Effectiveness of Structured Teacher Adaptations to an Evidence-Based Summer Literacy

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Abstract

We conducted a cluster randomized trial to examine the effectiveness of structured teacher adaptations to the implementation of an evidence-based summer literacy program that provided students with (a) books matched to their reading level and interests and (b) teacher scaffolding for summer reading in the form of end-of-year comprehension lessons and materials sent to students' homes in the summer months. In this study, 27 high-poverty elementary schools (75-100% eligibility for free- or-reduced price lunch) were matched by prior reading achievement and poverty level and randomly assigned to one of two implementation conditions: a *core treatment condition* that directly replicated implementation procedures used in previous experiments or a *core treatment with structured teacher adaptations condition*. In the adaptations condition, teachers were organized into grade-level teams around a practical improvement goal and given structured opportunities to use their knowledge, experience, and local data to extend or modify program components for their students and local contexts. Students in the adaptations condition performed .12 standard deviations higher on a reading comprehension posttest than students in the core treatment. An implementation analysis suggests that fidelity to core program components was high in both conditions, while teachers in the adaptations condition primarily made changes that extended or modified program procedures and activities in acceptable ways. Adaptations primarily served to increase the level of family engagement and student engagement with summer books. These results suggest that structured teacher adaptations may enhance rather than diminish the effectiveness of an evidence-based summer literacy program.

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Program

The task of bringing research-based programs to scale remains one of the most vexing

challenges in the literacy research community (Stein & Coburn, 2010). While researchers have

successfully employed randomized controlled trials (RCTs) to identify a variety of literacy

programs and practices that can work for some students under some conditions, there is still

much to be learned about how to implement these promising programs more effectively across a

wide range of contexts (Bryk, Gomez, Grunow, & LeMahieu, 2015) and how to sustain them

over time (Coburn, 2003).

For many years, the field has relied on a "linear" model to bridge the gap between

research and practice. Following the logic of this model, researchers translate basic research

findings into tools, such as lesson plans, instructional routines, and student materials, which

educators implement with fidelity (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005). As a

result, the use of manualized, evidence-based programs has proliferated (Stein & Coburn, 2010).

Linear strategies, however, have not been particular successful at either creating deep and lasting

change in teachers' instructional practices (Coburn, 2003; Kearns et al., 2010) or improving

student outcomes in the long term (Coalition for Evidence-Based Policy, 2013; McGill-Franzen,

2005). Many scholars now question the usefulness of implementation approaches that consider

teachers to be passive recipients of researcher-generated knowledge and have proposed

alternatives that create more active roles for educators (e.g., Cobb, Confrey, Lehrer, & Schauble,

2003; Fishman, Penuel, Allen, Cheng, & Sabelli, 2013; National Research Council, 2003; Snow,

2015).

More specifically, scholars have suggested that some amount of adaptation may be necessary in order to increase a program's effectiveness locally and to sustain evidence-based programs over time in diverse contexts (e.g., Datnow & Castellano, 2000; Gutiérrez & Penuel, 2014; Klingner, Cramer, & Harry, 2006; Lewis, 2015). At the same time, these scholars caution that not all local adaptations are acceptable. For example, Gutiérrez and Penuel (2014) specifiy the need for "productive adaptations" in order to increase program effectiveness, while Lewis (2015) points out that implementation approaches that actively involve teachers should still aim to avoid the "lethal mutation" of an evidence-based program. These scholars call for practitioners to walk a fine line between fidelity and flexibility. To date, however, there is little empirical research that speaks to the question of how researchers and practitioners might successfully balance these two important dimensions of implementation. How might researchers continue to promote fidelity to evidence-based programs, while at the same time providing opportunities and supports for teachers to modify or extend program components in acceptable ways? What sorts of adaptations might teachers make? And how might these structured teacher adaptations impact student outcomes?

The purpose of this study is to examine the effectiveness of structured teacher adaptations to an evidence-based summer literacy program called READS for Summer Learning (READS). To address this research goal, we report results from a cluster-randomized trial in 27 high-poverty elementary schools that were matched by prior reading achievement and poverty level and randomly assigned to one of two conditions: (1) a *core treatment condition* (Core READS), where we directly replicated implementation procedures used in previous experiments, and (2) a *core treatment plus structured teacher adaptations condition* (Adaptive READS), where teachers were afforded opportunities to adapt program components. Specifically, this study examines the

effects of structured teacher adaptations on measures of student and family engagement in program activities, as well as students' reading growth over the summer. We also describe the nature of the adaptations that teachers made to READS and compare teachers' fidelity across the two conditions.

In the following sections, we discuss how the field conceptualizes fidelity and adaptation. We then summarize extant research underlying models that extend greater agency to teachers around program implementation. Finally, we describe how we designed and empirically tested an implementation approach with the goal of supporting *both* fidelity and acceptable adaptation during the implementation of READS.

Fidelity and Adaptation: Two Dimensions of Program Implementation

In order to address questions about the potential of giving teachers greater agency over the local implementation of evidence-based programs, it is important to understand how the field conceptualizes both fidelity and adaptation, as well as the relationship between them. While fidelity has been conceptualized somewhat differently across studies (for reviews, see Dane & Schneider, 1998; Mowbray, Holter, Teague, & Bybee, 2003; O'Donnell, 2008), fidelity at its broadest is "the degree to which teachers and other program providers implement programs as intended by the program developers" (Dusenbury, Brannigan, Falco, & Hansen, 2003, p. 240). More specifically, fidelity criteria may include: exposure, adherence, quality of delivery, program differentiation, and participant responsiveness (Dane & Schneider, 1998). As with fidelity, adaptation is not consistently defined in the research literature. Some researchers consider any change to the original program model to be an adaptation, regardless of the extent to which the change adheres to foundational program principles (Domitrovich et al., 2009; Munter, Wilhelm, Cobb, & Cordray, 2014; Sherin & Drake, 2009). Others argue that clearer

lines need to be drawn between fidelity and adaptation, as fidelity may moderate the effect of local adaptation on program outcomes (O'Donnell, 2008).

A number of intervention studies have documented a positive relationship between fidelity of implementation and program outcomes (Durlak & DuPre, 2008; Fogarty et al., 2014; Vaughn et al., 2013; Vaughn et al., 2015). The effects of adaptation on program outcomes and sustainability, however, are less clear. Domitrovich, Gest, Jones, Gill, and DeRousie (2010) examined the relationship between teachers' implementation of an evidence-based preschool enrichment program (REDI) and student outcomes. They found positive associations between implementation fidelity and a variety of social-emotional outcomes. Surprisingly, they found no associations between fidelity and language and literacy outcomes, even though there were large effects of REDI on children's phonological awareness skills (Domitrovich et al., 2009). Domitrovich and colleagues (2010) hypothesize that this may be because teachers adapted the printed directions in ways that improved the program for their children. They call for research that attends to teachers' adaptations and the degree to which these adaptations "still adhere to the underlying logic of the intervention" (p. 296). Thus, like Gutiérrez and Penuel (2014) and others, the authors suggest that *some* adaptations are acceptable and compatible with fidelity, while *others* are not.

Indeed, under certain circumstances, fidelity and adaptation may be complementary rather than contradictory aspects of program implementation. In a review of over 500 studies that examined the influence of implementation on program outcomes, Durlak and DuPre (2008) found that fidelity and adaptation frequently co-occurred in intervention research. Rather than viewing program adaptation as an indication of implementation failure, the authors suggest that adaptations may contribute to program success, so long as core program components are in

place. And a few empirical studies have found positive effects of teachers' adaptations on

program outcomes (Durlak & DuPre, 2008). For example, Blakely et al. (1987) examined

fidelity and adaptation within the context of seven education and criminal justice interventions

and found a positive association between fidelity and participant outcomes. The authors also

found that additions, but not modifications, to the program model were associated with positive

outcomes when holding fidelity constant.

While it seems clear that supporting teachers' fidelity to core program components is

important, what's less clear is the role that local adaptation might play. In short, it is unclear

whether focusing *solely on fidelity* is enough for evidence-based programs to achieve positive

results across a wide range of contexts, particularly programs that are less prescribed (Berman,

1981; Munter et al., 2014) or that interact heavily with local systems (Bryk et al., 2015). Such

programs will likely require researchers and program developers to actively attend to adaptation,

as well as fidelity, so that practitioners can get programs to work locally. Providing structured

opportunities for teachers to design adaptations that do not undermine foundational program

principles may be one way to support both fidelity and acceptable adaptation.

Structured Adaptations to Support Both Fidelity and Acceptable Adaptation

By "structured adaptation," we mean that teachers receive guidance around *how* to design

acceptable adaptations, rather than just permission and/or encouragement to do so (Sailors et al.,

2014). While studies examining the effectiveness of structured teacher adaptation on student

outcomes are scarce, there is some empirical evidence supporting the use of such an approach.

One strategy for structuring teachers' adaptations is to ensure that teachers have a solid

understanding of the theoretical principles underlying the intervention (McLaughlin & Mitra,

2001). Thus, when teachers are faced with a situation in which their students are not successfully

engaging in program activities, for example, they can act to adapt the program in ways that will

increase engagement while continuing to adhere to the program's theory of action. Indeed,

professional development experiences that emphasize teachers' understanding of foundational

program principles may be more effective than those that emphasize prescription to particular

materials or routines. Kennedy (2016) reviewed 28 studies of the effectiveness of teacher

professional development approaches. Professional development approaches that emphasized

strategies (e.g., how to use classroom discussion to improve students' reading comprehension),

rather than prescription (e.g., how to implement a particular science curriculum) tended to have

larger effects on student learning outcomes.

Recently, Lemons, Fuchs, Gilbert, and Fuchs (2014) evaluated the effectiveness of a

condition in which teachers were extended some autonomy over the implementation of Peer-

Assisted Learning Strategies in Reading (PALS), an evidence-based peer-tutoring program

designed to increase reading achievement. To our knowledge, this is the only study in literacy

that examines the quasi-experimental effect of structured teacher adaptations on student

outcomes. The researchers "structured" teachers' adaptations by classifying some program

activities as "core" and others as "noncore." While it was acceptable for teachers to modify or

replace noncore activities, it was unacceptable to omit or adapt core activities in any way.

Teachers, all of whom had prior PALS experience, were encouraged to use their autonomy to

better meet students' needs. Students instructed by teachers who were able to make structured

adaptations enjoyed a significant advantage, with effect sizes (*ES)* between .25 and .60 on

standardized literacy posttests, relative to students whose teachers taught PALS "by the book"

(Lemons et al., 2014). Because teachers were not randomly assigned to conditions, it is unclear

whether differences favoring the adaptive condition reflect unobserved differences among

teachers or students. These results, however, suggest that structured teacher adaptations may enhance program effectiveness, particularly if teachers have a solid working understanding of the evidence-based program.

Collectively, these studies suggest that researchers might be able to help teachers strike an acceptable or "productive" balance between fidelity and adaptation by extending greater agency to teachers around program implementation, while at the same time structuring their adaptations to prevent the omission of core program components and ensure that extensions and modifications align with program logic.

Present Study

This study was designed to examine the effectiveness of an implementation approach where teachers made structured adaptations to READS. Were such an approach to be successful, we would expect to see high fidelity to core program components in the adaptive condition, as well as the implementation of adaptations that extend and/or modify program activities and procedures in ways that support students' success with the program. As a result of both high fidelity and productive adaptation, we would expect to see increased student and family engagement in program activities and, ultimately, more positive student outcomes on relevant measures. Thus, to evaluate the success of this particular adaptive implementation approach, we collected and analyzed data on both relevant student outcomes and teachers' implementation of program components. Specifically, we address three research questions:

1. Compared to Core READS, what is the effect of structured teacher adaptations on student and family engagement in READS activities (lessons, family events, summer books and comprehension activities)?

2. Compared to Core READS, what is the effect of structured teacher adaptations on student reading comprehension outcomes in the fall?

3. Compared to Core READS, what is the effect of structured teacher adaptations on teachers' fidelity to the READS lessons?

Method

Study Design and Participants

This study took place in North Carolina during the 2014-2015 school year and summer of 2015. Using a cluster randomized controlled trial, we compared two READS conditions: a *core treatment condition* that directly replicated implementation procedures used in previous experiments (Core READS) and a *core treatment with structured teacher adaptations condition* (Adaptive READS). We recruited 27 high-poverty schools to participate in this study, given previous research showing larger effects of READS in high-poverty contexts (Kim et al., 2016; White, Kim, Kingston, & Foster, 2014). Participating schools were located in two large metropolitan school districts, three mid-sized urban districts, and two rural districts. All participating schools had implemented Core READS in the previous year as part of a large randomized trial. For this study, within districts, pairs (and one triad) of schools were matched based on school poverty level and student performance on the state standardized test. Within each pair (or triad), one randomly-selected school was assigned to Adaptive READS; the other schools were assigned to Core READS.

All fourth-grade teachers at participating schools were invited to take part in this study and close to 100% (N = 125) accepted. As shown in Table 1, there were no statistically significant differences between Core and Adaptive READS schools on baseline teacher characteristics. Table 1 also shows that there were no statistically significant differences between

Core and Adaptive READS schools on baseline characteristics of students. The consort diagram in Figure 1 describes the flow of participating students through the study and displays attrition rates by condition. From the beginning of the study when schools were randomly assigned to conditions in October 2014 to when posttests were administered, approximately 29% of the sample was lost to attrition (1,627 baseline sample of consented students to 1,315 analytic sample). The attrition rate for Core READS schools (20.46%) and Adaptive READS schools (18.1%) was unrelated to condition. Among the analytic sample of students included in both pretests and posttests, there was also no difference in pretest 2014 EOG reading scores. Finally, there was no attrition at the school-level, i.e., the level of randomization.

Intervention Program

Core READS was designed to improve elementary students' reading comprehension by increasing their engagement with books over the summer. Core READS accomplishes this by providing students with (a) books matched to their reading level and interests and (b) teacher scaffolding for summer reading. Figure 2 illustrates our program theory. These foundational principles are embodied by four core program components: (1) a series of six end-of-year comprehension lessons and supporting materials, (2) family engagement activities, (3) matched books sent to students over the summer, and (4) summer nudges (e.g., incentives, reminders). Table 2 outlines the evidence base for each component, as well as how these program components are operationalized in both Core and Adaptive READS.

In Core READS, teachers are primarily responsible for teaching a comprehension routine that students then use independently with their books over the summer. Each book comes with a "tri-fold" activity that guides students through this routine. Teachers use scripted lesson plans over six consecutive school days to teach students how to complete tri-folds. Core teachers are

also responsible for distributing fliers to recruit families to a literacy event where a trained

READS facilitator demonstrates the routine and how families can support their children's

participation in READS. Also during the school year, students are matched to books by a

computer algorithm. Core READS teachers, however, are not involved in the book matching

process. Finally, over the summer, in addition to receiving books and tri-folds, families are sent

tips and reminders about READS and students receive prizes for turning in tri-folds. Core

READS teachers are not involved in these "summer nudges."

   The efficacy of Core READS as a strategy for addressing summer learning loss is backed

by a ten-year program of experimental research. Table 3 summarizes results from randomized

experiments of READS. Across four randomized experiments examining the near-term effects of

READS on reading comprehension, the mean effect size was $ES = .06$ on a standardized reading

comprehension assessment given the fall after students returned from summer break. Across two

studies looking at the delayed effects of READS on state end-of-grade reading comprehension

tests, the mean effect size was $ES = .09$. Importantly, the magnitude of the READS effect size on

fall reading comprehension is comparable to other large-scale literacy interventions (Lipsey et

al., 2012; Quint et al., 2014) and the program is more cost-effective than school-based summer

programs (Kim & Quinn, 2013; McCombs et al., 2014). READS is also the only evidence-based

summer literacy intervention that has been replicated at scale by a different investigator,

suggesting that program effects are reliable, robust, and replicable (Stein, 2016). Despite its

demonstrated efficacy, however, we hypothesized that teachers might be able to adapt READS

activities and processes in ways that would improve student and family engagement in program

activities and, ultimately, student literacy outcomes. Thus, we designed a version of READS that

increased teacher autonomy over local implementation.

Adaptive READS was designed to support both fidelity and acceptable adaptation (Durlak & DuPre, 2008). Thus, core components were operationalized so as to increase teacher autonomy over program activities and processes, while at the same time preserving the underlying program logic. In operationalizing core program components for adaptive teachers, we considered the evidence underlying each component—including both theory and empirical evidence tying particular components to outcomes—in order to determine which aspects of each component were "musts" and could not be adapted (Century, Rudnick, & Freeman, 2010; Munter et al., 2014; Waltz, Addis, Koerner, & Jacobson, 1993). For example, prior READS studies provide strong evidence for the effect of scaffolded teacher support on student outcomes (Kim & White, 2008). Thus, while adaptive teachers could adapt lesson procedures and content, they ultimately had to prepare students to independently use the comprehension routine.

Based on our knowledge of READS, as well as our understanding of the broader literature, we also considered local adaptations with the potential to improve program outcomes—that is, what adaptive teachers "might" do to improve program outcomes (Munter et al., 2014). For example, with respect to family engagement, we anticipated that teachers might use local knowledge of families to increase attendance at literacy events and/or make procedural or content changes to facilitate implementation and student and family engagement in these activities. Furthermore, while Core READS teachers had limited responsibility for family engagement activities and no responsibility for either the summer books or summer nudges components, we opened these components up to Adaptive READS teachers.

Supporting Structured Teacher Adaptations

In addition to providing Adaptive READS teachers with guidance around the "musts" of each core component, we supported structured teacher adaptations through a series of three

collaborative researcher-practitioner meetings. We began working with adaptive teachers in November of 2014. This is in comparison to Core READS teacher training, which took place shortly before implementation began in March of 2015. In Core READS, regardless of any prior experience with the intervention, teachers participated in a two-hour, in-person training where they received instruction in how to teach the six scripted lessons. Core READS schools could choose to implement READS activities (i.e., six lessons, the family event) at any point after both the completion of their lesson training and students' completion of the spring testing in March, which was used to identify appropriately leveled books for summer reading. Once begun, however, the lessons had to be taught across consecutive days. Each Core school's specific implementation timeline varied, but all schools completed their READS activities between April and the end of the school year in June. Adaptive READS schools also had to wait until the completion of spring testing to begin any READS activities. As with Core schools, each team's specific implementation timeline varied. While some Adaptive school teams began implementation activities as soon as possible—in late March—others waited until April or May. Unlike Core READS schools, however, adaptive teams had more flexibility as to (1) how they spaced out their required READS activities (i.e., six lessons, the family event) and (2) the nature and amount of READS activities implemented during the March-June implementation window. See Appendix A for a comparison of Core and Adaptive READS implementation activities.

Two goals guided our design of Adaptive READS supports for structured adaptations. First, we aimed to engage teachers in an authentic process without mandating levels of participation or change quotas. Second, we aimed to support both fidelity and acceptable adaptations to READS. With these goals in mind, we designed activities to address teachers' relatedness, competence, and autonomy (Ryan & Deci, 2000). We organized teachers into grade-

level teams and gave them opportunities to learn about READS program theory (McLaughlin & Mitra, 2001) and core components (Fixsen et al., 2005). Activities were designed to enhance teachers' "skill and will" (Lareau, 2008) to integrate an evidence-based literacy program into their local contexts and to sustain the reform over time (Bryk et al., 2015; Coburn, 2003).

In our first meeting with adaptive teachers, we challenged them to take on a practical improvement goal: "How can we, as a school, foster student engagement with books over the summer (as measured by tri-fold data)?" To support teachers' relatedness, grade-level teams were tasked with learning together and coming to consensus around a shared adaptation plan (Ryan & Deci, 2000). To support teachers' competence, we presented on the READS core components, including the underlying theory and evidence-base. We also supplied teams with school-specific data from previous READS implementations and the full complement of program materials. Following this meeting, teachers participated in an online training where they continued to learn about core components. Finally, teams were given autonomy to develop a set of additions and modifications to READS activities and procedures, within the limits outlined in Table 2. In short, teachers could not omit core components. They could, however, extend and modify existing program content (e.g., lessons, the family event) and procedures (e.g., recruitment of families to the event, matching of students to books). Teams were also able to create new activities and procedures, as long as they did not violate program principles.

In creating and implementing their plan, teachers were encouraged to use local knowledge (of students, of school context, of families) to extend, modify, or create new program components in ways that they hypothesized would accommodate local differences, particularly in individual students' motivation and skill. See Appendix B for a copy of the adaptation design template.

Nature of Teacher Adaptations to Core READS Intervention

Prior to implementation, all 13 Adaptive READS teams submitted an adaptation plan to the research team. At the end of the implementation period, the research team confirmed which adaptations had been carried out. These plans provided one source of data on the nature of teachers' adaptations. Adaptations were organized by core component and coded by type (*addition*, *modification-extension*, *modification-substitution*), as well as the degree to which teams chose to expand their responsibilities related to READS and the extent to which teams' adaptations adhered to READS program theory. See Appendix C for the full list of codes. In some cases, we supplemented these data with additional measures, as noted below.

Overall, teachers in Adaptive READS schools made a variety of changes across core program components. For the most part, teachers modified, rather than substituted existing READS components, often taking on additional implementation responsibilities in the process. A few teams created new READS activities; however, none of these new activities violated READS program principles. In the following sections, we discuss the nature of teachers' adaptations by core component. See Table 4 for additional detail.

Adaptations to READS lessons. In most cases, teachers modified existing READS lesson activities and procedures through extensions and/or substitutions. For example, three teams extended the lessons by adding new lesson activities (e.g., homework review). In addition to content changes, nine schools changed the timing of the lessons (e.g., taught lessons once or twice per week, rather than consecutively), while three schools taught additional lessons. Four teams, however, created adaptations that went beyond the activities and materials defined by READS. Two schools spread READS strategies into other parts of their school day. One school, for example, created a READS-like activity for students to use over the March-April spring

break. Students were given a leveled book, along with a comprehension activity to scaffold their engagement with the book. Two other schools held one or more READS pep rallies for students. At one school's rallies, school faculty and staff were recruited to talk with students about the importance of reading. Many of these adaptations required teachers to take on new responsibilities and/or to invest personal or classroom time.

   Adaptations to family engagement. To examine teachers' adaptations to procedures to increase family engagement, we conducted interviews with a random subsample of teachers. Between April and June 2015, we sampled teachers from both conditions to participate in a 60-minute, in-person, semi-structured interview (N = 55). Teachers were asked questions about their experiences with their family event(s), including recruitment strategies used. All interviews were recorded and transcribed, except in the case of one district where we were not permitted to record. In this case, detailed notes were taken. While we were primarily interested in adaptations made by adaptive teachers, we interviewed core teachers as a check on the counterfactual. We engaged in open coding of the teacher interviews to identify relevant categories. To establish the reliability of the coding scheme, 20% of the excerpts were double coded.

   Table 5 compares Core and Adaptive READS teachers' self-reported use of recruitment strategies for the family literacy events. Using multi-level models to conduct our analyses, we found no differences across conditions in strategies that the research team supported at all schools. However, there were statistically significant differences in the use of locally developed recruitment strategies. Adaptive teachers more often reported: using student incentives (41% compared to 15%), organizing student performances as a draw for parents (14% compared to 0%), sending home recorded phone messages (42% compared to 12%), and sending home teacher-generated recruitment documents (46% compared to 4%). Furthermore, Adaptive

READS teachers (13%) were less likely than Core READS teachers (42%) to communicate to

parents through existing communication channels at their schools (e.g., school website).

Similarly, in our analysis of adaptation plans, we found that all but one school planned to adapt

how they recruited families to this event. In most cases, teams extended the existing suite of

strategies, rather than substituting one strategy for another.

Beyond the use of local recruitment strategies, many teams further extended or made

substitutions to family engagement activities and procedures. Roughly half of these adaptations

were content-based and the other half were procedural in nature; almost all of the adaptations

required teachers to take on more READS-related responsibilities. Seven schools made changes

to the content of the event. The most common content adaptation was the addition of a READS

data presentation to the agenda. Seven schools made adaptations to the structure of the family

event. For example, four schools held multiple family events, running them either separately

(e.g., one in the morning and one in the evening) or concurrently (e.g., English-speaking families

in one room and Spanish-speaking families in another). This restructuring meant that teachers

had to take on presentation responsibilities during the event.

Adaptations to summer books. Adaptive READS teachers made changes to students'

book lists through an online database, which recorded all of their changes. In total, 34 teachers

from 11 of the 13 Adaptive READS schools altered students' book lists. Twenty teachers made

changes to at least one student's Lexile band, moving it either above or below the Iowa Test of

Basic Skills (ITBS) recommendation and resulting in a completely different list of summer

books. In total, teachers moved the Lexile band for 109 students. Additionally, 30 teachers

decided not to send students the READS lesson books (the default condition), preferring that

students be sent two additional matched books. Finally, 34 teachers made changes to at least one

student's book list by shifting the order of the books, resulting in 2,342 changes in total. Shifting

the order of the books made it more likely that students would receive some books and less likely

that they would receive other books. Table 6 reports treatment effects on the quantity and quality

of home-based summer book reading with READS books. Overall, books sent to students in

Adaptive READS schools tended to be more challenging. The mean Lexile of adaptive students'

summer books was, on average, 29 points higher than that of students in Core READS schools.

Adaptive students' books also tended to be longer (2,678 more tokens) and to contain more

unique words (250 more types).

With the exception of two schools that made changes to the materials used to gather

information on students' reading interests, adaptations to the summer books component were

related to the procedures through which students were either given access to or matched to

books. Four schools requested that students receive two of their summer books during the family

event, rather than receiving all of their books in the mail. Two other schools extended the

procedure for collecting students' contact information, in one case taking responsibility for

updating the research team when a student's address changed. Finally, two schools committed to

conferring with students and/or parents during the book matching process. Except for the

procedural changes to when books were delivered, these adaptations required that teachers

expend resources, including finding classroom time to confer with students and creating new

READS materials.

Adaptations to summer nudges. The most common adaptation to this component was the

addition of a new READS fall event, which was implemented by eight schools. While READS

was able to fund one READS family event at each school, teachers and school leaders were

responsible for organizing and funding all new events. One of these schools also implemented a

completely new teacher-staffed summer check-in event and invited students to bring books and tri-folds. Additionally, five teams made adaptations that either extended or replaced activities and procedures related to summer nudges. For example, as an extension of the standard summer phone calls made to families by the research team, two teams made phone calls to their students, while two schools either called parents or had an automated call sent home over the summer.

Measures

Table 7 summarizes features of the study design, including our research questions and measures, data collections methods, and analyses used to answer each question.

Student Outcome Measures

To address our first research question about student and family engagement in READS activities, we used a variety of measures to assess student and/or family engagement during the end-of-year lessons, family literacy events, and summer home book reading activities. To address our second research question about the effects of structured adaptations on reading outcomes, we administered a reading posttest to assess students' comprehension gains. The top section of Table 7 summarizes the measures and data collection procedures used to analyze student engagement and comprehension outcomes. Note that we conceptualize reading engagement in its behavioral form, using multiple measures of children's participation and involvement in leisure reading outside school (Guthrie, Wigfield, & You, 2012). In particular, we attend to both the quantity (i.e., students' self-reports of the amount of book reading during the summer) and the quality (i.e., students' self-reports of whether their books were appropriately challenging and interesting) of students' summer reading.

Student engagement in READS lessons and family events. Student attendance was taken at each of the six lessons. Additionally, we collected all assigned homework to assess

students' behavioral engagement in the lessons. This measure provided an indicator of students' participation and involvement in home-based reading activities immediately following the classroom lessons. To measure engagement in the family events, students and families were signed in as they entered the events and careful attendance records were kept. For these measures, we reported the proportion of children in each condition who attended lessons, completed homework assignments following the lessons, and attended the family event.

Student engagement in summer books. We assessed students' engagement with their summer books using a posttest survey that measured students' (a) amount of summer reading, (b) subjective interest in their books, and (c) perceptions of text difficulty. Students were asked to report the total number of books and the total number of mailed READS books with tri-folds that they read over the summer. The scale for each item ranged from 0 to 20 or more books. To assess the quality of summer book reading, students were asked, "overall, how much did you like the books you read this summer" and options ranged from (1) "I really didn't like them," (2) "I didn't like them," (3) "they were okay," (4) "I liked them," to (5) "I really liked them." The survey included an item to assess students' perception of the difficulty level of the books they read in the summer. Students responded to the prompt "The books I read this summer were___?" by selecting options ranging from (1) much too easy, (2) too easy, (3) just right, (4) too hard, to (5) much too hard. We transformed this item into three indicator variables for whether the student responded that his or her books were "too easy," "just right," or "too hard." For these measures, we estimated the treatment effect using a multilevel model, as described below in the analytic plan.

Student engagement in summer READS comprehension activities. The READS tri-fold served as proxy for the amount of home-based summer reading routines involving a

combination of child-initiated and parent-supported book reading. Each READS book came with a tri-fold that included three multiple-choice comprehension questions about the book. The validity of the tri-fold measure as a predictor of reading comprehension was demonstrated in a previous study of READS (Kim et al., 2016). Instrumental variables analysis showed that tri-fold returns had a causal impact on students' reading comprehension scores on the North Carolina's End of Grade (EOG) reading assessment the following spring. Specifically, each tri-fold returned predicted .22 additional months of reading comprehension growth, on average.

Iowa Test of Basic Skills (ITBS) posttest. When they returned to school in Fall 2015, students were administered the reading comprehension section of the Iowa Test of Basic Skills, Level 10, Form C. The ITBS is a reliable assessment with reported KR-20 coefficients above .93 and equivalent form estimates of .86 or higher (Hoover et al., 2003). The ITBS posttest scores yielded both a developmental standard score ($M = 195$, $SD = 30$, $Min = 135$, $Max = 279$) and national percentile ranks ($M = 50$, $SD = 32$). We standardized the developmental standard score to have a mean of 0 and a standard deviation of 1 and used this measure to analyze treatment effects on posttest reading comprehension measures.

Fidelity to READS Lessons

The bottom section of Table 7 highlights the measures, data collection, and analyses used to examine teachers' fidelity to the six READS lessons—our third research question. Teachers in both conditions were asked to audio record these lessons. Fidelity was measured by coding recordings of Lessons 1 and 4 for a random sub-sample of teachers, when recordings were available ($N = 51$). We created this sub-sample by stratifying by district and then randomly selecting at least two teachers from each school. Where possible, we selected one teacher with prior READS experience and one teacher with no READS experience.

We developed a checklist for each lesson. Checklists reflect core lesson components—that is, those parts of the lessons that are unique and essential to READS (Munter et al., 2014) and/or are backed by research evidence as important to achieving lesson objectives (McMaster et al., 2014). Each component was further operationalized by establishing its essential elements, which reflect the theory underlying the component and the teacher's responsibility in leading that component. Coders rated the presence or absence of each essential element. Checklists also captured the lesson duration and some quality indicators. See Appendix D for a list of core components and essential elements for Lessons 1 and 4. Lessons were coded by 3 members of the research team. Raters were blinded as to condition, district, and READS experience. For each lesson, interrater reliability was established by double coding 20% of the recordings. For Lesson 1, agreement ranged from 89.5% (kappa = .82) to 82.3% (kappa = .70); for Lesson 4, agreement ranged from 94.9% (kappa = .91) to 91.2% (kappa = .85).

Analytic Plan

We present our analytic plan by research question. Column 4 in Table 7 provides an overview.

Research question 1: The effect of structured adaptations on student and family engagement in READS activities. To assess student engagement in the READS lessons, we fit multi-level models comparing mean student attendance rates across condition, as well as differences in the proportion of homework returned by students across the lessons. To assess students' engagement in the family event(s), we compare mean student attendance rates across condition. Students were considered "present" if at least one family member was also in attendance. To assess student engagement with their summer books, we compare results from the fall survey that asked students about their matched summer books. To estimate the effect of

structured teacher adaptations on the student and family engagement measures, we fit models

similar to model 3 described below (except that models for engagement measures do not include

the pretest control).

Research question 2: The effect of structured adaptations on student reading

outcomes. To account for the fact that assignment to experimental condition was at the school

level and outcomes were measured at the student level, we used hierarchical linear models

(HLMs). We specified the following within-school (Level 1) model

(1) $Y_{ij}^{Post} = \beta_{0j} + \beta_1 EOG_{ij}^{Sp2014} + \varepsilon_{ij}$

and the following between-school (Level 2) model

(2) $\beta_{0j} = \gamma_{00} + \gamma_{01} Adaptive\ READS_j + \lambda_j + \mu_{0j}$

Combining equation 1 and 2 yielded the following multi-level model

(3) $Y_{ij}^{Post} = \gamma_{00} + \gamma_{01} Adaptive\ READS_j + \beta_1 EOG_{ij}^{Sp2014} + \lambda_j + \mu_{0j} + \varepsilon_{ij}$

where Y_{ij}^{Post} is the post-random assignment ITBS outcome for student i in school j measured in

the fall after students have returned from summer vacation, γ_{01} is the effect of being in a school

randomly assigned to Adaptive READS, β_1 is the parameter estimate for the student-level pretest

reading score in spring 2014 measured prior to random assignment, λ_j is a set of randomization

strata fixed effects, μ_{0j} is a school-level error term, and ε_{ij} is a student-level error term. School

and student errors are assumed to be independent and normally distributed. To address the

second research question, we estimated the intent-to-treat effect (i.e., γ_{01}) of being randomly

assigned to Adaptive READS on student comprehension outcomes.

Research question 3: Fidelity to READS lessons. To assess teachers' fidelity to the six

READS lessons across both conditions, we used the audio recordings of READS lesson

enactment. Looking across the coded lessons, we fit HLMs to estimate mean differences in

scores across condition for: lesson adherence to essential elements; time spent on each lesson overall; lesson quality (e.g., distractions during lesson, management of transitions); how much of the script the teacher read and how much the teacher added to the script.

<div align="center">

Results

</div>

Research Question 1: The Effect of Structured Adaptations on Student and Family Engagement in READS Activities

Table 8 displays effects on student engagement in the READS lessons and afterschool family literacy events. Attendance at READS lessons was high overall (94% on average), and there were no differences in the percentage of students who attended the READS lessons across condition. The proportion of students who completed homework assignments following Lessons 1 and 4 was also similar across conditions. Attendance at READS family literacy events, however, was significantly higher in Adaptive READS schools (45%) than in Core READS schools (35%).

Table 9 reports effects on students' engagement with their summer books. While there were no differences in the total number of books students reported reading by condition, compared to students in Core READS schools, students in Adaptive READS schools reported reading .37 more of the matched books that were delivered to them at the family event and/or mailed to their homes during the summer ($ES = .11$). Additionally, there was a seven percentage point difference between Adaptive READS and Core READS schools on students' perceptions of text-difficulty—Adaptive READS students were more likely to report that their books were "just right" (and less likely to report that their books were "too easy"). There were no differences on the measures for students' self-reported enjoying of their summer books. Finally, while there were no differences in the total number of comprehension questions correct across tri-folds, there

was a marginally significant difference in the number of tri-folds returned over the summer, in favor of Adaptive READS students (*ES* = .10). In sum, these results suggest that students in Adaptive READS schools read more of their matched books and were more likely to report that their books were appropriately challenging than students in Core READS schools.

Research Question 2: The Effect of Structured Adaptations on Student Reading Outcomes

Table 10 reports intent-to-treat (ITT) models for the impact of Adaptive READS expressed in standard deviation units. To improve the precision of the estimated treatment effect, model 3 includes the pretest score and the school-level Adaptive READS assignment variable. The final model indicates that students in Adaptive READS scored .12 SDs higher, on average, than students in Core READS schools. The magnitude of this effect size is comparable to mean difference from an earlier study of READS (Kim & White, 2008) that compared the posttest reading scores of (a) students who received only matched books in the summer to (b) students who received matched books and teacher scaffolding in the form of end-of-year of oral reading and comprehension instruction.

Research Question 3: Fidelity to READS Lessons

Given strong evidence from a previous READS experiment for the effect of scaffolded teacher support on student outcomes (Kim & White, 2008) and given that Core READS teachers are primarily responsible for delivering the READS lessons, it was important to assess teachers' fidelity to this component. Table 11 compares teachers' fidelity to the six READS lessons across Core and Adaptive READS, based on measures of adherence and quality. Overall, there were more similarities than differences. Adherence to the core lesson components was high across both a lesson using a narrative text (Lesson 1) and a lesson using an informational text (Lesson 4). On average, Core READS teachers implemented 87% of the essential lesson elements,

compared to 83% for Adaptive READS teachers, and adherence levels across both schools was comparable to our previous studies (Kim et al., 2016; White et al., 2014). High overall adherence may have been due, in part, to the closeness with which most teachers stuck to the lesson scripts, often reading them verbatim. With respect to quality, we found no differences across condition. Adaptive READS teachers, however, read somewhat less of the scripts and added more to the scripts than Core READS teachers, on average. Furthermore, Adaptive READS teachers' lessons averaged 7.8 minutes longer.

Discussion

Using a cluster randomized trial design involving 27 high-poverty elementary schools, we experimentally manipulated the conditions under which teachers implemented READS. We then examined the effects of structured teacher adaptations on student and family engagement in READS program activities, as well as student outcomes. We also sought to paint a detailed picture of teachers' implementation of the READS core components. In brief, fourth-graders whose teachers were assigned to Adaptive READS and their families engaged more deeply in READS activities than students in Core READS schools. Ultimately, these students also enjoyed significantly larger gains in reading comprehension, on average, than students in Core READS. In all likelihood, there are many reasons why structured teacher adaptations enhanced the implementation and effectiveness of READS. We discuss findings related to each of the three research questions to highlight the broader implications of this experimental study.

Evidence for the Effectiveness of Structured Adaptations

Our first goal was to understand whether and to what extent Adaptive READS teachers were able to stimulate the "active ingredients" in READS by increasing children's wide reading of well-matched books. In short, these findings indicate that structured teacher adaptations had

an immediate and proximal effect on students' opportunities to learn and apply the READS comprehension routine across intervention contexts. With respect to the classrooms lessons, while students in Adaptive READS schools had similar attendance and homework completion rates to students in Core READS schools, several teacher adaptations afforded students additional practice with the READS comprehension routine. For example, Adaptive READS teachers taught longer lessons, extended lesson activities, and increased attendance at the afterschool family event. Furthermore, survey results indicated that compared to students in the core treatment, Adaptive READS students read more of their matched books at home during the summer and found their books to be more appropriately challenging and at "just right" level of difficulty. These findings underscore that evidence-based literacy programs and practices can be "standardized and situated" (Fuchs & Fuchs, 1998, p. 135). In other words, the core components of an evidence-based program that have been validated by multiple replications should be operationalized and made explicit for teachers, including implementation "musts" and places where there is room for productive adaptation. In essence, structured teacher adaptations can support both fidelity as well as the local design of adaptations that do not undermine foundational program principles.

Our second research aim, tightly coupled to the first, was to examine whether and to what extent structured teacher adaptations improved student reading comprehension. Students in Adaptive READS schools out-performed students in Core READS schools by .12 standard deviations on a reading comprehension posttest. The magnitude of this effect size is consistent with prior experimental research on READS and other experimental and quasi-experimental studies of summer reading interventions (Kim & Quinn, 2013). The effect size is also practically meaningful because it is large enough to offset the gap in reading comprehension that expands

between low-income and middle-income children during the summer months (Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996). Taken together, findings from READS experiments imply that conventional resources like books, lessons, materials, and family literacy events are not the only critical factors driving student outcomes (Raudenbush, 2008). For example, all 27 schools in our experiment received the same infusion of resources. Rather, our findings indicate that teachers' ability to use conventional literacy resources, coupled with their ability to make productive adaptations to an evidence-based program, can enhance proximal measures of student engagement. Improving the extent to which students participated in the READS activities in the classroom, afterschool, and home contexts may underlie improvement in students' reading comprehension.

Our third question asked whether structured teacher adaptations could enhance the implementation of core program components. Findings from this study suggest that effective program implementation requires problem solving and creative solutions to a range of unanticipated and unknown challenges in each local context (Murnane & Nelson, 1984). For example, teachers used "home-grown" strategies to increase outreach to families and increase attendance at family events. Teachers also made a number of adaptations that enhanced core READS components—even beyond more scaffolded practice. Conferences with students and parents, in addition to teachers' knowledge of their students' reading abilities, for example, may have enabled them to reduce measurement error in the ITBS and improve the quality of the book matches for some students. Adaptations like contacting students and their families over the summer and creating celebratory fall events for participating students may have motivated some students to participate over the summer to a greater extent than they otherwise would have. Specific practices that were embedded in Adaptive READS—that is, collaborative decision-

making, integrating programs into existing school routines, and fostering shared agency—

appeared to facilitate program implementation (Durlak & DuPre, 2008). It is also possible that

the combination of these teacher adaptations (enhancements, modifications) enabled children to

more fully participate in READS and ultimately moved the needle on multiple dimensions of

implementation above and beyond fidelity measures (Century et al., 2010; Dane & Schneider,

1998).

Importantly, however, teachers in both conditions demonstrated high fidelity to the six

READS lessons that previous READS studies have demonstrated are critical to the success of the

intervention and that are teachers' primary responsibility in Core READS (Kim & White, 2008).

While teachers in Adaptive READS schools did make some changes to the lessons, they also

enacted over 80% of the essential lesson elements, which is comparable to previous READS

studies (Kim et al., 2016). At the same time, there were modest but statistically significant

differences suggesting that Adaptive READS teachers taught longer lessons and were less likely

to read from the lesson plans. Although it is beyond the scope of this study to probe how teacher

language affected student engagement, we agree with McGill-Franzen (2005) that more research

should aim to make connections between teacher adaptations during reading instruction and

improved student outcomes. Thus, our study does not suggest that fidelity to core intervention

components is not important, but rather that even within structured programs, there is room for

teacher adaptation—even relatively moderate changes—to enhance program effects.

Finally, it is critical to bear in mind the broader practical goal of improving student

literacy outcomes in high-poverty schools. That Adaptive READS succeeded in high-poverty

schools, where the social and organizational conditions that support collaborative inquiry are less

likely to be found (Finnigan & Daly, 2012), provides an existence proof that creating

opportunities for teachers to implement structured adaptations can foster conditions necessary to bridge the divide between research and practice. Indeed, to work better in a variety of contexts, many evidence-based literacy programs and practices must undergo substantial refinement and adaptation. McDonald and colleagues (2006) have argued that the goal of scale-up in education research "is not to prescribe a course of action for all schools" (p. 21). Instead, teachers must use both formal scientific knowledge (Stanovich, 2003) and local knowledge to improve the fit between an evidence-based program and their local school context (Goldenberg & Gallimore, 1991) and bridge the gap between research and practice. According to Bryk et al. (2015), the principle of adaptive integration "recognizes that each attempt to implement an intervention in a new setting…may require significant changes in the intervention, and in the work settings into which it is being introduced, for the intervention to fit and achieve quality outcomes locally" (p. 183). Such work is inherently challenging in high-poverty schools, which often get sidetracked as they "search for a single, magic bullet to solve all their ills, or, in response to a multitude of pressures from state or district mandates, they shift from topic to topic" (Taylor, Pearson, Peterson, & Rodriguez, 2005, p. 40). Despite the challenge of supporting literacy improvement at scale in high-poverty schools, it is possible and desirable to empower teachers to become active agents in addressing locally defined problems of practice, co-designing an implementation plan, and enacting the plan with fidelity to the foundational principles of an evidence-based program.

Study Limitations

This study has two critical limitations. First, findings from this study may not generalize to a broader implementation context or to other large-scale literacy programs, practices, and reform efforts. Therefore, it is critically important to underscore the conditions under which the positive effects on student reading outcomes were observed, both in this study of Adaptive

READS and in the study of customized PALS. The effectiveness of both adaptive program implementation models was observed when schools (a) had some prior experience implementing the evidence-based program with fidelity; (b) acquired formal knowledge from previous research to adhere closely to the program model, as prescribed by researchers; and (c) continued to implement core components, validated by multiple replications, with fidelity. Absent these conditions, which may not be feasible to put in place in all contexts, structured teacher adaptations may not improve program outcomes.

It is less clear, however, to what extent teacher collaboration is necessary for the success of structured teacher adaptations as an implementation strategy. While this condition made sense in the context of READS, where some program activities are completed as a grade level, teachers in the study of customized PALS independently determined if and how they wanted to adapt their lessons. Indeed, the extent of prior intervention experience, formal knowledge, and collaboration required in order for teachers to make productive adaptations likely varies depending on the nature of the intervention being implemented. Both Adaptive READS and customized PALS are modular interventions that do not require substantial changes in school-wide or district-level processes. It is likely that more time and money would be needed to enhance teachers' competence around the foundational program principles of more complex literacy reform efforts in both domestic and international contexts (Sailors et al., 2014; Taylor et al., 2005).

Second, teachers in Adaptive READS schools made a number of inter-related program adaptations. As a result, we cannot pinpoint precisely the mechanisms that led to improvements in student reading comprehension outcomes. Although we documented the nature and types of program adaptations made by teachers, no single modification is likely to be responsible for

improving student reading comprehension outcomes. For example, our study design does not allow us to say how much teachers' changes to their students' book lists or efforts to increase attendance at family events contributed to improvements in students' reading comprehension. Instead, the right mix of fidelity and adaptation needed to enhance program effectiveness varied across schools.

Future Research Questions

The results of this study beg the question: Who should be responsible for helping teachers to balance tensions between fidelity and adaptation? Testing the effectiveness of structured teacher adaptations required our research team to embrace a more active stance toward implementation during the scale-up phase, both with respect to fidelity of core components and acceptable adaptations. Rather than aiming to translate research findings into school practices, researchers may need to experimentally manipulate the conditions under which program implementation occurs. Systematic manipulations can test and potentially strengthen the case for structured, local adaptation of standardized research practices, within specific parameters, learning more about if and how these efforts might result in improved program effects and sustainability over time. Passive attention to implementation has led largely to observational studies that examine correlations between fidelity and outcomes, leading to ambiguous findings regarding the causal role of implementation on program effectiveness (Century et al., 2010).

Our results further suggest that future research should more fully probe teachers' intrinsic motivation to implement and improve evidence-based literacy programs. It is conceivable that teachers' willingness to design and implement program adaptations may serve as a proxy for their intrinsic motivation to improve a program for their schools and students. While we provided guidance to teachers around foundational program principles and made it possible for

teachers to collaboratively plan adaptations, we did not require or incentivize teachers to make adaptations. Yet, all 13 Adaptive school teams made adaptations, many of which required teachers to take on new responsibilities and expend local resources. Would these result generalize to different contexts? In other words, how feasible are adaptive approaches if teachers have to invest personal resources? Viewed through the lens of self-determination theory, intrinsic motivation reflects a professional's "inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn" (Ryan & Deci, 2000, p. 71). Thus, a lingering question persists: To what extent do social contexts that are supportive of teachers' autonomy, competence, and relatedness cultivate the conditions needed to implement evidence-based literacy programs with fidelity and flexibility? For example, future research might examine the moderating role of teachers' working conditions on program implementation and student outcomes (Coburn & Woulfin, 2012; Kraft & Papay, 2014).

Our study encourages researchers to view fidelity and adaptation as two complementary dimensions of program implementation. The vexing challenge of bridging the research-practice divide may require both "mutual adaptations" (Berman & McLaughlin, 1978) and mutual respect between researchers and practitioners (Browne & Wildavsky, 1983; Damschroder et al., 2009). After all, researchers and practitioners share a "what works" epistemology (Stanovich, 2003) and a common goal of improving student outcomes. The knowledge of researchers and practitioners are both essential to navigating the two-way street between research and practice.

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Table 1

Baseline and Posttest Comparisons of Students and Teachers in Core READS and Adaptive READS (Analytic Sample)

	Adaptive READS			Core READS				
	M	*SD*	*N*	*M*	*SD*	*N*	*t*	*p*
Characteristics of Students								
Pretest (Rdg EOG Scores, 2014)	435.86	9.93	724	435.17	9.91	591	0.91	0.37
School % FRL	86.22	6.29	724	84.82	9.48	591	0.92	0.37
Posttest (ITBS Rdg Comp. Standard Score)	197.27	30.83	724	191.92	29.55	591	3.39	0.00
Characteristics of Teachers								
Number years in education (censored at 20)	10.31	6.75	55	9.80	7.70	54	1.21	0.24
Had prior experience with READS?	0.59		64	0.51		61	1.33	0.20

Note. Rdg = Reading. EOG = End-of-Grade North Carolina Reading Test. FRL = Free or reduced price lunch. ITBS Comp. = Iowa Test of Basic Skills, reading comprehension. A-C difference estimated from an OLS regression model that controls for fixed effects of randomization blocs (and imputation indicator for pretest model). Standard errors clustered at the school level in parentheses. Missing pretest scores imputed with school mean. Years experience variable from fall survey, prior READS experience variable from spring survey (includes school coordinators).

Table 2

Operationalization of READS Core Components in Core and Adaptive READS

Core component	Evidence for component	Operationalization in Core READS	Operationalization in Adaptive READS	Potential for acceptable adaptation
Lessons and summer materials: Students learn a comprehension routine (READS Reading Routine) to use with summer books	Prior READS studies suggest that teacher scaffolding is essential to students' success with READS (Kim & White, 2008)	• Teachers must deliver 6 scripted lessons over 6 consecutive school days	• Teachers must teach at least 6 READS lessons (scripts are optional) • Teachers must prepare students to use the routine independently over the summer	• Make procedural changes to facilitate lesson implementation • Make content changes to address student engagement in or understanding of the routine
Family engagement activities: Families learn about READS and how they can encourage their children to participate	The READS family event is rooted in literature on strengthening the home-school connection (Reese, Sparks, & Leyva, 2010; Sénéchal & Young, 2008)	• Teachers must distribute fliers to recruit families to the event • Teachers must attend the event • A trained facilitator demonstrates the routine and describes how families can encourage participation over the summer	• Each school must host at least 1 family event where parents learn about READS • Teachers must recruit families to the event; they may distribute fliers and/or use other strategies • Teachers must attend the event; they may take on additional responsibilities at the event(s)	• Use knowledge of families to increase attendance • Make procedural changes to facilitate implementation • Make content changes to address student and family engagement in or understanding of READS
Summer books: Students receive 10 free books over the summer that are matched to their reading level and interests	Prior READS studies demonstrate the need to take both student reading level *and* preferences into account to	• Teachers play no role in this component • Student reading level is measured using Lexile framework • Students complete a reading preferences survey	• Student reading level and preferences are measured as in Core and a computer algorithm matches books to students • Teachers may move student Lexile bands up/down by	• Address measurement error in reading test and/or survey by using knowledge of students to improve computer book matches • Increase the chances that students receive their books

	improve reading comprehension over the summer (Kim & Guryan, 2010; Kim & White, 2008)	• A computer algorithm matches books to students (20 books matched, 8 matched books and 2 lesson books sent over the summer) • Books are distributed over the summer	100 points, generating new book lists • Teachers may rearrange ordering of books, making matches more or less likely • Teachers may opt to send students additional matched books, rather than the 2 lesson books • Teachers may opt to have some books delivered at the end of the school year	over the summer
Summer nudges: Students and families receive nudges (reminders, incentives) over the summer to encourage participation in READS	Prior READS studies suggest that summer phone calls from teachers improve program outcomes in high-poverty schools (Kim & Guryan, 2010; White et al., 2014)	• Teachers play no role in this component • Families receive tips and reminders via text or phone calls (sent by research team) • Students receive prizes for turning in tri-folds (sent by research team)	• Families receive tips and reminders via text or phone calls; teachers can personalize the tips • Students receive prizes for turning in tri-folds • Teachers can create additional nudges to remind and/or incentivize students over the summer	• Capitalize on personal relationships with students to encourage participation • Devise "nudges" that more successfully engage students and families in READS over the summer

Table 3

Summary of Effect Sizes from Randomized Experiments of READS

Reference	Sample	Treatment	Design	Outcomes
Kim (2006)	10 elementary schools, G4, N=552 students, 39% receiving FRL	Control vs. READS (matched books with oral reading and comprehension scaffolding)	Randomized experiment	Marginally significant effect of READS across all students on a standardized reading comprehension (Iowa Test of Basic Skills; ITBS) (*ES* = .08, p<.10)
Kim & White (2008)	2 elementary schools, 24 classrooms, G3-5, N=514 students, 38% receiving FRL	Control vs. READS (matched books with oral reading and comprehension scaffolding)	Randomized experiment	Significant effects of READS on reading comprehension (ITBS) (*ES* = .14)
Kim & Guryan (2010)	4 elementary schools, G4, N=400 students, over 90% receiving FRL	Control vs. READS (books with oral reading and comprehension scaffolding) vs. READS Family (books with scaffolding + family literacy group)	Randomized experiment	No significant effects of READS (*ES* = .02, n.s.) or READS Family (*ES* = .04, n.s.) on reading comprehension (Gates-MacGinitie Reading Test; GMRT)
White et al. (2014)	10 high-poverty schools (75-100% FRL) and 9 moderate-poverty schools (45-74% FRL), G3, N=1,421 students	Control vs. READS (matched books with oral reading and comprehension scaffolding) vs. READS Teacher (books with scaffolding + summer teacher phone calls)	Randomized experiment	Significant effects of READS and READS plus Teacher Calls for students in high-poverty schools on reading comprehension (ITBS) (*ES* = .08 and *ES* = .11), but not for students in moderate-poverty schools (*ES* = -.11 and *ES* = -.12)
Studies Assessing Near-Term Effects				*Average ES* = .06
Kim et al. (2016)	39 high-poverty schools (75-100% FRL) and 20 moderate-poverty schools (45-74% FRL), 463 classrooms, G2-3, N=6,383 students	Control vs. READS (matched books with oral reading and comprehension scaffolding)	Randomized experiment	Delayed effects on students' reading comprehension on end-of-grade North Carolina reading test (*ES* =.04 overall; *ES* = .05 in high-poverty schools)
Stein (2016)	35 high-poverty schools (80-100% FRL), G3-4, N=4,881	Control vs. READS (matched books with oral reading and comprehension scaffolding)	Randomized experiment	Delayed effects on G4 students' reading comprehension on end-of-grade Maryland tests (*ES* = .14 in high-poverty schools)
Studies Assessing Delayed Effects				*Average ES* = .09

Table 4

Type and Nature of Adaptations Completed by Adaptive READS School Teams

READS Component	Adaptations Completed (number of Adaptive schools)	
	Content	**Procedural**
Lessons and summer materials	Used teacher voice (5); Extended lesson activities (3); Spread READS strategies* (2); Held READS spring rally* (2); Extended and/or substituted lesson materials (1)	Changed lesson timing (9); Taught additional lessons (3)
Family engagement activities	Shared READS data with families (4); Extended family event with student performance (2); Provided an additional example of READS Reading Routine (1); Gave family event a theme (1); Put samples of READS books on display (1)	Used additional or alternative recruitment strategies (12); Held multiple family events (either separately or concurrently), with teachers taking on presentation responsibilities (4); Staffed a sibling room (2); Formally separated dinner from the presentation (1)
Summer books	Extended student reading preferences survey materials (2)	Changed how books distributed (4); Collected additional student contact information (2); Conferred with students and/or parents about books lists (2)
Summer nudges	Created new fall event* (8); Made summer phone calls to students (2); Made summer phone calls to parents (2); Send letter to parents (1); Personalized summer tips (1); Created and staffed summer check-in* (1)	

Note. A * indicates a new READS activity, rather than the modification (extension, substitution) of an existing activity.

Table 5

Effects of Adaptive READS on Teachers Self-Reported Use of READS Family Night Recruitment Strategies

Variable	Adaptive – Core Difference	Core READS	N
Student incentives (individual/class)	.26*	0.15	55
	(.13)		
Communication via existing channels	-.29**	0.42	55
	(.10)		
Direct parent outreach	.14	0.12	55
	(.09)		
Generating buy-in	.18	0.42	55
	(.12)		
Buy-in through data	.08~	0.00	55
	(.04)		
Recorded phone message	.30***	0.12	55
	(.09)		
Teacher-generated reminder	-.12	0.23	55
	(.09)		
Student presentation	.14**	0.00	55
	(.05)		
Teacher-generated document	.42***	0.04	55
	(.09)		
Number of strategies used	.65~	4.31	55
	(.33)		

Note. Core READS Mean is observed descriptive mean. Adaptive-Core difference is estimated from a multilevel regression model controlling for fixed effects of randomization bloc.
~ $p <0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6

Effects of Adaptive READS on the Quantity and Quality of Home-Based Summer Book Reading with READS Books

	Overall				Adaptive READS		Core READS			
	M	SD	Min	Max	M	SD	M	SD	Difference	N
Tokens across Summer Books	12577	9965	517	56099	13840	10667	11033	8799	2678*** (546)	1314
Types across Summer Books	1522	911	169	5433	1640	972	1378	807	250*** (50)	1314
Mean Lexile of Summer Books	609	167	165	1138	623	179	592	151	29** (9)	1315

Note. A-C difference estimated from a multi-level model that controls for fixed effects of randomization blocs. Standard errors in parentheses.
Book characteristics are based on the average for the 10 READS Summer books, including the number of tokens (total words), types (total unique words), and mean Lexile.
$\tilde{}\ p < 0.10,\ ^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

Table 7

Mixed methods used to align research questions, measures, data collection, and analyses

Research Questions	Measures	Data Collection	Analyses
Student Outcomes			
(1) Compared to Core READS, what is the effect of structured teacher adaptations on student and family engagement in READS activities?	(1a) Student completion of READS homework	(1a) Student homework collected after Lessons 1 and 4	(1a) HLM analyses of the proportion of homework returned after Lessons 1 and 4
	(1b) Student attendance at READS lessons and the family event	(1b) Attendance logs at READS lessons and the family events	(1b) HLM analyses of lessons attended; proportion of families who attended at each school site
	(1c) Student fall survey of summer book reading	(1c) Self-reported fall survey	(1c) HLM analyses of fall survey data (amount of summer reading, interest in books, perceptions of text difficulty)
	(1d) Student tri-folds mailed with each matched book	(1d) Mailed tri-folds and answers to questions	(1d) HLM analyses of tri-fold returns
(2) Compared to Core READS, what is the effect of structured teacher adaptations on student reading outcomes in the fall?	(2) Student fall ITBS	(2) Group administered third week of school (September 2015)	(2) HLM analyses of ITBS scores
Teacher Implementation Processes			
(3) Compared to Core READS, what is the effect of structured teacher adaptations on teachers' fidelity to the READS lessons?	(3) Teachers' fidelity of lesson implementation (adherence and quality)	(3) Recordings of Lessons 1 and 4 (teacher sub-sample)	(3) HLM analyses of lesson adherence and quality (teacher sub-sample)

Table 8

Effects of Adaptive READS on Student Engagement (Lessons and Family Night)

	Overall		Adaptive READS		Core READS			
	M	SD	M	SD	M	SD	Difference	N
Proportion of homework tri-folds returned in class across lessons (teacher-level)	0.72	0.16	0.71	0.16	0.74	0.17	-.03 (.04)	98
Proportion Lessons Attended	0.94	0.13	0.94	0.13	0.95	0.14	.00 (.01)	1314
Proportion READS Family Night Attendance	0.40	0.49	0.45	0.50	0.35	0.48	.10** (.03)	1275

Note. Difference is estimated from a multilevel regression model that controls for fixed effects of randomization blocs. Standard errors in parentheses.
$\tilde{~} p < 0.10$, $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

Table 9

Effects of Adaptive READS on Student Engagement (Quantity and Quality of Summer Book Reading)

	Overall		Adaptive READS		Core READS		A-C	
	M	SD	M	SD	M	SD	Difference	N
Total # Books Read over Summer (Fall Survey)	10.21	5.89	10.15	5.93	10.29	5.84	-.28 (.33)	1294
Total # READS Books Read over Summer (Fall Survey)	6.21	3.24	6.39	3.16	6.00	3.31	.37* (.19)	1274
Books Too Easy	0.22	0.41	0.18	0.39	0.25	0.44	-.07** (.02)	1295
Books Just Right	0.71	0.45	0.74	0.44	0.67	0.47	.07** (.03)	1295
Books Too Hard	0.07	0.26	0.08	0.27	0.07	0.26	0 (.01)	1295
Enjoyment of Books (1="I really didn't like them"; 5= "I really liked them")	3.5	1.16	3.47	1.17	3.53	1.15	-.07 (.07)	1297
Number Tri-folds Returned	3.45	3.75	3.65	3.76	3.19	3.73	.39~ (.21)	1315
Total # Correct across Tri-folds	6.86	7.81	7.19	7.79	6.46	7.83	.53 (.44)	1315

Note. A-C difference estimated from a multi-level regression model that controls for fixed effects of randomization blocs. Standard errors in parentheses.
~ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10

Multi-Level Models Estimating the Effects of Adaptive READS on Student Reading Comprehension (Std.)

	(1) ITBS RC (Std.)	(2) ITBS RC (Std.)	(3) ITBS RC (Std.)
Pretest (EOG)		0.0707***	0.0704***
		(0.00204)	(0.00205)
Adaptive			0.121**
			(0.0413)
N	1315	1315	1315
sigma2_u	0.000781	0.00553	0.000735
sigma2_e	0.961	0.482	0.483
rho	0.000812	0.0113	0.00152

Note. EOG = North Carolina End of Reading Pretest, Spring Grade 4. ITBS RC (Std.) = Iowa Test of Basic Skills, Reading Comprehension standardized to a mean of 0 and standard deviation of 1. Standard errors in parentheses. All models control for fixed effects of randomization blocs. In pretest models, pretest is imputed using school mean for students with missing pretest; models control for imputation indicator.
˜ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11

Effects of Adaptive READS on Teachers' Fidelity of Lesson Implementation (Adherence and Quality)

	Overall		Adaptive READS		Core READS			
	M	SD	M	SD	M	SD	Difference	N
Lesson Adherence (%)	84.91	8.55	82.84	10.41	87.24	5.07	-4.55* (2.29)	49
Lesson Quality (0=Low, 1=Med, 2=High)	1.35	0.38	1.35	0.44	1.35	0.31	.00 (.09)	49
Mean Number Minutes Spent on Lessons 1 & 4	37.1	9.77	40.62	10.57	33.13	7.12	7.80*** (2.25)	49
How much of script does teacher read? (total across Lessons 1 & 4)	5.36	0.94	5.05	1.17	5.68	0.48	-.92** (.3)	44
How much does teacher add to script? (total across Lessons 1 & 4)	3.09	0.96	3.36	0.95	2.82	0.91	.59* (.25)	44

Note. Difference is estimated from a multilevel regression model that controls for fixed effects of randomization blocs. Standard errors in parentheses.
$^{\sim} p <0.10, ^{*} p < 0.05, ^{**} p < 0.01, ^{***} p < 0.001$

Appendix A

Comparison of Implementation Activities for Core READS and Adaptive READS

Time Period	Adaptive READS Activity	Description of Adaptive READS Activity	Core READS Activity	Description of Core READS Activity
November 2014	Initial working group meeting (2 hours)	School teacher teams meet to 1) learn about the research-based principles underlying READS; 2) discuss their school-specific READS data; 3) identify problems of practice related to READS. Research team member and implementation partner are present.	Nothing	
December 2014	Online discussion forums	Working at their own pace, teachers learn more about the core components of READS through a series of online modules. Teachers participate in discussion forums with their teammates. Teachers brainstorm adaptations to READS.	Nothing	
January-March 2015	Working group meetings (60-90 minutes per meeting); spring ITBS testing to identify leveled books	School teacher teams meet to 1) discuss possible adaptations and why they want to make them; 2) finalize a set of adaptations that they will commit to. Research team member and/or local implementation partner are present. Students take the ITBS.	Core READS lesson training (2 hours); spring ITBS testing to identify leveled books	In March, each school team participates in a training to learn how to implement the scripted READS lessons. Students take the ITBS.
March-June 2015	Adaptive READS implementation window	Teachers implement their adaptation plan with support from their local implementation partner. Teachers meet monthly to discuss implementation and prepare for upcoming READS activities. Implementation timelines varied by school.	Core READS implementation window	Teachers teach the six scripted READS lessons and attend READS Family Night. Implementation timelines varied by school.
June-July 2015	Adaptive READS conference in Boston	Adaptive READS school teams gather in Boston to share their implementation experiences and learnings.	Core READS conference in North Carolina	Core READS teachers gather in North Carolina to share implementation experiences and learnings.

Appendix B

Adaptive READS Working Group Adaptation Template

[SCHOOL NAME]
Module 5 Working Group Template
Due:

DIRECTIONS FOR TEACHERS: Welcome to Module 5! Instead of posting in a discussion forum, you will work with your team in Google docs to populate the template below. This template will serve as your "rough draft" adaptation plan. Later this month, your team will meet again to discuss the ideas in the template and to finalize your plan.

★ **Start** by reading numbers 1 through 4 below. With [name of School Coordinator] help, we used our notes from the November meeting to complete these sections. We wanted to refresh your memories about all of the great work you did a few months ago. These notes should be helpful as you fill out the template.
★ **Then**, read the documents called "READS Must Haves" and "Adaptation Idea Starters."
★ **Finally**, work on the template. Use any of the resources that are available to you, including: your ideas from November, new thinking you've done while working through the modules, the idea starters we provided, etc.
★ Include your name when you write in the template and try to build on one another's ideas (see example). Remember, this is a collaborative process!

If you have any questions, be in touch with [School Coordinator].

As a reminder, these are the focus area questions that you considered in November:
- How can we increase engagement and tri-fold returns for a subpopulation of our students (boys/girls, lower-level/higher-level readers) and/or a book genre (narrative/informational)?
- How can we better connect our families to READS?
- How can we integrate READS into the work our school is doing around reading instruction and engagement?

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1. **Your focus area questions:**
2. **Why are these questions important** – i.e., why will focusing on these questions get more of our students engaged in summer reading:

3. **Themes and questions emerging from the November meeting**: These themes and questions are here for your reference.
4. **Adaptation ideas that came up in November:** These ideas are here for your reference. You do not need to include them in the template unless you want to. Participation in the modules may have sparked new ideas or changed your thinking on these ideas.

What is the adaptation?	Which READS core components does this adaptation impact (book matching, lessons, family engagement, summer scaffolding)?	Why do you want to make this adaptation (based on what data or theory of action)? How will it address your focus area question?	When will you do this adaptation?	Who is responsible for this adaptation (e.g., 4th grade team, particular teacher, School Coordinator, etc.)?	What artifact will you collect to document this adaptation?	How will you know if the adaptation is doing what you want it to do?

Appendix C

Codebook for Team Adaptation Plans

1. **Core component affected:**
   a. *Lessons*
   b. *Family engagement*
   c. *Books*
   d. *Summer nudges*
2. **Type of adaptation:**
   a. *Addition:* Adaptation does not "fall within the activities, materials, facilities, etc., defined by any of the existing fidelity components" (Blakeley et al., 1987)
      i. *Clearly aligned* to READS principles
      ii. *Not clearly aligned* to READS principles
   b. *Modification:* Adaptation falls "within the realm of activities defined by an existing fidelity component but outside the bounds defined by prescribed variations" (Blakeley et al., 1987)
      i. *Extension*: Adaptation modifies an existing READS activity or process (e.g., lesson, family event) by creating new components (Sherin & Drake, 2009)
      ii. *Substitution*: Adaptation modifies an existing READS activity or process by replacing or substituting one component of an activity or aspect of a process with something different (Sherin & Drake, 2009)
      iii. *Omission* (not acceptable): Adaptation changes a READS activity by omitting components of the activity, that is, deleting one part of an activity without adding something in its place (Sherin & Drake, 2009)
3. **Resources and responsibilities:**
   a. *Yes*, teachers and/or other school personnel are taking on additional responsibilities and/or investing resources (personal time, classroom time, material resources)
   b. *No*, teachers and/or other school personnel are not taking on additional responsibilities or investing resources (e.g., adaptation carried out by READS research team or does not require additional resources)
4. **Nature of adaptation**:
   a. *Procedural*: Adaptation modifies an existing READS process (e.g., how families are recruited to the family event, how students are matched to books, how students receive books)
   b. *Content*: Adaptation modifies an existing READS activity (e.g., the content of the lessons, the content of the family event)

Appendix D

Lesson Adherence Rubric

Lesson 4
Core Component 1: Main Idea Predictions
Essential elements:
1. YES NO: Reads or paraphrases the definition of "informational book" provided in the script
2. YES NO: Reads or paraphrases the different types of main ideas found in each type of informational book
3. YES NO: Reads or paraphrases the description of how to make a Main Idea Prediction provided in the script
4. YES NO: Reads aloud all of the words/phrases (and/or asks students to read them aloud)
5. YES NO: Identifies or asks students to identify A Picture Book of Cesar Chavez as a biography
6. YES NO: Facilitates the making of class Main Idea Predictions for all three circles
7. For at least one circle, teacher explicates for students how to make a main ideas guess
   a. NO (0) – Thinking behind guessing is not exposed, either by teacher or student.
   b. YES, medium (1) – Thinking behind guessing is somewhat exposed by either teacher or student.
   c. YES, high (2) – Thinking behind guessing is clearly exposed by either teacher or student—i.e., teacher and/or students walks through each answer choice and gives a reason for why it is or is not the best answer.
8. Check all that apply:
   a. Teacher provides students with an opportunity to discuss some of the words and phrases (e.g., by asking students if there are any words/phrases in Circle 1 that they don't know)
   b. Teacher provides students with an opportunity to discuss all of the words and phrases
   c. Teacher discusses the meaning of at least one word or phrase with students
   d. Teacher tells students that any one of the three guesses (C1, C2, C3) is correct (i.e., rather than leaving open the possibility that the guess could be wrong)

Core Component 2: Read Aloud
Essential elements:
1. YES NO: Reads aloud the informational lesson book
2. YES NO: Rereads at least 3 of the sentences that have Information Impressions words/phrases in them
3. YES NO: Asks at least 3 questions (scripted or unscripted) during or after the read aloud
4. YES NO: Asks (scripted or unscripted) questions at different levels of abstraction (at least two levels)

Core Component 3: Main Idea Prediction Check
Essential elements:

1. YES NO: Teacher confirms the correct answer for each of the three Main Idea Guesses
2. YES NO: For Main Idea Prediction 1 (correct answer = "What Cesar's childhood was like"), makes some effort to explain or discuss with students how the correct answer was reached
3. YES NO: For Main Idea Prediction 2 (correct answer = "How Cesar become a leader"), makes some effort to explain or discuss with students how the correct answer was reached
4. YES NO: For Main Idea Prediction 3 (correct answer = "What made Cesar famous"), makes some effort to explain or discuss with students how the correct answer was reached

Core Component 4: Tri-Fold Activity

Essential elements:

1. YES NO: Reviews the tri-fold with students, highlighting the different sections of the tri-fold (e.g., words/phrases, area to make Main Idea Predictions)
2. YES NO: Clearly explains the homework assignment to students
3. YES NO: Reviews the READS Reading Routine with students