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The underutilized potential of teacher-to-parent communication: Evidence from a field experiment

Matthew A. Kraft [a,*], Todd Rogers [b,1]

[a] Brown University, Box 1938, Providence, RI 02912, USA
[b] Harvard Kennedy School, Student Social Support Lab, Center for Public Leadership, 79 JFK Street, Cambridge, MA 02138, USA

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ABSTRACT

Parental involvement is correlated with student performance, though the causal relationship is less well established. This experiment examined an intervention that delivered weekly one-sentence individualized messages from teachers to the parents of high school students in a credit recovery program. Messages decreased the percentage of students who failed to earn course credit from 15.8% to 9.3%—a 41% reduction. This reduction resulted primarily from preventing drop-outs, rather than from reducing failure or dismissal rates. The intervention shaped the content of parent–child conversations with messages emphasizing what students could improve, versus what students were doing well, producing the largest effects. We estimate the cost of this intervention per additional student credit earned to be less than one-tenth the typical cost per credit earned for the district. These findings underscore the value of educational policies that encourage and facilitate teacher-to-parent communication to empower parental involvement in their children's education.

1. Introduction

Students typically spend only 25% of their waking hours in school. Accordingly, out-of-school factors account for the vast majority of differences in educational achievement in the United States (Altonji & Mansfield, 2010; Coleman et al., 1996; Goldhaber & Brewer, 1997). We posit that policymakers and educators may be underinvesting in strategies to leverage one of the largest out-of-school influences on students' academic success: their parents. The positive relationship between parental involvement in their children's education and students' success in school is widely documented in the research literature (Barnard, 2004; Cheung & Pomerantz, 2012; Fan & Chen, 2001; Houtenville & Conway, 2008; Todd & Wolpin, 2007). When Americans are asked about the most important priorities for improving student achievement, they consistently cite increased parental support as a top priority (Bushaw & Lopez, 2011; Time Magazine, 2010).

At the same time, evidence suggests that schools are failing to fully engage parents and provide them with information about what their children are learning and how they are performing in school. Only four out of every ten families with school-age children in the U.S. report receiving a phone call specifically about their child from a school administrator or teacher in the preceding year (Noel, Stark, Redford, & Zukerberg, 2013). Among secondary school parents, 66% do not agree that teachers keep them informed about classroom activities, events and requirements (National School Public Relations Association, 2011). Fewer than one in four parents can name a basic milestone that their child should have learned in school over the previous year (Public Agenda, 2012).

In this paper, we examine the effects of a light-touch communication intervention aimed at increasing parents' efforts and effectiveness at supporting their child's success

* Corresponding author. Tel.: +1 401 863 3795.
E-mail addresses: mkraft@brown.edu (M.A. Kraft), todd_rogers@hks.harvard.edu (T. Rogers).
[1] Tel.: +1 617 496 3421.

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in school. Each week we sent parents brief individualized messages from teachers about their child's performance in school. Although the positive association between parental involvement and student success is well established, we know far less about the causal mechanisms behind this relationship. Our work is among only a handful of experimental studies to document a direct causal relationship between parent–child interactions and student performance in school. Our research design also allows us to get inside the black box of communication between schools, parents, and students to examine how the frequency and content of those interactions matter.

The present study builds on several recent experimental evaluations of interventions designed to strengthen parental involvement in their child's education through increased communication. Kraft and Dougherty (2013) found that frequent teacher-to-parent phone calls, a time-intensive bi-directional intervention, increased student engagement as measured by homework completion, in-class behavior, and in-class participation during a summer school program ($n = 140$). Bergman (2012) found that sending parents SMS text messages when their child was missing assignments resulted in significant gains in GPA, tests scores, and measures of student engagement ($n = 306$). This intervention required no extra effort on the part of teachers, but also failed to leverage their unique knowledge about students. Harackiewicz, Rozek, Hulleman, and Hyde (2012) studied the effect of informing parents about the career value of taking classes in science, technology, engineering, and mathematics (STEM) for high school students. Their experiment involved mailing parents two brochures and offering access to an informational website and found that the treatment increased the number of STEM classes that students took ($n = 188$). Although these studies are limited to relatively small samples, taken together they suggest that educators have information to convey to parents that could motivate them to act, and that parents can affect students' educational behaviors and success when they receive information from educators.

We extend this literature by exploring how parent–child interactions can increase student performance. Specifically, we examine the effect of delivering weekly messages written by teachers about each student's performance and behavior in school on the likelihood students passed their classes. We also explore how this effect differs based on the type of message teachers were instructed to write. We accomplish this by conducting a field experiment during a credit recovery program in a large urban school district. The summer program offered high school students the opportunity to earn credits in up to two different courses they had failed during the previous academic year. We randomly assigned the parents of participating students to one of three experimental conditions: some parents received information about what their students were doing well and should continue doing (positive); others received information about what their students needed to improve upon (improvement); and a third group served as the control.

We find that weekly teacher-to-parent communication in the form of messages sent to parents from teachers increased the probability a student earned credit for each class they took by 6.5 percentage points. Given a control group passing rate of 84.2%, this represents a 41% reduction in students failing to earn course credit. We find that most of this aggregate effect is driven by students in the improvement condition. Students who received messages that focused on what they needed to improve in class were almost 9 percentage points more likely to earn course credit, although we do not have the power to distinguish this estimate from the 4.5 percentage point increase we observe for students in the positive treatment condition. These increases in passing rates can be attributed almost exclusively to preventing students from dropping out of the credit recovery program, rather than by reducing failure or dismissal rates.

Exploratory analyses suggest that the treatments did not substantially increase the frequency of conversations between students and their parents about school, but instead changed the content of these conversations; the student–parent conversations were informed by the teacher-to-parent messages. We find suggestive evidence that the sizable increase in passing rates among students in the improvement condition is the result of parents speaking with their children about what they needed to improve in school. Students whose parents received messages from teachers judged their own school performance as substantially lower than that of those in the control group. Additionally, a descriptive analysis of the content of teachers' messages reveals that improvement messages were overwhelmingly "actionable", slightly longer, and more likely to address things outside of class that parents could monitor such as making up missing assignments and studying. Finally, a back of the envelope cost–benefit analysis suggests that this teacher-to-parent communication program compares very favorably to other educational interventions. These findings illustrate the potential of developing policies to substantially increase parental involvement in their children's education.

In the following sections, we describe our research design and the data we collected. Next, we present our empirical strategy and findings. We conclude with a discussion of our results and their implications for policy and future research.

2. Context and research design

2.1. Site

We examined the effects of weekly teacher-to-parent messages sent to the parents of high-school students during a traditional summer school program offered by a large urban school district in the Northeastern United States. The large majority of the district's students are minorities, predominantly Hispanic and African-American, and come from low-income families. Each summer the district offers students a variety of academic and enrichment programs. We partnered with the director and coordinators of the district's high school credit recovery program to learn about whether and how teacher-to-parent communications could improve student success in the summer program. Alternative programs for high school students included an on-line credit recovery program and programs specifically for English language learners and special education students.

The credit recovery program offered high school students the opportunity to earn credits in different courses they had previously failed. High school students from across the district enrolled in the program operated on one large

Table 1
Student characteristics of study participants and non-participants.

	All summer academy students	Study participants	Study non-participants	Difference	*p* value
Male	0.58	0.55	0.60	−0.05	0.123
9th grade	0.37	0.40	0.35	0.05	0.100
10th grade	0.31	0.32	0.30	0.02	0.490
11th grade	0.25	0.22	0.26	−0.04	0.088
12th grade	0.06	0.06	0.06	0.00	0.656
Age (years)	16.97	16.85	17.03	−0.18	0.024
African American	0.58	0.56	0.59	−0.03	0.330
White	0.06	0.03	0.08	−0.05	0.000
Asian	0.02	0.03	0.02	0.01	0.437
Hispanic	0.32	0.37	0.30	0.07	0.013
Free or reduced price lunch	0.81	0.79	0.82	−0.03	0.234
Special education	0.22	0.23	0.22	0.01	0.770
Limited English proficient	0.17	0.16	0.17	−0.01	0.607
Non-native English speaker	0.42	0.45	0.40	0.05	0.088
8th grade English language arts raw scores	29.03	29.18	28.96	0.22	0.714
8th grade mathematics raw scores	22.98	23.36	22.78	0.58	0.407
Attendance rate in 2011/12	86.91	88.96	85.95	3.01	0.000
No. of courses failed in 2011/12	1.28	1.25	1.29	−0.04	0.593
n students who attended district schools	1242	399	843	–	–
n students	1417	435	982	–	–

Notes: p values are derived from regressions of a given student characteristic on an indicator for participating with robust standard errors. Eighth grade raw test scores are available for a reduced sample in English language arts (all students = 976, participants = 324, non-participants = 652) and mathematics (all students = 986, participants = 332, non-participants = 654). We also find no evidence of differential selection between participants and non-participants based on the number of summer courses students were enrolled in using unverified course enrollment records. We do not report these data here because we were only able to verify course enrollment records for participating students.

high school campus. The district maintained a policy that restricted enrollment to students who were absent on no more than 30 days during the academic year, and who had received a failing grade of "F+." In practice, these enrollment and grade requirements were used more as guidelines than as inflexible eligibility standards. High school guidance counselors pre-registered students for the credit recovery program throughout the spring and sent enrollment notices home to parents in the early summer. Program administrators estimated that three out of every four students pre-registered by their counselors actually enrolled and attended the program. Students were also permitted to proactively enroll themselves during the first two days of the program.

Courses were offered across high school grade levels in four core content areas: English language arts, history, mathematics, and science. Content drew largely from district curricula with teachers focused on reviewing concepts taught during the academic year. Students could enroll in up to two courses at the same time. Each class met for 2 h each day in either the early or late morning during the five-week program with an average class size of 33 students. Frequent informal observations throughout the program suggested that classroom instruction was primarily organized around lectures and individual assignments that students completed in class. The program employed twenty-nine teachers, each of whom taught two courses. The majority of these teachers were certified full-time teachers in the district, while several were finishing teacher residency programs or were substitute teachers during the academic year. Teacher experience varied considerably among the staff which included novices, early-career teachers and experienced veterans.

2.2. Sample

A total of 1417 students actively enrolled in the credit recovery program. Of these students, 1242 had attended a district school in the prior year and thus were in the district administrative database, 88% of the sample. Non-district students attended private schools and neighboring district schools that participated in a voluntary inter-district bussing program. In Table 1, we report on the background characteristics and prior academic performance of these students for whom we have administrative data. However, we conduct all of our primary analyses below using our full sample of participating students.

The credit recovery program enrolled students from over 30 high schools in the district across all four grades, the vast majority of whom were African-American and Hispanic, 58% and 32% respectively. Over 80% were eligible for free or reduced price lunch and 22% participated in special education programs. English was not the native language of many of the students and their families. There were over ten different native languages represented among the students with 42% of all students speaking a language other than English at home; in total, 17% of students were classified as limited English proficient.

Given the nature of the program, enrolled students had notably lower levels of academic achievement and engagement in school than typical students in the district. Only 12% of students earned a proficient score on the state's standardized mathematics exam in 8th grade, and only 42% were proficient in English language arts. On average, students were absent from school 13% of the school year in 2011/12 and had failed more than one class.

Table 2
Student characteristics across treatment and control groups.

	Positive	Improvement	Pooled treatment	Control	*p* value (treatment vs. control)	*p* value (positive vs. improvement)
Male	0.51	0.61	0.56	0.54	0.730	0.093
9th grade	0.42	0.43	0.42	0.35	0.167	0.863
10th grade	0.32	0.32	0.32	0.32	0.927	0.953
11th grade	0.21	0.20	0.20	0.25	0.283	0.834
12th grade	0.04	0.06	0.05	0.07	0.396	0.692
Age (years)	16.70	16.81	16.76	17.02	0.048	0.508
African American	0.58	0.55	0.57	0.55	0.827	0.577
White	0.04	0.00	0.02	0.04	0.353	0.024
Asian	0.01	0.03	0.02	0.04	0.483	0.374
Hispanic	0.35	0.38	0.37	0.37	0.864	0.615
Free or reduced price lunch	0.81	0.79	0.80	0.78	0.713	0.579
Special Education	0.21	0.23	0.22	0.24	0.571	0.681
Limited English proficient	0.13	0.17	0.15	0.17	0.631	0.372
Non-native English speaker	0.39	0.56	0.47	0.42	0.285	0.005
8th grade English language arts raw scores	29.78	29.28	29.55	28.44	0.270	0.663
8th grade mathematics raw scores	24.18	23.68	23.95	22.21	0.141	0.730
Attendance rate in 2011/12	88.80	89.03	88.91	89.06	0.901	0.923
No. of courses failed in 2011/12	1.35	1.41	1.38	1.32	0.671	0.378
Enrolled in two summer courses	0.31	0.29	0.30	0.37	0.176	0.797
n students who attended district schools	134	126	260	139		
n students	146	136	282	153		
F-statistic from joint test with raw scores					0.83	0.93
p-value					0.66	0.55
F-statistic from Joint test without raw scores					0.87	1.11
p-value					0.60	0.34

Notes: p values are derived from regressions of a given student characteristic on an indicator for pooled treatment in the full sample or on an indicator for the improvement condition in a sample that excludes students in the control group, both with robust standard errors. Eighth grade raw test scores are available for a reduced sample in English language arts (positive = 117, improvement = 98, control = 109) and mathematics (positive = 119, improvement = 101, control = 112). Joint *F*-tests are conducted in the full sample of students who attended district schools when omitting 8th grade test scores as well in the reduced sample of students with eighth grade test scores. Ninth grade is omitted as the reference category for grade when conducting joint *F*-tests.

We recruited 435, or 34%, of these students and their parents to participate in our study. Consent forms were included in a general information packet that went home with students. Classes that achieved an 80% return rate of signed forms (either granting or denying consent) earned a pizza party. As part of the active consent process, we gathered information about the current contact information and preferred method or multiple methods of contact for each parent/guardian of participating students. Eighty percent of parents responded that a phone call was one preferred method, while 23% and 20% included text messages and emails as preferred methods, respectively. In columns 2 and 3 of Table 1, we present the average characteristics of those students who participated in the study and those that did not participate. These statistics suggest that participating students were broadly similar to those students who did not participate. We find no difference in the performance on 8th grade standardize tests in mathematics or English language arts. Participating students were slightly younger on average, more likely to be Hispanic, and attended class somewhat more frequently in the prior year than non-participating students. Of course we cannot decisively rule out differences along unobserved dimensions, but the small observable differences between participants and non-participants suggest that our findings are likely to be broadly generalizable to the full population of students who enrolled in the credit recovery program.

2.3. Experimental design

In order to test both the overall effect of teacher-to-parent communication and the specific effect of different message types, we conducted a blocked randomized trial with multiple treatment arms. We randomly assigned students and their parents to one of three conditions – positive information ($n = 146$), improvement information ($n = 136$), or control ($n = 153$) – blocking on the first class taken by each student. Among participating students, a total of 141 or 32% were enrolled in two courses. We chose to randomize at the student-level rather than the classroom-level to reduce potential spillover effects where parents who received a message from one teacher might then inquire about a student's second class. This is analogous to a cluster randomized trial where classes are clustered within students. Thus, students who were enrolled in two classes and were randomly assigned to either treatment arm were assigned to have messages sent home from each of their two teachers. Better understanding the dynamics of how teacher-to-parent communication about one class affects parent–student communication about other classes is an important question that we are unable to address with our design.

In Table 2, we report the mean characteristics and prior academic performance of participating students across each of the three conditions as well as for a pooled treatment group which combines students assigned to the positive and

improvement conditions. The only statistically significant difference between our pooled treatment group and control group is for students' age, with students in the pooled treatment group slightly younger than those in the control group. It is likely this is the result of multiple hypothesis testing given that we examine 18 different measures. *F*-tests confirm that, jointly, our set of observed student characteristics is orthogonal to treatment assignment suggesting that our randomization was implemented successfully. Similar balance tests across students randomly assigned to the positive and improvement conditions further confirm the validity of the randomization process. Although we find that students in the positive condition are more likely to be white and less likely to be non-native English speakers, joint *F*-tests fail to reject that those students assigned to the treatment conditions are no different than those assigned to the control condition. That is, the full set of student characteristics is not jointly predictive of the experimental condition to which students were assigned.

All participating parents were assigned to receive an introductory phone call from their child's teacher(s) regardless of the group to which they were randomized. Those in the positive information condition were assigned to receive subsequent weekly communications highlighting what the student was doing well behaviorally or academically. Those in the improvement information condition were assigned to receive communications that highlighted what the student needed to improve on in school.

When we asked teachers informally whether positive or improvement information would be most beneficial to students, their answers were decidedly mixed. Positive information may motivate parents to reinforce students' good behavior and reward hard work. Parents' self-concepts are often intertwined with the success of their children. Affirming their students' success may bolster their own self-esteem and that of their children (Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995). Similarly, students may perform better when they receive positive information because of an increased sense of self-efficacy (Bandura, 1977; Schunk, 1991). At the same time, we note that some research suggests that bolstering students' self-esteem can actually undermine academic performance (Forsyth, Lawrence, Burnette, & Baumeister 2007).

Alternatively, negative information may motivate parents and students because of what psychologists call the "negativity bias" (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Rozin & Royzman, 2001). This is the phenomenon where people pay more attention to negative information, and they find it more memorable and motivating than comparable, but opposite positive information. Negative information may serve as a threat to the self-worth of parents who consequently might be motivated to neutralize it by attempting to change their child's academic behavior and effort. Further, to the extent that students identify with their performance in school, they too could be motivated to neutralize the self-worth threat by changing their academic behaviors (Tajfel, 1974).

Importantly, the message writing and communication process were designed to keep teachers blind to the treatment status of students. After making introductory calls, teachers wrote both positive and improvement messages each week for the parents of every student in the study. At the beginning of the study we provided instructions and example messages to teachers and explained how our research team would communicate the notes within a standardized script to parents (see Appendix A). Research assistants collected these from teachers at the end of each week and followed up with every teacher on Monday to collect any missing messages. Research assistants then communicated the relevant messages to parents in each of the two treatment groups via email, phone or text depending on parents' reported preference (see Appendix B). Parents in the positive and improvement conditions received four messages from their child's teacher over the course of the study. We hired translators to communicate messages in Spanish, Haitian Creole, Cantonese and Vietnamese for parents who did not speak English, as indicated in the information they provided on consent forms.

Instructing teachers to write both positive and improvement messages for all students and then masking who received messages, as well as which message they received, guarded against several potential confounding threats. If teachers only wrote messages for students in the treatment group, the act of reflecting on students' performance could cause teachers to increase their attention on, or tailor their instruction for, students in the treatment group. Alternatively, teachers could consciously or unconsciously become more lenient (strident) in their grading and passing criteria for students about whom they were assigned to write messages. Although it is possible that some students revealed their treatment status to teachers, we did not uncover any anecdotal evidence of this happening even though members of our research team visited classrooms and interacted with teachers multiple times each week. We present evidence below that treatment effects are likely driven by the direct effect of messages on parent–student interactions, but we cannot rule out the potential contribution of subsequent interactions between students, parents and teachers caused by these messages.

3. Data and empirical strategy

3.1. Outcomes

Our primary outcome of interest is a binary indicator for whether students earned credit for a course they were enrolled in during the credit recovery program. Credits were awarded by teachers to students who earned passing grades. Students could fail to earn credits for three reasons: dropping out of a class, failing a course, or being dismissed from the program. Students were dismissed for two primary reasons—behavior and attendance. The credit recovery program maintained a zero-tolerance discipline policy and an attendance policy that prohibited students from missing more than two days of class. In practice, these policies were applied with discretion with program coordinators considering the unique situation of each individual student.

Attendance records during the first four weeks of the credit recovery program provide us with a second outcome of interest. Using administrative records, we created a student–class–day dataset that contains a binary indictor for whether a student was absent for each class period.

3.2. Teacher surveys

In addition to writing messages, teachers also completed a brief survey about each of the students who participated in the study. These surveys were collected in the final weeks of the credit recovery program and consisted of three Likert-scale questions asking teachers to assess the effort and behavior of each individual student, as well as their relationship with each student during the credit recovery program. We collected teacher surveys for 535 of the 576 total student–class combinations in our study, a 93% response rate. Response rates were nearly identical across the pooled treatment and control groups (93.1% vs. 92.3%) given that our blocking design randomized within teachers' classroom.

3.3. Student surveys

We administered surveys to students at the end of the credit recovery program in order to explore potential mechanisms through which teacher-to-parent communication might affect student outcomes. The survey asked students to self-assess three items that were also on the teacher survey (about effort, behavior, and their relationships with their teachers), as well as three additional questions (about their persistence, engagement, and participation during the program). The survey also included five items about the frequency and nature of parent–student conversations about the credit recovery program. Students responded to all items on a five-point Likert scale. Three-hundred and fifty three students took the in-class survey during the last week of class, a response rate of 81%. Students in the pooled treatment conditions were significantly more likely to have completed the survey than those in the control group (84.0% vs. 75.8%), evidence that students in the treatment group were more likely to persist in the program through the last week of class. Given this differential attrition, we interpret our analyses using these data as only suggestive and provide bounds on our estimates.

3.4. Data analysis

We begin by estimating the pooled treatment effect of being assigned to receive the teacher-to-parent communication in either treatment arm of the study, *TREAT*.

$$Y_{ijc} = \alpha + \beta_1 TREAT_i + \sum_k \delta_k d_{ik} + \varepsilon_{ijc} \quad (1)$$

where Y_{ijc} represents a given outcome of interest for student i with teacher j in class c. The set of indicator variables d_{ik} controls for the first course taken by each student, indexed by k. These indicator variables account for the blocked randomized design where the assignment to treatment is only random within blocks. The coefficient on *TREAT*, β_1, captures our estimate of the intent-to-treat (ITT) effect of teacher-to-parent communication. A positive and statistically significant estimate of β_1 will suggest that teacher-to-parent communication improved student outcomes.

In our second set of analyses, we estimate ITT effects for each of our two distinct treatment arms, the positive information condition, *POSITIVE*, and the improvement information condition, *IMPROVE*.

$$Y_{ijc} = \alpha + \beta_1 POSITIVE_i + \beta_2 IMPROVE_i + \sum_k \delta_k d_{ik} + \varepsilon_{ijc} \quad (2)$$

Here, the coefficients β_1 and β_2 provide estimates of the positive and improvement information ITT effects relative to students in the control group. In both models, we account for the multiple observations per-student for students who took two courses by clustering our standard errors at the student-level.[2]

We fit parallel structural models using ordered logistic regression when examining students' and teachers' responses to survey item. We present parameter estimates from these models as proportional odds ratios to allow for a more meaningful interpretation of our results. Given the differential attrition in student survey responses, we provide upper and lower bounds estimates for models where student survey items are our outcomes following Lee (2009). Lee bounds are particularly well suited for randomized trials with missing outcome data where no credible instruments exist (Heckman, 1979) and data are unlikely to be missing at random, conditional on a set of covariates (Little & Rubin 1987). The Lee bounding approach assumes that (1) the predictor of interest is independent from the errors in the conventional outcome and selection models and, (2) monotonicity between treatment status and sample selection. The first assumption is assured by random assignment of the treatment status, and the second is commonly invoked and plausible in this context. To implement this approach, we estimate the proportion of students who were induced by the treatment to be present when the survey was administered, and then re-estimate treatment effects with this proportion of student responses removed from the upper (lower) tail of the distribution of student responses to obtain lower (upper) bounds. Lee bounds also provide more narrow ranges than the worst-case imputation procedure developed by Horowitz and Manski (2000).

4. Results

4.1. Implementation

Detailed communication records allow us to evaluate the degree to which the assigned teacher-to-parent communication was implemented in practice. Introductory phone calls home to all students in our study were implemented by teachers with limited success due, in part, to a delayed enrollment process and scheduling challenges that led to frequent changes to class rosters in the first week of the program. Overall, 51.3% of all assigned calls were made by teachers in the first week; there were no statistically significant differences in introductory phone call completion rates across the three experimental groups. As shown in Table 3, teachers' messages

[2] We also fit models where we cluster our standard errors at the teacher-class-level to account for any potential classroom effects that are common across students. Our estimated standard errors using this approach are slightly smaller than the more conservative estimates we report as our preferred estimates. This is a result of the inclusion of teacher fixed effects as our blocking variables in both models.

Table 3
Introductory phone call and teacher message implementation rates.

	Introductory call by teaches	Teacher message communicated by research team			
	Week 1	Week 2	Week 3	Week 4	Week 5
Proportion of messages delivered					
Pooled treatment	0.528	0.950	0.982	0.981	0.934
Control	0.484	–	–	–	–
Proportion of phone calls resulting in a conversation					
Pooled treatment	–	0.583	0.537	0.538	0.468

Notes: Messages were delivered by email, text and phone calls according to parent/guardian preferences. Messages left on voicemail were considered a successful delivery.

Table 4
Intent to treat effects of teacher-to-parent communication on the probability of earning course credit.

			Predictors		
Outcomes	*n*	Control group mean	Pooled treatment	Positive	Improvement
Pass	509	0.842	0.065**	0.045	0.088**
			(0.033)	(0.038)	(0.036)
Dropout	52	0.129	−0.061**	−0.042	−0.081**
			(0.030)	(0.035)	(0.033)
Fail	7	0.014	−0.003	−0.003	−0.002
			(0.009)	(0.010)	(0.011)
Dismiss	8	0.014	−0.002	0.000	−0.005
			(0.010)	(0.012)	(0.011)
Observations			576	576	576

Notes: Each cell reports results from a separate regression for pooled treatment estimates. Estimates for positive and improvement treatment arms are estimated simultaneously for each individual outcome. Standard errors represented in parentheses are clustered at the student level.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

were collected and communicated with much higher rates of success. In the second week, we communicated 95% of all assigned messages via phone calls, texts, or emails for those students who remained in the credit recovery program. This delivery rate increased to 98% in the following two weeks and dropped to 93% in the final week of the program. Failures to deliver messages were caused by deactivated numbers, incorrect emails, or phone numbers without answering machines. Of those messages delivered via phone calls in the 2nd week, 58% resulted in a live conversation with a parent or guardian. This success rate dropped slightly to 54% in the 3rd and 4th weeks and fell to 47% in the final week. The decline in the rate at which phone calls were answered each week suggests that weekly calls were more frequent than some parents desired given the information conveyed by brief teacher messages.

4.2. The effects of teacher-to-parent communication

We report estimates from model 1 of the pooled treatment effect as well as estimates from model 2 of the effects for the positive and improvement treatment conditions in Table 4. Analyses of the pooled treatment effect show that teacher-to-parent communication substantially increased the probability students passed their courses and earned credit towards graduation. The vast majority of students in our control condition earned credits in the courses in which they were originally enrolled (84.2%). Students whose parents were assigned to receive either form of additional information were 6.5 percentage points ($p = .048$) more likely to earn course credit for classes they enrolled in compared to the control group. Given that 15.8% of those in the control condition failed to earn course credit, the 6.5 percentage point increase in course credit earning represents a 41% reduction in students failing to earn credit. Analyses of each of the three reasons why a student might not have earned credit reveal that this effect is almost entirely explained by a decrease in dropouts among the treatment group. Substituting indicators for whether a student dropped out, failed or was dismissed as outcomes reveals that students in the pooled treatment group were 6.1 percentage points ($p = .046$) less likely to drop out of a class.

When we estimate treatment effects separately by treatment arms we find that the large positive effect of teacher-to-parent communication is driven by students in the improvement information condition who experienced an 8.8 percentage point ($p = .016$) increase in their probability of earning course credit. In contrast, the estimated treatment effect for students in the positive information condition was positive but not statistically significant (4.5 percentage points, $p = .236$). Although we do not have the statistical power to distinguish between these two estimates, these results are consistent with an interpretation that teacher-to-parent improvement information was more effective at inducing students to earn course credit, relative to teacher-to-parent positive information.

Table 5
Intent to treat effects of teacher-to-parent communication on the probability of earning course credit estimated with baseline controls.

			Predictors			
Outcomes	*n*	Control group mean	Pooled treatment		Positive	Improvement
Pass	461	0.830	0.079**	0.070**	0.052	0.091**
			(0.034)	(0.033)	(0.038)	(0.037)
Dropout	47	0.138	−0.069**	−0.058**	−0.042	−0.076**
			(0.031)	(0.029)	(0.033)	(0.033)
Fail	6	0.016	−0.005	−0.003	−0.006	0.000
			(0.009)	(0.008)	(0.009)	(0.010)
Dismiss	7	0.016	−0.006	−0.009	−0.004	−0.015
			(0.011)	(0.012)	(0.016)	(0.012)
Baseline Controls			No	Yes	Yes	Yes
Observations			521	521	521	521

Notes: Each cell reports results from a separate regression. Standard errors represented in parentheses are clustered at the student level. Baseline controls include gender, grade, age, race, eligibility for free or reduced price lunch, limited English proficient, non-native English speakers, 8th grade mathematics and English language arts standardized test scores, attendance rate in the previous academic year, and the number of courses failed in the previous academic year. We account for missing 8th grade test scores in mathematics and English language arts for 25% and 26% of the sub-sample of within district students using multiple imputation with twenty replication datasets.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

To test the robustness of our estimates to any idiosyncratic sampling differences across experimental conditions, we refit models 1 and 2 and include our rich set of baseline characteristics. This exercise requires us to limit our analyses to the 92% of students in our full analytic sample who were enrolled in the district prior to the credit recovery program. We obtained complete records for all of our measures reported in Table 1 except for 8th grade test scores. As is common in district administrative datasets, our data are missing mathematics and English language arts test scores for approximately a quarter of the students who were enrolled in the district. These missing scores are the result of students who were absent during exams or who enrolled in the district after 8th grade. In order to preserve our complete subsample of district students, we impute missing 8th grade scores using multiple imputation with 20 replication datasets following Little and Rubin (1987). In Table 5, we report the conditional average treatment effect across the twenty imputed data sets and their corresponding standard errors corrected for the degrees of freedom used in the imputation process. Among this district sample, we find that when baseline covariates are added to the model our estimates are quite consistent with our primary findings. The small increase we observe is primarily attributable to sample differences as illustrated by the slightly larger pooled treatment effect in this district sample when baseline controls are omitted.

4.3. Mechanisms

There are several potential mechanisms through which our teacher-to-parent messages could have affected a student's likelihood of earning course credit. We begin by examining how the messages affected student in-school behaviors. Reduced student absenteeism appears to be a key student behavior affected by the messages. As shown in Table 6 Panel A, analyses of the pooled treatment effect on student absenteeism conducted in a student-class-day dataset show that teacher-to-parent communication decreased the probability a student was absent by 2.5 percentage points ($p = .011$), from 12% to 9.5%. Students in the improvement information condition were 3.2 percentage points less likely to be absent from a class than control group students ($p = .004$), while students in the positive information condition were slightly less likely to be absent than control group students (−1.9, $p = .095$).

In the remaining panels of Table 6, we present treatment effects on a range of potential mechanisms captured on teacher and student surveys that might explain how teacher-to-parent communication increased passing rates. Estimates are reported as proportional odds ratios with corresponding *t*-statistics. Panel B examines teachers' assessments of their students' effort and behavior, and reports of their relationships with each student. We find no evidence that the treatment affected teachers' perceptions of student effort or behavior. However, we find surprising evidence that teachers' perceptions of their relationships with students were weakened when their messages were communicated to students' parents. We estimate that teacher-to-parent communication reduced the odds teachers rated their relationships with students one level higher (e.g. "above average" vs. "excellent") on the Likert response scale by 31%. Model-based predictions suggest that the increased communication lowered the probability a teacher rated her relationship with a student as "excellent" by 6.8 percentage points ($p = 0.041$). These counterintuitive results are consistent with previous findings that, unlike younger students, high schoolers can become less willing to participate in class as a result of teachers communicating more with their parents (Kraft and Dougherty, 2013).

Student surveys provide further insight into the causal chain of events that resulted in increased attendance and

Table 6
Intent to treat effects of teacher-to-parent communication on absenteeism, students' communication with parents, and students' and teachers' evaluation of performance during the summer program.

Outcomes	Predictors			
	Pooled treatment	Positive	Improvement	*n*
	Panel A: Attendance			
Absent	−0.025**	−0.019*	−0.032***	27037
	(0.010)	(0.011)	(0.011)	
	Panel B: Teachers' perceptions of students			
Effort in school	1.145	1.060	1.251	534
	[0.742]	[0.285]	[1.003]	
Behavior in class	0.926	0.947	0.901	534
	[0.425]	[0.270]	[0.466]	
Relationship with teacher	0.691**	0.650**	0.741	533
	[2.069]	[2.183]	[1.346]	
	Panel C: Students' perceptions of their communication with parents			
Parent spoke with student about school work	1.188	1.312	1.064	350
	[0.790]	[1.120]	[0.235]	
Parent congratulated student about success in summer school	1.180	1.381	1.005	351
	[0.727]	[1.267]	[0.020]	
Parent rewarded student for success in summer school	1.183	1.042	1.340	351
	[0.726]	[0.156]	[1.111]	
Parent assisted student with academic work in summer school	1.135	1.090	1.183	347
	[0.541]	[0.333]	[0.617]	
Parent spoke to student about what to do better	1.266	0.993	1.630*	351
	[1.110]	[0.027]	[1.927]	
	Panel D: Students' self-assessments			
Effort in school	0.628**	0.850	0.473***	350
	[2.033]	[0.593]	[2.897]	
Behavior in class	0.682	0.787	0.579*	351
	[1.486]	[0.846]	[1.792]	
Relationship with teacher	0.755	0.755	0.756	439
	[1.249]	[1.073]	[1.068]	
Persistence when work was difficult or demanding	0.494***	0.574**	0.428***	351
	[2.929]	[1.968]	[3.266]	
Engagement in class	0.554**	0.584**	0.526**	351
	[2.540]	[2.029]	[2.404]	
Class participation	0.591**	0.675	0.517***	347
	[2.441]	[1.577]	[2.623]	

Notes: Each cell represents results from a separate regression. In Panel A, we report estimates and corresponding standard errors in parentheses derived from a linear probability model analysis of class absences. In Panels B, C and D, we report proportional odds ratios and corresponding *t*-statistics from ordered logistic regression models analyzing teacher and student survey responses. Standard errors are clustered at the student-level for outcomes estimated in a student-class dataset. These include absences, teachers' perceptions of students, and students' perception of their relationship with a teacher.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

passing rates, but slightly less positive relationships with teachers. In Panel C, we examine students' perceptions of their communication with parents. We find no strong evidence that either form of teacher-to-parent communication increased the extent to which students report that their parents communicated with them overall, congratulated them, rewarded them, or assisted them with their course work. The odds that parents in the treatment group interacted with their child about their schoolwork are consistently greater than 1, but not statistically significant. However, the messages sent home appear to have influenced the content of conversations about the credit recovery program between parents and students.

We find that students whose parents received improvement information reported that their parents spoke to them more frequently about what they needed to do better in school compared to control group students (OR = 1.63), while students in the positive information condition reported no difference in this measure (OR = .99). To provide further intuition about the magnitude of this effect, we estimate the treatment effects of receiving improvement messages on the predicted probability a student chose each of the five survey response options. The results of these analyses are represented in Fig. 1. Model-based predictions suggest that improvement messages reduced the probability a student said that their parent "never" spoke to them about "what I needed to do better during summer school" by 6.5 percentage points ($p = 0.045$) and increased the probability a student said their parent "almost always" spoke to them about doing better by 8.9 percentage points ($p = 0.063$). In contrast, we estimate

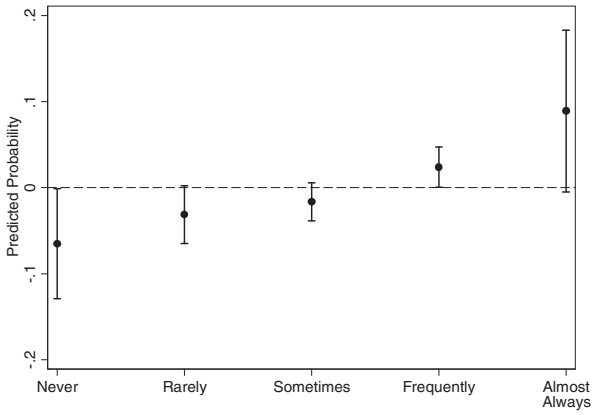

Fig. 1. Estimated treatment effects of improvement messages on the predicted probability of how students responded to the statement "My parent/guardian(s) spoke to me about what I needed to do better during summer school." Error bars represent 95% confidence intervals.

nearly identical predicted probabilities across the positive information and control groups of students' reports of the frequency with which parents spoke with them about what they need to improve. We present Lee bounds for this and all other treatment effect estimates with teacher and student survey items as outcomes in Table A1. Our lower bound estimate for the proportional odds that parents in the improvement condition spoke with their students more frequently about what they need to do better remains meaningfully larger than 1 although it cannot be distinguished from zero. This suggests that sample selection bias is unlikely to account entirely for the sizable effects we observe.

Finally, we examine students' own assessments of their performance in school, presented in Panel D. The results suggest that, in contrast to teachers' perceptions, students whose parents received messages from teachers judged their own performance as substantially lower than those in the control group. The proportional odds that students in the pooled treatment group rated their effort, persistence, engagement, and participation in class one response scale point higher (e.g. "above average" vs. "excellent") compared to students in the control group are all substantially below 1. Estimates for students in the improvement condition show the biggest decrease in perceived performance; however, we also see some evidence of decreases in students' self-ratings even in the positive information condition. Bounding these estimates for potential bias due to sample selection in Table A1 suggests that the uniform pattern of lowered perceptions cannot be entirely explained away. Upper bound estimates remain consistently below 1. In fact, our upper bound estimate of the pooled treatment effect on students' persistence remains negative (lower than an odds ratio of 1) and statistically significant.

One possible explanation for these results could be that parents and/or students perceive any type of personalized communication from school as cause for concern, a perception that could be propagated by the common practice of teachers communicating to parents about specific student behaviors that need to change only when there is a problem. If this explanation were accurate, it could result in parents or students reaching out directly to teachers about their concerns. It might also change how parents communicate with students about their schooling and monitor their school-related behaviors. Our finding that increased attendance appears to be the key mediator of the treatment effect suggests that parent communication and monitoring at home are likely the primary drivers of our results.

4.4. The characteristics and content of teacher-to-parent messages

One distinct advantage of delivering teachers' messages to parents on their behalf is that we have a complete record of the content of these messages. Analyzing these messages provides new insights into what teachers identified as essential information to communicate to parents and how they presented this information. We began by coding messages for characteristics we hypothesized might be mediators of the effect of this communication. First, we coded messages as "actionable" or "not-actionable" to capture whether each message provided a clear and specific prescription for something a student should stop doing, start doing, or continue doing. Second, we coded messages as referencing issues that pertained to "in class," "out of class," both, or neither and created two non-mutually exclusive indicator variables for "in class" and "out of class" messages. We also calculated the number of words in each of their written messages. Finally, we coded messages using a taxonomy of twelve different content types which emerged from an exploratory review of the data, where messages were allowed to be categorized under multiple content types.[3]

As shown in Table 7, of the 1418 messages that were written by teachers and delivered to parents over the course of the experiment, 45.5% were actionable, 52.0% referenced an in-class issue and 22.2% referenced an out-of-class issue. The average message length was only 8.7 words but varied considerably with the shortest 10% of messages having three words or less and the longest 10% having 18 words or more. The content of messages varied considerably and was fairly evenly distributed across the twelve different content types. The most common topic was about students' classwork (24%) followed by participation in class (16%) and students' overall performance (11%).

Comparing message characteristics and content types across treatment arms provides suggestive evidence for why improvement messages may have been marginally more effective. Improvement messages were overwhelmingly actionable, slightly longer, and were more likely to address things outside of class that parents could monitor such as making up missing assignments and studying. Just over 84% of all improvement messages were actionable while only 8.5% of positive messages referenced specific actions. Improvement messages were also 18 percentage points more likely to be about an out-of-class issue compared to positive

[3] Messages were coded for characteristics by three research assistants who were blind to the treatment condition. Exact agreement rates among all three pairwise combinations of raters were above 90% for actionable, 67% for in-class, and 87% for out of class in a subsample of sentences. Rates came to a consensus agreement about the final ratings within this subsample. Content codes were coded by a single research assistant who was blind to the treatment status.

Table 7.
Proportion of messages with a given characteristic or content type.

	Pooled treatment	Positive	Improvement	Difference	*p*-value
	Panel A: Characteristics				
Actionable	0.455	0.086	0.844	−0.759	0.000
In-class	0.520	0.532	0.507	0.025	0.345
Out-of-class	0.222	0.134	0.314	−0.180	0.000
Number of words	8.77	7.81	9.79	−1.96	0.000
	Panel B: Content				
Attendance	0.052	0.041	0.063	−0.023	0.063
Behavior in class	0.092	0.113	0.070	0.043	0.005
Participation in class	0.160	0.139	0.182	−0.042	0.031
Focus in class	0.100	0.044	0.158	−0.114	0.000
Effort	0.064	0.059	0.068	−0.009	0.494
Classwork	0.243	0.310	0.173	0.137	0.000
Homework	0.071	0.063	0.079	−0.015	0.275
Missing assignments	0.050	0.019	0.083	−0.063	0.000
Coming to class prepared	0.025	0.036	0.013	0.023	0.006
Studying	0.082	0.003	0.166	−0.162	0.000
Grades	0.076	0.086	0.065	0.020	0.151
Overall performance	0.109	0.179	0.035	0.144	0.000
n	1418	727	691		

Table 8
Exploratory analyses of the differential effect of teacher-to-parent communication on the probability of earning course credit by student characteristics.

	Probability of passing a summer credit recovery course						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Pooled treatment	0.116**	0.083**	0.086*	0.078*	0.122*	0.048	0.041
	(0.052)	(0.042)	(0.051)	(0.045)	(0.072)	(0.034)	(0.042)
Pooled treatment × male	−0.069						
	(0.068)						
Pooled treatment × 9th grade		−0.002					
		(0.071)					
Pooled treatment × African American			−0.012				
			(0.071)				
Pooled treatment × Hispanic				0.002			
				(0.074)			
Pooled treatment × FRPL					−0.054		
					(0.083)		
Pooled treatment × LEP						0.159	
						(0.113)	
Pooled treatment × no. of courses failed							0.026
							(0.027)
Observations	521	521	521	521	521	521	521

Notes: All regression models include the main effect of a given student characteristic as well as indicators for randomization blocks. Standard errors are clustered at the student-level. FRPL = Free or Reduced Priced Lunch. LEP = Limited English Proficient.

messages, although there was no difference in the frequency of references to in-class issues across treatment arms. Improvement messages were also two words longer on average than positive messages.

Important differences in the content of message types are also revealed in Table 7. Positive messages were approximately 14 percentage points more likely to focus on broad topics such as students' overall performance and their classwork. Teachers were also more likely to mention students' behavior in class in a positive context. In contrast, improvement messages were focused more on specifics. They were sixteen percentage points more likely to be about studying, eleven percentage points more likely to be about a students' focus in class, and six percentage points more likely to be about missing assignments.

4.5. Moderators

We extend our primary analyses above to explore whether there is any evidence that teacher-to-parent communication was particularly beneficial or ineffectual with subgroups of students. We accomplish this by refitting model 1 to include the main effect of a given student characteristics and its interaction with the pooled treatment indicator, and report the results in Table 8. We select a parsimonious set of student characteristics with which to conduct these analyses including indicators for males, 9th graders, African-Americans, Hispanics, students eligible for free or reduced prince lunch, limited English proficient students, and the number of courses a student had failed in the previous academic year. We find no statistically significant moderation effects across

all our student characteristic measures suggesting that the intervention benefitted a diverse range of students. However, one point estimate of considerable size is worth noting. We estimate the treatment effect for limited English proficient students was a 21 percentage point increase in the probability of earning course credit compared to only a 5 percentage points increase for non-LEP students ($p = .162$). These results suggest that our efforts to translate messages for parents who did not speak English may have had a particularly large effect on students who were also still mastering the English language themselves.

5. Discussion and conclusion

In this study, we illustrate the underutilized potential of leveraging policy initiatives to increase parental involvement in their children's education. There is widespread agreement among educators and parents that communicating with each other benefits students. However, evidence suggests this communication is infrequent and unsystematic in most schools. The challenge for policymakers and school administrators is to design policies that set clear but reasonable expectations for teachers while also designing systems that make communication efficient and effective. Our study provides evidence that such policies are both possible and can have substantial effects on at least some populations of at-risk urban students.

We provided parents on a weekly basis with a one-sentence message from teachers about their children's schoolwork. This teacher-to-parent communication empowered parents to support students' efforts to earn course credit towards graduation—increasing the probability that students passed a course by 6.5 percentage points during a credit recovery program. This is a 41% reduction in the fraction of students who failed to earn course credit. For participating students, these course credits could be the difference between being on-track or off-track to graduate from high school. In the process of increasing student passing rates, this intervention improved student attendance, and shaped outside-of-school parent–student conversations.

Our findings further suggest that these effects operated through an increase in the effectiveness of parent–child interactions rather than a substantial increase in the frequency of these interactions. In particular, messages emphasizing what children need to improve produced the largest effects although we do not have the power to confirm that messages emphasizing what children are doing well were not equally effective. We do not interpret these suggestive results as implying that teachers should exclusively communicate improvement information to parents. In practice, when teachers communicate directly with parents they can incorporate both positive and improvement information into their messages. These findings underscore the importance of incorporating actionable, improvement information because this information enhances the productivity of parent–child interactions.

While the intervention increased student success in school, it resulted in at least two counterintuitive effects on their beliefs. First, students in the treatment conditions judged their own school performance as substantially lower than that of those in the control group—despite actually performing better than those in the control group. Second, teachers reported weaker relationships with students in the treatment groups than in the control group. Taken together, these findings suggest that while the increased parental involvement improved students' likelihood of earning course credits, it also produced psychological and social externalities. This is consistent with other research showing that increasing teacher communication with parents causes high school students to misbehave less in class, but can also make them less willing to participate in class at all (Kraft & Dougherty, 2013). Future research should explore how these externalities affect other measures of student engagement and achievement.

This intervention was relatively inexpensive compared to typical education programs and reform initiatives, while its sizable effect highlights the under-explored potential of teacher-to-parent communication. A simple back-of-the-envelope calculation of the costs and benefits of such a policy underscores this point. It took teachers less than 30 min each week to write two messages for approximately 15 students in each of their two classes. If we were to compensate teachers for their time at a standard hourly wage of $40 and asked them to write only one message a week for each student in the treatment group, the treatment would have cost a total $2320.[4] Our research team spent approximately 170 h collecting and sending messages to parents over the course of the program.[5] This would have cost us an additional $2520 at an hourly wage of $15. By these calculations, implementing our communication policy costs just over $13 per student-course treated.[6] The return to these investments was an additional 24 course credits earned at a cost of $200 per credit.[7] The district, in comparison, spends approximately $13,350 per student annually or $2225 per student-course during the academic year. Implementing a similar intervention during the academic year would, of course, result in an increase in costs proportional to the length of the academic semester. However, these costs could be substantially reduced by integrating time to write messages into teachers' regular workday, and by having volunteer parent outreach coordinators or automated email or SMS systems deliver messages to parents.

There is still much to learn about the content, delivery method and frequency of messages that elicit meaningful parental investment and involvement in their children's academic work. The external validity of our findings is likely limited to populations of low-performing urban high-school students. Additional research should examine the effects of teacher-to-parent communication on students across diverse school settings. Future research would also benefit from studies with even greater treatment intensity and a larger sample size than the present study. This would allow for more nuanced explorations of the moderators and mechanisms of effective teacher-to-parent communication. To this end, we attempted to increase the precision of our own estimates by replicating this study in partnership with the same credit

[4] $40 an hour × 1/2 an hour for one message each for 15 students in each of two classes × 4 weeks × 29 teachers.

[5] (5 people × 4 h/day × 2 days/week × 4 weeks) + (2 h/week collecting sentences × 4 weeks) = 168 h.

[6] ($2320 +$2530)/367 student-courses in the treatment group.

[7] 6.5 percentage point average treatment × 367 treated student-courses.

recovery program the following year, but that follow-up study was undermined by the success of the study reported in this manuscript. As a result of telling the program's leadership and teachers about the findings reported here, they implemented a new regime of proactive outreach to parents of students who were at risk of failing their courses at any point during the credit recovery program. This led to parents in the control group being contacted directly by teachers at an extremely high rate—a positive outcome for students, but one that largely eliminated our treatment-control contrast (see supplemental material).

Better understanding of the underlying mechanisms behind the results reported in this manuscript can inform the design of parent communication policies and programs. Does teacher-to-parent communication benefit students by reducing information asymmetries between students and parents? Does it work by providing specific recommendations about how to support their children academically? Does teacher-to-parent communication increase subsequent parent-to-teacher communication, creating a reinforcing cycle of collaboration and communication? Do parents assume that if they do not hear from their children's schools that things are going well? Does a message from school simply nudge parents to act on the information they already know about their child's performance? The answers to these questions and others can also support efforts to improve teacher education and the organizational design of schools. Advancing our understanding in these areas is particularly important as mobile communication technologies and learning management systems offer new low-cost opportunities to communicate individualized information directly to parents to improve student success.

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Appendix A. Teacher instructions

1. Distribute parent consent forms on the first day of class **(7/2).**

We will provide you with these forms. Please ask your students to return them by **Thursday, 7/5** at the latest. There will be a pizza party for any class with an 80% return rate!

We will collect the forms from you as they are turned in. Once all the forms have been collected on **Thursday, 7/5**, we will send you a list of participating students.

2. Conduct an introductory phone call to participating parents **(by 7/8)**

Once we have sent you a list of participating students, we ask that you conduct a very brief introductory phone call to each student's parent. Here is a sample script:

> Hi, my name is _____and I will be teaching (name of child) (name of class) this summer during the [Credit Recovery Program]. I wanted to introduce myself and let you know how excited I am to have (name of child) in my class. I believe this summer program will provide (name of child) with a great opportunity to master new material and to earn important credits for graduation.
> - Brief description of the school, grades, and subjects you teach during the academic year.
> - Brief description of the academic content that will be covered in the class.
>
> I also wanted to let you know that you may be receiving weekly communications that I write about your student's progress in my class. These are meant to give you more information about his/her progress during the program. Please feel free to contact me if you have any other questions. Take care

Please feel free to complete these phone calls at your own pace. We ask that you have all phone calls completed by the end of the day on **Sunday, 7/8.**

3. Write 2 messages a week for each participating student **(Due to us on Monday by 1:00 pm on 7/9, 7/16, 7/23, 7/30)**

We ask that you write **2 messages** each week about each student's performance in class. One message will be an "encouragement" message, citing something positive the student has done. The other message will be a "need-to-improve" message, citing something the student needs to work on. Here are some sample messages:

> Positive Information Message Examples:
> - John was an active participant in class all through this week – great job!
> - Kelly got an A- on her in-class quiz on cell biology – keep up the great work!
> - Jamaal stayed focused in class all week – great improvement!
>
> Needs Improvement Message Examples:
>
> - Kirk was easily distracted in class this – it is important he try his best to stay focused.
> - Tina missed two homework assignments this week – I know she can do better.
> - Tom fell asleep in class twice this week – I need more from him.
>
> We will e-mail you a weekly spreadsheet, which you may use to submit your messages. You can also submit your messages by e-mail or in paper form—whatever is easiest for you! We ask that you submit all messages by 1:00 pm on Mondays.

Table A1
Lee (2009) lower and upper bound estimates of the intent to treat effects of teacher-to-parent communication on students' communication with parents' self-assessment of their performance during the summer program.

	Predictors					
	Pooled treatment		Positive		Improvement	
Outcomes	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
	Panel A: Students' perceptions of their communication with parents					
Parent spoke with student about school work	0.900	1.684**	1.072	1.743**	0.772	1.489
	[0.454]	[2.240]	[0.265]	[2.167]	[0.960]	[1.424]
Parent congratulated student about success in summer school	0.849	1.638**	1.110	1.815**	0.676	1.482
	[0.659]	[1.996]	[0.371]	[2.201]	[1.462]	[1.458]
Parent rewarded student for success in summer school	0.835	1.420	0.772	1.215	0.886	1.713**
	[0.712]	[1.458]	[0.917]	[0.707]	[0.427]	[1.997]
Parent assisted student with academic work in summer school	0.807	1.353	0.882	1.141	0.759	1.539
	[0.864]	[1.268]	[0.457]	[0.486]	[0.974]	[1.546]
Parent spoke to student about what to do better	1.001	1.702**	0.816	1.143	1.231	2.525***
	[0.004]	[2.383]	[0.817]	[0.511]	[0.789]	[3.576]
	Panel B: Students' self-assessments					
Effort in school	0.479***	0.853	0.691	1.155	0.334***	0.665
	[3.138]	[0.652]	[1.314]	[0.494]	[4.037]	[1.466]
Behavior in class	0.562**	0.971	0.692	1.059	0.459**	0.879
	[2.187]	[0.107]	[1.265]	[0.194]	[2.522]	[0.413]
Relationship with teacher	0.590	1.135	0.590	1.261	0.590	1.025
	[2.270]	[0.527]	[1.939]	[0.828]	[1.923]	[0.086]
Persistence when work was difficult or demanding	0.339***	0.634*	0.400***	0.704	0.252***	0.560**
	[4.091]	[1.783]	[2.987]	[1.214]	[4.993]	[2.129]
Engagement in class	0.445***	0.721	0.495**	0.697	0.393***	0.743
	[3.351]	[1.366]	[2.531]	[1.320]	[3.370]	[1.097]
Class participation	0.449***	0.842	0.542**	0.898	0.376***	0.787
	[3.560]	[0.751]	[2.366]	[0.407]	[3.716]	[0.918]

Notes: Each cell represents results from a separate regression. Estimates are reported as proportional odds ratios with corresponding *t*-statistics from ordered logistic regression models. Standard errors are clustered at the student-level for outcomes estimated in a student–class dataset. These include teachers' perceptions of students and students' perception of their relationship with a teacher.

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

Appendix B

PHONE CALL SCRIPT

Hello, my name is_____. Name of student is a student at XXXXX High School. I'm calling with a short message from name of student's teacher.

Could I please speak to name of guardian on form?

(If the person is not available) Is there another adult available that I can speak to?

Hi, I'm a volunteer working on a project at XXXXX where name of student is attending summer school. We're just calling to update you about your child's progress during Week X. Name of teacher would like you to know that teacher message. He/She encourages you to ask Student Name about their work in Subject summer school class. (Brief Pause)

This message is part of an effort to provide parents with more information about their students' progress in summer review. Many parents are receiving similar messages. You did not receive this message because Student Name is in trouble. We will be following up next week with another message. Again, Name of teacher, wanted to you know that teacher message.

Thanks very much for your time! Have a good night

EMAIL SCRIPT

Hello Parent Name,

I am a volunteer working on a project at XXXXX High School where Student Name is attending summer school. I'm writing to pass along a short message from Student Name's teacher. Teacher's Name would like you to know that Student Name . . . message. He/She encourages you to ask Student Name about their work in Subject summer school class.

This message is part of an effort to provide parents with more information about their students' progress in summer review. Many parents are receiving similar messages. You did not receive this message because Student Name is in trouble. Unfortunately, due to the large number of emails we send it is not always possible for us to respond to specific inquiries. We suggest you follow up with your student's teacher directly or contact the director of the summer review program, Mrs. XXXXXX, at XXX-XXX-XXXX.

Thanks very much.

The volunteer team

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.econedurev.2015.04.001.

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