term
a. Student dosage in Fusion classes
b. Amount of curriculum covered
4.2. Long Term
a. Increased motivation to read
b. Increased reading performance
c. Increased performance on state accountability tests

Figure 1.

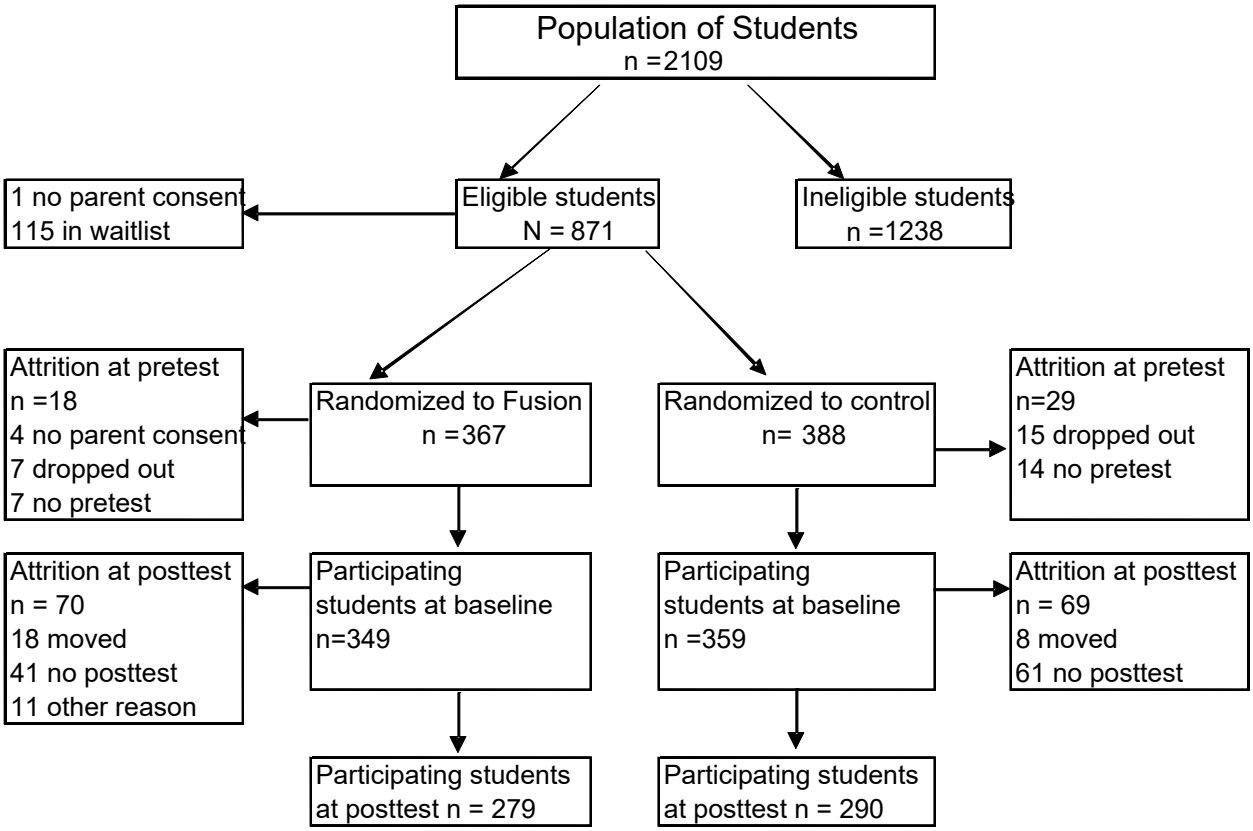
Population of Students
n =2109
1 no parent consent
115 in waitlist
Eligible students
N = 871
Ineligible students
n =1238
Attrition at pretest
n =18
4 no parent consent
7 dropped out
7 no pretest
Randomized to Fusion
n =367
Randomized to control
n= 388
Attrition at pretest
n=29
15 dropped out
14 no pretest
Attrition at posttest
n = 70
18 moved
41 no posttest
11 other reason
Participating
students at baseline
n=349
Participating
students at baseline
n =359
Attrition at posttest
n = 69
8 moved
61 no posttest
Participating students
at posttest n = 279
Participating students
at posttest n = 290

Figure 2.

Figure captions:

Figure 1. Logic model for Fusion Reading Intervention.

Figure 2. Overview of the flow of research participants through screening, randomization, consent procedures, and data collection of the Fusion Reading Intervention randomized controlled trial.