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**Can a Scaffolded Summer Reading Intervention Reduce Socioeconomic Gaps  
in Children's Reading Comprehension Ability and Home Book Access? Results  
from a Randomized Experiment**

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**DRAFT**

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## **Abstract**

The researchers conducted a randomized experiment involving 824 third-grade children in 14 elementary schools (K-5) to examine the effects of a scaffolded summer reading intervention that provided books matched to children's reading level and interests and teacher scaffolding in the form of end-of-year comprehension instruction. Within each school, children and teachers were randomly assigned to (a) a control condition involving six math lessons, (b) a treatment condition with six reading comprehension lessons and an afterschool family literacy event, and (c) an enhanced treatment that also included follow-up phone calls to parents. During summer vacation, children in the treatment conditions received two lesson books and eight matched books. A treatment by socioeconomic status (SES) interaction effect on reading comprehension posttests revealed larger positive effects for children in high poverty schools than children in moderate-high poverty schools. In addition, among a random subsample of children ( $n = 121$ ) who were part of a home visit study, there were positive treatment effects on the quantity and the diversity of books at home and trends suggested larger effects for children from low SES families. The results highlight the variability in treatment effects across different school and family contexts.

*Keywords: summer learning loss, randomized controlled trial, reading comprehension, parent involvement, poverty*

# Can a Scaffolded Summer Reading Intervention Reduce Socioeconomic Gaps on Children's Reading Comprehension Ability and Home Book Access? Results from a Randomized Experiment

## Introduction

Children in lower socioeconomic status (SES) schools and families lose ground to their higher-SES peers in reading comprehension during summer vacation. On average, the gap in reading scores between low- and high-SES children widens by approximately three months during summer vacation (Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996). In addition, longitudinal research suggests that socioeconomic differences in reading growth rates are larger in the summer months than in the school year (Cheadle, 2008; Downey, von Hippel, & Broh, 2004; LoGerfo, Nichols, & Reardon, 2006; McCoach, O'Connell, Reis, & Levitt, 2006). Given the preponderance of evidence on summer reading loss for low-SES children, cost-effective interventions are critical to addressing SES-based gaps in reading comprehension during the elementary grades (McCombs, Augustine, Schwartz, Bodilly, McInnis, Lichter, & Cross, 2011).

The purpose of this study is to examine whether a scaffolded summer reading intervention can reduce SES-based gaps in children's reading comprehension ability and home book access. We report findings from a randomized experiment of a home-based, scaffolded summer reading intervention called READS for Summer Learning. It is supported by research indicating that home-based summer reading interventions may increase low-SES children's home book access during the summer months and improve reading comprehension outcomes (Kim & Quinn, 2013; McCombs et al., 2012). Figure 1 describes the program theory underpinning READS for Summer Learning and the context for the intervention activities as they are implemented over time (Bronfenbrenner & Morris, 2005). Beginning in the spring, teachers implement comprehension lessons in classrooms and children and parents attend an afterschool family literacy event. Then,

during the summer months, children are mailed two lesson books and eight matched books along with reading comprehension activities and questions tailored to each book. The READS for Summer Learning program theory flows from (a) studies comparing children's reading growth during the summer months and academic school year, (b) studies on the quantity and diversity of books in low SES children's homes, and (c) studies on the effects of summer reading interventions for low-SES children.

### **Theoretical and Empirical Background**

#### **Seasonal Comparisons of Children's Reading Growth During the Summer and School Year**

Seasonal comparisons of children's reading growth suggest that socioeconomic gaps expand more rapidly in the summer months than the school year. The faucet theory of learning, proposed by sociologists, suggests that children from low-SES and high-SES families enjoy similar gains in reading comprehension during the traditional nine-month school calendar when school resource faucet is turned on (Entwisle, Alexander, & Olson, 2000). When school is not in session, the resource faucet is turned off for low-SES children, who consequently make smaller gains in reading than their middle-class peers, for whom the faucet is not turned off during the summer months.

There are several theorized mechanisms driving the rich/poor gap in reading comprehension outside school, especially during the summer months. Researchers have suggested that, compared to children in middle- and high-SES families, low-SES children have lower quality home literacy environments and limited opportunities to participate in center-based enrichment activities outside of school (Dearing, et al., 2009; Duncan & Brooks-Gunn, 1997; Entwisle et al., 1997; Hart & Risley, 2003; Heyns, 1978; Lareau, 2003). Research suggests that, in the absence of formal schooling, low-SES parents have fewer material and psychological resources to invest in

their children's reading skills compared to middle- and high-SES parents; in addition, economic hardships and family stress make it difficult for low-SES parents to nurture their children's cognitive, social, and emotional development (Bradley & Corwyn, 2002; Conger & Donnellan, 2007). In particular, parents' socioeconomic status may have immediate effects on the quantity and quality of children's home learning opportunities. For example, family investment models highlight SES differences in parents' ability to promote their children's well-being (Bornstein & Bradley, 2003; Bradley & Corwyn 2002; Duncan & Magnuson 2003, Haveman & Wolfe 1994; Mayer, 1997). Compared to low-SES parents, middle-SES parents have more access to financial capital (income) and human capital (education) and are able to invest in learning materials at home, to provide specialized tutoring for their children, and to live in neighborhoods with better schools, libraries, and community programs (Conger & Donnellan, 2007; Lareau, 1989). As a result, middle SES parents are able to sustain home literacy routines that promote their children's reading skills when the school learning faucet is shut off during the summer months.

Longitudinal studies of children's reading growth during the summer months and school year provide convergent evidence supporting the faucet theory of learning. Studies based on data from urban school districts and nationally representative samples suggest that inequality expands mostly during the summer months. For example, Heyns (1978) examined reading gains for a sample of 1,128 sixth- and seventh-grade students in the Atlanta public schools, and found that socioeconomic disparities expanded more rapidly during the summer months than school year. Using data from the Beginning School Study, a longitudinal study that followed a representative sample of Grade 1 children (1982 cohort) in Baltimore public schools, Alexander, Entwisle, and Olson (2007) found that two-thirds of the low and high socioeconomic status gap in children's reading comprehension scores at the end of ninth grade originated in the summer months following

first- to fourth-grade. In a more recent analysis involving the Early Childhood Longitudinal Survey, Kindergarten Class of 1998-99 (ECLS-K), Downey, von Hippel, and Broh (2004) replicated findings from previous seasonal comparisons research and concluded that schools mitigated socioeconomic inequities in reading achievement. Given these findings, Downey et al. (2004, p. 614) hypothesized that disadvantaged children attending low quality schools can enjoy a larger “school boost” than advantaged children attending high quality schools. These seasonal comparisons showing that SES-based reading comprehension gaps expand more rapidly in the summer than the school year (Alexander, Entwisle, & Olson, 2007; Downey, von Hippel, & Broh, 2004) provide a strong rationale for intervening during the summer months.

### **Quantity and Diversity of Books in Low-SES Children’s Homes**

To reduce socioeconomic disparities in reading during the summer months, it is critical to address SES disparities in children’s opportunities to read books at home. Descriptive results from the National Longitudinal Survey of Youth (NLSY) indicate that children from poor families (those meeting the federal definition of poverty) were less likely than non-poor children to own 10 or more books (Bradley, Corwyn, McAdoo, & Coll, 2001). The income-based difference in the proportion of children owning 10 or more books was .57 standard deviations (SD) in early childhood (3-5 years) and .25 SD in middle childhood (6-12 years). Analyses based on the ECLS-K suggest that the number of books in children’s homes explains variation in reading outcomes in the early elementary grades, controlling for the effects of family socioeconomic status (Fryer & Levitt, 2004). The number of books in a child’s home is an important material resource for parents to use in cultivating their children’s reading skills and motivation to read (Burgess, Hecht, & Lonigan, 2002; Cheadle, 2008; Mayer, 1997).

Descriptive studies suggest that low SES children have fewer opportunities to read a diversity of appropriately challenging books. For example, children from low-SES families tend to have less access not only to books in general, but also to books that are engaging and at the appropriate reading level, specifically. Ethnographic research indicates that low-SES parents are less-skilled than middle -SES parents in purchasing books that are well-matched to their children's reading level and interests (Lareau, 2003; Chin & Phillips, 2004). Children in lower-SES schools also have fewer opportunities than children in higher-SES schools to read informational texts. Drawing from observations of 20 first-grade classrooms from low and high SES school districts, Duke (2000) found substantial differences in children's access to informational texts. Across four classroom visits, high-SES schools displayed an average of 14.5 informational texts in the classrooms, while low-SES schools displayed only 4.3 informational texts. While first grade teachers spent little time discussing informational texts in general, teachers in low-SES schools spent less time discussing such texts with students than teachers in high-SES schools. These differences are particularly noteworthy given that difficulties with informational texts may help to explain gaps in reading achievement by Grade 4 (Chall, Jacobs, & Baldwin, 1990). Clearly, then, low-SES children need more opportunities to read informational books in order to build the background knowledge and inferencing skills that underlie skillful comprehension of expository texts (Best, Floyd, & McNamara, 2005; Duke & Billman, 2009; Eason, Goldberg, Young, Geist, & Cutting, 2012). Accordingly, in the absence of an intervention, low-SES children are less likely than middle-SES children to read a variety of texts, particularly informational books.

### **Effects of Summer Reading Interventions for Low-SES Children**

In recent years, a number of experimental studies have provided stronger causal evidence that efforts to increase children's home book access can improve the reading achievement of low-

SES children. For example, a recent meta-analysis of home-based summer reading interventions (Kim & Quinn, 2013) indicated that the income status of samples moderated effects on reading comprehension. For reading comprehension outcomes, the mean effect size for majority low-income samples ( $d = .20$ , 95% CI = .11/.29) was significantly higher than the mean effect size for mixed-income samples ( $d = .00$ , 95% CI = -.11/.10). In addition, a longitudinal randomized experiment (Allington et al., 2010) in which children self-selected books to read for three consecutive summer vacations yielded positive effects for low-income children who were eligible for free lunch ( $d = .21$ ) and negative effects for middle-income children who were not eligible for free lunch ( $d = -.18$ ). Thus, experimental studies of home-based summer reading interventions suggest that treatment effects are likely to vary across school and family SES contexts, producing potentially more positive effects on reading comprehension for low-SES children.

To better understand why home-based summer reading interventions may be more effective for low-SES children than middle-SES children, more research is needed to understand treatment-control differences in the quantity and diversity of books in children's homes across a variety of family SES contexts. We are aware of no study to date that uses direct observations to measure children's home access to books or a composite family SES measure that captures variability in parents' education, income, or occupation. In the absence of this information, we rely on the faucet theory of learning and meta-analytic evidence to highlight the likely mechanisms driving treatment effect variability across family SES contexts. Because low-SES children have limited access to a wide variety of texts at home, the treatment-control contrast in children's home access to books is likely to be more positive for low-SES children. Improving the measurement of children's home access to books and family SES would shed light on whether a home-based summer reading

intervention creates a more positive treatment-control contrast in the quantity and diversity of books at home and the reading comprehension ability of low-SES children.

In this study, we pursued the twin goal of using direct observations to measure treatment-control differences in children's home access to books and to examine treatment effects on reading comprehension outcomes across a range of school and family SES contexts. We did so in the context of a replication and extension of the Reads for Summer Learning intervention, a scaffolded home-based summer reading intervention that is designed to increase low-SES children's home access to books and reading comprehension outcomes. The Reads for Summer Learning program theory (Figure 1) suggests that the combination of (a) end-of-year teacher scaffolding in classroom lessons and a school-based family literacy event and (b) opportunities to read matched and interesting books at home will improve low-SES children's reading comprehension. Consistent with Graves and Graves (2003), we define scaffolding as "a set of prereading, during reading, and postreading opportunities and experiences designed to assist a particular group of students in successfully reading, understanding, learning from, and enjoying a particular selection" (p.2), such as instructional procedures for teaching reading comprehension strategies and instructional frameworks that foster content learning (Clark & Graves, 2005). In addition to teacher scaffolding of summer reading through end-of-year lessons, we also scaffold summer reading by selecting texts that were matched to each child's reading interest and reading level.

In an earlier test of our program theory (Kim & White, 2008), we randomly assigned 400 children in grades 3 to 5 to one of four experimental conditions, including (a) control condition, (b) matched books only condition, (c) matched books with oral reading scaffolding condition, and (d) matched books with oral reading and comprehension scaffolding condition. To assess each child's reading interests, teachers administered a reading preference survey that asked children how much

they enjoyed reading books from 25 categories. We used a two-step computer algorithm to select eight matched books from among 240 available titles for which a readability measure in Lexiles was available. We selected books that matched both (a) the child's interests based on the reading preference survey, and (b) the child's independent reading level based on the comprehension pretest, where the independent reading level was defined as Lexile range (i.e., +50 Lexiles to -100 Lexiles around the observed pretest Lexile score). The Lexile framework uses a Rasch model to place measures of reader ability and the readability level of texts on a common scale and is used by researchers and educators to determine whether the readability level of a book is matched to a child's independent reading level (Rasch, 1980; Schnick & Knickelbine, 2000). For students in the treatment groups, one matched book was mailed each week for eight successive weeks from early July until the end of August. In this study, we replicated the reader-text matching procedure used in our previous studies, and also mailed home two books used by teachers in end-of-year lessons.

The most effective treatment condition involved the matched books with oral reading and comprehension scaffolding at the end of the school year. Specifically, children in the matched books with oral reading and comprehension scaffolding group scored significantly higher on the Iowa Test of Basic Skills reading comprehension test than the control group ( $d = .14$ ), and effect sizes were largest for low-income children (i.e., eligible for free and reduced lunch) ( $d = .28$ ). A replication experiment (Kim, 2006) involving the effective teacher-scaffolded and matched book condition revealed positive effects on reading comprehension ( $d = .08$ ), and more promising effects for Black students ( $d = .22$ ), Latino students ( $d = .14$ ), less fluent readers ( $d = .17$ ), and students who reported owning fewer than 50 children's books ( $d = .13$ ).

In our most recent experiment (White, Kim, Kingston, & Foster, 2014), we examined whether the effects of the matched books with oral reading and comprehension scaffolding condition (i.e., basic treatment) were replicated in a new district and whether additional teacher scaffolding with three follow-up phone calls during summer (i.e., enhanced treatment) could

enhance effects on comprehension. School poverty levels moderated the efficacy of the basic and enhanced treatments with more positive effects of  $d = .08$  and  $d = .11$  in high poverty schools (75-100% free and reduced-price lunch), and  $d = -.11$  and  $d = -.12$  in moderate poverty schools (45-74% free and reduced-price lunch).

### **Study Goals and Research Questions**

This study was designed (a) to examine whether a scaffolded summer reading intervention can reduce SES-based gaps in children's home book access and reading comprehension and (b) to improve the measurement of children's home book access and family socioeconomic status backgrounds. First, we replicated the basic treatment involving matched books and teacher scaffolding in the form of six comprehension lessons at the end of the school year and extended the lesson activities into an afterschool family literacy event (teacher- and parent-scaffolded condition = TPS). The goal of the afterschool family literacy event was to bridge the classroom and home contexts by helping parents understand the reading routines that children were prompted to use with each book that was mailed home during the summer months (Bronfenbrenner & Morris, 2006). In addition, we replicated and extended the enhanced treatment condition by conducting follow-up calls with parents whose children were not completing the reading activities tied to each mailed book (i.e., teacher- and parent-scaffolded condition with follow-up phone calls = TPSF).

Second, we improved the measurement of children's home access to books and children's SES backgrounds using data from home visits with a representative sample of 121 children drawn from the control and treatment groups. We measured the quantity and diversity of the books in the home and we created a composite family SES measure based on parent education, income, and occupational status. In this study, we address the following two questions:

1. What was the impact of the TPS and TPSF treatment conditions on reading comprehension outcomes? Were the effects of the TPS and TPSF conditions on reading comprehension more positive for children from low SES backgrounds?
2. Were the treatment effects (combining TPS and TPSF) on the quantity and diversity of books in the home more positive for children from low SES backgrounds?

## **Method**

### **Study Context and Participants**

A total of 824 Grade 3 children in 14 public elementary schools in North Carolina obtained active consent and completed reading pretests. To recruit the schools, we worked with affiliates in three districts with a Communities In Schools (CIS) program, and purposefully sampled 10 schools from a mid-sized urban district, two schools from a rural district, and two schools from a larger metropolitan district. Black children (55%) and Latino/a children (30%) comprised a clear majority of the sample. Baseline scores on the Iowa Test of Basic Skills comprehension test ( $M = 37$  percentile rank,  $SD = 26$ ) indicate that the sample mean was below the national norm. Children in our study context attended mostly moderate to high poverty schools and came from low- to middle-SES families. The school-level percentage of children eligible for free and reduced lunch ranged from a low of 61% to a high of 100%.

In addition, the median household income for children in our home visit sub-sample, at \$25,000, was below the median US household income of \$51,017 in 2012 (DeNavas-Walt, Proctor, & Smith, 2013). In addition, the mean family income across quintiles of the SES distribution displayed substantial variability (\$7,500; 15,435; 25,400; 38,690; 74,405) consistent with the variability in median family income (\$12,000, 29,912, 40,000, 55,000, 87,000) in the

Early Childhood Longitudinal Survey, Kindergarten Class of 1998-99 (Burkam, Ready, Lee, & LoGerfo, 2004).

## **Research Design**

**Student assignment to conditions.** After receiving parental consent, children completed reading comprehension tests in May in their homeroom classroom. To generate internally valid estimates of the READS intervention effects, we implemented a two-stage random assignment process for the end-of-year classroom lessons. First, children were blocked by school and homeroom teacher, and were randomly assigned to a one of three conditions: control, treatment with teacher and parent scaffolding (TPS), or treatment and parent scaffolding with follow-up phone calls (TPSF). Second, teachers were randomly assigned to conditions within schools, independent of student random assignment. Teachers randomly assigned to treatment taught six READS lessons, while teachers randomly assigned to control taught six math lessons (lessons are described below). Treatment students were randomly assigned to a treatment teacher for lessons, and control students were randomly assigned to a control teacher for lessons. The student and teacher random assignment procedures enabled us to eliminate any confounds related to student and teacher characteristics.

Children in the control condition participated in six math lessons (instead of the six READS lessons), were not invited to a school-based family night, and received no matched books during the summer. For children in the treatment condition, teacher- and parent scaffolding (TPS), teachers implemented end-of-year lessons using a content-based prediction routine using lessons that incorporated a story impression activity with narrative text and an information impressions activity with informational text, and these lessons were taught again in an afterschool family literacy event. Students received 10 books (and 10 postcards) in the mail each week of summer,

including two lesson books and eight matched books. Students also received book specific trifold that prompted children to use the content-based prediction activity and to answer three comprehension questions. For students in the enhanced treatment condition, teacher and parent-scaffolding with follow-up summer phone calls (TPSF), in addition to participating in lessons and receiving summer books, parents also received a phone call if their child did not complete one trifold by July 1 or three trifolds by August 1.

**Student selection and recruitment for the home visit subsample.** For the home visit sub-sample, we randomly sampled 121 children from the 10 schools in the mid-sized urban district and 117 completed the reading pretest (analytic sample sizes for analyses range from 107-116). A total of 11 research staff were trained by the first and second authors to conduct home visits, which took place from August to October. In the analytic sample, there was no difference on the pretest reading comprehension standard scores between children in the home visit sample ( $n = 116, M = 177.22, SD = 21.00$ ) and children who were not in the home visit sample ( $n = 586, M = 177.09, SD = 20.50$ ),  $t(702) = .07, p = .95$ .

In addition, there was no difference on pretest reading scores among control children ( $n = 37, M = 179.03, SD = 19.25$ ), TPS children ( $n = 39, M = 173.36, SD = 20.04$ ), and TPSF children ( $n = 40, M = 179.33, SD = 23.33$ ),  $F(2, 113) = 1, p = .37$  in the home visit sample. These results suggest that the children in the home visits were a representative sample of the full study sample and that the children in the three conditions had similar pretest reading scores.

## Measures

**Socioeconomic status.** We used two related measures of a child's socioeconomic status in the current study. First, we used school poverty as the best available measure of a child's SES when examining the effects of READS on the entire student sample. Second, we used family SES

as our best available measure when examining the effects of READS on the home visit sample. This measure is a more precise indicator of family SES than school poverty and was available only for our home visit subsample. We describe each SES in greater detail below.

***School poverty.*** The percentage of children eligible for free and reduced price lunch (% FRL) at the school level is a measure of school and neighborhood poverty (Aikens & Barbarin, 2008; Harwell & LeBeau, 2010; McCoach, O’Connell, Reis, & Levitt, 2006; Neuman & Celano, 2001). We used administrative data from districts to obtain the percentage of children who were eligible for free or reduced price lunch at the school-level ( $M = 85\%$ ,  $SD = 13\%$ ,  $Min = 61\%$ ,  $Max = 100\%$ ). We did not have access to child-level measures of free or reduced-price lunch status. Consistent with definitions from the National Center for Education Statistics (2013), we defined high poverty schools as public schools where more than 75% of the students were eligible for free or reduced price lunch (FRL) and moderate-high poverty schools as public schools where 50% to 75% of the students were eligible for FRL.

***Family socioeconomic status (SES).*** The family socioeconomic status variable was based on a composite of household income, parent education, and occupational status and closely mirrored the composite family SES measure used in the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (National Center for Education Statistics, 2002). We created predetermined categories to assess parent education (none- to doctorate degree), and household income i.e., (\$0 to \$10,000 for category 1, \$10,001 to \$20,000 for category 2, to \$200,001 or more), and we asked an open-ended question to collect information on occupation. For the analyses of household income, we assigned a dollar figure equal to the midpoint of each category (i.e., \$5000 for category 1, \$15,000 for category 2) and took its natural log. For parent education, we created a continuous measure of years of education ranging from 8 years to 21 years. In our

sample, the mean household income ( $M = 31,954$ ,  $SD = 30,840$ ,  $Min = 5,000$ ,  $Max = 150,000$ ) and years of education ( $M = 13.02$ ,  $SD = 3.44$ ,  $Min = 8$ ,  $Max = 21$ ) were below the state median. Finally, we coded parents' occupation using the National Opinion Research Center's ratings of occupational prestige (Nakao & Treas, 1990;  $M = 38.24$ ,  $SD = 9.56$ ,  $Min = 23$ ,  $Max = 64$ ). We then standardized each SES component to a sample mean of 0 and *sd* of 1, took the mean standardized component score for each student (on the components for which the student had non-missing data), and standardized those means to form the SES composite ( $M = 0.00$ ,  $SD = 1.0$ ).

**Iowa Test of Basic Skills, Reading Comprehension (ITBS).** Children were administered the Iowa Test of Basic Skills, Reading Comprehension (ITBS) as a pre and posttest. Level 9, Form A was administered in spring 2012 and Form C was administered in fall 2012. The ITBS is a 37-item comprehension test including 20 items from narrative passages (sample  $\alpha = 0.76$ ) and 17 items from informational passages (sample  $\alpha = 0.78$ ). 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). In our main analyses, we use the Standard Score metric from the reading total test (vocab + reading comprehension) and the reading comprehension subtest. The Iowa Test of Basic Skills (Hoover et al., 2003), reading comprehension tests, includes both narrative passages with short stories about fictional characters and expository passages designed to inform readers about a person or topic of general interest. For each student, we computed the number of correct expository and narrative items from this subtest and standardize these raw scores to the spring sample raw score mean and *sd* for use in separate analyses.

**Survey of children's reading preferences.** To assess children's personal reading interests, we administered a survey of reading preferences at baseline. Children completed a 4-point scale (I don't like it, I like it, It's okay, I really like it) indicating their reading preferences for

19 unique categories. The 19 categories were based on children's book catalogues and published surveys of children's reading preferences (Galda, Ash, & Cullinan, 2000; Ivey & Broaddus, 2001; Monson & Sebesta, 1991; Summers & Lukasevich, 1983). Data from the preference score and pretest reading score were used in a computer algorithm that identified books that were matched to each child's interest and reading level (see details below for mean Lexile of matched books).

**End-of-year classroom lesson fidelity.** To assess fidelity of implementation of the lessons, we developed an adherence checklist for each of the six lessons. The checklist included elements representing adherence to the script. Each lesson contained five sections (introduction, making guesses, reading and comprehension, guess check, and wrap-up); within each section, teachers were expected to execute specific scripted component. On average, there was a similar number of coded components for the narrative lessons ( $M = 38$ ,  $Min = 30$ ,  $Max = 41$ ) and informational lessons ( $M = 42$ ,  $Min = 38$ ,  $Max = 47$ ). If a lesson component was observed by the rater, the teacher earned a score of "1" for that element; if it was not observed, the teacher scored "0." These scores were then averaged within each lesson section to give each teacher an overall score for that lesson section. Each section score was then averaged to give each teacher an overall adherence score for the whole lesson. We then estimated teachers' overall adherence across lessons by averaging their lesson adherence scores for each observed lesson.

We assessed each teacher's fidelity of lesson implementation by sampling and video-taping one full lesson. We randomly selected and video-taped a classroom lesson to assess each teacher's adherence to the lesson script. A random 20% sample of lesson videos was coded to assess rater reliability. Reliability was assessed using percent agreement obtained through a double-coding process, which exceeded 80%.

**Afterschool family literacy event.** We collected attendance data for each of the 14 school-based family literacy events.

**Trifolds returned.** We used trifold data to check implementation and assess treatment group children's reading engagement with their matched summer books. We coded whether or not a child returned a trifold for each matched book sent home, and computed the number of comprehension items that a child correctly answered for each book.

**Follow-up phone calls.** We assessed implementation of the follow-up phone call condition by dividing the number of parents who were contacted by the number of children needing a call for a particular month. Children needed a July call if they did not mail one trifold by July 1 and needed an August call if they did not mail three trifolds by August 1.

**Child Book Access Inventory (CBAI).** We developed the CBAI to examine treatment and control children's home access to books. Home visitors (a) explained to children that they were interested in learning about the books in their homes and (b) asked children to bring them one of the books that they had in their home. If children were able to show home visitors at least one book, home visitors asked children to show them up to nine more books for a total of ten books. If children showed home visitors fewer than ten total books, the home visitors prompted children to show them additional books until children either showed a total of ten books or indicated that they did not have any more books. We selected ten books as the maximum because evidence from the National Longitudinal Survey of Youth suggests that poor children (i.e., those meeting the federal definition of poverty) were less likely than non-poor children to own ten or more books (Bradley, Corwyn, McAdoo, & Coll, 2001). Each book was then coded, generating information on the title, author, and whether it was a READS book. The genre (i.e., narrative or informational) of each book was coded based on the purpose and textual attributes (Duke, 2000). Narrative texts typically

included a series of events involving a story, charters, and familiar language related to oral conversation whereas informational text communicated information about the natural and social world.

## **Procedures**

**Description of book selection, matching, and distribution to children.** We identified 492 books based on recommendations from a national children's book distributor, previous studies on summer book reading, and teacher and librarian recommendations. The final list included both narrative and informational books. The narrative books included high-interest series books that included a story grammar (Stein & Glenn, 1979) involving characters, settings, plots, problems, resolutions, and themes. Informational books included texts about animals, biographies, and natural science.

To replicate book match procedures from our previous studies, we used a computer algorithm to identify a set of eight books matched to each student's interests and reading level. The algorithm merged data from two files. One file included a reading level and preference category for each of the 492 book titles, and the second file included each student's preference scores from the spring survey and Lexile scores from the spring administration of the ITBS.

Lesson books were selected with several criteria in mind: high-interest, not commonly known and read by students, appropriate text difficulty, and richness and complexity of content for instructional purposes. Lesson books were selected to illustrate different types of narrative and informational text structures students might encounter in their summer books. The narrative text, *Look Out, Jeremy Bean* (420L) was selected because it was accessible to most students because the Lexile score was below the mean Lexile for the sample ( $M = 439L$ ). It also included three chapters that facilitated teaching the comprehension routines with a narrative text in the first three

lessons. In lessons four, five and six, teachers used the informational texts *Owls* (Gibbons, 2005), *Tornado Alert* (Branley, 1988), and *A Picture Book of Helen Keller* (Adler, 1990), which represented the 3 most common genres of informational text that were part of our book list (animals, nature, biography). In the first mailing, all children received the same narrative and informational texts used in the classroom lessons. Thus, the first two summer books were scaffolded by teacher lessons.

For children in the two treatment groups (TPS and TPSF), the lesson books, *Look Out, Jeremy Bean!*, and *Owls* were mailed to students in the first two weeks of the summer. Every other week for the next eight weeks, two matched books were mailed to treatment group students. Every effort was made to ensure the delivery of all 10 books to each student during the summer. When a book package was returned as undeliverable, we attempted to obtain a correct address and resend it.

**Lesson development and teacher training.** The reading comprehension lessons were developed by the research team in collaboration with third grade teacher consultants from one of the participating districts. The lessons were reviewed by a panel of five national literacy experts who provided detailed feedback and suggestions to align the lessons with Common Core standards as well as best practices based on their own research.

Teachers in the treatment and control groups attended separate two-hour training sessions, during which they received six lesson plans and materials. Control teachers were directed to teach six math lessons, using a curriculum developed by a professor of mathematics education. Math lesson training for the control group was led by veteran North Carolina elementary school teachers. Reading lesson training for the treatment groups was led by two veteran teachers in the North Carolina district. For the reading lessons, teachers were instructed to follow a lesson script.

Teacher trainers walked them through the lesson procedures, modeling lessons and answering questions. Teachers were given the opportunity to ask follow-up questions up until and during the week of lessons via email and phone. The stated goals of the lessons were to draw students' attention to structural differences between narrative and informational texts, to prompt the use of a different routine with each type of text, and to motivate engagement with text during the reading activities at school and home (content-based prediction).

**End-of-year classroom lessons.** Teachers instructed children to use a content-based comprehension routine (Duke & Pearson, 2002) with narrative or informational texts in end-of-year classroom lessons and a school-based family literacy event (teachers were instructed to deliver the lessons during the last four weeks of school).

In the first three lessons with the narrative text, *Look Out, Jeremy Bean!*, the routine was based on a story impression activity (McGinley & Denner, 1987). The story impression activity is an instructional tool that prompts children to make a story guess using content drawn from narrative text, to read the story with their teachers, and then to check the guess after reading the text. The lesson materials included key words selected from the story and listed in the order they appeared. In the pre-reading activity, the teacher read aloud the story impression words and phrases and prompted students to use the words and phrases to make a story guess based on common text structures such as character, setting, goal, problem, plot or action, resolution, or theme. The words and phrases were selected specifically to direct students' attention to such text structures and to frame their story guesses within these text structures. In the during-reading activity, the teacher read the story aloud and asked literal and inferential text-based questions that helped students activate and integrate text-based ideas. In the post-reading activity, the teacher led a discussion comparing the story guess with the actual content of the story. Thus the teacher

provided scaffolding for the content routine by helping students perform each part of the routine prior to summer vacation (Graves & Graves, 2003; Rogoff, 1990).

In the next three lessons, we adapted the story impressions activity for informational text in which children were given “information impressions.” Teachers prompted children to make a prediction about main ideas related to books about animals, nature, or famous people.

**Afterschool family literacy event.** In the school-based family literacy event, children and their parents had another opportunity to use the content-based prediction routine prior to receiving matched books in the mail during the summer months. Accordingly, the family night event was designed to link and strengthen the school and home microsystems by providing information to parents about the comprehension routines that children were encouraged to use with the matched books that were mailed home during the summer (Bronfenbrenner & Morris, 2006; Lareau, 1989).

The school-based family literacy events were implemented after school; schools were asked to hold family nights after teachers had begun implementing classroom lessons, but before the end of the school year. The family night included two primary components. First, teachers informed parents about key components of the summer reading intervention. Specifically, parents learned that their children would receive books in the mail during the summer and were expected to complete before- and after-reading activities on a trifold (described below). Using a brief narrative text written for the event, facilitators guided parents and students through the entire comprehension routine (i.e., completing the story impression, reading the story, checking guesses, and completing comprehension questions). Second, facilitators asked parents to be involved with their children’s home reading activities in four ways, as expressed by the acronym EATS: (a) Encourage children to read matched books, (b) Ask them whether they completed the trifold, (c) Talk with children about the books, and (d) Send back the trifolds. Children also recited a reading

pledge and received medals. To increase attendance at family night, participating families were offered a ticket for an opportunity to win a \$50 gift card.

**Trifolds returned.** We individualized the comprehension routine for each narrative and informational text that was mailed home during the summer months. Consistent with this idea, children received an individualized scaffold for each book—a reading trifold—that was mailed home during the summer. The reading trifold was designed to help children recall the procedures for the narrative or informational text routine. In addition, each trifold included three comprehension questions about each book that was mailed to children’s homes.

**Follow-up phone calls.** An implementation team affiliated with Communities In Schools of North Carolina (CIS) called parents whose children did not mail one trifold to school by July 1 and three trifolds by August 1, reminding parents to help their children to complete the trifold.

## **Results**

### **Implementation Checks**

To check implementation of the treatment components, we analyzed data from the lessons, school family literacy event, follow-up phone calls, and trifolds. Implementation measures and their inter-correlations are reported in Table 1. Sample sizes for these statistics range from 151 (for the variable representing the percent of called students who were contacted over the phone in August) to 469.

**End-of-year classroom lessons.** On average across lessons, treatment teachers’ mean adherence rate was 72.51%, consistent with other experimental studies of comprehension instruction in the elementary grades (Williams & Stone, 2004; Guthrie et al., 2004). Teacher adherence was unrelated to school poverty and student pretest reading scores or posttest reading scores.

**Afterschool family literacy event.** As shown in Table 1, 30% of the treatment group children attended a family literacy event. Children who attended a family literacy event mailed more trifold (M = 4.96, SD = 3.33) to school than non-attending children (M = 2.45, SD = 3.05).

**Trifolds returned.** Children in the treatment groups read three books (M = 3.19, SD = 3.34), as measured by the number of trifolds mailed to school, and answered an average of 11.77 comprehension questions correctly across all trifolds (SD = 6.41).

**Follow-up phone calls.** We computed the phone call adherence rate in the analytic sample as the number of children whose parents were contacted by phone divided by the number of children needing a call (from the TPSF condition). The adherence rate in July (58% = 100 contacted / 172 children needing a call) and August (51% = 77 contacted / 151 children needing a call) was similar.

The last row in Table 1 indicates that school poverty was negatively correlated with reading pretests and posttests, positively correlated with the afterschool family literacy event attendance and receipt of a July phone call, and unrelated to trifold return rates. The correlations suggest that children in higher poverty schools had lower reading comprehension scores, higher attendance rates at the afterschool family literacy event, and were more likely to receive a follow-up phone call during the summer.

### **Data Analytic Strategy and Model Specifications**

To assess the comparability of the experimental conditions on baseline reading tests, we examined group equivalence on student-level ITBS reading comprehension measures. There was no significant difference on pretest reading comprehension standard scores among children in (a) the control condition ( $n = 271$ ,  $M = 177.24$ ,  $SD = 20.29$ ), (b) the TPS condition ( $n = 272$ ,  $M = 175.07$ ,  $SD = 18.98$ ), or (c) the TPSF condition ( $n = 281$ ,  $M = 177.97$ ,  $SD = 22.19$ ),  $F(2, 821) =$

1.48,  $p = .23$ . Over the course of the study, 15% of the children were lost to attrition and there was no relation between attrition rates and experimental condition,  $\chi^2(2, 824) = .97, p = .61$ . Among children who remained in the study and completed pretests and posttests, there was no difference on pretest reading measures among the control condition ( $n = 233, M = 177.77, SD = 19.91$ ), the TPS condition ( $n = 227, M = 175.04, SD = 19.31$ ), and the TPSF condition ( $n = 242, M = 178.41, SD = 22.20$ ),  $F(2, 699) = 1.75, p = .17$ . Finally, the pretest reading scores of children who remained in the study ( $n = 702, M = 177.11, SD = 20.57$ ) and those who were lost to attrition ( $n = 122, M = 174.82, SD = 20.49$ ) were statistically equivalent,  $t(822) = 1.14, p = .26$ .

We began by testing for main effects of treatment assignment on reading comprehension, by fitting the following model using ordinary least squares (OLS) regression:

$$(1) \quad Y_i = \beta_0 + \beta_1 TPS_i + \beta_2 TPSF_i + \beta_3 PRETEST_i + \sum RB_j + \epsilon_i,$$

where  $Y_i$  represents student  $i$ 's standardized fall ITBS Standard Score (reading total or reading comprehension),  $TPS_i$  is an indicator variable representing assignment to the TPS condition,  $TPSF_i$  is an indicator variable representing assignment to the TPSF condition,  $PRETEST_i$  represents student  $i$ 's spring ITBS Standard Score (reading total or reading comprehension),  $RB$  is a vector of randomization block dummies, and  $\epsilon$  is the error term.

Our first research question asked whether treatment effects were more positive for children from low-SES backgrounds. First, we used a measure of school poverty level to fit the following model:

$$(2) \quad Y_i = \beta_0 + \beta_1 TPS_i + \beta_2 TPSF_i + \beta_3 (TPS \times SCHPOV)_i + \beta_4 (TPSF \times SCHPOV)_i + \beta_5 PRETEST_i + \sum RB_j + \epsilon_i,$$

where  $TPS \times SCHPOV$  represents the interaction between school poverty (represented by school proportion FRL) and random assignment to TPS condition,  $TPSF \times SCHPOV$  represents the

interaction between school poverty and assignment to the TPSF condition, and the other variables are as defined above (note that the main effect of school poverty does not appear in the model due to its collinearity with the randomization blocks).

Second, we used a measure of family SES to examine treatment effects across family SES contexts. Due to the small sample size in the home visit sample, we pooled the two treatments (TPS + TPSF) and fit the following model:

$$(3) \quad Y_i = \beta_0 + \beta_1 TREATMENT_i + \beta_2 FAMSES_i + \beta_3 (TREATMENT \times FAMSES)_i + \beta_4 PRETEST_i + \epsilon_i,$$

where *TREATMENT* is an indicator representing whether the student was assigned to treatment (either TPS or TPSF), *FAMSES* represents the student's family SES (as measured by the composite of family income, parental education, and occupational prestige), *TREATMENT* × *FAMSES* represents the interaction between treatment assignment and family SES, and all other variables are as defined above. We also fit model 3 with different outcomes to analyze treatment effects on the quantity and diversity of books in children's homes (note that because these analyses use a random sub-sample of the full sample, randomization blocks were no longer intact). Finally, we conducted sensitivity analyses to examine whether the replicates were similar for posttest scores for narrative and expository text comprehension.

### **Treatment Effects on Reading Comprehension**

Question 1: Were the effects of the TPS and TPSF condition on reading comprehension more positive for children from low SES backgrounds?

*Treatment by school poverty interaction effects on reading comprehension.* In Table 2, we present results for regression analyses for reading comprehension involving the main effects and the treatment by school poverty interactions. In Models 1 and 3, the results of the regression

analysis revealed no difference in the predicted reading total or comprehension scores between the control group and either the TPS or TPSF conditions. In Models 2 and 4, the statistically significant coefficients for the TPSF by school poverty variable indicates that school poverty moderated the effects of the TPSF condition on reading total and reading comprehension; in addition, there were significant TPS by school poverty interactions. Using the coefficients for the interaction effects (TPS  $\times$  Sch pov and TPSF  $\times$  Sch pov) in Model 4, we estimated the predicted effect sizes for the TPS and TPSF conditions across poverty levels, ranging from ES = .11 (both TPS and TPSF) for children in high poverty schools (90<sup>th</sup> percentile of FRL = 100 % FRL) to ES = -.22 (both TPS and TPSF) for children in moderate-high poverty schools (10<sup>th</sup> percentile of FRL = 64% FRL).

*Treatment by school poverty interaction effects on expository and narrative text comprehension.* To test the sensitivity of the results to difference measures of reading comprehension, we examined effects separately for narrative and expository posttests. In Table 2, we also present results for regression analyses involving the main effects and the treatment by school poverty interactions effects on expository text comprehension standardized number-right scores (Models 5 and 6, respectively). In Model 5, the results of the regression analysis revealed a non-significant effect of -.05 standard deviations for TPS and effect of less than -.01 *sd* for TPSF. In Model 6, the statistically significant coefficient for the TPS by school poverty and the marginally significant TPSF by school poverty variables suggest that school poverty moderated the effects of treatment on expository comprehension. The predicted effect sizes for the TPS and TPSF conditions ranged from ES = .13 and ES = .14 for children in high poverty schools (90<sup>th</sup> percentile of FRL = 100% FRL) to ES = -.30 and ES = -.21 for children in moderate-high poverty schools (10<sup>th</sup> percentile of FRL = 64% FRL).

In columns 7 and 8 of Table 2, we replicated these analyses for narrative comprehension and found no main effect or interaction between treatment and school poverty.

*Treatment by family SES interaction effects on reading comprehension.* In Table 3, we present results for children in the home visit subsample. Given the smaller size of the home visit subsample, and the non-significant difference between the two treatment conditions, we pooled the two treatment conditions (TPS and TPSF) for these analyses. Models 1 and 3 revealed no significant treatment main effect on overall reading total or reading comprehension. In Models 2 and 4, the treatment-by-family SES interactions were not statistically significant. However, the trend of the predicted effect sizes mirrored the trend for the previous analysis involving the school poverty interactions. The predicted effect size on reading comprehension ranged from  $ES = .18$  for children from low SES families (10<sup>th</sup> percentile of family SES) to  $ES = -.11$  for children from middle SES families (90<sup>th</sup> percentile of family SES). In sum, these descriptive trends suggest that the treatment by family SES interaction displayed a pattern that was similar to the treatment by school poverty interactions on reading comprehension. However, among children from middle SES families, the treatment effects were negative, contrary to our expectations.

*Treatment by family SES interaction effects on expository and narrative comprehension.* Similar to the analyses involving the treatment by school poverty interactions, we again tested the sensitivity of the results to difference measures of reading comprehension. In Table 3, we also present main effects and interaction effects for expository comprehension (Models 5 and 6, respectively) and narrative comprehension (Models 7 and 8). These results match the pattern of results for the full sample. While there was no significant main effect of treatment on expository comprehension (Model 5), there was a significant interaction of treatment with family SES, such that treatment effects were more positive for students from low SES families. The predicted effect

size on expository comprehension were  $ES = .47$  for children from low SES families (10<sup>th</sup> percentile of family SES),  $ES=.07$  for low-middle SES families (50<sup>th</sup> percentile of family SES), and  $ES = -.33$  for children from middle SES families (90<sup>th</sup> percentile of family SES). Consistent with the full sample results for narrative comprehension, there was no main effect of the treatment on narrative comprehension in the home visit sample (Model 7) and no interaction between treatment and family SES (Model 8).

### **Treatment Effects on Home Book Access**

Question 2: Were the treatment effects (combining TPS and TPSF) on the quantity and diversity of books in the home more positive for children from low SES backgrounds?

*Effects on the Quantity of Books.* To examine whether treatment effects on children's home access to books varied across family SES, we fit a series of regression models involving treatment by family SES interactions, as displayed in Table 4. To begin, model 1 suggests an overall positive main effect on the number of books in children's homes. In model 2, although the treatment by family SES interaction was not statistically significant, the magnitude of the treatment-control contrast in the number of books was larger for lower SES children (sensitivity analyses using tobit regression showed the same pattern of results). Figure 2 highlights the descriptive trend indicating variability in home access to books across family SES contexts. It displays the predicted number of total books shown by children in the treatment and control groups by family SES. Among children at the 10<sup>th</sup> percentile of family SES, treatment children ( $M = 7.98$ ) were able to show home visitors 2.42 more books, on average, than control children ( $M = 5.56$ ). The magnitude of the treatment-control difference among low SES children was larger than the predicted 1.32 book difference among children at the 50<sup>th</sup> percentile of family SES and the predicted .25 book difference among children at the 90<sup>th</sup> percentile of family SES.

To supplement these analyses, we also examined treatment-control differences in the proportion of total books that were mailed to children's homes through the READS intervention. Among the books that children showed home visitors, a predicted mean of 54% of the books were READS books among low SES families compared to 41% among low-middle SES families and 28% among middle SES families. In sum, these results suggest that the treatment had a larger positive impact on the number of books at home for low-SES children than middle SES children and that a larger percentage of the books at home for low-SES children's were provided by the READS intervention.

*Effects on the Diversity of Books.* To measure treatment effects on children's access to a variety of texts, we examined treatment-control differences in proportion of books that were coded as narrative texts, as shown in model 3 and 4 of Table 4. In these models, we examined whether children in the treatment groups had a smaller proportion of narrative texts, and therefore a more diverse mix of books (i.e., narrative and information books). The main effect of the treatment in model 3 indicates that treatment group children showed home visitor fewer narrative texts, implying that the children had a greater mix of books at home. In model 4, the direction of the treatment by family SES interaction suggests that the treatment led to a greater mix of narrative and informational books among low SES children than middle SES children.

Using model 4, we estimated the predicted proportion of books that were narrative among the treatment and control groups by family SES. As shown in Figure 3, Treatment group children from low SES families showed a predicted average of 74% narrative whereas the control group children showed a predicted average of 93% narrative. Among middle SES children with family SES scores at the 50<sup>th</sup> and 90<sup>th</sup> percentiles, there were smaller treatment and control differences in the percentage of books that were narrative texts. Although the treatment by family SES

interaction was not statistically significant, these descriptive trends suggest that the effects on the quantity and diversity of books in the homes were more positive for low-SES children.

### **Describing Variation in Control Group Children's Performance in Reading Comprehension**

To understand the variation in treatment effects across family SES contexts, we examined control group children's performance on reading comprehension raw score outcomes. Figure 4 displays summer gains or losses as effect sizes (i.e., standardized differences between the fall posttest and spring pretest using the number correct for narrative and expository passages). Children from the low-SES families (10<sup>th</sup> percentile of sample) underwent summer losses in reading comprehension (-.24) that were driven by larger losses in expository (-.35) than narrative (-.13) scores. However, middle-SES students (90<sup>th</sup> percentile of sample) enjoyed summer gains in reading comprehension that were driven by larger gains in expository (.39) than narrative (.05) scores.

### **Discussion**

The purpose of this randomized experiment was to examine whether a scaffolded summer reading intervention could reduce socioeconomic gaps in children's home access to books and reading comprehension outcomes. We replicated procedures used in previous experimental studies of a scaffolded summer reading intervention (READS) that was designed to increase children's access to a wide variety of narrative and informational book, match books to children's reading level and interests, and scaffold summer book reading with end-of-year lessons in classrooms and an afterschool family literacy event. Guided by the READS program theory in Figure 1, our major goals in this study were to examine whether the effects of the basic and enhanced treatments on reading comprehension and home book access were more positive for children from low-SES

backgrounds. In the following sections, we highlight the theoretical and practical implications of the results.

### **Replicating Treatment by School Poverty Interaction Effects on Reading Comprehension**

Consistent with our most recent randomized experiment (White, Kim, Kingston, & Foster, 2014), we found clear evidence that treatment effects varied by children's socioeconomic status. More precisely, the predicted effect sizes on reading comprehension outcomes for the teacher and parent scaffolded conditions with and without summer phone calls were  $ES = .11$  in high-poverty schools and  $ES = -.22$  in moderate-high poverty schools. The predicted effect sizes by family SES mirrored these trends and ranged from  $ES = .17$  for children from low SES families to  $ES = -.11$  for children from middle SES families. Our sensitivity analyses also extend prior research by showing that the treatment by school poverty interactions, as well as the treatment by family SES interactions, were driven by children's performance on the expository rather than narrative subtests of the ITBS. The most consistent interaction effect indicated that there was significant variability in treatment effects across school poverty and family SES contexts on expository rather than narrative posttests. How, then, do we explain the converging evidence from this study and our most recent experiment highlighting treatment effect variability across school poverty and family SES contexts?

### **Differences in Control Group Performance on Reading Comprehension**

Our first explanation focuses on SES-linked differences in control group children's performance on reading comprehension from spring to fall. Previous meta-analytic research indicates the magnitude of the treatment-control contrast in post-intervention in reading comprehension outcomes depends on the extent to which control children lose ground in reading comprehension during the summer. Seasonal comparisons researchers have consistently shown

that socioeconomic gaps expand during the summer months when the school learning faucet is turned off and parents and families are largely responsible for cultivating children's literacy skills (Downey et al., 2004; Entwisle, Alexander, Olson, 2000; Heyns, 1978). Consistent with these predictions, findings from our study indicate that children from low-SES families lost more ground in reading comprehension than children from middle-SES families. Our findings both replicate and extend prior research. We found that low-SES children in the control group lost -.24 standard deviations in reading comprehension, replicating the average loss in reading comprehension for low-income children ( $d = -.27$ ) in Cooper et al.'s (1996) meta-analysis on summer vacation and achievement scores. We extend prior research by showing that the low-SES group also lost more in expository ( $d = -.35$ ) than narrative ( $d = -.13$ ) comprehension. In the absence of an intervention, it is clear that low-SES children are most at-risk of falling behind in reading comprehension, especially the ability to read expository texts that are an increasingly important part of the Common Core Standards and school subjects in the upper and elementary middle grades Common Core Standards Initiative, 2014. Our results, coupled with meta-analytic evidence on summer loss, indicate that summer reading interventions may work best for low-SES children who, in the absence of a formal intervention, are likely to fall behind their middle-SES peers in reading comprehension.

Given the larger reading comprehension losses that low-SES children experience over summer vacation, prior research has implicated the home learning resources as an important mechanism driving SES-gaps in reading comprehension (Burgess, Hecht, & Lonigan, 2002; Bradley & Corwyn 2002; Duncan & Magnuson 2003). At the same time, while it is difficult to experimentally manipulate parent's socioeconomic status, social scientists have encouraged randomized experiments of policy interventions that may address socioeconomic disparities in

children's cognitive skills and that carefully measure effects on home learning opportunities (Duncan & Magnuson, 2005). To pursue this goal, we examined the treatment-control differences in the quantity and diversity of books in children's home by family SES. In the random sample of children drawn from the full experimental sample, home visitors observed significantly more books in the homes of treatment group children than control children. Although the treatment by family SES interaction was not statistically significant, the descriptive trends of the effect size also indicated a larger treatment-control difference in the predicted number of books in low-SES families (ES = 2.44 books) than middle-SES families (ES = .28 books). In addition, among the books that children showed home visitors, over 50% were READS books for low-SES children compared to 28% for middle-SES children. In sum, these findings suggest that the treatment had a particularly positive impact on low-SES children's home access to books.

These findings also extend previous research by drawing on direct observations of the key home learning resource—children's access to a variety of texts—that promote family literacy routines and independent book reading activities. These measures are usually based on parent self-reports of their children's home book reading (Entwisle, Alexander, & Olson, 1997; Heyns, 1978; Kim, 2004). Our study, however, substantially improved the measurement of children's home book access and revealed an increase in children's access to a diversity of texts at home. Specifically, the treatment led to a reduction in the proportion of narrative books in children's homes. Put another way, children in the treatment had more informational books in their books. Thus, one speculation emerging from our study is that for low-SES children in particular, the significant increase in the number of informational books at home may be a necessary first-step toward preventing the larger drop in expository text comprehension. Descriptive research on classroom instruction suggests that low-SES children have fewer opportunities to read expository

text than middle-SES children (Duke, 2000). Our research suggests that similar SES-related gaps in opportunities to read and learn from expository texts also exist in children's homes during summer vacation.

Furthermore, the variability in treatment effects indicates that middle-SES children did not benefit from the core activities in the READS intervention. Among middle-SES families, control children outperformed treatment children on reading comprehension posttest, producing negative effects on reading comprehension. Why? One explanation stems from research on social-class differences in parenting practices. Keeping in mind that we did not collect specific information on parenting practices, we highlight prior research on SES-related differences in parenting style and how such differences may lead to different home learning and literacy environments for low- and middle-SES children (Chin & Phillips, 2004). Mounting evidence from national samples and ethnographic research indicates that middle-SES parents have more money, time, and knowledge than low-SES parents to invest in their children's home literacy activities (Bradley & Corwyn, 2002; Conger & Donnellan, 2007; Dearing, et al., 2009; Lareau, 2003; Reardon, 2013). Middle-SES parents are also more likely than low-SES parents to customize learning for their children and cultivate and continue classroom literacy activities in the home (Lareau, 2003).

It is possible, then, that the core activities in formal summer programs may be inferior to the typical home and summer literacy activities that take place in middle-SES children's homes. The negative treatment effects for middle-SES children are suggestive of the hypothesis that the formal activities in home-based summer reading interventions are inferior to the typical home literacy activities of control children in middle-SES homes. Additional support for this hypothesis comes from a longitudinal randomized experiment (Allington et al., 2010) in which children self-selected books to read at home during the summer months. After three years, there were positive

effects on standardized reading comprehension for low-income children eligible for free lunch (ES = .21) and negative effects for middle-income children (ES = -.18). Our findings, coupled with findings from a related home-based summer reading intervention, suggest the typical summer experiences of middle-SES children are superior to intervention efforts designed to increase children's home access to books.

### **Limitations**

Of course, this study was not designed to identify the specific components of READS that improve low SES children's reading comprehension. To address this limitation, a future study could randomly assign children to different intervention components to isolate the relative importance of the classroom lessons, afterschool family literacy event, and trifolds associated with each mailed book. Absent such experimental evidence, both theoretical and empirical research would support efforts to increase print exposure for low-SES children as a longer term strategy for reducing SES disparities in reading comprehension (Mol & Bus, 2011; Stanovich, 2000).

The external validity of the results from this study is clearly limited. It is unclear, for example, whether the internally valid treatment effect estimates from our study would generalize to prospective implementations of READS. Ultimately, our findings provide a cautionary tale about the benefits and costs of compensatory educational interventions in general and summer reading interventions in particular. The more encouraging findings suggest that a scaffolded summer reading intervention can support the reading comprehension of low-SES children. At the same time, there are clear costs to providing the intervention for a mix of low-SES and middle-SES children, since there are negative effects for middle-SES children. Efforts to target the educational interventions for low-SES children may be essential to reducing the heterogeneity in treatment effects and generating more consistently positive effects on reading comprehension.

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Table 1

*Intercorrelations Among Measured Intervention Components, Treatment Group Only*

Variable	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	1	2	3	4	5	6	7
1. ITBS comprehension (posttest)	180.43	24.04	128.00	255.00	1.00						
2. ITBS comprehension (pretest)	176.78	20.90	128.00	260.00	0.77**	1.00					
3. Family literacy night attendance	0.30	0.46	0	1	0.16**	0.13**	1.00				
4. No. trifolds mailed during summer	3.19	3.34	0	10	0.23**	0.17**	0.34**	1.00			
5. Phone call contact with parent (July)	0.58	0.49	0	1	-0.09	-0.09	0.06	-0.02	1.00		
6. Phone call contact with parent (August)	0.51	0.50	0	1	-0.08	-0.07	0.13	0.08	0.11	1.00	
7. School poverty (% FRL)	0.86	0.13	61	100	-0.13**	-0.10*	0.11*	-0.05	0.21**	0.06	1.00

~  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$

*Note.* Correlations are based on treatment group reading comprehension analytic sample. Sample sizes differ by variable and range from 151 (phone call contact in August for students needing a call) to 469. ITBS = Iowa Test of Basic Skills, Reading Comprehension standard score. School FRL = school mean percentage of children eligible for free or reduced price lunch.

Table 2. Regression Analyses for Treatment Main Effects and Treatment by School Poverty Interaction Effects on Reading Total, Reading Comprehension, Expository, and Narrative Posttests

	(1) Reading Total b/se	(2) Reading Total b/se	(3) Reading Comp b/se	(4) Reading Comp b/se	(5) Expository b/se	(6) Expository b/se	(7) Narrative b/se	(8) Narrative b/se
TPS	-0.92 (0.98)	-21.47*** (5.10)	-0.52 (0.98)	-19.85** (6.39)	-0.05 (0.06)	-1.09** (0.33)	0.04 (0.05)	-0.42 (0.32)
TPS-F	-1.00 (0.97)	-22.30*** (5.45)	-0.56 (1.28)	-19.36* (9.34)	-0.00 (0.07)	-0.84~ (0.46)	0.01 (0.05)	-0.55 (0.43)
TPS*Sch Pov		24.04*** (5.87)		22.59** (7.25)		1.22** (0.38)		0.53 (0.36)
TPS- F*Sch Pov		24.92*** (6.28)		21.98* (10.47)		0.99~ (0.52)		0.66 (0.47)
ITBS Pretest	0.95*** (0.03)	0.94*** (0.02)	0.92*** (0.03)	0.92*** (0.03)	0.03*** (0.00)	0.03*** (0.00)	0.03*** (0.00)	0.03*** (0.00)
Intercept	14.22** (4.28)	14.83** (4.36)	18.38** (5.36)	18.76** (5.40)	-5.50*** (0.28)	-5.48*** (0.28)	-6.13*** (0.18)	-6.11*** (0.18)
R-sq	0.759	0.764	0.646	0.649	0.498	0.503	0.608	0.609
N	679	679	702	702	692	692	711	711

~p<0.10 \*p<0.05 \*\*p<0.01 \*\*\*p<0.001 Note. Standard errors clustered at the lesson classroom in parentheses. Models control for fixed effects of randomization blocs. TPS = Teacher and parent scaffolding. TPS-F = Teacher and parent scaffolding with follow-up. Sch Pov = percentage of children eligible for free- or reduced-price lunch. Reading Total and Reading Comp are in ITBS's standard score metric; expository and narrative are raw number correct standardized to fall mean and sd.

Table 3. Regression Analyses for Treatment Main Effects and Treatment by Family SES Interaction Effects on Reading Total, Reading Comprehension, Expository, and Narrative Posttests (Home Visit Subsample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Reading Total b/se	Reading Total b/se	Reading Comp b/se	Reading Comp b/se	Expository b/se	Expository b/se	Narrative b/se	Narrative b/se
Treatment (TPS + TPS-F)	2.99	3.12~	1.17	1.18	0.08	0.08	-0.01	-0.01
	(1.89)	(1.83)	(1.85)	(1.79)	(0.13)	(0.11)	(0.10)	(0.10)
Family SES	1.72	3.54	3.30	4.85	0.17	0.37**	0.10	0.10
	(2.58)	(3.81)	(2.71)	(4.15)	(0.11)	(0.13)	(0.10)	(0.15)
Family SES*Trea tment		-3.34		-2.78		-0.35*		-0.01
		(3.26)		(3.84)		(0.15)		(0.15)
ITBS Pretest	0.91***	0.92***	0.90***	0.91***	0.03***	0.03***	0.04***	0.04***
	(0.11)	(0.11)	(0.09)	(0.09)	(0.00)	(0.00)	(0.00)	(0.00)
Intercept	15.61	14.44	18.68	17.20	-4.89***	-5.05***	-6.19***	-6.20***
	(19.55)	(19.23)	(16.23)	(16.26)	(0.84)	(0.83)	(0.71)	(0.73)
R-sq	0.839	0.843	0.780	0.782	0.676	0.698	0.719	0.719
N	110	110	115	115	112	112	115	115

~p<0.10 \*p<0.05 \*\*p<0.01 \*\*\*p<0.001 Note. Standard errors clustered at the lesson classroom in parentheses. Models control for fixed effects of randomization blocs. TPS = Teacher and parent scaffolding. TPS-F = Teacher and parent scaffolding with follow-up. Sch Pov = percentage of children eligible for free- or reduced-price lunch. Reading Total and Reading Comp are in ITBS's standard score metric; expository and narrative are raw number correct standardized to fall mean and sd.

Table 4.

*Results of Models Testing Treatment Main Effects and Treatment by Family SES Interaction Effects on Measures of Quantity and Diversity of Home Books (Home Visit Subsample)*

	(1)	(2)	(3)	(4)
	No. Books	No. Books	Proportion	Proportion

	b/se	b/se	Narr. b/se	Narr. b/se
Treatment (TPS + TPSF)	1.30*	1.30*	-0.14**	-0.14**
	(0.65)	(0.65)	(0.04)	(0.04)
Family SES	0.48	0.95*	-0.00	-0.03
	(0.32)	(0.48)	(0.02)	(0.03)
ITBS Pretest	0.03~	0.03~	0.00	0.00
	(0.02)	(0.02)	(0.00)	(0.00)
SES * Treatment		-0.82		0.04
		(0.62)		(0.04)
Intercept	2.27	1.87	0.62**	0.64***
	(2.78)	(2.78)	(0.19)	(0.19)
R-sq	0.092	0.106	0.107	0.115
N	116	116	107	107

~p<0.10 \*p<0.05 \*\*p<0.01 \*\*\*p<0.001

*Note.* Standard errors in parentheses. TPS = Teacher and parent scaffolding. TPSF = Teacher and parent scaffolding with follow-up. SES = composite of parent income, education, occupation.

Figure 1: READS for Summer Learning Program Theory

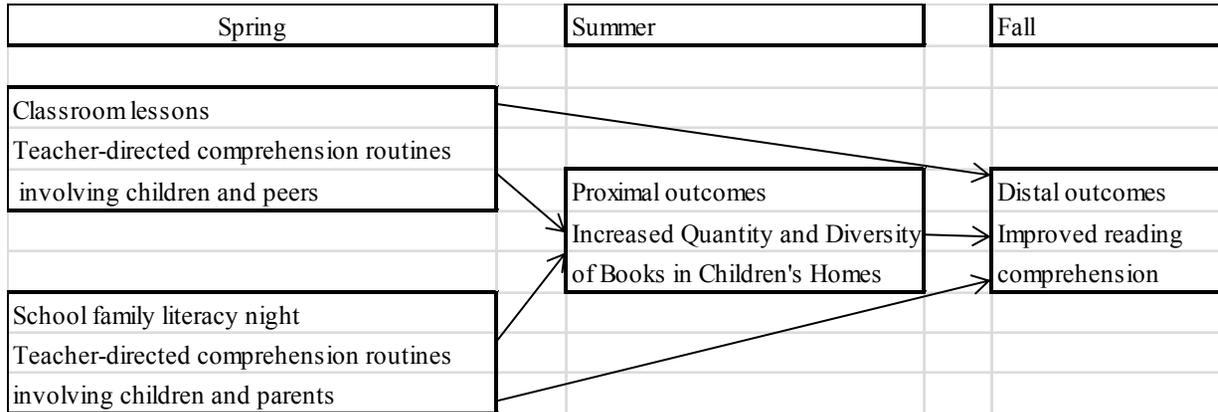


Figure 2. Family SES as a moderator of treatment effects on number of books shown during home visit. Vertical axis displays covariate-adjusted number of books. Horizontal axis displays SES percentiles (10<sup>th</sup>, 50<sup>th</sup>, 90<sup>th</sup>). The pooled treatment combines the TPS and TPSF conditions (moderation not statistically significant).

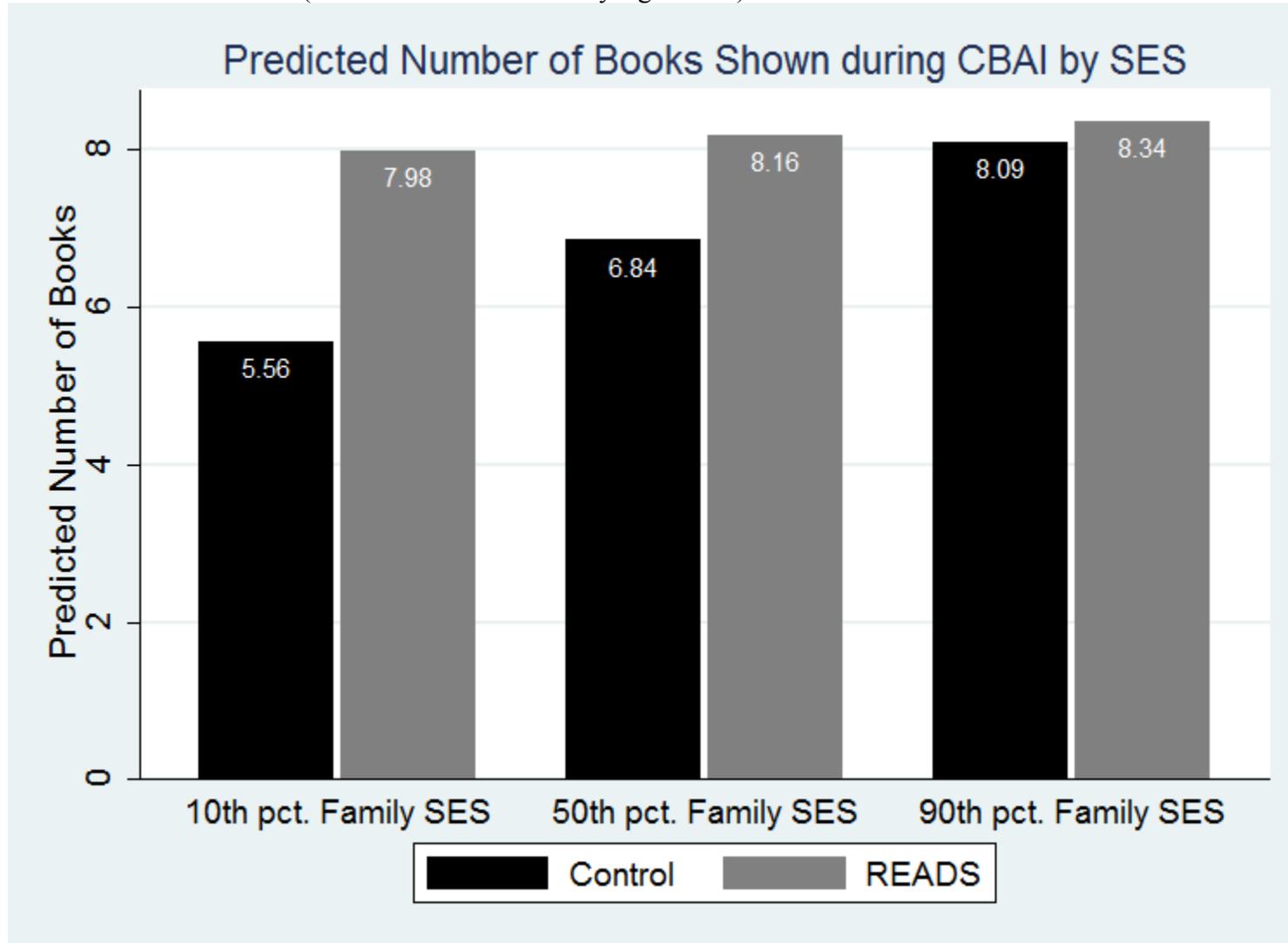


Figure 3. Family SES as a moderator of treatment effects on proportion of books shown home visit that were fiction. Vertical axis displays covariate-adjusted proportion fiction. Horizontal axis displays SES percentiles (10<sup>th</sup>, 50<sup>th</sup>, 90<sup>th</sup>). The pooled treatment combines the TPS and TPSF conditions (moderation not statistically significant).

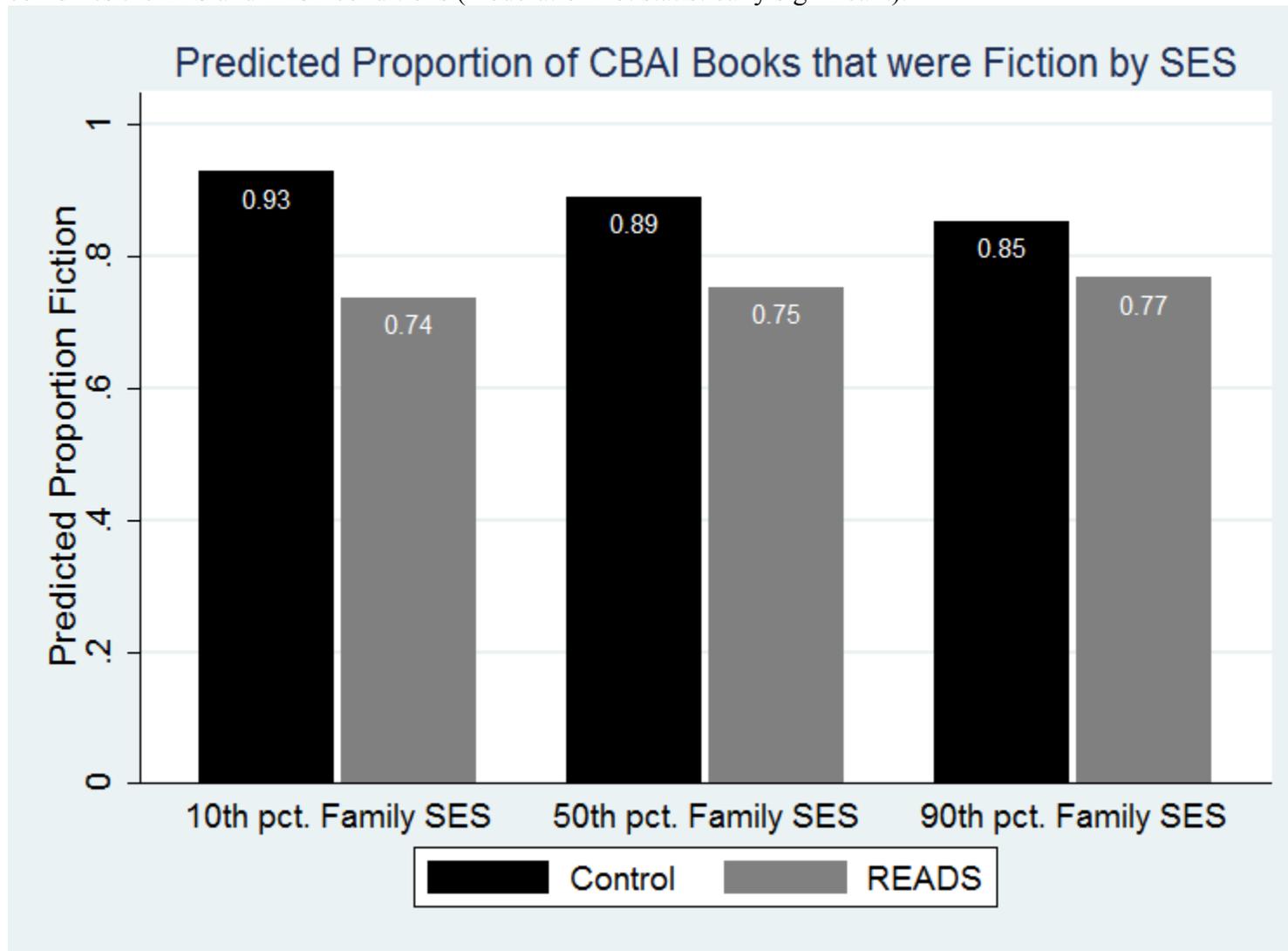


Figure 4. Predicted control group summer change in standardized scores (standardized by spring mean and sd) by family SES and reading test (n=37) for raw reading comprehension (total number correct for expository and narrative questions), expository comprehension (number correct for expository questions), and narrative comprehension (number correct for narrative questions).

