Can Schools Empower Parents to Prevent Summer Learning Loss? A Text Messaging Field Experiment to Promote Literacy Skills

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Abstract

Vast differences in summer learning opportunities present a major obstacle to providing equal educational opportunities for all children. To date, most initiatives aimed at reversing summer learning loss have focused on resource-intensive school- or center-based programs. This study explores the potential of empowering parents to provide more frequent and enriching literacy development opportunities at home as a low-cost and scalable alternative. We conduct a randomized field trial of a summer text-messaging pilot program for parents focused on promoting literacy skills among 1st through 4th graders. Effects on reading comprehension are concentrated among 3rd and 4th graders with effect sizes of .21 to .29 standard deviations, more than compensating for summer learning loss. Texts also increased attendance at parent-teacher conferences but not at other school-related activities. Parents' responses to a follow-up survey provide further evidence to inform efforts to refine and scale programs designed to empower parents to reverse summer learning loss.

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Introduction

Over a half a century since the release of the Equality of Educational Opportunity report, James Coleman's work continues to influence social science and public policy. Among its most important and surprising findings was that "schools account for only a small fraction of differences in pupil achievement" after taking into account students' socioeconomic backgrounds (p.21). Coleman found that family background factors such as parents' level of educational attainment as well as the amount of reading materials and types of reading practices in the home had far more predictive power than school characteristics. This seminal finding was received with disappointment by many at the time who hoped to document large gaps in school quality and resources as the primary sources of educational inequality. It has also stood the test of time, with reanalyses replicating Coleman's results (e.g. Konstantopoulous & Borman, 2011) and a large literature documenting how factors outside of school explain the majority of variation in student achievement (Goldhaber & Brewer, 1997; Goldhaber, Brewer & Anderson, 1999; Nye, Konstantopoulos & Hedges, 2004; Altonji & Mansfielf, 2011).

In our view, the Coleman Report and subsequent studies on school effects should not be interpreted to mean that schools do not or cannot matter. Despite the limitations of the public education system, it has long been and remains the primary vehicle for social investment in the U.S. (Steffes, 2012). For example, programs such as Head Start, a free federally funded and nationwide preschool program for poor children, has been shown to close a significant portion of the earnings gap in adulthood between children from poor and middle-income families (Deming, 2009). School finance reforms between the early 1970s and 1990s that raised state funding levels for low-income school districts substantially increased students' achievement (Lafortune Rothstein, Schanzenbach, 2016) and earnings in adulthood (Jackson, Johnson & Persico, 2016).

Schools matter, particularly for children from families with limited resources to invest in supplemental educational opportunities.

We interpret Coleman's findings and the larger school-effects literature as highlighting the need and potential for schools to broaden their influence by more directly engaging parents as active partners in students' learning. The positive relationship between parental involvement in their children's education and students' success in school is widely documented (Barnard 2004; Cheung and Pomerantz 2012; Fan and Chen 2001; Houtenville and Conway 2008; Todd and Wolpin 2007). Studies have identified positive learning environments at home, integration of parents into school programs, and strong relationships between school, family, and the community as distinct ways that parent engagement supports student achievement (Hoover-Dempsey et al., 2005; Henderson, 1987). However, research has been less successful at identifying how to promote higher levels of parent involvement in students' education both at home and at school (Mapp & Kutner, 2014; Anderson & Minke, 2007; Hoover-Dempsey et al., 2005). One study found that parents of students attending urban elementary schools reported that direct invitations from teachers to attend school events and encouragement to engage in their students' learning process had the largest influence on involvement (Anderson & Minke, 2007).

Research in recent decades has also helped identify the roles that schools and home environments play in the time dynamics of educational inequality. We now know minority students and students from disadvantaged backgrounds enter kindergarten well behind their white and more advantaged peers and that these initial achievement gaps at school entry have lasting effects on students' educational attainment (Fryer & Levitt, 2004; Quinn, 2015). Research also shows that while these achievement gaps continue to grow as student pass through primary and secondary schooling, this widening is driven primarily by different rates of learning

during the summer where students are exposed to vastly different learning opportunities, and home and neighborhood environments (Alexander et al., 2001; Atteberry & McEachin, 2016; Alexander, Entwisle, & Olson, 2001; Cooper et. al., 1996; Downey, Von Hippel, & Broh, 2004; Downey, Von Hippel, & Hughes, 2008; Quinn, Cooc, McIntyre, & Gomez, 2016). While estimates of summer learning loss differ between studies and student populations, Atteberry and McEachin (2016) found that, on average, public school students across an unidentified Southern state lost between 25% and 30% of the learning growth they gained in the preceding school year in both reading and math. Studies also consistently document large differences in summer learning loss rates across socio-economic groups amounting to as much as 3 months of learning (Alexander et al., 2007; Burkam et al., 2004; Cooper et. al., 1996; Downey, von Hippel, & Broh, 2004).

In this paper, we describe and report findings from a school-administered pilot initiative intended to empower parents to provide educationally enriching opportunities for their kids over the summer. Our study evaluates the effect of a pilot text-messaging program aimed at reducing summer learning loss by enriching students' literacy learning opportunities at home with the support of parents, as well as by promoting greater parental involvement in their child's education. A large body of literature highlights the benefits of parent-child joint book reading on children's literacy development (Senechal & Young, 2008). Research also demonstrates that when parents increase their involvement in school activities it is associated with improved literacy outcomes for their children (Dearing et al, 2006).

The intervention we develop and evaluate is a product of a research-practitioner partnership aiming to expand the reach of schools beyond the academic year and school walls to leverage parents as partners in their students' education. We conducted this research in

partnership with two elementary charter schools in Rhode Island that serve a diverse student body where 59% of the students are minorities and 63% of students are eligible for free or reduced price lunch (FRPL). Figure 1 illustrates the nature and magnitude of summer learning loss among students at the elementary schools we study. Amongst elementary students in our study schools, student literacy, as measured by the STAR standardized test, decreased by an average of 9.89 scaled points from June to September, a loss of approximately 8% of the preceding year's learning growth.

Among the 183 families that volunteered to participate in the study, we randomly assigned half (N=91) to receive a series of 18 text messages in July and August of 2015. The messages, developed by school personnel and the research team, suggested different literacy activities and resources while emphasizing the importance of summer reading. The focus on reading and use of text-messages as the delivery mechanism of the program were informed by several literatures. Efforts to provide more academically enriching summer opportunities to students and reduce summer learning loss have traditionally overlooked the potential role of parents and taken the form of resource intensive school- or center based programs costing around $1,500 per student. The evidence on the effect of such programs on student achievement is decidedly mixed (Matsudaira, 2008; Jacob & Lefgren, 2004; Borman & Dowling, 2006; Chaplin & Capizzano, 2006; Schacter & Jo, 2005; Borman et al., 2009).

A growing body of research suggests summer reading programs that provide books and scaffolded reading strategies for students can be a cost-efficient (~$100 per student) and effective way to raise student achievement in reading (Kim, 2006; Kim, 2007; Kim & White, 2008; Allington et al., 2010; Kim & Guryan, 2010; White et al., 2014). Fryer (2013) found that paying students to read books during the school year increased reading achievement among 2nd graders.

An emerging body of literature also points to the potential of school-based efforts to engage parents more directly in students' learning by communicating with them more frequently (often via text message) and providing them with more detailed information about their students' performance (Bergman, 2012; Bergman & Chan, 2017; Kraft & Dougherty, 2013; Kraft & Rogers, 2014). Finally, the frequency and framing of the text messages are motivated by research that posits that relevant reminders and positive messaging can nudge parents to engage in activities with their children they intend to do but that happen infrequently due to competing demands, distractions and other challenges (Thaler & Sunstein, 2009).

Two recent studies most directly related to our intervention examine the effects of text messaging programs for parents of preschoolers aimed at helping them support their children's learning during the school year. York and Loeb (2014) evaluate the effect of READY4K!, a text-messaging campaign implemented among a sample of 440 parents. Parents in the treatment group received three text messages per week that provided facts, tips and encouragement on how to help preschool children develop their literacy skills. The program increased the frequency of home literacy activities as reported by parents, increased the likelihood that parents asked questions about their children's learning as reported by teachers, and increased student performance on several sub-domains of the Phonological Awareness Literacy Screening assessment. Hurwitz et al. (2015) evaluated the effect of a six-week intervention where 253 parents of children enrolled in Early Head Start centers were randomly assigned to receive daily tips about parent-child activities that promote learning across a range of domains. The authors found impacts of approximately one fourth of a standard deviation on the total number of learning activities parents reported engaging in with their children.

Our study builds on these studies and makes several contributions to the literature. We provide the first causal evidence of the effect of a school-based text messaging program aimed at supporting parents to promote literacy skills during the summer. This allows us to explore the potential for literacy-focused text-message interventions to empower parents to reduce summer learning loss and enhance parents' engagement in school-based activities. Our study is also the first to examine the effects of any type of text-messaging intervention for parents aimed at increasing student achievement among elementary school students. Prior studies have focused on preschool and kindergarten students (Doss, Fahle, Loeb & York, 2016; Hurwitz et al., 2015; York and Loeb, 2014) or middle and high school students (Bergman, 2012; Bergman & Chan, 2017; Kraft & Dougherty, 2013; Kraft & Rogers, 2014). In our primary analyses, we examine the effects on student achievement captured by two complementary standardized assessments of early literacy and reading skills administered four times across the following school year. These multiple vertically-equated test administrations allow us to examine the time dynamics and potential for compounding effects of the intervention. We complement these analyses by assessing program effects on multiple measures of parent engagement in school-related activities. We conclude by exploring potential mechanisms using parent responses to surveys and discussing how future programs can address implementation challenges and enhance program design features.

Context & Procedure

Setting

We conducted this research in partnership with Blackstone Valley Prep Mayoral Academy (BVP) located in Cumberland, Rhode Island during the summer of 2015. BVP is a network of charter schools serving students from across four school districts in Rhode Island: Central Falls, Cumberland, Lincoln and Pawtucket. First opened in 2009, the BVP network has expanded to six schools including three elementary schools, two middle schools and one high school. Drawing students from across four diverse sending districts allows BVP to serve a more racially and socio-economically diverse student population than many urban charter schools. Two of the sending districts, Cumberland and Lincoln, are home to more affluent and homogenous populations where less than 30% of students are eligible for free or reduced price lunch and between 80% to 90% are White. In comparison, in the Central Falls and Pawtucket districts 85% of students are eligible for FRPL and two thirds are African American or Latino. Consequently, relative to state averages, BVP schools serve an especially diverse student population. BVP schools are known for their high academic standards and have consistently outperformed the state average as well as their four sending districts on state standardized tests.

Sample

Principals at two of the Elementary schools opted to take part in the study. BVP administrators recruited the parents of students rising into 1st through 4th grades to participate in the program. Out of 522 parent households, 183 opted in to the study. This represented an opt-in rate of 35% of potential households with a total of 232 students rising into the 1st through 4th grades. Among the 181 participating families, 137 had one child enrolled in the two participating elementary schools, 43 had two students, and three had three students.

In Table 1, we report on the demographic characteristics and previous academic performance of students participating and not participating in the study. Participating students were relatively evenly distributed across 1st through 4th grades with a racial composition of 32% Hispanic, 12% African American, 52% White and 3% Asian. Nearly 50% of the students came from households eligible to receive free or reduced price lunch and 8% were receiving special education services. Students of households that opted into the study, on average, earned higher scores on standardized reading assessments than those of non-participant households. Minority, especially Hispanic and African American students, English language learners and those eligible for free or reduced price lunch were less likely to opt-in. These lower take-up rates among minority, non-native English speaking, and lower socio-economic status families point to the importance of targeted recruitment efforts or opt-out enrollment policies for parent engagement programs.

Text Messaging Program

Over the course of the spring semester, the research team worked with BVP administrators and lead teachers to design and develop the content of a text messaging intervention. Parents of the 118 students randomly assigned into the treatment group received a total of 18 text messages, roughly two per week, throughout the months of July and August of 2015. In order to take advantage of previously established communication between schools and parents, summer messages were sent through the schools' communication management system. All parents, including parents of the 114 students in the control group and those not involved in the study, received ongoing texts and recorded messages from the schools about school-related

summer events. All messages were translated into Spanish for parents who indicated a preference to receive communication in Spanish.

The text messages were framed as "Pro-tips" about specific literacy and enrichment activities parents and children could engage in over the summer. The messages emphasized the importance of reading and the role of parents in summer months and provided information on resources and ideas for summer learning activities. The content of the messages was organized under three distinct categories:

- **Resources:** messages that provided information about accessible and affordable educational resources parents and students could utilize. These messages about local summer resources were intended to reduce barriers to learning for all families, with a particular emphasis on those with less access to educational activities and familiarity with relevant resources.

  e.g. "Pro-tip: RI public libraries have built suggested kid (and adult) summer reading lists full of great reads. Learn more at www.askri.org"

- **Ideas**: messages containing suggestions for creative and effective practices and activities for parents to support their children's literacy development. These messages were intended to expand parents' tool-kit of educational activities that could be flexibly and easily integrated into summer plans and schedules.

  e.g. "Pro-tip: Take turns reading OUT LOUD with your scholar. You read a page then your child reads a page, and so on (great at any age)!"

- **Signals:** messages that conveyed information about summer learning loss and reinforced the positive effects of reading and learning outside of classroom time. These messages served to increase the saliency of summer learning and reading and nudge parents whom,

for many reasons, might not be consistently helping their children engage in educational activities.

e.g. "Did you know? Kids who read 4+ books over the summer fare MUCH better on tests in the fall than their peers who read 0-1 books?"

Research Design

Data

Reading Achievement. Our primary outcome of interest is student reading achievement captured by two widely used literacy and reading comprehension tests, the Standardized Test for the Assessment of Reading (STAR) and the Strategic Teaching and Evaluation of Progress (STEP). Both assessments are vertically equated which allows us to document how students' literacy skills changed over time and to pool students' scores across grade levels. The STAR test, developed by Renaissance Learning, is a computer adaptive test that assesses reading comprehension in 10 minutes or less through 25 multiple-choice items testing vocabulary in-context. The test is administered to students starting in 1st grade and is scored on a scale ranging from 0 to 1400.

The STEP test, developed by the University of Chicago Consortium on School Research, is administered by teachers working one-on-one with students to assess a range of reading comprehension skills. Beyond measuring word recognition, reading speed and accuracy, STEP also evaluates comprehension and critical thinking. The assessment is divided into 13 steps or scale points, which in turn are subdivided into three shorter levels, and is administered to students in grades K through 3rd. The STEP assessment is generally scored on a scale ranging

from -1 (pre-literacy) to 12 (3rd grade literacy level). Teachers in one of the BVP elementary schools also used the Fountas and Pinnell Benchmark Assessment Systems (BAS) to extend the STEP scoring range up to 27 for students that had reached a 3rd grade literacy level. This reading ability and comprehension assessment, like the STEP is conducted one-on-one between teachers and students and is graded on a 15-point scale. In the other elementary school, scores were capped at 12 on the STEP assessment limiting our ability to capture growth in reading skills among those students reading above a 3rd grade level. Both the STAR and STEP assessments were administered in September, November, February and June of the 2015/16 academic year, except in one of the schools where teachers did not administer the STEP assessment in September. Examining how student achievement in reading is affected over the course of the following year allows us to test a common hypothesis in sociology and social psychology that small interventions such as ours can trigger recursive processes that, when sustained, can result in a cumulative advantage over time (DiPrete & Eirich, 2006; Yeager & Walton, 2011).

Parent Engagement. We were also interested in analyzing whether parents who received text messages from BVP about how to support their child's literacy development would be motivated to become more engaged in school activities both during the summer and after the start of the new school year. To examine this question, we worked with BVP to collect several measures of parent engagement by recording whether parents participated in the following, chronologically ordered events and activities: a back-to-school ice cream social for teachers, parents and students; home visits where teachers meet with parents at home or another designated location outside of school; and fall semester parent-teacher conferences. At the conclusion of the pilot program we also invited all parents in the study to sign up to receive text

messages during the school year about how they could support student learning outside of school time.

Parent Survey. We administered surveys to parents after the conclusion of the summer learning text messaging program in order to confirm the delivery of text messages and capture data on potential mechanisms through which text messages might affect student outcomes. The survey asked about student reading habits, parent involvement in student learning and reasons for increased (decreased) reading over summer. The survey included questions about the frequency with which parents and students engaged in the different activities over the summer suggested in the series of text messages (text messages were not mentioned in these questions). Parents responded to each item on a five point Likert scaled ranging from *never* to *more than once a week*.

The post-study survey was administered online during early October. Recruitment was done via text, email, school newsletters, and flyers sent home with students. Raffle tickets for a $100 amazon gift card were offered for participation. These efforts resulted in a 69% household response rate among study participants. However, families in the treatment group were 11 percentage points less likely to complete the survey than those from the control group (63% treatment vs. 74% control). In Appendix Table A1, we report the student characteristics of parents who did and did not respond to the survey. Non-respondents were significantly more likely to be Hispanic, low-income and have students who were lower-achieving in reading. Given the differential survey response rate across treatment status and select student characteristics, we interpret our analyses of potential mechanisms based on parent responses as exploratory rather than causal evidence.

Randomization

We evaluate the causal effect of our pilot text-messaging program to promote literacy skills development by conducting a cluster randomized trial at the household-level. Our research design and analyses described below were pre-registered with the Institute for Education Sciences What Works Clearinghouse Randomized Control Trial Registry (ID #489). We randomly assigned students and their parents to receive texts or to a control condition in which households only received standard school announcements via text-messages. We chose to assign treatment at the household-level to reduce potential spillovers between siblings. If the text messages had an effect on parents' behavior, it would likely change parents' involvement with all their elementary-age children. While this design approach reduces the potential for spillover effects, it does not eliminate the possibility that parents or students in the treatment group could communicate and share information provided in the text messages with parents or students in the control group over the summer or the following school year. We examine the potential threat posed by spillovers in detail below based on self-reported data from the parent survey.

We examine the validity of the randomization process by testing for mean differences across students in the treatment and control group. As shown in Table 2, there were no statistically significant differences between the two groups across 23 observable characteristics, affirming the validity of the randomization process.

Analytic Approach

We begin by estimating the effect of being a student in a household randomly assigned to receive summer learning text messages, *TREAT*, using a multilevel model as follows.

$$Y_{ij} = \alpha + \beta_1 TREAT_j + \delta X_i + (\nu_j + \varepsilon_{ij}) \quad (1)$$

Here Y_{ij} represents a given outcome of interest for student *i* from family *j*, X_{ij} is a vector of household-level controls including sending district, FRPL status and student-level controls including age, ELL, race, disability, and grade. The coefficient on *TREAT*, β_1, captures our estimate of the intent-to-treat (ITT) effect of summer learning text messages given that we cannot confirm with certainty that all the text messages were received or read by participating parents. A positive and statistically significant estimate of β_1 will suggest that assigning households to receive summer learning text messages improved student achievement in reading. We specify an error structure where individual students are nested within households by fitting models with household random effects, which are orthogonal to *TREAT* by construction.

In a second specification of our model, we include 2014/15 end-of-year STEP test scores to control for baseline literacy levels.

$$Y_{ij} = \alpha + \beta_1 TREAT_j + \lambda STEP_i^{June\,'15} + \delta X_i + (\nu_j + \varepsilon_{ij}) \quad (2)$$

The addition of STEP scores serves to further test the robustness and increase the precision of our estimates. We are unable to fit corresponding models in our full sample using prior scores on the STAR exam given that baseline STAR scores are not available for incoming 1st graders as the test is not administered in Kindergarten.

Next we leverage the repeated outcome measures of reading achievement by estimating pooled effects in a student-by-test-period dataset. These stacked models provide a single

estimated treatment effect that averages across the four test administrations in 2015/16 and increases the precision of our estimates (McKenzie, 2012).

$$Y_{ijt} = \alpha + \beta_1 TREAT_j + \lambda STEP_i^{June\ '15} + \delta X_i + (\nu_j + \varepsilon_i + \eta_{ijt}) \qquad (3)$$

Here we model STAR or STEP test scores for student *i* in family *j* in time *t* where *t* captures the four time periods when students are assessed. Our covariates remain the same as in equation (2), while we expand our multilevel error structure to include both random effects for households (ν_j) and students (ε).

We then test whether the treatment had a differential effect on different subgroups of students as specified in the pre-registration plan. We do this by refitting equation (2) to include the main effect of a given student characteristic and its interaction effect with the treatment indicator. The subgroups we examine are eligibility for FRPL, race (African American and Hispanic), and grade level (1st & 2nd and 3rd & 4th).

We fit parallel logistic regression models using the same structural components from equation (2) when examining parents' school engagement outcomes. We present parameter estimates from these models as odds ratios as well as marginal effects to facilitate a more direct comparison with our achievement results. Finally, we fit corresponding ordered logistic regression models with the same structural components of equation (2) when analyzing responses to survey items, and report the results as proportional odds ratios. For both of these models we account for the multilevel nature of the data by clustering our standard errors at the household level. This approach, necessary given the lack of convergence for models with

random effects, produces consistent estimates of our parameters but less efficient estimates of our standard errors.

Findings

Take-Up

BVP's communication management system allowed us to track the distribution of text messages to parents in the treatment group. These records reveal that 97.29% of messages were sent and delivered. To confirm the effective reception of messages, we included questions in the post-study survey on whether households had received text messages from BVP, if they had received text messages about learning and literacy skills specifically, and if so, how many they had received. As shown in Table 3, households in the treatment group were 32 percentage points more likely to report having received text messages over the summer than households in the control group. On average, households in the treatment group reported receiving an average of almost nine more text messages from BVP over the summer than parents in the control group and over six more text messages specifically about summer learning and literacy skills. These findings confirm that the delivery of the treatment was largely successful given that recall bias when answering survey questions about past behavior likely contributed to differences in the reported and actual number of texts received.

Effect on Literacy Skills

We report estimates from our model of the treatment effect on reading achievement scores in Table 4. We include treatment effects for STAR and STEP tests taken in September, November, February, and June of the 2015/16 school year as well as an estimate that pools

scores from across these test administrations. Estimates across models, tests, and time periods are uniformly positive, and for STEP, significant at the 0.1 level. Estimates remain largely unchanged when we control for baseline literacy levels with the inclusion of STEP test scores from June of the prior academic year, while the corresponding standard errors become meaningfully smaller due to the reduction in residual variance.

Focusing on models that include STEP baselines scores, we find point estimates ranging from 5.9 to 20.8 scaled score points on the STAR assessments, with a pooled estimate of 13.9 scaled score points (p=.35) although none of these estimates are statistically significant. The magnitude of the pooled estimate, while indistinguishable from zero, is almost one and half times the average rate of summer learning loss in the school. Given that the standard deviation of STAR test scores among 1st through 4th graders is 215.8, these estimates correspond to effect sizes ranging from .03 to .10 standard deviations (SD) with a pooled estimate of .06 SD.

Treatment effects on student reading fluency as measured by the STEP exam range from .25 to .49 score levels with a pooled estimate of .36 score levels (p=.06). Estimates for the November, June and pooled effect are all statistically significant at the .10 level. Converting these into effect sizes using the standard deviation of STEP tests among 1st through 4th graders of 2.47, these effects range from .10 to .19 SD with a pooled effect size of .15 SD. Figures 2 and 3 display the time dynamics of the estimated standardized effects for STAR and STEP, respectively. The pattern of results over the course of the 2015/16 school year is suggestive of sustained (on STAR) and incrementally increasing effects (on STEP) although we do not have the power to distinguish these point estimates across time from each other.

We extend our primary test-score analyses to examine whether the summer learning text messages had a differential effect on students by grade level, socio-economic status, and race.

These analyses are exploratory in nature as they are underpowered to detect small to moderate differences across sub-groups. In Table 5, we report estimates from models where we interact the main effect of treatment with indicators for upper grade levels (3rd & 4th grade), FRPL eligibility, Hispanic, and African American.

We find compelling evidence that the positive impact of the text messaging intervention was concentrated among students in the upper elementary grade levels. Estimates for the coefficient associated with *TREAT**(3rd & 4th Graders) variable reported in Table 5 provide the difference in the magnitude of treatment effects between 3rd and 4th graders relative to 1st and 2nd graders as well as the corresponding significance test of this difference. Focusing on our pooled effect estimates, we find that the treatment effect was 57.2 scale score points (p=.04) larger for upper-grade students relative to lower-grade student on the STAR exam and .65 score levels (p=. 09) larger on the STEP exam. These estimates correspond with effect size *differences* of exactly .26 SD for both reading assessments.

We plot the subgroup effect sizes for 1st and 2nd graders (the standardized coefficient on *TREAT*) and for 3rd and 4th graders (the standardized linear combination of the coefficients on *TREAT* and *TREAT**[3rd & 4th Graders]) in Figures 4 and 5, respectively. As can be seen, effects for upper grades (3rd & 4th) for STAR and STEP both, illustrate large effects that appear to increase over the course of the semester. Effect sizes for upper grade students ranged from .14 SD to .30 SD on STAR and .24 SD to .38 SD on STEP. Seven out of eight of these estimated effects are significant at the .05 level. For pooled effect estimates, effect sizes for upper grade students were 0.21 SD (p=.036) on the STAR exam and 0.29 SD (p=.008) on the STEP exam. In stark contrast, we find near zero and statistically insignificant effects on lower grade students. One possible explanation for this pattern is that older students, most of whom have mastered

basic literacy skills, were more likely to benefit from a more general literacy text messaging initiative than younger students who need to be exposed to more specific pre- and emerging-literacy skill building activities.

We find little evidence of any differential effects on students based on socio-economic status given estimates are both positively and negatively signed and never statistically significant. Our estimates do suggest that the text messaging program was differentially more effective for African American students compared to non-Hispanic White students. Estimates for both tests in all four testing periods are positively signed while two for the STEP assessment – September (p=.05) and November (p=.04) – are significant at the 0.1 level. These estimates suggest that the text messaging program may advance efforts to reduce educational disparities.

Effect on Parent Engagement

We next examine the effect of summer learning text messages sent to parents on their engagement in academic events that occurred at the end of the summer and through the fall semester. Despite not directly encouraging parents to attend or participate in school-related activities, the summer learning text messages had the intention of making parents more engaged in the learning process of their children and thus, we theorized, more likely to participate in academic events in general. In Table 6, we report treatment effects, displayed as odd ratios, on attendance at an ice cream summer social event, a home visit with a school teacher, a parent conference in the fall, and on signing up to receive future messages about learning outside of school time. We find statistically significant effects on one out of the four measures of parent engagement, attending a fall semester parent-teacher conference. We estimate that receiving the summer learning text messages increased the probability that a parent would attend the meeting

by a predicted marginal effect of 5.4 percentage points on top of a control group mean of 91%. The sign of the predicted marginal effects is negative for the Ice Cream Social, near zero for home visits, and positive for text messages sign-ups. These mixed results suggest that parent engagement in their children's education can take multiple forms (e.g. with students at home, with teachers, with school-wide events) and that effects of interventions intended to promote engagement of one type may translate to additional but not all forms of engagement. Specific direct invitations and reminders might be required for different academic events and forms of engagement (Hoover-Dempsey et al., 2005).

Mechanisms

We explore the potential mechanism through which effects on reaching achievement may operate by analyzing parent responses to a post-study survey. The survey asked parents about the frequency with which they engaged in specific parent-student learning activities such as reading out loud, explaining new words, and going to a library. In Table 7, we report proportional odd ratios from ordered logistic regression models for responses to individual survey questions. We find no clear pattern of results or statistically significant effects on the frequency of parent's self-reported literacy activities. Estimates are both positive (above 1) and negative (below 1). Despite the exploratory and limited nature of these data, these estimates do not point toward any specific parent behavior that might have been a primary mechanism for how the summer learning text messages to parents increased students' achievement in reading.

Spillover

Our research design – clustered randomization at the household level – captures any spillover effects among siblings living in the same household. We could not, however, prevent parents in the treatment group from speaking to other parents in the control group about the content of the text messages they received. If parents shared the content of the messages, (e.g. ideas about how to improve reading habits over the summer), with parents in the control group this could attenuate the treatment effect. We examine whether there is evidence of spillovers by analyzing parents' responses to a question in the post-study survey on whether they had shared any of the texts with other BVP parents. We find that 31% of parents from the treatment group who responded the question in the survey (n = 63) indicated that they had shared texts with other BVP parents. We also were notified by BVP administrators that on two occasions a BVP parent posted a comment on the school Facebook page describing the general content of a text message they received. This anecdotal evidence suggests that, if anything, our findings are likely conservative estimates given the potential for the treatment-control contrast to be attenuated by parents in the treatment groups influencing the summer reading practices of parents in the control group.

Attrition

Given that test score data is missing for up to 6.5% of our sample for some test-score administrations, we test for differential attrition from the study across treatment and control groups for each of our achievement outcomes. Specifically, we explore whether students in the treatment group were more likely than students in the control group to be absent for STAR or STEP assessments during the 2015/16 school year. We accomplish this by fitting OLS regression models using a binary indicator for missing for each assessment on an indicator for

treatment status. We report the estimated coefficients on *TREAT* in Table 8. Differences in missingness rates are not statistically significant and never larger than 3.3 percentage points. These tests reveal no evidence to suggest differential attrition poses a threat to our test-score effect estimates.

Lessons for Future Text-Messaging Programs for Parents

Our interpretation of the impact evaluation results described above suggest that summer literacy text messaging programs for parents have potential but that design details and implementation strategies matter. The process of designing, implementing and evaluating our pilot text-messaging intervention intended to support parents to engage in literacy enrichment activities with their children during the summer affords several lessons for program redesign and scale-up efforts. Parents' responses to questions about whether they faced any difficult challenges over the summer that limited the amount of reading they could do with their children suggest some parents faced substantial obstacles that were unaddressed by the text-messaging initiative. Across the treatment group, nearly 25% of respondents reported facing a unique or difficult challenge that acted as a barrier to engaging in reading activities with their children.

We coded parents' responses to an open-ended follow-up question into five broad categories to describe the general nature of these challenges and present the results in Table 9. The most common challenges reported by parents were vacation conflicts followed by health issues and work demands. For example, one parent wrote that "working all day shifts not coming home till 10 p.m. at night six days a week" presented a significant challenge to engaging in the suggested literacy activities. Another described her challenge as "(My) child's two younger brothers and myself have a lot of serious medical issues. We have a lot of doctor

appointments, usually several a week. I am also on the phone a lot due to all these appointments."

Text messaging interventions should be designed with careful attention paid to the content, frequency and duration of the initiative, especially as they pertain to helping specific groups of families and their children. Our program delivered messages that promoted literacy activities to students that ranged from slightly under six to just over ten years old. The effects we find are largely concentrated among elementary school students in higher grades suggesting our focus on reading activities maybe have been less appropriate for parents with younger children still developing pre-literacy skills. A recent study by Doss et al. (2016) found evidence supporting this hypothesis. The authors found larger effects for an early literacy text-messaging program that was differentiated and personalization based on the child's developmental level compared to one that delivered more general literacy suggestions to parents of preschool students. Furthermore, several parents' open-ended survey responses pointed to the desire for messages to be more relevant to their students' coursework in the prior and upcoming school years. Together, insights from these studies point to the importance of targeting grade-specific skills with text messaging literacy interventions. They also point to the potential to further individualize text messaging interventions based on students' performance on interim reading assessments such as the STEP and STAR exams. The possibility of automating the targeting of more specific messages based on age, achievement or other characteristics would allow similar interventions to increase their efficacy while remaining scalable and cost-effective.

Future text-messaging interventions might attempt to increase participation and impacts by refining several program implementation practices. Opt-in policies may cause programs to miss families whose children experience the largest summer learning loss even when opting in

only requires replying to a text message. Changing the default setting to be opt-out can dramatically increase participation rates for parent information interventions delivered via text message. Our study also illustrates the critical importance of proactively updating cellphone records throughout the summer and academic year. We found that approximately one out of every four phone number provided by parents did not work six months later.

Responses on the parent survey also reveal the importance of identifying which parent in a household should receive the texts. In our study, texts were sent to the primary phone number listed in parents' contact information. Parents reported that in some instances this was not the parent who was home more often or more likely to engage with their child in literacy development activities. Text-messaging programs might instead aim to send messages to all adult members of a household as well as to older siblings in certain cases. This would both increase the likelihood that messages reach the adult most likely to interact with students and possibly generate momentum for a focus on literacy development at home by prompting adults to discuss the tips and activity suggestions they receive. Finally, the enthusiasm of several parents who posted the literacy practices they were engaged in with their children on the school's social media sites points to the potential of using social networks to amplify the impact of text messaging interventions.

Conclusion

The Coleman Report first documented how students' experiences outside of school are the dominant influence on their success inside the classroom. Given this finding and a large body of subsequent evidence affirming it (Goldhaber & Brewer, 1997; Goldhaber, Brewer & Anderson, 1999; Nye, Konstantopoulos & Hedges, 2004; Altonji & Mansfielf, 2011), it would be

reasonable to conclude that efforts to address inequitable educational outcomes need not directly involve schools at all. Instead, we posit that schools can magnify their potential impacts by empowering parents and partnering with them to support students' learning process. This text-messaging study illustrates one of many potential ways in which schools can leverage their relationships with parents to help create better learning opportunities for students outside of school walls.

The sustained and even increasing positive effects on the literacy skills of upper elementary students throughout the school year suggest the text message intervention effects were the result of a process of cumulative advantage, cumulative exposure, or both (DiPrete & Eirich, 2006). Scholars have posited that reading ability develops through a virtuous cycle where, for example, having a larger vocabulary improves reading comprehension, which in turn improves textual inferences and expands vocabulary (Stanovich, 1986). It could be that improvements in students' literacy skills over the summer allowed them to access and benefit more from literacy instruction during the school year. It is also possible that the intervention had a lasting effect on the frequency and or quality of literacy activities parents engage in with their children at home beyond the time of the intervention. This cumulative benefit of the increase in the quality of learning opportunities outside of school could also explain the larger effects we observe over time.

Text-messaging interventions such as the one we studied are particularly attractive given evidence that they can be taken to scale with limited financial investments and have been shown to be effective across a range of contexts (Castleman, 2015). Our intervention leveraged texts as a way to deliver encouragement, reminders, and suggestions for literacy activities. The feedback we received from parents about this intervention suggests that future development and scaling-up

efforts of text-messaging campaigns during the summer would benefit from efforts to address challenges that limited parents' ability to provide enriching literacy activities for their children. For example, schools could experiment with combining a text messaging campaign with a program to provide summer reading materials or transportation to libraries, museums, and other learning activities. The results of this intervention coupled with feedback from parents suggest that similar interventions could be improved by individualizing the content of the messages based on the students' current learning abilities and needs.

Many of the inequitable educational outcomes documented in the Coleman report remain over 50 years later. Addressing these persistent inequities will require schools and educators to move beyond the traditional domain of the classroom. This study provides an example of how schools have the potential to extend their influence on students' educational opportunities by partnering with and empowering parents.

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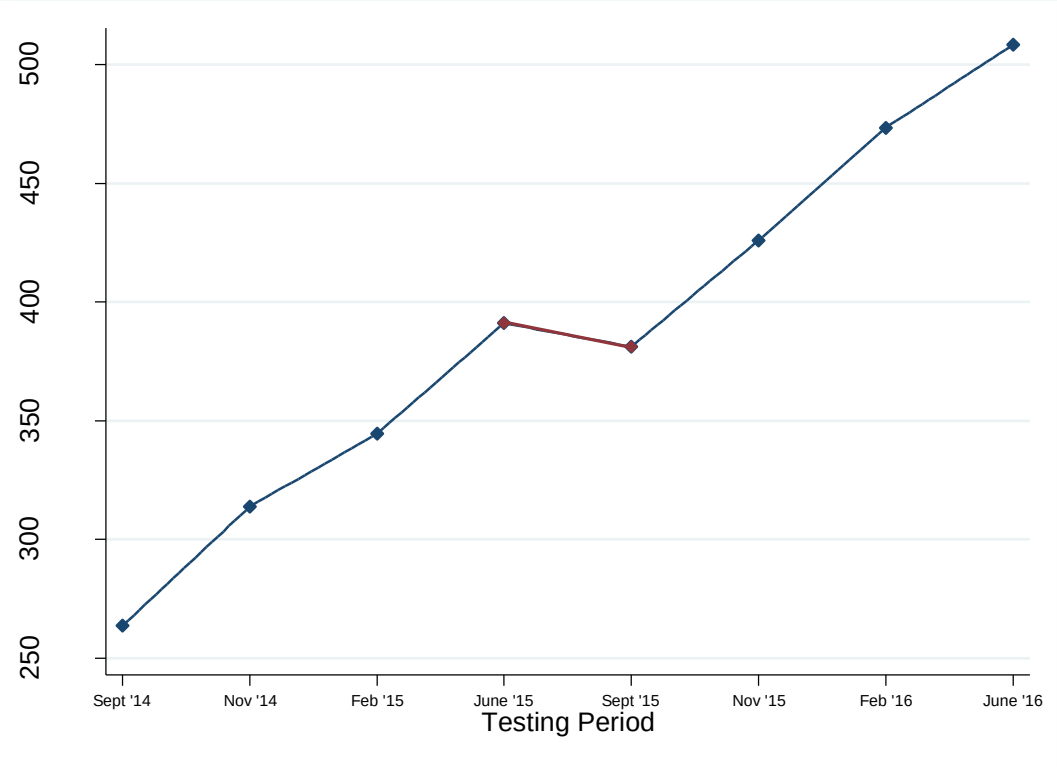
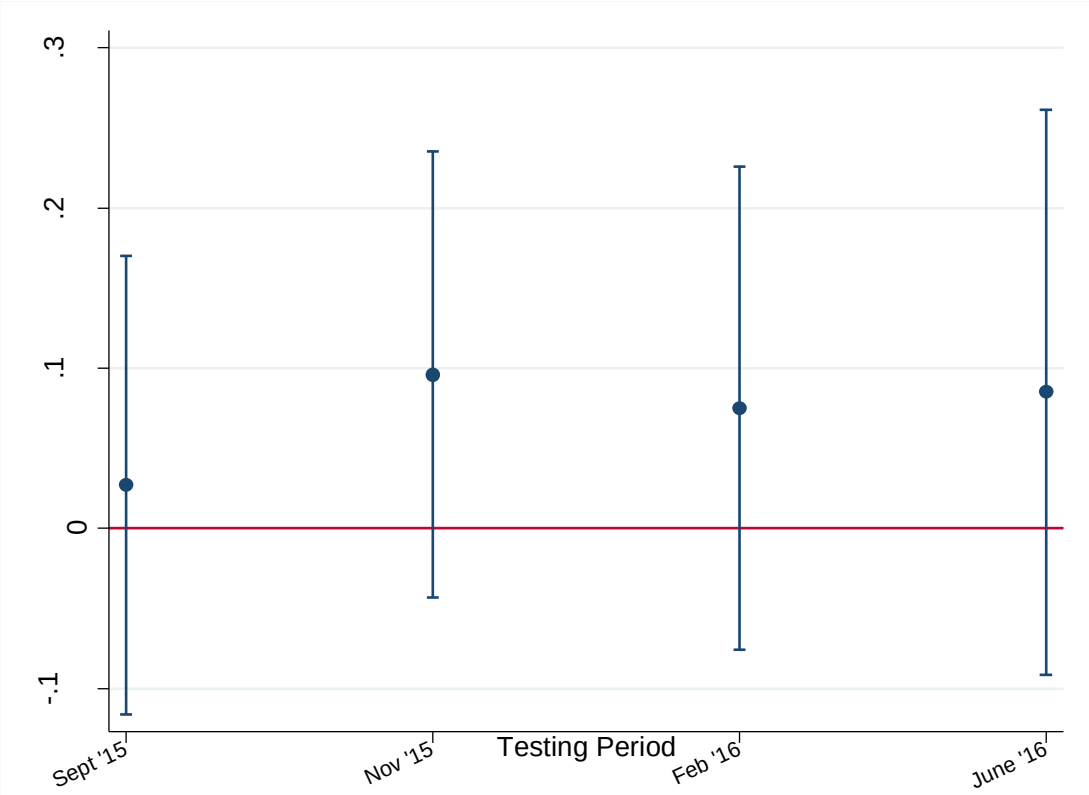
Figure 1: Summer Learning Loss on the STAR Reading Assessment



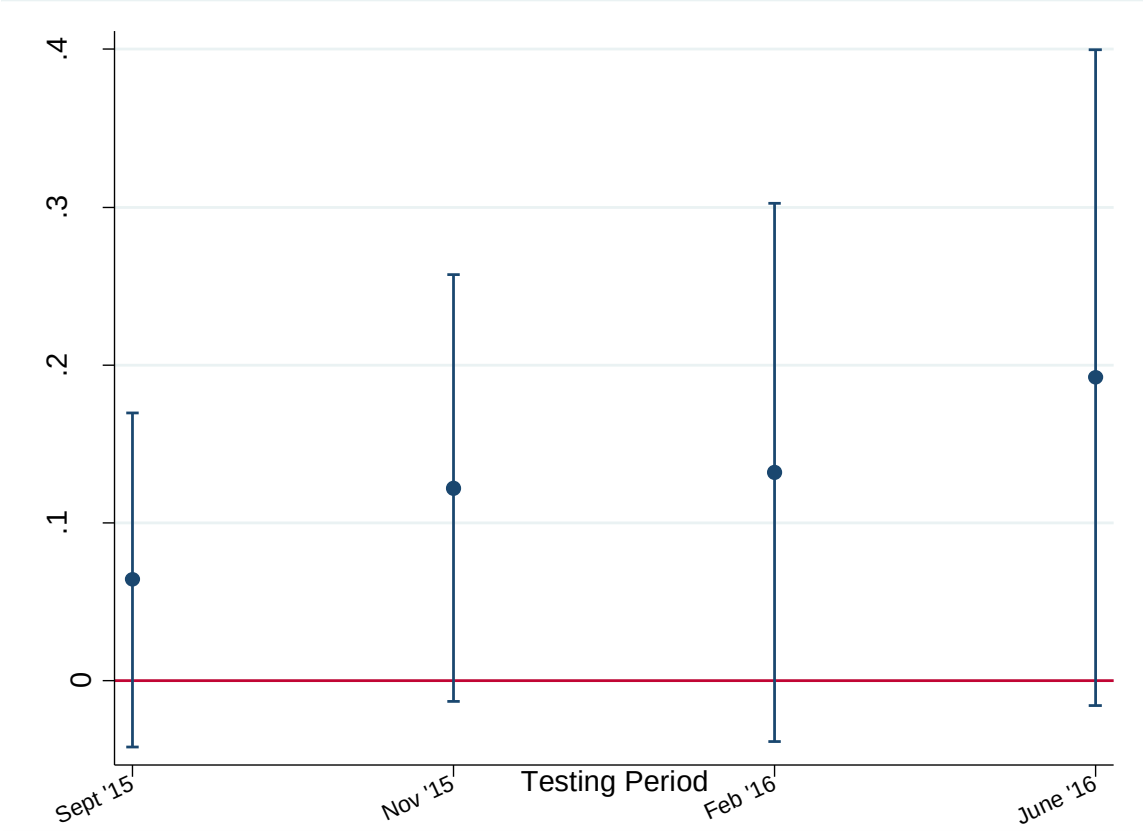
Notes: Average STAR scaled scores for students in the 2nd through 4th grade as of 2014/15 from beginning of 2014/15 academic year to end of 2015/16 academic year. Students that were assigned to the treatment group are not included in figure as their 2015/16 scores were potentially influenced by the treatment. Students included in figure are those with complete test data across all testing periods (n = 337).

Figure 2: Effect Sizes on the STAR Reading Assessment across the School Year



Notes: STAR scaled scores are standardized relative to the average of 1st to 4th graders in the study schools. Model for treatment effects is estimated with parent random effects and includes student demographics, grade level, school, sending district, and June 2014/15 STEP scores as covariates.

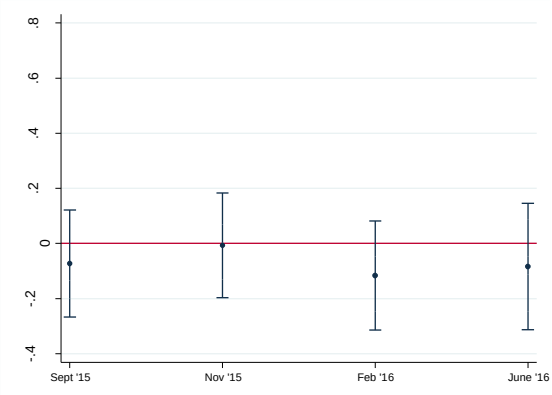
Figure 3: Effect Sizes on the STEP Reading Assessment across the School Year



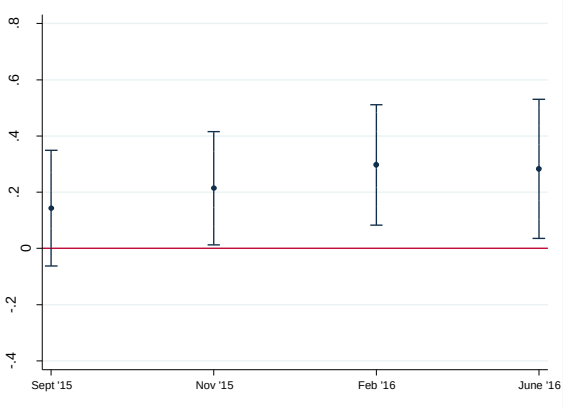
Notes: STEP scaled scores are standardized relative to the average of 1st to 4th graders in the study schools. Model for treatment effects is estimated with parent random effects and includes student demographics, grade level, school, sending district, and June 2014/15 STEP scores as covariates.

Figure 4: Effect Sizes by Grade Level on the STAR Reading Assessment across the School Year

Panel A: 1st & 2nd Graders

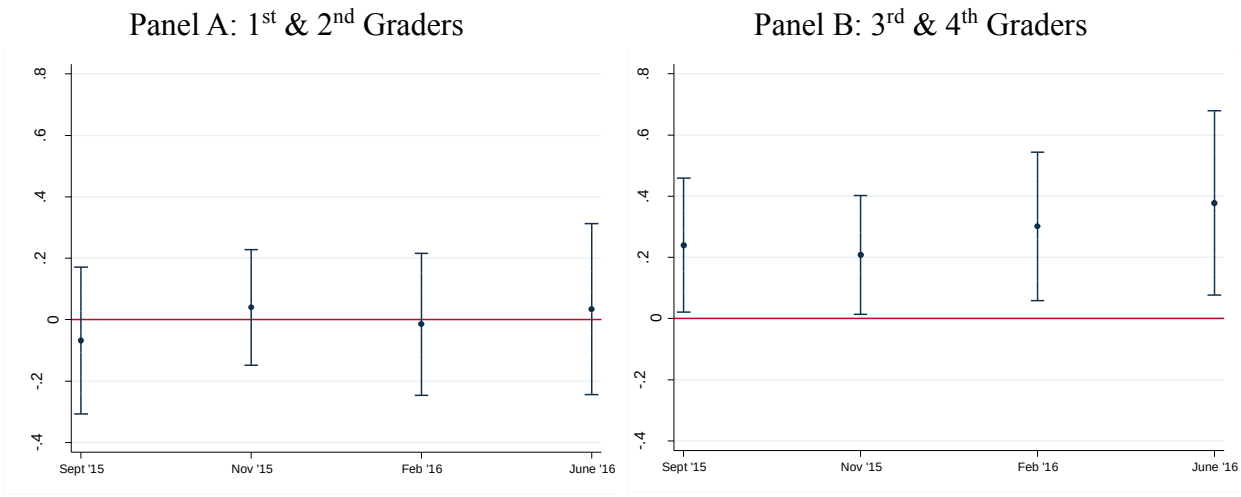


Panel B: 3rd & 4th Graders



Notes: Estimates from equation (2) where *TREAT* is replaced by two mutually exclusive treatment indicators, *TREAT**(1st & 2nd Graders) and *TREAT**(1st & 2nd Graders). See Figure 2 for further model details.

Figure 5: Effect Sizes by Grade Level on the STEP Reading Assessment across the School Year



Notes: Estimates from equation (2) where *TREAT* is replaced by two mutually exclusive treatment indicators, *TREAT**(1st & 2nd Graders) and *TREAT**(1st & 2nd Graders). See Figure 3 for further model details.

Tables

Table 1. Student Characteristics among Study Participants and non-Participants

	All students	Students in Study	Students not in Study	Difference	P-value
STEP June 14/15	8.19	8.13	8.23	-0.10	0.714
STAR reading June 14/15	398.18	438.30	376.67	61.63	0.001
STAR math June 14/15	563.17	572.85	557.99	14.86	0.175
Age	7.87	7.74	7.94	-0.2	0.042
Female	50.5	50	50.7	-0.7	0.854
Asian	3.5	3.4	3.5	-0.1	0.931
Black	12	11.6	12.2	-0.6	0.572
Hispanic	44	32.3	50.9	-18.6	0.000
White, not Hispanic	39.9	52.2	32.7	19.5	0.001
Native American	0.6	0.4	0.8	-0.4	0.888
FRPL	68.8	53.4	77.2	-23.8	0.000
ELL	9.4	3.4	12.7	-9.3	0.000
Special Education	9.9	6.9	11.5	-4.6	0.078
Rising 1st Grade	24.5	28.1	22.6	5.5	0.137
Rising 2nd Grade	25.1	25.1	25.1	0.0	0.976
Rising 3rd Grade	24.8	23.8	25.3	-1.5	0.639
Rising 4th Grade	25.4	22.5	26.9	-4.4	0.245
Elementary School 1	50.1	53	48.6	4.4	0.414
Elementary School 2	49.6	47	50.9	-3.9	0.414
CF Sending District	26.1	15.1	32.2	-17.1	0.001
CU Sending District	26.9	32.3	23.9	8.4	0.101
LN Sending District	15	22.4	11	11.4	0.000
PA Sending District	31.3	29.3	32.4	-3.1	0.195
N (Students)	670	232	438		

Notes: Sample sizes for baseline test scores are not constant across variables (STEP - 232 students in study and 390 students not in study; STAR - 163 students in study and 305 students not in study). Rising 1st Graders do not have STAR baseline scores as the test is not assessed in Kindergarten. Age is as of 07/01/2015. P-values of the difference estimated from models where a given characteristic is regressed on an indicator for opting in to the study and parent random effects.

Table 2. Baseline Characteristics, by Treatment Status

	Students in Treatment Group	Students in Control Group	Difference	P-value
STEP June 14/15	7.96	8.30	-0.34	0.428
STAR reading June 14/15	446.92	430.19	16.73	0.539
STAR math June 14/15	567.63	577.76	-10.13	0.558
Age	7.69	7.79	-0.10	0.530
Female	51.7	48.2	3.5	0.601
Asian	2.5	4.4	-1.9	0.443
Black	12.7	10.5	2.2	0.449
Hispanic	28.0	36.8	-8.8	0.150
White, not Hispanic	55.9	48.2	7.7	0.548
Native American	0.8	0.0	0.8	0.326
Free or reduced price lunch	55.9	50.9	5.0	0.379
English as a second language	2.5	4.4	-1.9	0.440
Enrolled in Special Education	7.6	6.1	1.5	0.656
Rising 1st Grade	31.4	24.8	6.6	0.267
Rising 2nd Grade	23.7	26.5	-2.8	0.623
Rising 3rd Grade	23.7	23.9	-0.2	0.973
Rising 4th Grade	21.2	23.9	-2.7	0.624
Elementary School 1	50.0	56.1	-6.1	0.182
Elementary School 2	50.0	43.9	6.1	0.182
CF Sending District	14.4	15.8	-1.4	0.567
CU Sending District	33.9	30.7	3.2	0.604
LN Sending District	23.7	21.1	2.6	0.627
PA Sending District	27.1	31.6	-4.5	0.912
N (Students)	118	114		
N (Parents)	91	92		

Notes: Sample sizes for baseline test scores are not constant across variables (STEP - 118 students in treatment group and 112 students in control group; STAR - 79 students in treatment group, and 84 students in control group). Rising 1st Graders do not have STAR baseline scores as the test is not assessed in Kindergarten. Age is as of 07/01/2015. P-values calculated by regressing the indicator for treatment on each variable, model is estimated with parent random effects.

Table 3. Confirmation of Treatment Delivery

	Did Parent Receive Texts	Number of Texts Received	Number of summer learning texts received
Treat	0.311***	8.131***	6.067***
	(0.078)	(1.364)	(1.352)
Constant	0.515***	3.249***	2.666***
	(0.053)	(0.927)	(0.944)
N (Students)	161	159	136

Notes: OLS regressions are unconditional but include a random effect for parents. Standard errors shown in parenthesis. (* p<0.1, ** p<0.05, *** p<0.01)

Table 4. Effects of Summer Learning Texting Intervention on Reading Achievement

	Sept 15/16		Nov 15/16		Feb 15/16		June 15/16		Stacked Periods	
					Panel A: STAR					
Treat	6.26	5.89	20.44	20.75	15.02	16.08	18.05	18.37	12.39	13.92
	(20.40)	(15.82)	(20.96)	(15.42)	(21.00)	(16.54)	(23.86)	(19.39)	(20.19)	(15.17)
STEP June 1415		y		y		y		y		y
N (Students)	224	224	225	225	223	223	224	224	896	896
Effect Size	0.03	0.03	0.09	0.10	0.07	0.07	0.08	0.09	0.06	0.06
					Panel B: STEP					
Treat	0.543	0.246	0.333	0.301*	0.282	0.326	0.488	0.476*	0.330	0.361*
	(0.447)	(0.210)	(0.284)	(0.171)	(0.294)	(0.214)	(0.323)	(0.263)	(0.279)	(0.193)
STEP June 1415		y		y		y		y		y
N (Students)	112	112	223	223	227	227	217	217	779	779
Effect Size	0.22	0.10	0.13	0.12	0.11	0.13	0.20	0.19	0.13	0.15

Notes: Columns show treatment estimates from OLS that include as covariates student demographics, grade level, school, and sending district. Second column for each outcome include as baseline achievement STEP June 14/15 scores. All models include parent random effects. In last column of Panel B for grade interactions we fit the model via restricted maximum likelihood (REML) as the sample is not large enough to converge. Sample for Sept 15/16 is reduced because only one school tested in that period. Effect size shows the treatment estimate in standard deviations relative to the average of 1st to 4th graders in the study schools. Standard errors are shown in parenthesis. (* $p<0.1$, ** $p<0.05$, *** $p<0.01$)

Table 5. Tests for Differential Effects of Summer Learning Texting Intervention on Reading Achievement

	Sept 15/16			Nov 15/16			Feb 15/16			June 15/16			Stacked Periods		
	Panel A: STAR														
Treat	-15.25	12.17	10.82	-1.20	27.907	21.74	-24.35	6.69	8.50	-15.16	21.96	18.23	-12.70	17.33	16.60
	(21.53)	(24.13)	(21.374)	(21.044)	(23.392)	(20.81)	(21.95)	(25.06)	(22.060)	(25.57)	(29.27)	(25.87)	(19.95)	(22.89)	(20.42)
Treat*3rd & 4th	45.01			46.73			87.47***			72.41**			57.23**		
	(31.34)			(30.72)			(32.001)			(36.70)			(28.42)		
Treat*FRPL		-11.81			-13.55			17.59			-6.76			-6.44	
		(34.07)			(33.14)			(35.27)			(41.24)			(32.35)	
Treat*Hispanic			-26.02			-15.17			13.10			-21.47			-18.35
			(35.76)			(34.73)			(36.98)			(43.30)			(34.02)
Treat*Afri.-Amer.			29.86			33.22			29.70			63.70			28.44
			(50.59)			(49.45)			(53.89)			(62.90)			(48.57)
N (Students)	224	224	224	225	225	225	223	223	223	224	224	224	896	896	896
	Panel B: STEP														
Treat	-0.168	0.212	0.107	0.098	0.247	0.080	-0.037	0.074	0.094	0.089	0.185	0.220	0.052	0.214	0.120
	(0.301)	(0.319)	(0.276)	(0.239)	(0.258)	(0.229)	(0.292)	(0.325)	(0.284)	(0.352)	(0.393)	(0.346)	(0.265)	(0.279)	(0.245)
Treat*3rd & 4th	0.763*			0.417			0.773*			0.843			0.651*		
	(0.405)			(0.343)			(0.425)			(0.518)			(0.384)		
Treat*FRPL		0.064			0.104			0.475			0.554			0.280	
		(0.453)			(0.366)			(0.459)			(0.559)			(0.396)	
Treat*Hispanic			0.035			0.271			0.574			0.614			0.516
			(0.485)			(0.379)			(0.477)			(0.583)			(0.411)
Treat*Afri.-Amer.			1.330*			1.083**			0.440			0.518			0.662
			(0.685)			(0.538)			(0.689)			(0.842)			(0.590)
N (Students)	112	112	112	223	223	223	227	227	227	217	217	217	779	779	779

Notes: Columns show treatment estimates and interaction effects for subgroups of interest from OLS regressions that include as covariates student demographics, grade level, school, sending district, and June STEP 14/15 scores. All models include parent random effects. In last column of Panel B for grade interactions we fit the model via restricted maximum likelihood (REML) as the sample is not large enough to converge. Sample for Sept 15/16 is reduced because only one school tested in that period. Standard errors are shown in parenthesis. (* p<0.1, ** p<0.05, *** p<0.01)

Table 6. Effects of Summer Learning Texting Intervention on Parent Engagement

	Attend Ice Cream Social	Host Home Visit or Meet Teacher Outside School	Attend Parent-Teacher Conference	Sign up for Additional Text Messages
Treat	0.697	1.011	5.640**	1.427
	[1.151]	[0.031]	[2.154]	[0.733]
N (Students)	231	231	231	231
Marginal Effect	-0.082	0.002	0.054	0.037
Standard Error	0.071	0.066	0.027	0.049

Notes: Odd ratios and marginal effects reported in table. Logistic regressions include as covariates student characteristics, grade level, school, and sending district, as well as June 14/15 STEP scores. FRPL not included in the vector of student covariates for Parent Conference Attendance as it predicts the outcome perfectly. ESL not included in the vector of student covariates for Sign Up for Additional Text Messages as it predicts failure perfectly. Standard errors clustered at parent level. T statistics are shown in brackets. (* $p<0.1$, ** $p<0.05$, *** $p<0.01$)

Table 7. Exploratory Effects of Summer Learning Texting Intervention on Parent-Student Literacy Activities

	Treatment	T-Stat	N (Students)
Told a story to child	1.629	[1.339]	158
Read a book out loud to child	1.228	[0.560]	158
Gave a book to child to read	0.534	[1.625]	159
Asked child about books he/she read	0.685	[0.964]	158
Encouraged child to read on his/her own	1.224	[0.409]	161
Encouraged child to write on his/her own	0.619	[1.306]	160
Wrote with child	0.778	[0.640]	158
Explained new words to child	0.874	[0.365]	158
Took child to library	0.491*	[1.936]	160
Checked out books from library with child	0.581	[1.492]	160
Took child to a museum	1.575	[1.204]	159
Helped child with BVP homework packet	0.929	[0.178]	161

Notes: Survey questions about how often parents and children participated in a given activity. Parents answered questions about each student in a household using a 5 point Likert scale, ranging from never to more than once a week. Odd ratios shown in table. Ordered logistic regression include as covariates student demographics, grade level, school, sending district, and STEP June 14/15 scores. Standard errors clustered at parent level. T statistics in brackets. (* $p<0.1$, ** $p<0.05$, *** $p<0.01$)

Table 8. Differential Attrition Tests

	Treatment
STAR Sept 1516	-0.001
	(0.024)
STAR Nov 1516	-0.013
	(0.024)
STAR Feb 1516	-0.024
	(0.027)
STAR June 1516	-0.001
	(0.024)
STEP Sept 1516	0.033
	(0.029)
STEP Nov 1516	-0.027
	(0.026)
STEP Feb 1516	-0.001
	(0.020)
STEP June 1516	-0.012
	(0.033)
N (students)	232

Notes: Attrition coefficients attained by regressing on a binary indicator of missing data for each outcome. Models include parent random effects Standard errors in parenthesis. (* p<0.1, ** p<0.05, *** p<0.01)

Table 9. Coded Responses to the Types of Challenges Parents Report that Limited their Ability to Read with Children During the Summer

	Treatment	Control	In Analysis
Health Issues	3	2	5
Work Demands	2	4	6
Summer Plans	8	3	11
Family Challenges	3	4	7
Student Resistance	0	1	1
Undisclosed	0	2	2
N (Parents w/unique challenge)	14	13	27
N (Parents survey responders)	60	70	130

Notes: Table shows response counts for survey question about having unique challenges that impeded reading over summer months. Challenge types are determined by analyzing parents' short answer responses, each responder could mention more than one type of challenge. Surveys were answered by parents about challenges affecting all students in household. Counts are at the parent level.

Appendix

Table A1a. Baseline characteristics of students in analysis, by survey respondents

	All students in Study	Responded Survey	Did Not Respond Survey	Difference	P-value
Received Treatment	0.51	0.47	0.59	-0.12	0.091
STEP June 14/15	8.13	8.29	7.76	0.52	0.257
STAR reading June 14/15	438.30	465.32	380.62	84.71	0.009
STAR math June 14/15	572.85	585.47	545.92	39.55	0.025
Age	7.74	7.76	7.69	0.07	0.703
Female	50.0	48.4	53.5	-5.1	0.476
Asian	3.4	3.1	4.2	-1.1	0.667
Black	11.6	11.2	12.7	-1.5	0.971
Hispanic	32.3	26.7	45.1	-18.4	0.005
White, not Hispanic	52.2	58.4	38.0	20.4	0.145
Native American	0.4	0.6	0.0	0.6	0.505
FRPL	53.4	42.9	77.5	-34.6	0.008
ELL	3.4	3.1	4.2	-1.1	0.664
Special Education	6.9	4.3	12.7	-8.4	0.02
Rising 1st Grade	28.1	30.4	22.9	7.5	0.238
Rising 2nd Grade	25.1	22.4	31.4	-9.0	0.142
Rising 3rd Grade	23.8	21.1	30.0	-8.9	0.143
Rising 4th Grade	22.5	25.5	15.7	9.8	0.101
Elementary School 1	53.0	53.4	52.1	1.3	0.938
Elementary School 2	47.0	46.6	47.9	-1.3	0.938
CF Sending District	15.1	13.0	19.7	-6.7	0.057
CU Sending District	32.3	36.0	23.9	12.1	0.069
LN Sending District	22.4	23.0	21.1	1.9	0.755
PA Sending District	29.3	26.7	35.2	-8.5	0.626
N (Students)	232	161	71		

Notes: Characteristics of students in households that responded and did not respond to the parent survey. P-values calculated by regressing the indicator for treatment on each variable, model uses parent random effects.