STEM Learning Opportunities Providing Equity: An Investing in Innovation (i3) Grant

Final Evaluation Report

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Introduction

In 2010, Dr. Penny Edgert, on behalf of the California Education Round Table Intersegmental Coordinating Committee (CERT ICC) and the Alliance for Regional Collaboration to Heighten Educational Success (ARCHES), was awarded a five-year Investing in Innovation (i3) development grant from the U.S. Department of Education. In partnership with ConnectEd: The California Center for College and Career, Dr. Ivan Cheng (California State University, Northridge), and R.T. Fisher Educational Enterprises, Principal Investigator (P.I.) Dr. Edgert and her grant team (hereafter referred to as the Intervention Team) implemented an intervention entitled Science, Technology, Engineering, and Mathematics (STEM) Learning Opportunities Providing Equity (SLOPE).

WestEd served as the external evaluator for this grant. Under the direction of Dr. Carole Gallagher and lead analyst Dr. Kevin Huang, a team of WestEd researchers conducted an Institutional Review Board (IRB) regulated, mixed-methods evaluation that included a randomized controlled trial (RCT). Oversight of many evaluation activities was provided by the i3 national evaluator, Abt Associates, who reviewed and approved the design, methodology, and planned analyses for the impact and implementation studies. The WestEd team held monthly conference calls with its i3 national evaluator representative to monitor study progress and discuss emerging challenges. The intent of this collaboration was to ensure that all i3 evaluations were conducted in compliance with the What Works Clearinghouse principles for rigorous scientific research.

During the evaluation, quantitative and qualitative data were collected and analyzed to examine (a) the impact of the intervention on students and teachers and (b) the fidelity of implementation of the intervention components by teachers. Findings were intended to be used formatively by the P.I. and her team for intervention refinement prior to the RCT and summatively for decision-making about the effectiveness of the intervention based on findings from the RCT. This final report, developed for Dr. Edgert and her team, describes the methods used to conduct the evaluation and summarizes findings from key analyses completed during and following implementation of the intervention.

Intervention Components and Time Line for Implementation

The purpose of this intervention was to increase the success of all students, especially those with a history of low performance in mathematics, in grade 8 Algebra I through rigorous and relevant project-based contextual study that promoted learning of fundamental math concepts.[1] This curriculum was intended to help bridge the gap between the Algebra I content students learn in class and the associated college preparation leading to STEM careers. Intervention developers relied on research that indicates learning mathematics in a project-based context assists in promoting student motivation and interest and transference of skills by linking classroom activities with real-world mathematics. In keeping with the intervention's logic model (see Appendix A), the study curricula were supplemented with academic coaching opportunities for teachers to promote confidence with teaching the challenging algebra content in the California State Standards (the Common Core State Standards) and incorporating project-

[1] Algebra I is widely considered a *"gatekeeper" course*, one that is particularly important for success in STEM careers.

based learning as a forum for practical application of the knowledge and skills learned during formal instruction.

The following activities took place during the five years of this grant:

- Between the grant award in October 2010 through June 2012, the intervention components underwent various stages of development, review, and piloting. During that time period, the Intervention Team recruited 56 California grade 8 Algebra I teachers to participate in the two-year intervention (see the Summary of Findings section for descriptive information about this sample of teachers).[2] WestEd researchers randomly assigned these teachers to a Treatment or Control group. Teachers assigned to the Treatment group were trained to implement the intervention during the 2012–13 and 2013–14 school years.[3] All Treatment and Control teachers were required to complete a survey about their professional background (see Appendix B).
- During the 2012–13 school year, the intervention was formally studied via a randomized controlled trial (RCT). During that time, the grade 8 Algebra I teachers in the Treatment group were exposed to the intervention components—strategic professional development opportunities and access to curricular materials that reinforced critical elements of standards-based mathematics instruction and provided information about STEM career pathways. All students assigned to grade 8 Algebra I classrooms taught by these teachers were exposed to the special curricula in addition to the district-specific curriculum. A small subset of students assigned to these classrooms also was exposed to an optional pre-grade 8 summer session (half-day on Monday–Friday for four weeks) taught by a trained Treatment teacher that was designed to support students identified as having high academic need. All students assigned to grade 8 Algebra I classrooms taught by teachers assigned to the Control group were exposed only to the district-specific curriculum and were not invited to the summer session. All students—those in classrooms taught by teachers in both the Treatment and Control groups—were administered the end-of-grade, standardized state test in mathematics. Scores from that test and from the prior school year (grade 7) were collected for all students in classrooms taught by teachers in the Treatment and Control groups. [4] Information about implementation was collected from teachers via detailed surveys that required them to carefully document the ways in which they carried out the intervention.

[2] All districts targeted for recruitment had existing relationships with the ICC/ARCHES or ConnectEd through other types of activities. These districts were representative of the diversity of California geographically and demographically. All of the districts had middle schools that enrolled a majority of minority/low-income students.

[3] It is important to note that during both years of the intervention (2012–13 and 2013–14), Grade 8 students in participating schools were assigned to Algebra I classrooms using normal district-approved methods; those assigned to classrooms assigned to teachers in the Treatment group would be exposed to the intervention in addition to the district curriculum, and those assigned to teachers in the Control group were exposed only to the District curriculum. In this way, two cohorts of students would benefit from the intervention, those in grade 8 during the 2012–13 school year (Student Cohort 1) and those in grade 8 during the 2013–14 school year (Student Cohort 2).

[4] During all phases of work, using IRB-approved methods and tools, obtaining informed consent was a priority for the evaluation team. In all districts except one, an opt-out procedure was used to ensure all students and their families were fully informed about their schools' participation in the study, how student-level data (test scores for grades 7 and 8) would be used, and who would have access to those data. In one district, parents were required to return a consent form indicating that their students' data could be used in the evaluation.

- During the 2013–14 school year, though the formal impact study was concluded, exploratory work continued under the same RCT conditions previously described. Teachers in the Treatment group again taught the intervention curricula in addition to the district-specific curriculum and information about implementation was collected. Teachers in the Control group taught the district-specific curriculum only. All students assigned to grade 8 Algebra I classrooms taught by teachers in the Treatment group were exposed to the special curricula in addition to the district-specific curriculum. A small subset of students assigned to these classrooms also was exposed to the pre-grade 8 summer session. All students assigned to grade 8 Algebra I classrooms taught by teachers assigned to the Control group were exposed only to the district curriculum. Because the Governor of California suspended state testing in Spring 2014, scores could not be collected for students using procedures used in School Year 2012–13. The Intervention Team, however, was able to secure permission from the state testing vendor to administer the test in those districts that would allow this supplementary administration.[5]
- During the 2014–15 school year, data collected during the 2012–13 and 2013–14 school years were analyzed. In addition, supplementary exploratory analyses were conducted to address specific research questions from the Implementation Team. Teachers assigned to the Control group were provided access to the intervention curricular materials. WestEd evaluators and the Intervention Team Director, Ms. Sharon Twitty, presented preliminary findings at conventions that included the annual meeting of the American Educational Research Association (AERA)(see Appendix C for the paper presented at AERA).

Evaluation Approach

A key goal of the evaluation of this i3 grant was to implement a research-supported process for meaningfully interpreting findings from an RCT using contextual information about implementation fidelity that was systematically collected during the course of an evaluation. In theory-based evaluations, the systematic examination of implementation of fidelity allows experimental-design researchers to open up the "black box," i.e., to better understand the causal processes underlying the outcomes that emerge (Donaldson & Lipsey, 2006). Specifically, a fidelity of implementation index describes the degree to which key components of the intervention are delivered with integrity, through adherence to the developers' intent and/or in keeping with the original program design (O'Donnell, 2008). Contextual information that compares actual implementation processes and practices to ideal practices can provide valuable insight into possible explanations for statistically significant or non-significant findings (Century, Rudnick, & Freeman, 2010; Hulleman & Cordray, 2009; Mowbray, Holter, Teague, & Bybee, 2003; National Research Council, 2004). For evaluations focused on measuring the effectiveness of innovative curricular tools, this information may be particularly useful, as results can be used formatively by intervention developers to refine processes or procedures prior to scale-up (O'Donnell, 2008).

This study uses an a priori intervention model, in which expectations about implementation are specified by the developers and documented by the evaluator prior to data collection (Hulleman & Cordray, 2009). These expectations are linked to the intervention's theoretical foundation (theory of

[5] Only about half of the total pool of participating schools agreed to this supplementary administration. WestEd researchers collected student responses, scored the responses, and completed the raw-to-scale score conversion using vendor-approved methods. In completing these activities, the evaluation team complied with all IRB regulations in place to protect the confidentiality of individual students and ensure data security.

action or logic model) and become the standard ("threshold") for fidelity for all study participants. As shown in the intervention logic model (see Appendix A), the inputs include curricular materials, training, and professional coaching, which support delivery of the instructional units at the classroom level during the summer prior to grade 8 and in grade 8. The student-level outcome of interest is performance on the state's standardized test for grade 8 in Algebra I, administered annually in late spring.

Methodology

This evaluation was designed to (a) examine the **impact** of an intervention aimed at increasing the academic achievement of students in Algebra I, a "gatekeeper" course for careers in the STEM pathways, and (b) better understand the relationship between the impact of an intervention and **implementation fidelity**, as measured by participants' capacity to meet or exceed thresholds for performance set by intervention developers. The components of the intervention that were evaluated included (a) the Algebra I curricula (three project-based, drop-in instructional modules incorporated into the district-specific Algebra I curriculum plus the college-awareness activities), (b) the optional summer curricula, and (c) professional coaching activities for teachers.

a) ***Algebra I Curricula*.** The Algebra I instructional units consisted of three project-based STEM-oriented academic units designed to be taught at various points during the school year and integrated into the district-selected mathematics curriculum. These units were entitled Puzzle Cube, Air Traffic Control, and Catapult Game. Each required the students to work in small teams to apply mathematical concepts to design or build a structure or tool. Overall, these three units were expected to take approximately forty class periods, with some flexibility in instructional time in order to accommodate each district's pre-existing guidelines for timing and sequence of instruction. Only teachers assigned to the treatment condition received these curricular materials. All students who were enrolled in Algebra I classrooms taught by teachers assigned to the treatment condition were exposed to the district's curriculum as well as to the intervention curriculum. Students taught by control teachers or teachers not participating in the study were exposed only to the district curriculum and did not have access to the intervention curricular materials.

b) ***Optional Summer Curricula*.** Summer C.A.M.P. was a four-week program consisting of three project-based, STEM-oriented academic units that required creative problem solving and reinforced mathematics concepts and skills needed for success in Algebra I. For example, one unit required students to model and build wind turbines that could generate a given amount of power. This unit reviewed the concepts of fractions, angles, and constraints. Summer C.A.M.P. was designed for students who had not reached proficient status on the grade 7 state test in mathematics in spring 2012. In some districts, however, administrators were not able to fill all program slots with low-performing students; in those districts, some of the students who were invited to attend Summer C.A.M.P. had reached proficient status on the grade 7 state test in mathematics. In all districts, student participation was optional. Students assigned to classrooms taught by control teachers (i.e., teachers not participating in the study) were not eligible to participate in Summer C.A.M.P. To accommodate the addition of the supplementary summer session for a small subset of participating Algebra I students, WestEd researchers examined the impact of this intervention in "dosages" administered. That is, all students assigned to an Algebra I classroom taught by a treatment teacher were exposed to at least one dose of the intervention (project-based Algebra I curriculum in grade 8); a small subgroup of students also was exposed to an additional dose (summer session in addition to the Algebra I curriculum).

c) ***Professional Coaching Activities for Teachers.*** Teachers assigned to the Treatment group were required to attend all scheduled professional development and coaching sessions focused on implementing the instructional units as intended and reinforcing effective instructional

strategies. Each was assigned a coach with whom they conferred on a regular basis and could discuss emerging challenges. Through the 2012–13 and 2013–14 school years, this included weekly coaching and collaborative meetings to strengthen teacher understanding of the mathematics content and increase the likelihood of consistent implementation across teachers.[6]

Impact Study

As previously described, during the 2012–13 school year, the impact of the intervention was studied through a RCT. The research questions guiding the impact evaluation were as follows:

- ***Contrast 1*:** On average, among students in participating grade 8 Algebra I classrooms in the 2012–13 school year who scored at the *proficient or above* level on their grade 7 standardized assessment in mathematics, does performance on the state's grade 8 standardized assessment in mathematics (Algebra I) differ between students who are exposed to the grade 8 Algebra I intervention curricula and students who are not exposed to the Algebra I intervention curricula?
- ***Contrast 2*:** On average, among students in participating grade 8 Algebra I classrooms in the 2012–13 school year who scored at the *below* proficient level on their grade 7 standardized assessment in mathematics, does performance on the state's grade 8 standardized assessment in mathematics (Algebra I) differ between students whose are exposed to the grade 8 Algebra I intervention curricula *plus Summer C.A.M.P.* and students who are not exposed to the Algebra I intervention curricula?
- ***Contrast 3*:** On average, among all students participating in this evaluation study with a score from the grade 7 state tests in mathematics administered in 2012, does performance on the state's grade 8 standardized assessment in mathematics (Algebra I) differ for students who are exposed to any intervention components and students who are not exposed to any intervention components?

In all cases, the contrast of interest for the impact study was performance on the state's standardized Algebra I test by students assigned to Algebra I classrooms taught by treatment teachers compared to performance by students assigned to Algebra I classrooms taught by control teachers. Analyses were conducted using a two-level hierarchical linear model (students nested within teachers) that examined the impact of the intervention on test scores. A cross-tabulation of cohort by demographic variables (e.g., gender, free/reduced lunch status, race/ethnicity, and English learner status) also will be presented.

A statistical power analysis was conducted to determine the minimum detectable effect size for the first two contrasts. Findings were as follows:

- For student-level analyses for Impact Research Question #1, the MDES = 0.24 (MDES = 0.28 if 30 teachers per group, holding all others constant), assuming that: (a) two sections per teacher and 30 students per section, (b) 30 teachers per group (T or C), (c) intra-class correlation = 0.2, (d) teacher-level covariates explain 50% of variance on student outcome, and (e) alpha = 0.05 & power = 0.8.

[6] Participating teachers received the following incentives to participate, regardless of group assignment, once they completed all required activities: $750/year + iPad2. Treatment teachers who taught a summer session could earn an additional $550 per session. Control teachers did not receive any coaching or professional development from the SLOPE Intervention Team, hence their incentives were awarded following completion of the background survey and semi-annual check-ins with the Intervention Team's director.

- For student-level analyses for the Impact Research Question #2, the MDES = 0.27 (MDES = 0.31 if 30 teachers per group, holding all others constant).

Implementation Fidelity Study

The goal of the implementation study was to better understand the ways in which teachers assigned to the Treatment group carried out the required components of the intervention and the choices teachers made during the course of the study. Such information, collected from each participating teacher and then aggregated up to the program level, can shed light on how fidelity of implementation affected the student learning outcomes as specified in the logic model. Analyzing these data can promote more meaningfully interpretations of findings from the impact study.

Core activities for teachers in the SLOPE Treatment group included use of the prescribed curricular materials during Algebra I instruction, attendance at training activities, and participation in coaching sessions. These components were mandatory, but within each component, teachers could make individual choices about certain elements of the activities. For example, each drop-in unit was divided into lessons, and lessons were subdivided into steps (e.g., worksheets, activities, instructional modules). Teachers were not required to use *every* lesson in a particular unit to reach the threshold for fidelity. In addition, those teachers who were assigned to the Treatment group and who elected to teach a summer session were required to use prescribed mathematics curricular materials during instruction and to attend a special training session. Actions taken and decisions made were collected via an implementation log or survey (see Appendix D for example survey) that teachers in the Treatment group completed that documented the ways in which they implemented the various components of the intervention (e.g., time spent on each unit).

The method used in this study to evaluate fidelity of implementation included the following steps:

1. Specification of the intervention logic model (theory of action) that identifies all key components of the intervention, the mediating factors through which the intervention is implemented, and the outcomes that the intervention is designed to achieve (see Appendix A);
2. Identification of the instruments (e.g., surveys, attendance rosters, and other documentation) that will be used to collect information about each teacher's experiences;
3. Development of a matrix that operationalizes the constructs of interest in terms of the observable indicators that are collected and that can be used to evaluate the degree to which each component was implemented "with fidelity," or in accordance with the developers' intent (see Appendix E for an excerpt); and
4. Calculation of a composite fidelity index for each component (e.g., training, coaching, or curriculum unit) for each teacher (teacher-level score) and for the entire sample (program-level score).

This method calls for clear linkage among the intervention logic model, which explains the hypothesized cause for the differences in outcomes between the treatment and control conditions, and the selected fidelity indices. Importantly, it also calls for the thresholds for fidelity to be determined by the intervention developers, with support from the evaluator. This methodology promotes study coherence, ensures that findings that emerge from the implementation fidelity analyses are meaningfully associated with the findings from impact analyses, and supports the validity of findings that emerge from the implementation study.

Consistent with this method, with support from the i3 National Evaluation team, WestEd evaluators designed a fidelity matrix (see Appendix E for an excerpt) that is linked to the logic model and aims to capture meaningful and discernible levels of implementation among teachers.

Exploratory Analyses

Additional research questions were explored in the 2014–15 school year. Findings from associated analyses were intended to provide feedback that the Intervention Team could use formatively to refine the intervention for application beyond this grant. These findings were not used for formal reporting of the impact or implementation study results, but are included in the findings section for review by the Intervention Team. This work explored the following research questions:

- *Was participation in the summer program consistent with the program's goals? Specifically, were any students who attended the summer program* not *enrolled in a Treatment teacher's classroom during the academic year? Were any students who attended the summer session enrolled in a Control teacher's classroom during the academic year? And, overall, how many students participated in the summer program?*

What can we conclude about how implementation affected outcomes? Specifically, was there a relationship between the degree to which participating teachers implemented the intervention as intended and student-level outcomes?

Summary of Findings

Impact Study Findings

As previously described, the contrast of interest for the impact study was performance on the state's standardized Algebra I test by students assigned to Algebra I classrooms taught by Treatment teachers compared to performance by students assigned to Algebra I classrooms taught by Control teachers. Analyses were conducted using a 2-level hierarchical linear model that examined the impact of the intervention on test scores.

The final analytic sample for the 2012–13 cohort included 1,384 students assigned to 28 Treatment teachers and 1,088 students assigned to 27 Control teachers.[7] Table 1 presents descriptive information about the teacher participants.

Table 1. Descriptive Information About Teacher Cohort, 2012–13 School Year

	n	Percentage Male	Average Years Mathematics Teaching Experience	Percentage with Degree Beyond Bachelor's
Treatment	28	39%	10.86	32%
Control	27	11%	8.52	30%
Total	55			

Students who were included in the 2012–13 cohort met the following criteria: (1) were enrolled in an Algebra I class taught by a participating treatment or control teacher; (2) were classified as a grade 8 student by the district; (3) had a valid test score for grade 8 Algebra I; and (4) did not opt out of data collection (most districts) or had parent permission to participate in data collection (one district).[8] All other students were included for instruction but excluded for impact analyses.

Preliminary findings from the analyses are provided in Table 2.

Table 2. Research Questions and Planned Analyses for Impact Study (RCT Year 1)

Research Question	*n*	Mean Test Score	T/C Mean Difference (S.D.)	p-Value
Contrast 1	T = 673 C = 519	T = 351 C = 357	-6.01 (4.798)	.210
Contrast 2	T = 149 C = 452	T = 282 C = 288	-5.73 (3.336)	.086
Contrast 3	T = 1,384 C = 1,088	T = 320 C = 325	-5.38 (3.953)	.174

*significant at .05 level

[7] Eight teachers were not eligible to participate in the study, as they were not assigned to teach grade 8 Algebra I in fall 2012. The remaining teachers, from the original cohort of 70, exited the study for personal reasons. Please see the Sample Description (CONSORT) table in Appendix F.

[8] As previously described, the majority of schools/districts had an "opt-out" policy that involves informed consent but does not require a parent to return a permission form to the school. One district, however—the largest district in the study—had an active consent policy requiring a student's guardian to return a permission form in order to collect data about that student.

As shown in Table 2, during the 2012–13 school year, no contrast showed a statistically significant difference at the .05 level. Students who were assigned to classrooms taught by Treatment teachers did not perform differently than those assigned to classrooms taught by Control teachers.

Implementation Fidelity Study Findings

As shown in the sample survey in Appendix D, we describe the levels of implementation that the developers, in consultation with the research team, set as the thresholds for fidelity. Appendix B also includes teacher-reported information about the number of lessons used, the time spent on each lesson, the steps used within each lesson, and the estimated amount of effort needed for each lesson. The indexing scheme included in Appendix B provides an overall assessment of an individual teacher's fidelity to the implementation model.

A sample of findings from the implementation study for Algebra I teachers (the coaching component and Algebra I drop-in units) is presented in Table 3. Findings for other components (distribution of curricular materials, participation in professional development seminars, and implementation of College Awareness Curriculum activities) are provided in Appendix G. Thresholds for program-level fidelity (80% or more of teachers meeting individual thresholds for each component) also are indicated.

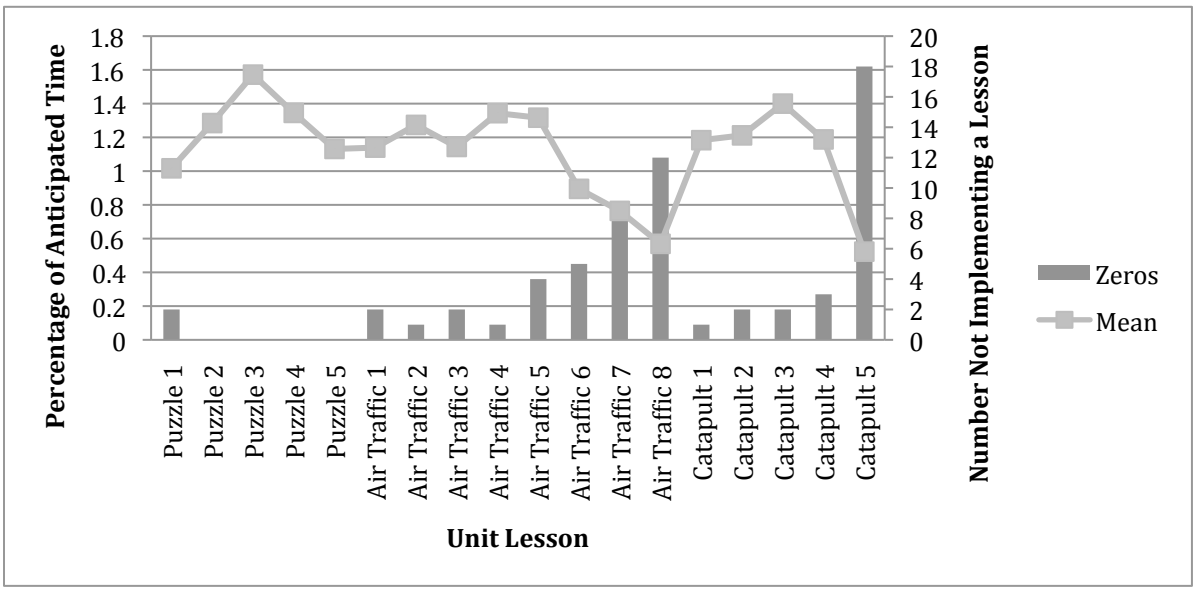
Table 3. Preliminary Implementation Study Findings, by Component

Component	Description	Number of Teachers Meeting Fidelity Threshold	Percent of Teachers Meeting Fidelity Threshold	Program-Level Fidelity
Coaching	Teacher participates in an average of one or more hours of coaching and collaboration sessions for each unit.	16/28	57%	No
Unit 1: Puzzle Cube	Teacher implements Unit 1 of intervention curriculum.	25/28	89%	Yes
Unit 2: Air Traffic Control	Teacher implements Unit 2 of intervention curriculum.	18/28	64%	No
Unit 3: Catapult Game	Teacher implements Unit 3 of intervention curriculum.	21/28	75%	No

As shown in Table 3, in terms of the coaching component, while every teacher participated in some level of coaching, only 16 of the 28 Algebra I teachers participated regularly enough and for enough time to reach the threshold for fidelity. The implementation expectations for each of the core elements of this intervention, the three drop-in units, are reported separately. The percentages of teachers reaching the fidelity threshold ranged from 64% for Unit 2 to 89% for Unit 1. Teacher level data showed that only 16 of the 28 treatment teachers met the threshold for fidelity for all three units.

Figure 1 (next page) shows the trends in instructional time spent on each lesson. The marks corresponding to the graph's left axis in Figure 1 show the average percentages of expected time that teachers spent on each lesson within the Algebra I drop-in units.

Figure 1. Percentages of expected time spent on each lesson



As an example, the curriculum developers planned for the first lesson of the first unit ("Puzzle 1") to take 75 minutes of class time. If the average implementation time for teachers who reported using this lesson at all were exactly 75 minutes, the mark would be exactly at 1. As shown in Figure 1, the average implementation time was 101% of the expected time. If the average were below 100%, the mark would fall below 1. The bars corresponding to the graph's right axis show the numbers of teachers who did not implement a given lesson at all. A taller bar indicates that more teachers did not implement any steps in the given lesson. Treatment teachers appear to start with high levels of implementation for each unit, but drop-offs in implementation levels are increasingly evident toward the ends of units, especially for the second and third units.

Figures 2a and 2b (next page) show the medians and interquartile ranges of the data that are shown in Figure 1. The data in these figures are divided into two subsamples of treatment teachers: treatment teachers who implemented all of the curriculum units with fidelity (Figure 2a) and those who did not implement one or more of the curriculum units with fidelity (Figure 2b).

Figure 2a. Teachers implementing all curriculum units with fidelity

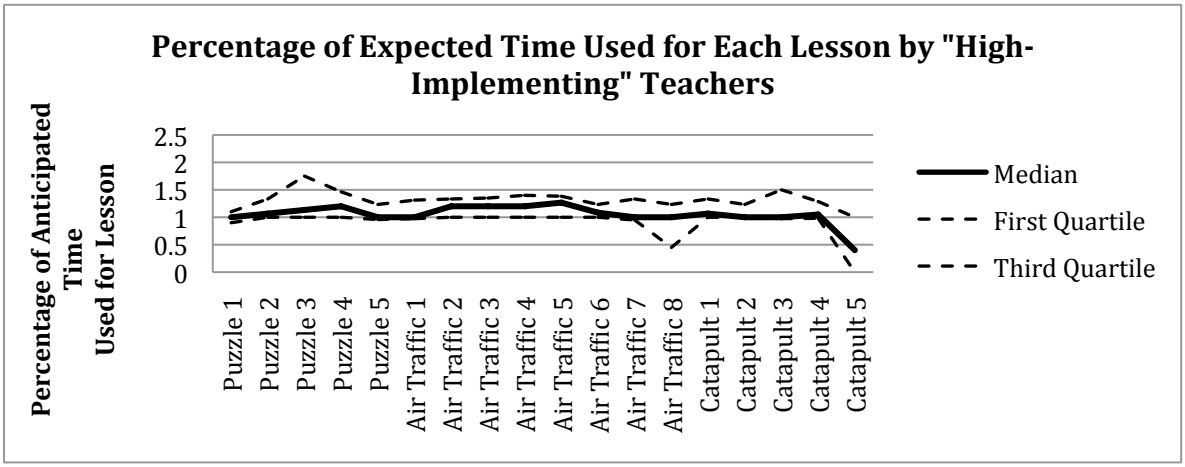
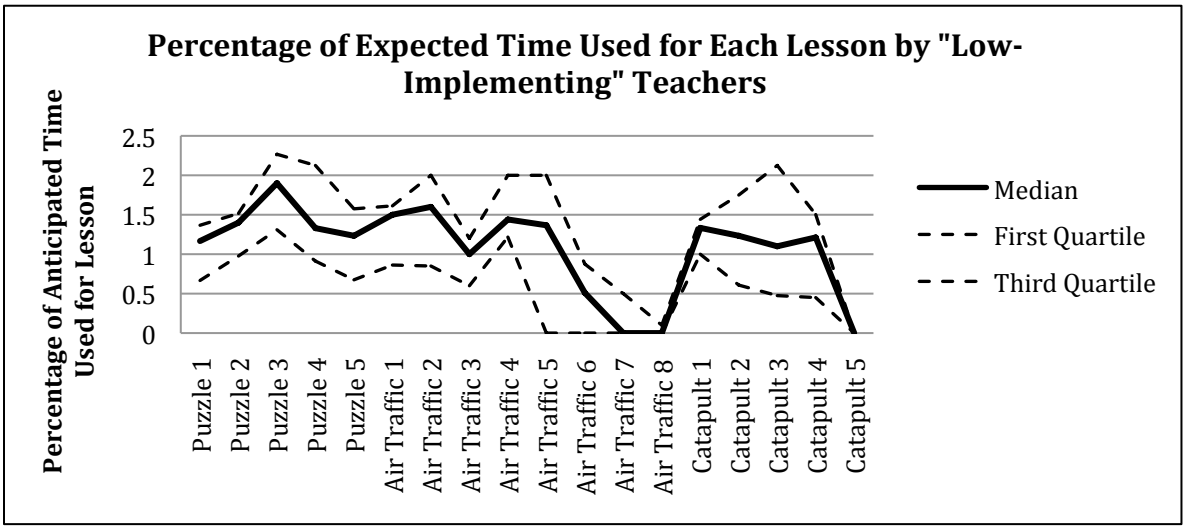


Figure 2b. Teachers who did not implement one or more curriculum units with fidelity



As shown in Figure 2a, teachers who implemented all three curriculum units with fidelity generally had a median amount of time spent on each lesson at or just above the expectation. In contrast, as shown in Figure 2b, teachers who did not implement every unit with fidelity had much more variation in the time spent on implementation across lessons.

Among the 28 treatment teachers, 16 appear to have completed all three required units with a high level of fidelity, while 12 completed the units with a mix of high and low levels of fidelity. To explore the effect of these different rates of implementation in greater depth, we conducted an impact analysis that was similar to Contrast 3 (all treatment and control students included), examining three teacher groups: treatment teachers with a high level of fidelity on all three units (n = 16) vs. other treatment teachers (n = 12) vs. control teachers (n = 24). We chose to focus our investigation on the curricular units because they are the core components of the intervention. The Contrast 3 sample was used so that there would be more students in each of the two newly constructed treatment groups, and thus more statistical power to detect possible differences.[9]

[9] It should be noted, however, that the study was not powered to detect such group differences. Non-significant differences could be primarily due to an insufficient number of teachers in comparison groups.

Table 4 summarizes the findings from this analysis.

Table 4. Impact Analysis on Student Algebra I Scores, by Three Teacher Groups

Group Membership	*n*	Adjusted Mean	Mean Difference	p-Value	Effect Size
Treatment (low fidelity)	581	311.62			
Treatment (high fidelity)	803	324.65			
Control	1,088	324.62			
Diff: T-low and C			-13.00	0.039*	-0.21
Diff: T-high and C			0.03	0.996	0.00
Diff: T-low and T-high			-13.03	0.048*	-0.21

*significant at .05 level

As shown in Table 4, students with high-fidelity treatment teachers did not perform differently from control students on the Algebra I assessment. Students with low-fidelity treatment teachers, however, scored significantly lower than control students. Similarly, students with low-fidelity treatment teachers also scored significantly lower than students with high-fidelity treatment teachers.

Findings from Exploratory Analysis

Additional research questions were explored in the 2014–15 school year, with findings intended to be used formatively by the Intervention Team. Findings are provided below, by research question.

- *Was participation in the summer program consistent with the program's goals? Specifically, were any students who attended the summer program* not *enrolled in a Treatment teacher's classroom during the academic year? Were any students who attended the summer session enrolled in a Control teacher's classroom during the academic year? And, overall, how many students participated in the summer program?*

Only grade 7 students assigned to grade 8 Treatment teachers were eligible for the summer program, but each district determined which subset of Treatment students would be invited to the summer program. Two students, however, who were originally assigned to a classroom taught by a Treatment teacher for grade 8 Algebra I and attended the summer program, subsequently experienced schedule changes and thus ended up in a classroom taught by an Algebra I teacher who was not participating in the study. These students were not included in any analyses. No student who attended the summer program was assigned to a Control teacher during the 2012–13 school year.

- *What can we conclude about how implementation affected outcomes? Specifically, was there a relationship between the degree to which participating teachers implemented the intervention as intended and student-level outcomes?*

WestEd researchers completed a separate study to specifically address this important question. That effort culminated in a paper presented at the 2015 annual conference of the American Educational Research Association. This paper, entitled *Interpreting Intervention Impact through the Lens of Implementation Fidelity: Finding from a Federally Funded Evaluation*, is provided in Appendix C.

Discussion

This paper presents findings from a federally funded evaluation of an i3 development grant. It describes the methods used to study an intervention designed to improve the academic achievement of all students in a "gatekeeper" course that is integrally linked to future success in STEM career pathways. Algebra I is an entry-level course that is a prerequisite for placement in more advanced courses; it also provides the foundation for learning in subsequent courses in the sciences and other content areas. Students who do not successfully complete this course are restricted in terms of future academic opportunities and are more likely to experience educational marginalization than their higher-achieving peers (Adelman, 2006; Gamoran & Hannigan, 2000; Institute of Education Sciences, 2007; Simard, 2009; Stoelinga & Lynn, 2013; Wimberly & Noeth, 2005).

WestEd evaluators found no statistically significant differences in the outcomes of interest, specifically between the end-of-grade state test scores for students taught by teachers assigned to the Treatment group and those taught by teachers assigned to the Control group. Statistically non-significant results are oftentimes the most difficult to interpret, leaving researchers to conjecture about the possible explanations for such outcomes.[10] A systematic analysis of implementation, however, can lead researchers toward an evidence-based hypothesis that may be a catalyst for future research and practice.

In this study, it was informative to open up the “black box” of implementation so that the underlying factors that might have affected the outcomes could be examined (Donaldson & Lipsey, 2006). Consideration of implementation information reported by participating teachers provided contextual information about the ways in which this intervention was implemented. It appears that grade 8 Algebra I teachers face many competing priorities, and allocating the amount of time expected in order to implement the intervention was a challenge for many participants. As shown in Figure 1 (pg. 11), treatment teachers started with high levels of implementation for each unit, but implementation levels dropped toward the ends of units, especially in the second and third units.

Comments from teachers suggested that the district curriculum was a main priority, as was preparing for the state test at the end of the year. Many teachers did not end up spending enough time delivering the intervention units or participating in coaching to reach the fidelity thresholds. Representative comments from teachers included the following:

> “Students liked the lesson. I just didn’t have time to finish.”
>
> “Trying to finish before CST [the California Standards Test] was a challenge.”
>
> “Once again, we had to stop the unit due to CST preparation.”

In addition, teachers who did not implement every unit with fidelity nevertheless had high levels of implementation for many lessons. Indeed, the time spent on some lessons by these teachers was notably higher than that of their peers. However, levels of implementation for other lessons were notably lower. In contrast, teachers who achieved fidelity for all three units had much less volatility in

[10] Such explanations may include, e.g., insufficient power to detect a true effect; an intervention that was not implemented with fidelity to the prescribed methods and procedures; or an ineffective intervention.

implementation. With the exception of the final lesson in the final unit, the median implementation time for each lesson was very close to the time expected by the developers.

When discussing these patterns with the curriculum developers, WestEd evaluators learned that the last one or two lessons in each unit were designed to integrate the concepts discovered through the project-based learning with the mathematical concepts delivered through direct instruction within the units. Implementing the project-based curriculum without scaffolding that provides appropriate context and integration with mathematical processes may have been a severe detriment to the curriculum. Teachers spent time with engaging projects (and away from standard curricular instruction aligned with CST standards), but many did not follow through to make critical connections essential to the developers' intended learning process.

It is also enlightening to consider the implications of the findings that suggest that students with low-fidelity Treatment teachers scored significantly lower on the state test in Algebra I than students taught by high-fidelity Treatment teachers. While this is a correlational, not causal, relationship, it nonetheless provides instructive feedback to developers about the importance of strict adherence to standardization during an RCT, with options for individual choice in which elements of the units to use introduced at the conclusion of the RCT. These findings also serve as a catalyst for further investigation into possible links between teachers' background characteristics (e.g., number of years of teaching experience, advanced coursework in mathematics) and their levels of implementation.

References

Adelman, C. (2006). The toolbox revisited: Paths to degree completion from high school through college. Washington, DC: U.S. Department of Education.

Century, J., Rudnick, M., & Freeman, C. (2010). A framework for measuring fidelity of implementation: A foundation for shared language and accumulation of knowledge. *American Journal of Evaluation, 31*(2), 199–218.

Donaldson, S., & Lipsey, M. (2006). Roles for theory in contemporary evaluation practice: Developing practical knowledge. In I. Shaw, J. Greene, & M. Mark (Eds.), *The handbook of evaluation: Policies, programs, and practices* (pp. 56–75). London, England: Sage.

Gamoran, A., & Hannigan, E. (2000). Algebra for everyone? Benefits of college preparatory mathematics for students with diverse abilities in early secondary school. *Educational Evaluation and Policy Analysis, 22*(3), 241–254.

Hulleman, C., & Cordray, D. (2009). Moving from the lab to the field: The role of fidelity and achieved relative intervention strength. *Journal of Research on Intervention Effectiveness*, *2*(1), 88–110.

Institute of Education Sciences. (2007). *High school coursetaking: Findings from the Condition of Education 2007*. Washington, DC: National Center for Education Statistics, U.S. Department of Education.

Mowbray, C., Holter, M., Teague, G., & Bybee, D. (2003). Fidelity criteria: Development, measurement, and validation. *American Journal of Evaluation, 24*(3), 315–340.

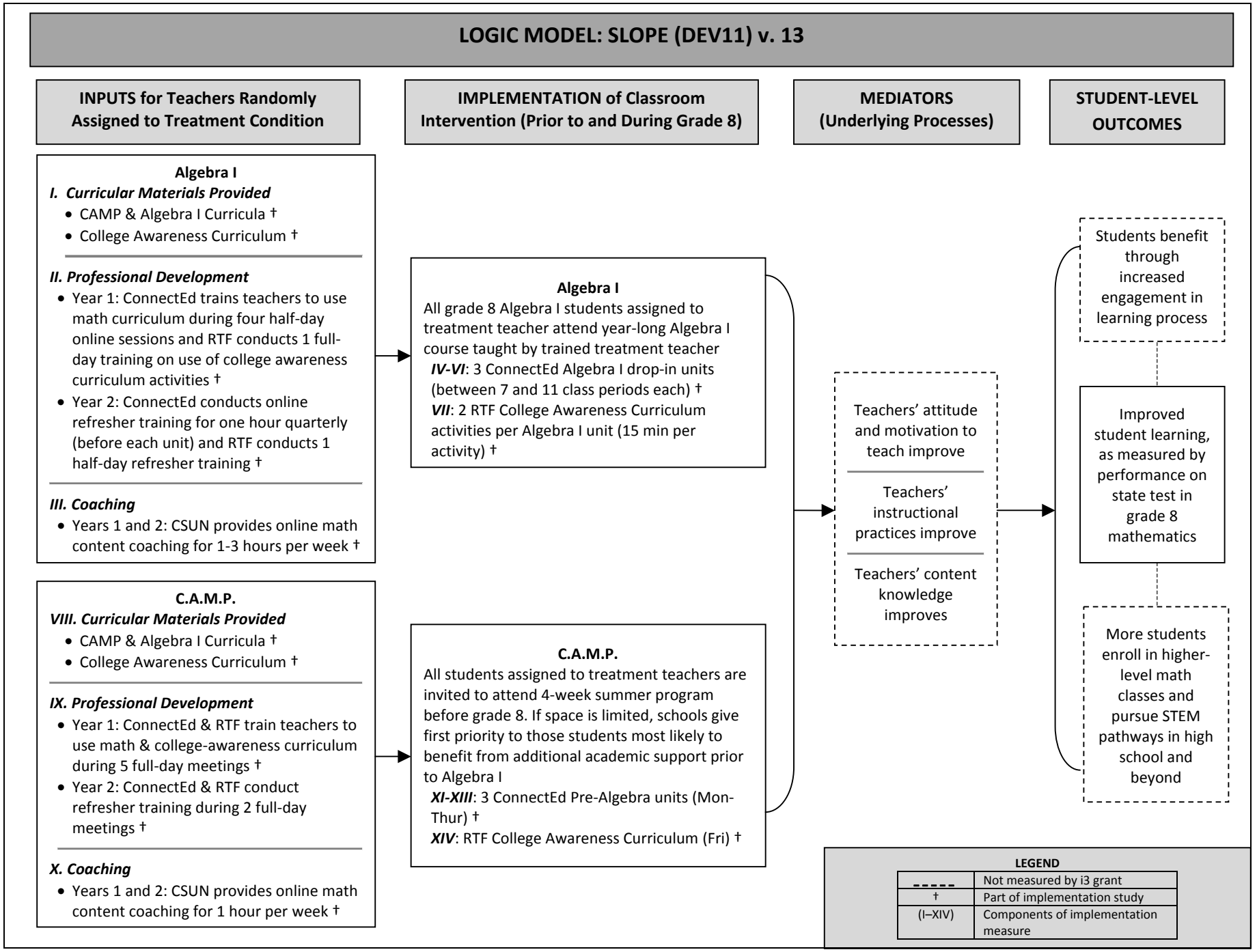
National Research Council. (2004). *On evaluating curricular effectiveness: Judging the quality of K–12 mathematics evaluations*. Washington, DC: National Academies Press.

O'Donnell, C. (2008). Defining, conceptualizing, and measuring fidelity of implementation and its relationship to outcomes in K–12 curriculum intervention research. *Review of Educational Research*, *78*(1), 33–84.

Simard, C. (2009). *Obstacles and solutions for underrepresented minorities in technology*. Palo Alto, CA: Anita Borg Institute for Women and Technology.

Stoelinga, T., & Lynn, J. (2013). *Algebra and the underprepared learner* (UIC Research on Urban Education Policy Initiative Policy Brief, 2[3]). Chicago, IL: University of Illinois at Chicago.

Wimberly, G., & Noeth, R. (2005). *College readiness begins in middle school* (ACT Policy Report). Iowa City, IA: ACT Inc.


LOGIC MODEL: SLOPE (DEV11) v. 13
INPUTS for Teachers Randomly Assigned to Treatment Condition
IMPLEMENTATION of Classroom Intervention (Prior to and During Grade 8)
MEDIATORS (Underlying Processes)
STUDENT-LEVEL OUTCOMES
Algebra I
I. Curricular Materials Provided
CAMP & Algebra I Curricula †
College Awareness Curriculum †
II. Professional Development
Year 1: ConnectEd trains teachers to use math curriculum during four half-day online sessions and RTF conducts 1 full-day training on use of college awareness curriculum activities †
Year 2: ConnectEd conducts online refresher training for one hour quarterly (before each unit) and RTF conducts 1 half-day refresher training †
III. Coaching
Years 1 and 2: CSUN provides online math content coaching for 1-3 hours per week †
C.A.M.P.
VIII. Curricular Materials Provided
CAMP & Algebra I Curricula †
College Awareness Curriculum †
IX. Professional Development
Year 1: ConnectEd & RTF train teachers to use math & college-awareness curriculum during 5 full-day meetings †
Year 2: ConnectEd & RTF conduct refresher training during 2 full-day meetings †
X. Coaching
Years 1 and 2: CSUN provides online math content coaching for 1 hour per week †
Algebra I
All grade 8 Algebra I students assigned to treatment teacher attend year-long Algebra I course taught by trained treatment teacher
IV-VI: 3 ConnectEd Algebra I drop-in units (between 7 and 11 class periods each) †
VII: 2 RTF College Awareness Curriculum activities per Algebra I unit (15 min per activity) †
C.A.M.P.
All students assigned to treatment teachers are invited to attend 4-week summer program before grade 8. If space is limited, schools give first priority to those students most likely to benefit from additional academic support prior to Algebra I
XI-XIII: 3 ConnectEd Pre-Algebra units (Mon-Thur) †
XIV: RTF College Awareness Curriculum (Fri) †
Teachers' attitude and motivation to teach improve
Teachers' instructional practices improve
Teachers' content knowledge improves
Students benefit through increased engagement in learning process
Improved student learning, as measured by performance on state test in grade 8 mathematics
More students enroll in higher-level math classes and pursue STEM pathways in high school and beyond
LEGEND
_ _ _ _ _ Not measured by i3 grant
† Part of implementation study
(I–XIV) Components of implementation measure

Teacher Background Survey

STEM Learning Opportunities Providing Equity

Spring 2012

This survey is being administered by WestEd as part of the STEM Learning Opportunities Providing Equity project. This project is funded by the U. S. Department of Education. Several questions in this survey are from the National Assessment of Educational Progress 2009 Teacher Background Questionnaire for Grade 8 Mathematics.

STEM Learning Opportunities Providing Equity
Teacher Background Survey (RCT)

Dear Teacher,

Thank you in advance for completing this survey! This purpose of this survey is to gather your demographic information and background information in relation to your role as a mathematics teacher. All data you provide will remain confidential and will be used solely for this research study. No data you provide will be shared with your school principal or other school/district administrators or staff. If you have any questions about this survey, please contact Carol Whang at (415) 615-3346 or cwhang@wested.org.

1. Name: Please provide your first name, middle initial, and last name below.

First	M.I.	Last

2. Contact Information: Please provide your email address and phone number. We will only use this information to contact you if we have questions about any information you submit for this study.

Email address	Phone Number
	( )

3. School Mailing Address**:** Please provide your school mailing address. We will use this information to send study materials directly to you (e.g., for data collection over the course of this 2-year study).

School Name		
Street		
City	**State**	**Zip code**
	CA	

4. Gender

☐Female ☐Male

5. Are you Hispanic or Latino? (Select one or more boxes.)

☐No, I am not Hispanic or Latino.
☐Yes, I am Mexican, Mexican American, or Chicano.
☐Yes, I am Puerto Rican or Puerto Rican American.
☐Yes, I am Cuban or Cuban American.
☐Yes, I am from some other Hispanic or Latino background.

Please go on→

6. Which of the following best describes you? (Select one or more boxes.)
   - ☐ White
   - ☐ Black or African American
   - ☐ Asian
   - ☐ American Indian or Alaska Native
   - ☐ Native Hawaiian or other Pacific Islander

7. Counting this year, how many years have you worked as an elementary or secondary teacher? Include any full-time teaching assignments, part-time teaching assignments, and long-term substitute assignments, but not student teaching. If less than 4 months total experience, enter "00."

   _____ YEARS

8. Counting this year, how many years have you taught mathematics in grades 6 through 12? Include any full-time teaching assignments, part-time teaching assignments, and long-term substitute assignments, but not student teaching. If less than 4 months total experience, enter "00."

   _____ YEARS

9. Did you enter teaching through an alternative certification program? (An alternative program is a program that was designed to expedite the transition of non-teachers to a teaching career, for example, a state, district, or university alternative certification program.)

   ☐Yes ☐No

10. What type of teaching certificate do you hold in the state where you currently teach?
    - ☐Regular or standard state certificate or advanced professional certificate → *Skip to Question 12.*
    - ☐ Certificate issued after satisfying all requirements except the completion of a probationary period →*Go to Question 11.*
    - ☐Certificate that requires some additional coursework, student teaching or passage of a test before regular certification can be obtained →*Go to Question 11.*
    - ☐ Certificate issued to persons who must complete a certification program in order to continue teaching → *Go to Question 11.*
    - ☐I do not hold any of the above certifications in the state where I currently teach → *Go to Question 11.*

Please go on→

11. Do you hold a currently valid regular or standard certification from a state other than the one in which you are currently teaching?
    ☐Yes ☐No

12. This school year, are you a Highly Qualified Teacher (HQT) according to your state's requirements? (Generally, to be Highly Qualified, teachers must meet requirements related to (1) a bachelor's degree, (2) full state certification, and (3) demonstrate competency in the subject area(s) taught. The HQT requirement is a provision under the No Child Left Behind (NCLB) Act.)
    ☐Yes
    ☐I meet my state's requirements for a Highly Qualified Teacher in at least one subject that I teach.
    ☐No

13. Are you certified by the National Board for Professional Teaching Standards in at least one content area? (The National Board of Professional Teaching Standards is a nongovernmental organization that administers National Board certification, a voluntary national assessment program that certifies teachers who meet high professional standards. In order to gain certification, the candidate must at least complete a portfolio of classroom practice and pass one or more tests of content knowledge.)
    ☐Yes, I am fully certified by the National Board for Professional Teaching Standards.
    ☐I am working toward my National Board certification.
    ☐No

14. What is the highest level of education you have completed? (please select one)
    ☐High school diploma
    ☐Associate's degree/vocational certification
    ☐Bachelor's degree
    ☐Master's degree
    ☐Education specialist's or professional diploma based on at least one year's work past master's degree
    ☐Doctorate
    ☐Professional degree (e.g., M.D., LL.B., J.D., D.D.S.)

Please go on→

15. Did you have a major, minor, or special emphasis in any of the following subjects as part of your **undergraduate** coursework? (Select **one** box for each line.)

	Yes, a major	Yes, a minor or special emphasis	No
a. Mathematics education	☐	☐	☐
b. Mathematics	☐	☐	☐
c. Other mathematics-related subject such as statistics	☐	☐	☐
d. Education (including secondary education)	☐	☐	☐

16. Did you have a major, minor, or special emphasis in any of the following subjects as part of your **graduate** coursework? (Select **one** box for each line.)

	Yes, a major	Yes, a minor or special emphasis	No
a. Mathematics education	☐	☐	☐
b. Mathematics	☐	☐	☐
c. Other mathematics-related subject such as statistics	☐	☐	☐
d. Education (including secondary education)	☐	☐	☐

17. Date this survey was completed:

Month	Day	Year
		2012

Thank you very much for completing this survey!

Please place your completed survey in the business reply envelope (provided) and place the envelope in the mail (no postage is necessary). We appreciate you returning this survey as soon as you complete it.

Interpreting Intervention Impact through the Lens of Implementation Fidelity: Findings from a Federally Funded Evaluation

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Introduction

This research paper describes the methods and preliminary findings from a five-year evaluation of a promising middle-school mathematics intervention funded through an Investing in Innovation (i3) development grant from the U.S. Department of Education. The objectives of this federally funded study are (1) to examine the impact of an intervention aimed at increasing the academic achievement of students in a gatekeeper course,[1] Algebra I, as measured by students' end-of-year state test scores in mathematics; and (2) to better understand the relationship between intervention impact and implementation fidelity, as measured by teachers' levels of compliance with the study protocol. The goal of this paper is to suggest a process for meaningfully interpreting findings from a randomized controlled trial (RCT), using contextual information about implementation fidelity that has been systematically collected during the course of an evaluation.

Theoretical Framework

In theory-based evaluations, the systematic examination of implementation of fidelity allows experimental-design researchers to open up the "black box," i.e., to better understand the causal processes underlying the outcomes that emerge (Donaldson & Lipsey, 2006). Specifically, a fidelity of implementation index describes the degree to which key components of the intervention are delivered with integrity, through adherence to the developers' intent and/or in keeping with the original program design (O'Donnell, 2008). Contextual information that compares actual implementation processes and practices to the ideal practices can provide valuable insight into possible explanations for statistically significant or non-significant findings (Century, Rudnick, & Freeman, 2010; Hulleman & Cordray, 2009; Mowbray, Holter, Teague, & Bybee, 2003; National Research Council, 2004). For evaluations focused on measuring the effectiveness of innovative curricular tools, this information may be particularly useful, as results can be used formatively by intervention developers to refine processes or procedures prior to scale-up (O'Donnell, 2008).

This study uses an a priori intervention model, in which expectations about implementation are specified by the developers and documented by the evaluator prior to data collection (Hulleman & Cordray, 2009). These expectations are linked to the intervention's theoretical foundation (theory of action or logic model) and become the standard ("threshold") for fidelity for all study participants. The logic model for the intervention studied in this evaluation is provided as a figure in Appendix A. As shown in that figure, the inputs include curricular materials, training, and professional coaching, which support delivery of the instructional units at the classroom level during the summer prior to grade 8 and in grade 8. The student-level outcome of interest is performance on the state's standardized test for grade 8 in Algebra I, administered annually in late spring.

[1] A *gatekeeper course* is one that is viewed as of particular importance for success in nearly all career pathways associated with gainful employment. See the Implications and Discussion section of this report for additional information.

Methods

The intervention evaluated in this study consists of three main components: (1) project-based, drop-in instructional units that are strategically incorporated into the existing locally determined Algebra I curriculum; (2) project-based Pre-Algebra curriculum units delivered in an optional summer program ("C.A.M.P."); and (3) professional coaching for participating grade 8 Algebra I teachers. Each component is described in greater detail in the following text.

- The Algebra I instructional units consisted of three project-based science, technology, engineering, and mathematics (STEM)–oriented academic units designed to be taught at various points during the 2012–13 school year and integrated into the district-selected mathematics curriculum. The topics for the units were Puzzle Cube, Air Traffic Control, and Catapult Game. Each required the students to work in small teams to apply mathematical concepts to design, create, or build a structure or tool. Overall, these three units were expected to take approximately forty class periods, with some flexibility in instructional time in order to accommodate each district's pre-existing guidelines for timing and sequence of instruction. Only teachers assigned to the treatment condition received these curricular materials. All students who were enrolled in Algebra I classrooms taught by teachers assigned to the treatment condition were exposed to the locally determined curriculum as well as to the intervention curriculum. Students taught by control teachers or teachers not participating in the study were exposed only to the district-determined curriculum and had no access to the intervention curricular materials.
- Summer C.A.M.P. was a four-week program consisting of three project-based, STEM-oriented academic units that required creative problem solving and reinforced mathematics concepts and skills needed for success in Algebra I. For example, one unit required students to model and build wind turbines that could generate a given amount of power. This unit reviewed the concepts of fractions, angles, and constraints. Summer C.A.M.P. was designed for students who had not reached proficient status on the grade 7 state test in mathematics in spring 2012; however, in a few districts, administrators were not able to fill all program slots with low-performing students, so some students who had reached proficient status were allowed to attend Summer C.A.M.P. In all districts, student participation was optional. Students assigned to classrooms taught by control teachers or teachers not participating in the study were not eligible to participate in Summer C.A.M.P.
- Intervention teacher attendance at professional development and coaching sessions was mandatory. Sessions held in the spring, summer, and fall of 2012 focused on implementing the instructional units as intended and reinforcing effective instructional strategies. Through the 2012–13 school year, weekly coaching and collaborative meetings were provided, to strengthen teacher understanding of the mathematics content and increase the likelihood of consistent implementation across teachers. Control teachers did not receive any coaching or professional development from i3 researchers.

All evaluation activities were regulated by an Institutional Review Board, and the evaluation was conducted with oversight from the i3 national evaluation team led by Abt Associates. This team

reviewed and approved the design, methodology, and planned analyses for the impact and implementation studies. WestEd researchers had conference calls monthly with a representative of this team to monitor study progress and discuss emerging challenges. The intent of this oversight was to ensure that all i3 evaluations were conducted in compliance with the What Works Clearinghouse principles for rigorous scientific research.

The intervention was piloted in year 2 of the grant (2011–12 school year), followed by a two-year RCT in grant years 3 (2012–13 school year) and 4 (2013–14 school year). Data collected in the RCT years were focused on impact and exploratory analyses, respectively. Findings from the first year of the RCT—the impact study and associated implementation data—are reported in this paper. Each is described in greater detail in the following sections.

A. Impact study: RCT year 1, grant year 3 (2012–13 school year).

For this study, 70 grade 8 Algebra I teachers were recruited from 15 school districts across California. Collectively, these districts are representative of the state in terms of geography, size, demographics, and socioeconomic status. Randomization into treatment and control status occurred at the teacher level in spring 2012; half of the teachers were randomly assigned to the treatment condition and half to the control condition. Students were assigned to classrooms without knowledge of teachers' group membership, using each district's routine placement policies.

Research questions and associated analyses are presented in Table 1. The contrast of interest was performance on a standardized Algebra I test by students assigned to Algebra I classrooms taught by treatment teachers compared to performance by students assigned to Algebra I classrooms taught by control teachers.

Table 1
Research Questions and Planned Analyses for Impact Study (RCT Year 1)

Research Question	Analysis
Contrast 1: On average, for participating students whose performance was at or above proficient on the grade 7 state test in mathematics administered in 2012, does performance on the state's grade 8 test in Algebra I differ between students who are exposed to the grade 8 Algebra I intervention and students who are not exposed to the grade 8 Algebra I intervention?	A 2-level hierarchical linear model (HLM) that examines the impact of project-based drop-in units on grade 8 test scores collected in spring 2013
Contrast 2: On average, for participating students whose performance was below proficient on the grade 7 state test in mathematics administered in 2012, does performance on the state's grade 8 test in Algebra I differ between students who are exposed to the grade 8 Algebra I intervention *plus* C.A.M.P. and students who are not exposed to these two components of the intervention?	A 2-level HLM that examines the impact of project-based drop-in units *and* Summer C.A.M.P. on grade 8 test scores collected in spring 2013
Contrast 3: On average, for all students participating in this study with a score from the grade 7 state tests in mathematics administered in 2012, does performance on the state's grade 8 test in Algebra I differ for students who are exposed to any intervention components and students who are not exposed to any intervention components?	A 2-level hierarchical linear model (HLM) that examines the impact of the intervention on grade 8 test scores collected in spring 2013

B. Implementation study.[2]

The focus of the implementation study was on better understanding the ways in which participating teachers assigned to the treatment condition carried out the required components of the intervention, and the choices they made during the course of the study. Such information, collected from each participating teacher and then aggregated up to the program level, may shed light on how fidelity of implementation affected the student learning outcomes as specified in the logic model. This information allows us to more meaningfully interpret the impact findings.

The core components of the intervention included use of the prescribed mathematics curricular materials during Algebra I instruction, attendance at training activities, and participation in coaching sessions. These components were mandatory, but within each component, teachers could make individual choices about certain activities. For example, each drop-in unit was divided into lessons, and lessons were subdivided into steps (e.g., worksheets, activities, instructional modules). Teachers were not required to use *every* lesson in a particular unit in order to reach the threshold for fidelity. In addition, those teachers who were assigned to the treatment condition and who elected to teach a Summer C.A.M.P. session were required to use prescribed mathematics curricular materials during instruction and to attend a special training session.

The method used in this study to evaluate fidelity of implementation included the following steps:

1. Specification of the intervention logic model (theory of action) that identifies all key components of the intervention, the mediating factors through which the intervention is implemented, and the outcomes that the intervention is designed to achieve;
2. Identification of the instruments (e.g., surveys, attendance rosters, and other documentation) that will be used to collect information about each teacher's experiences;
3. Development of a matrix that operationalizes the constructs of interest in terms of the observable indicators that are collected and that can be used to evaluate the degree to which each component was implemented "with fidelity," or in accordance with the developers' intent; and
4. Calculation of a composite fidelity index for each component (e.g., training, coaching, or curriculum unit) for each teacher (teacher-level score) and for the entire sample (program-level score).

This method calls for clear linkage among the intervention logic model, which explains the hypothesized cause for the differences in outcomes between the treatment and control conditions, and the selected fidelity indices. Importantly, it also calls for the thresholds for fidelity to be determined by the intervention developers, with support from the evaluator. This methodology promotes study coherence, ensures that findings that emerge from the implementation fidelity analyses are meaningfully associated with the findings from impact analyses, and supports the validity of findings that emerge from the implementation study.

[2] The techniques described in this section were developed in conjunction with the i3 National Evaluator, Abt Associates (Barbara Goodson, Principal Investigator), and its partners.

Consistent with this method, we designed a sophisticated fidelity matrix (see Appendix B for an example) that is linked to the logic model and that aims to capture meaningful and discernible levels of implementation among teachers.

Data Sources

Data were collected during year 1 of the RCT in order to study intervention impact and implementation fidelity; these data are the focus of this paper. For all participating students (those in Algebra I classes taught by teachers assigned to treatment or control conditions), demographic information (e.g., gender, race/ethnicity, free/reduced-price lunch status, English learner status, and special education status) and test scores were collected during the 2013 end-of-year administration of the California Standards Test (CST) in Algebra I. For baseline equivalency testing, evaluators collected the prior year's (grade 7 in 2012) test scores. WestEd researchers matched data from the two years for each participating student.

In spring 2011, immediately following randomization, background information was collected from each participating treatment and control teacher via an online Teacher Background Survey (see Appendix C). In fall 2012, each participating treatment and control teacher also provided a roster listing the names of all students in their classrooms at that time.

Teachers who were assigned to the treatment condition and who elected to teach a Summer C.A.M.P. session in summer 2012 recorded information about each unit that they taught in an implementation survey. In addition, throughout the 2012–13 school year, teachers assigned to the treatment condition (including those who taught Summer C.A.M.P. sessions) who were teaching Algebra I that year completed an implementation survey, as they finished each unit of instruction, and provided specific information about the instructional activities in which they had participated and time spent in each activity. In that survey, treatment teachers were also asked to answer specific questions about their experiences with the coaching component of the study. An example of an end-of-unit implementation survey is included in Appendix D.

The study director provided documentation of teacher participation in mandatory training and professional development sessions to the evaluation team.

A summary of data sources is provided in Table 2.

Table 2

Data Sources for 2012–13 RCT and Implementation Studies

Study	Student or Teacher Population	Student-Level Data Source	Teacher-Level Data Source
RCT	All grade 8 students in participating Algebra I classrooms (treatment and control)	State test (CST) in Algebra I in spring 2013	
Implementation Study	All participating treatment and control teachers		Teacher Background Survey Class roster
Implementation Study	All grade 8 Algebra I teachers assigned to the treatment condition who elected to teach C.A.M.P.		C.A.M.P Implementation Survey (by unit)
Implementation Study	All grade 8 Algebra I teachers assigned to the treatment condition		Algebra I Implementation Survey (by unit) Documentation from study director verifying attendance at training

Findings

The final analytic sample for the 2012–13 cohort included 1,384 students assigned to 28 treatment teachers and 1,088 students assigned to 27 control teachers.[3] Table 3 presents descriptive information about the teacher participants.

Table 3

Descriptive Information About Teacher Cohort, 2012–13 School Year

	n	Percentage Male	Average Years Mathematics Teaching Experience	Percentage with Degree Beyond Bachelor's
Treatment	28	39%	10.86	32%
Control	27	11%	8.52	30%
Total	55			

Students who were included in the 2012–13 cohort met the following criteria: (1) were enrolled in an Algebra I class taught by a participating treatment or control teacher; (2) were classified as a grade 8 student by the district; (3) had a valid test score for grade 8 Algebra I; and (4) did not opt out of data collection (most districts) or had parent permission to participate in data collection (one district).[4] All other students were included for instruction but excluded for impact analyses.

Preliminary findings from the analyses are provided in Table 4.

[3] Eight teachers were not eligible to participate in the study, as they were not assigned to teach grade 8 Algebra I in fall 2012. The remaining attriters, from the original cohort of 70 teachers, exited the study for personal reasons.

[4] The majority of schools/districts had an "opt-out" policy. This means that a student's guardian had to return a waiver in order for the student to be excluded from the study. However, one district, the largest district in the study, insisted on an "opt-in" policy. This means that a student's guardian had to return a waiver in order for the student to be included in the study.

Table 4
Research Questions and Planned Analyses for Impact Study (RCT Year 1)

Research Question	*n*	Mean Test Score	T/C Mean Difference (S.D.)	p-Value
Contrast 1	T = 673 C = 519	T = 351 C = 357	-6.01 (4.798)	.210
Contrast 2	T = 149 C = 452	T = 282 C = 288	-5.73 (3.336)	.086
Contrast 3	T = 1,384 C = 1,088	T = 320 C = 325	-5.38 (3.953)	.174

*significant at .05 level

As shown in Table 4, no contrast showed a statistically significant difference at the .05 level. Students who were assigned to classrooms taught by treatment teachers did not perform differently in relation to those assigned to classrooms taught by control teachers.

Implementation study.

In Appendix B (one sample unit: Unit 1), we describe the levels of implementation that the developers, in consultation with the research team, set as the thresholds for fidelity. Appendix B also includes teacher-reported information about the number of lessons used, the time spent on each lesson, the steps used within each lesson, and the estimated amount of effort needed for each lesson. The indexing scheme included in Appendix B provides an overall assessment of an individual teacher's fidelity to the implementation model.

Preliminary findings from the implementation study for Algebra I teachers are presented in Table 5. Fidelity findings are presented for the coaching component and for each Algebra I drop-in unit.[5] Thresholds for program-level fidelity (80% or more of teachers meeting individual thresholds for each component) are also indicated.

Table 5
Preliminary Implementation Study Findings, by Component

Component	Description	Number of Teachers Meeting Fidelity Threshold	Percent of Teachers Meeting Fidelity Threshold	Program-Level Fidelity
Coaching	Teacher participates in an average of one or more hours of coaching and collaboration sessions for each unit.	16/28	57%	No

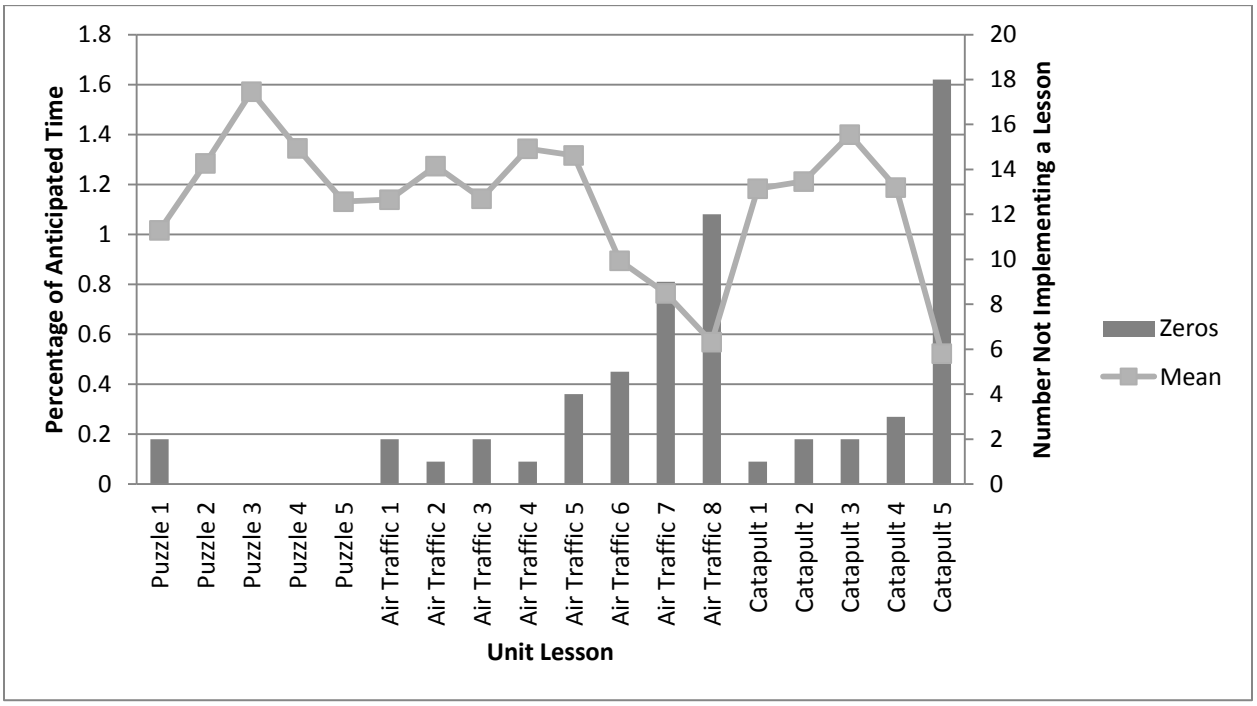
[5] Implementation fidelity was assessed for every part of the intervention, including the distribution of curricular materials, participation in professional development seminars, and implementation of College Awareness Curriculum activities. In addition, WestEd researchers conducted a full implementation study for the Summer C.A.M.P. program. Only the results for coaching and collaboration time and direct implementation of the curricular units are reported and discussed in this paper.

Unit 1: Puzzle Cube	Teacher implements Unit 1 of intervention curriculum.	25/28	89%	Yes
Unit 2: Air Traffic Control	Teacher implements Unit 2 of intervention curriculum.	18/28	64%	No
Unit 3: Catapult Game	Teacher implements Unit 3 of intervention curriculum.	21/28	75%	No

As shown in Table 5, in terms of the coaching component, while every teacher participated in some level of coaching, only 16 of the 28 Algebra I teachers participated regularly enough and for enough time to reach the threshold for fidelity. The implementation expectations for each of the core elements of this intervention, the three drop-in units, are reported separately. The percentages of teachers reaching the fidelity threshold ranged from 64% for Unit 2 to 89% for Unit 1. Teacher level data showed that only 16 of the 28 treatment teachers met the threshold for fidelity for all three units.

The marks corresponding to the graph's left axis in Figure 1 show the average percentages of expected time that teachers spent on each lesson within the Algebra I drop-in units.

Figure 1.
Percentages of expected time spent on each lesson.



As an example, the curriculum developers planned for the first lesson of the first unit ("Puzzle 1") to take seventy-five minutes of class time. If the average implementation time for teachers who reported using this lesson at all were exactly seventy-five minutes, the mark would be exactly at 1. As shown in Figure 1, the average implementation time was 101% of the expected time. If the average were below 100%, the mark would fall below 1, and vice versa for an average higher than the anticipated rate. Additionally, the bars corresponding to the graph's right axis show the numbers of teachers who did not implement a given lesson at all. A taller bar indicates that more teachers did not implement any steps in the given lesson. As shown in Figure 1, treatment teachers appear to start with high levels of

implementation for each unit, but drop-offs in implementation levels are increasingly evident toward the ends of units, especially for the second and third units.

Figures 2a and 2b show the medians and interquartile ranges of the data that are shown in Figure 1. The data in these figures are divided into two subsamples of treatment teachers: treatment teachers who implemented all of the units with fidelity (Figure 2a) and those who did not implement one or more of the units with fidelity (Figure 2b).

Figure 2a.
Teachers implementing all curriculum units with fidelity.

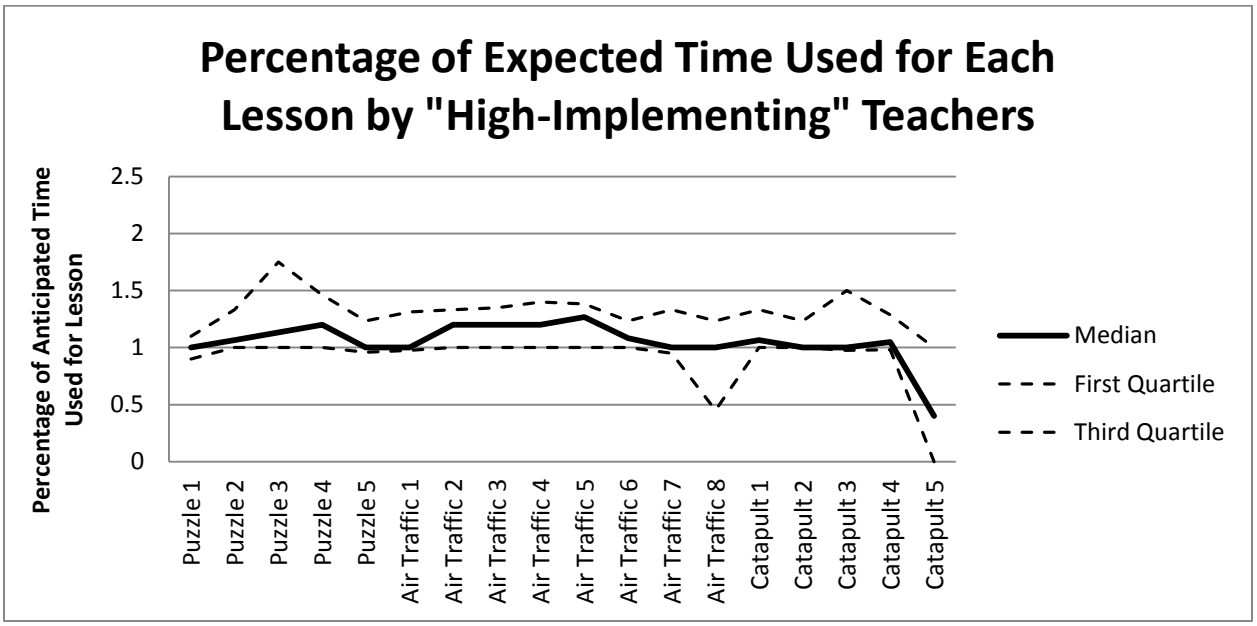
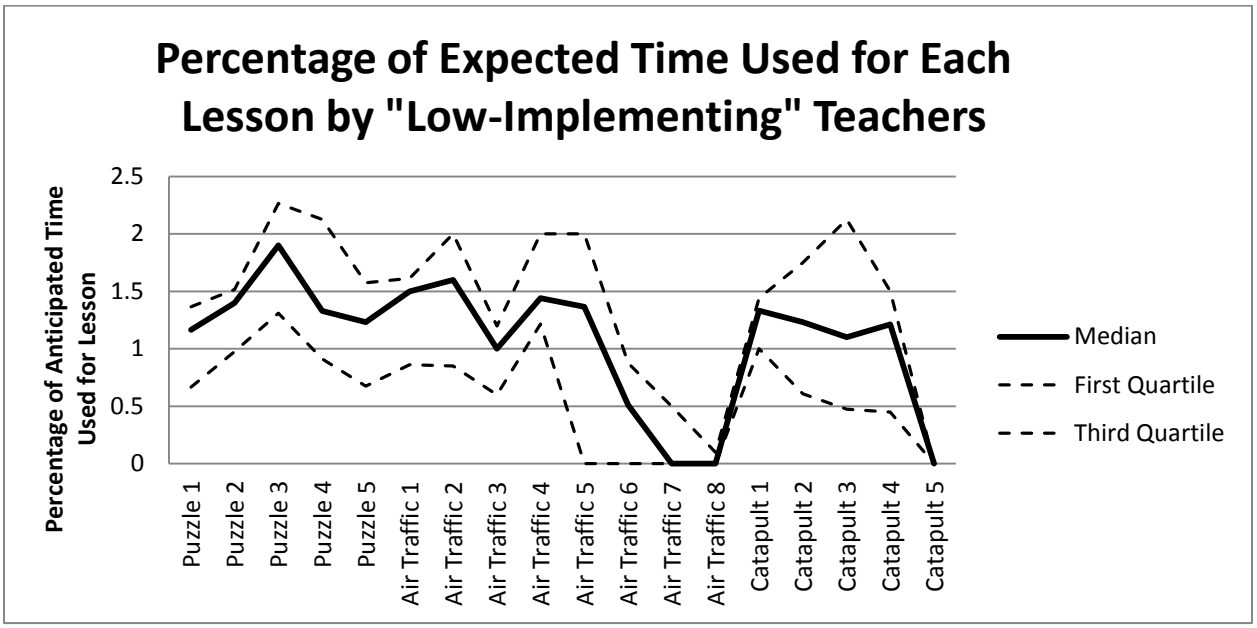


Figure 2b.
Teachers who did not implement one or more curriculum units with fidelity.



As shown in Figure 2a, teachers who implemented all three units with fidelity generally had a median amount of time spent on each lesson at or just above the expectation. In contrast, as shown in Figure 2b, teachers who did not implement every unit with fidelity had much more variation in the time spent on implementation across lessons.

Importantly, among the 28 treatment teachers, 16 appear to have completed all three required units with a high level of fidelity, while 12 completed the units with a mix of high and low levels of fidelity. To explore the effect of these different rates of implementation in greater depth, we conducted an impact analysis that was similar to Contrast 3 (all treatment and control students included), examining three teacher groups: treatment teachers with a high level of fidelity on all three units (n = 16) vs. other treatment teachers (n = 12) vs. control teachers (n = 24). We chose to focus our investigation on the curricular units because they are the core components of the intervention. The Contrast 3 sample was used so that there would be more students in each of the two newly constructed treatment groups, and thus more statistical power to detect possible differences.[6]

Table 6 summarizes the findings from this analysis.

[6] It should be noted, however, that the study was not powered to detect such group differences. Non-significant differences could be primarily due to an insufficient number of teachers in comparison groups.

Table 6
Impact Analysis on Student Algebra I Scores, by Three Teacher Groups

Group Membership	*n*	Adjusted Mean	Mean Difference	p-Value	Effect Size
Treatment (low fidelity)	581	311.62			
Treatment (high fidelity)	803	324.65			
Control	1,088	324.62			
Diff: T-low and C			-13.00	0.039*	-0.21
Diff: T-high and C			0.03	0.996	0.00
Diff: T-low and T-high			-13.03	0.048*	-0.21

*significant at .05 level

As shown in Table 6, students with high-fidelity treatment teachers did not perform differently from control students on the Algebra I assessment. Students with low-fidelity treatment teachers, however, scored significantly lower than control students. Similarly, students with low-fidelity treatment teachers also scored significantly lower than students with high-fidelity treatment teachers.

Implications and Discussion

This paper presents findings from a federally funded evaluation of an intervention designed to improve the academic achievement of all students in a gatekeeper course that is integrally linked to future success in STEM career pathways. Algebra I is an entry-level course that is a prerequisite for placement in more advanced courses; it also provides the foundation for learning in subsequent courses in the sciences and other content areas. Students who do not successfully complete this course are restricted in terms of future academic opportunities and are more likely to experience educational marginalization than their higher-achieving peers (Adelman, 2006; Gamoran & Hannigan, 2000; Institute of Education Sciences, 2007; Simard, 2009; Stoelinga & Lynn, 2013; Wimberly & Noeth, 2005).

In this study, no statistically significant differences in the outcomes of interest emerged between students taught by teachers assigned to the treatment condition and those taught by teachers assigned to the control condition. Statistically non-significant results are oftentimes the most difficult to interpret, leaving researchers to conjecture about the possible explanations for such outcomes.[7] A systematic analysis of implementation, however, can lead researchers toward an evidence-based hypothesis that may be a catalyst for future research and practice. In this study, it was informative to open up the "black box" of implementation so that the underlying factors that might have affected the outcomes could be examined (Donaldson & Lipsey, 2006).

In this study, consideration of implementation information reported by participating teachers provided contextual information about the way in which this intervention was implemented. It appears that grade 8 Algebra I teachers face many competing priorities, and allocating the amount of time expected in order to implement the intervention was a challenge for many participants. Comments from teachers suggest that the district curriculum was a main priority, as was preparing for the state test at the end of

[7] Such explanations may include, e.g., insufficient power to detect a true effect; an intervention that was not implemented with fidelity to the prescribed methods and procedures; or an ineffective intervention.

the year. Many teachers did not end up spending enough time delivering the intervention units or participating in coaching to reach the fidelity thresholds. As shown in Figure 1, treatment teachers started with high levels of implementation for each unit, but implementation levels dropped toward the ends of units, especially in the second and third units. Representative comments from teachers included the following:

> "Students liked the lesson. I just didn't have time to finish."
>
> "Trying to finish before CST [the California Standards Test] was a challenge."
>
> "Once again, we had to stop the unit due to CST preparation."

Figures 2a and 2b provide a more detailed picture of the trends shown in Figure 1. Teachers who did not implement every unit with fidelity nevertheless had high levels of implementation for many lessons. Indeed, the time spent on some lessons by these teachers was notably higher than that of their peers. However, levels of implementation for other lessons were notably lower. In contrast, teachers who achieved fidelity for all three units had much less volatility in implementation. With the exception of the final lesson in the final unit, the median implementation time for each lesson was very close to the time expected by the developers.

When discussing these patterns with the curriculum developers, we discovered that the last one or two lessons in each unit were designed to integrate the concepts discovered through the project-based learning with the mathematical concepts delivered through direct instruction within the units. Implementing the project-based curriculum without scaffolding that provides appropriate context and integration with mathematical processes may have been a severe detriment to the curriculum. Teachers spent time with engaging projects (and away from standard curricular instruction aligned with CST standards), but many did not follow through to make critical connections essential to the developers' intended learning process.

It is also enlightening to consider the implications of the data presented in Table 6. Findings suggest that students with low-fidelity treatment teachers scored significantly lower on the state test in Algebra I than students taught by high-fidelity treatment teachers. While this is a correlational, not causal, relationship, it nonetheless provides instructive feedback to developers about the importance of strict adherence to standardization during an RCT, with options for individual choice in which elements of the units to use introduced at the conclusion of the RCT. These findings also serve as a catalyst for further investigation into possible links between teachers' background characteristics (e.g., number of years of teaching experience, advanced coursework in mathematics) and their levels of implementation.

References

Adelman, C. (2006). *The toolbox revisited: Paths to degree completion from high school through college.* Washington, DC: U.S. Department of Education.

Century, J., Rudnick, M., & Freeman, C. (2010). A framework for measuring fidelity of implementation: A foundation for shared language and accumulation of knowledge. *American Journal of Evaluation, 31*(2), 199–218.

Donaldson, S., & Lipsey, M. (2006). Roles for theory in contemporary evaluation practice: Developing practical knowledge. In I. Shaw, J. Greene, & M. Mark (Eds.), *The handbook of evaluation: Policies, programs, and practices* (pp. 56–75). London, England: Sage.

Gamoran, A., & Hannigan, E. (2000). Algebra for everyone? Benefits of college preparatory mathematics for students with diverse abilities in early secondary school. *Educational Evaluation and Policy Analysis, 22*(3), 241–254.

Hulleman, C., & Cordray, D. (2009). Moving from the lab to the field: The role of fidelity and achieved relative intervention strength. *Journal of Research on Intervention Effectiveness*, *2*(1), 88–110.

Institute of Education Sciences. (2007). *High school coursetaking: Findings from the Condition of Education 2007*. Washington, DC: National Center for Education Statistics, U.S. Department of Education.

Mowbray, C., Holter, M., Teague, G., & Bybee, D. (2003). Fidelity criteria: Development, measurement, and validation. *American Journal of Evaluation, 24*(3), 315–340.

National Research Council. (2004). *On evaluating curricular effectiveness: Judging the quality of K–12 mathematics evaluations*. Washington, DC: National Academies Press.

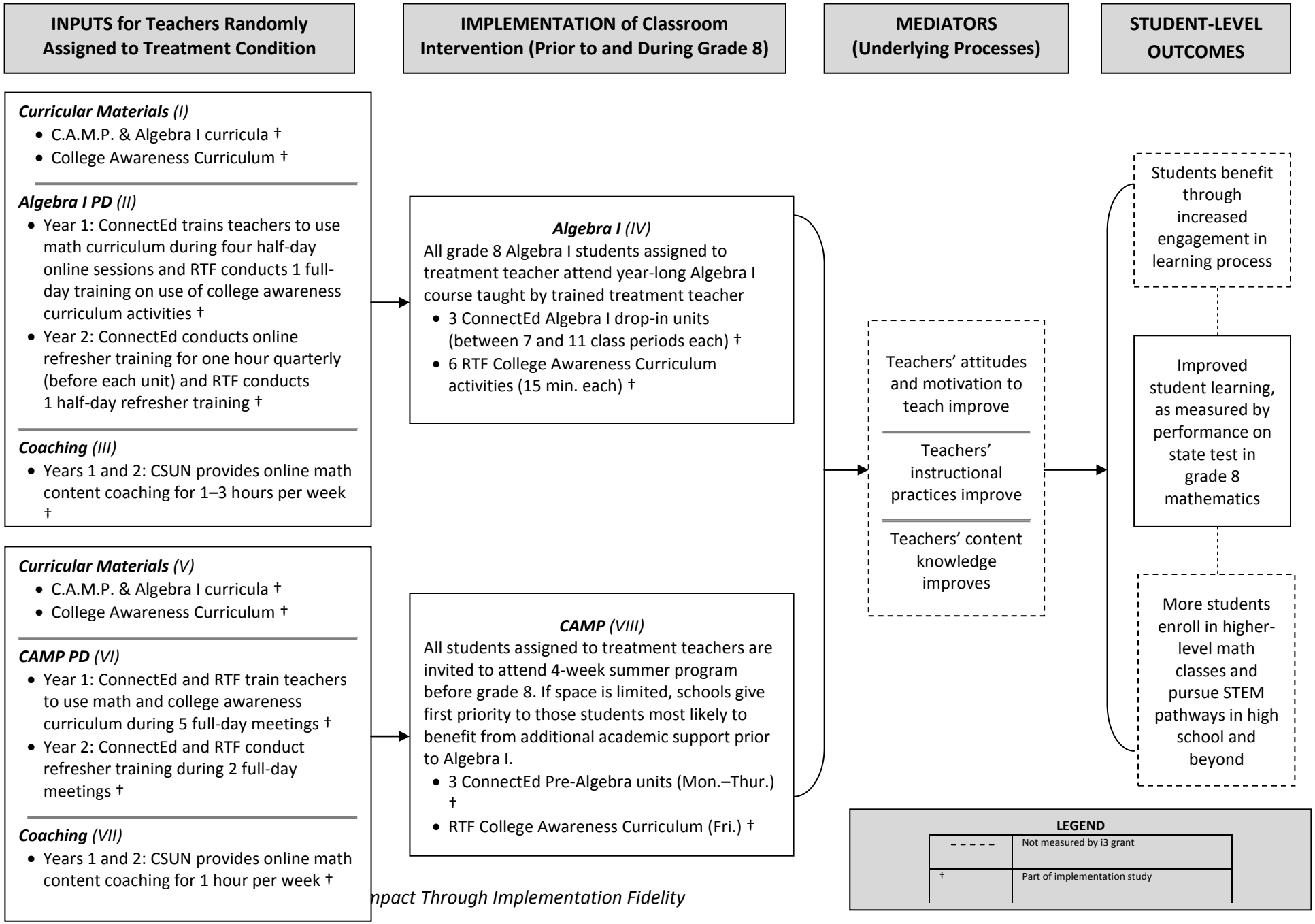
O'Donnell, C. (2008). Defining, conceptualizing, and measuring fidelity of implementation and its relationship to outcomes in K–12 curriculum intervention research. *Review of Educational Research*, *78*(1), 33–84.

Simard, C. (2009). *Obstacles and solutions for underrepresented minorities in technology*. Palo Alto, CA: Anita Borg Institute for Women and Technology.

Stoelinga, T., & Lynn, J. (2013). *Algebra and the underprepared learner* (UIC Research on Urban Education Policy Initiative Policy Brief, 2[3]). Chicago, IL: University of Illinois at Chicago.

Wimberly, G., & Noeth, R. (2005). *College readiness begins in middle school* (ACT Policy Report). Iowa City, IA: ACT Inc.

Appendix A. i3 Intervention Logic Model



mpact Through Implementation Fidelity

Appendix B. Algebra I Implementation Matrix (Unit 1)

2012-2013 Measuring Fidelity of Implementation for Algebra I Drop-in Units: DEV11 (SLOPE)

	Component Description	Operational Definition	Data Collection Measure	Possible Implementation Range	Expected Teacher-level Implementation with Fidelity / Corresponding Score	Teacher-level Composite Score / Criterion for Adequate (implementation "with fidelity")	Program-level Criterion for Adequate (implementation "with fidelity")	Considered "with fidelity" for Year 1
Component III. Coaching (online)								
4	Y1 Algebra 1 Coaching and Collaboration for all treatment teachers (online sessions scheduled for 1-3 hours/week): Unit 1	Teacher discusses at least one issue with coach and/or interacts with coach and other teachers	Algebra I Implementation Survey for Puzzle Cube (Questions 19-21), and/or coaching log	0–3 hrs per week	Participated at least 1 hour per week / No or Yes: 0-1	0-3 Adequate: 3	80% of teachers met criterion	No or Yes
Components IV-a, IV-b, IV-c. Teacher Implementation of Classroom Intervention (Algebra I Units 1, 2, and 3 Respectively)								
	Component: 3 Algebra I units	**Operational Definition**	**Data Collection Measure**	**Possible Implementation Range**	**Expected Teacher-level Implementation with Fidelity / Corresponding Score**	**Teacher-level Composite Score / Criterion for Adequate (implementation "with fidelity")**	**Program-level Criterion for Adequate (implementation "with fidelity")**	**Considered "with fidelity" for Year 1**
7 IV-a	Y1 Algebra I: Implementation of Algebra Drop-in Unit 1	Teacher implements ConnectEd math curriculum as trained in PD	Algebra I Implementation Survey for Puzzle Cube (Questions 2-18)					
		a. Number of lessons used		a. 0–5 lessons	a. ≥ 80% of implementation range (i.e., 4 lessons) / No or Yes: 0-1	**0-16** Adequate: ≥ 75% of possible highest composite score; i.e., **the score for implementation with fidelity is at least 12** (this indicates that the minimal number of lessons to be taught is 4; no way to reach a	80% of teachers meet criterion	No or Yes
		b. Time spent on each lesson		b. 0–150 minutes (varies for each lesson)	b. ≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			

		c. Number of steps used within each lesson		c. 0–8 steps (varies for each lesson)	b. ≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)	score of 12 or above if teachers cover 3 or less lessons)		
		d. Average level of attention given to used steps within each lesson		d. 1–3 (1 = gave only a little attention; 3 = gave a lot of attention)	d. ≥ 2 for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			
		b. Time spent on each lesson / time spent across all lessons		b. 0–200 minutes (varies for each lesson)	b. ≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			
		c. Number of steps used within each lesson / number of steps used across all lessons		c. 0–9 steps (varies for each lesson)	b. ≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			
		d. Average level of attention given to each lesson / average level of attention given across all lessons		d. 1–3 (1 = gave only a little attention; 3 = gave a lot of attention)	d. ≥ 2 for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			

Appendix C. Teacher Background Survey

Dear Teacher,

Thank you in advance for completing this survey! This purpose of this survey is to gather your demographic information and background information in relation to your role as a mathematics teacher. All data you provide will remain confidential and will be used solely for this research study. No data you provide will be shared with your school principal or other school/district administrators or staff. If you have any questions about this survey, please contact Dr. Carole Gallagher at cgallag@wested.org.

1. Name: Please provide your first name, middle initial, and last name below.

First	M.I.	Last

2. Contact Information: Please provide your email address and phone number. We will only use this information to contact you if we have questions about any information you submit for this study.

Email address	Phone Number
	( )

3. School Mailing Address**:** Please provide your school mailing address. We will use this information to send study materials directly to you (e.g., for data collection over the course of this 2-year study).

School Name		
Street		
City	**State**	**Zip code**
	CA	

4. Gender
   ☐Female ☐Male

5. Are you Hispanic or Latino? (Select one or more boxes.)
   ☐No, I am not Hispanic or Latino.
   ☐Yes, I am Mexican, Mexican American, or Chicano.
   ☐Yes, I am Puerto Rican or Puerto Rican American.
   ☐Yes, I am Cuban or Cuban American.
   ☐Yes, I am from some other Hispanic or Latino background.

Please go on→

6. Which of the following best describes you? (Select one or more boxes.)
   ☐ White
   ☐ Black or African American
   ☐ Asian

☐ American Indian or Alaska Native
☐ Native Hawaiian or other Pacific Islander

7. Counting this year, how many years have you worked as an elementary or secondary teacher? Include any full-time teaching assignments, part-time teaching assignments, and long-term substitute assignments, but not student teaching. If less than 4 months total experience, enter "00."

_____ YEARS

8. Counting this year, how many years have you taught mathematics in grades 6 through 12? Include any full-time teaching assignments, part-time teaching assignments, and long-term substitute assignments, but not student teaching. If less than 4 months total experience, enter "00."

_____ YEARS

9. Did you enter teaching through an alternative certification program? (An alternative program is a program that was designed to expedite the transition of non-teachers to a teaching career, for example, a state, district, or university alternative certification program.)
☐Yes ☐No

10. What type of teaching certificate do you hold in the state where you currently teach?
☐Regular or standard state certificate or advanced professional certificate → *Skip to Question 12.*
☐ Certificate issued after satisfying all requirements except the completion of a probationary period →*Go to Question 11.*
☐Certificate that requires some additional coursework, student teaching or passage of a test before regular certification can be obtained →*Go to Question 11.*
☐ Certificate issued to persons who must complete a certification program in order to continue teaching → *Go to Question 11.*
☐I do not hold any of the above certifications in the state where I currently teach → *Go to Question 11.*

Please go on→

11. Do you hold a currently valid regular or standard certification from a state other than the one in which you are currently teaching?
☐Yes ☐No

12. This school year, are you a Highly Qualified Teacher (HQT) according to your state's requirements? (Generally, to be Highly Qualified, teachers must meet requirements related to (1) a bachelor's degree, (2) full state certification, and (3) demonstrate competency in the subject area(s) taught. The HQT requirement is a provision under the No Child Left Behind (NCLB) Act.)
☐Yes
☐I meet my state's requirements for a Highly Qualified Teacher in at least one subject that I teach.
☐No

13. Are you certified by the National Board for Professional Teaching Standards in at least one content area? (The National Board of Professional Teaching Standards is a nongovernmental organization that administers National Board certification, a voluntary national assessment program that certifies teachers who meet high professional standards. In order to gain certification, the candidate must at least complete a portfolio of classroom practice and pass one or more tests of content knowledge.)
    - ☐ Yes, I am fully certified by the National Board for Professional Teaching Standards.
    - ☐ I am working toward my National Board certification.
    - ☐ No

14. What is the highest level of education you have completed? (please select one)
    - ☐ High school diploma
    - ☐ Associate's degree/vocational certification
    - ☐ Bachelor's degree
    - ☐ Master's degree
    - ☐ Education specialist's or professional diploma based on at least one year's work past master's degree
    - ☐ Doctorate
    - ☐ Professional degree (e.g., M.D., LL.B., J.D., D.D.S.)

Please go on→

15. Did you have a major, minor, or special emphasis in any of the following subjects as part of your **undergraduate** coursework? (Select **one** box for each line.)

	Yes, a major	Yes, a minor or special emphasis	No
a. Mathematics education	☐	☐	☐
b. Mathematics	☐	☐	☐
c. Other mathematics-related subject such as statistics	☐	☐	☐
d. Education (including secondary education)	☐	☐	☐

16. Did you have a major, minor, or special emphasis in any of the following subjects as part of your **graduate** coursework? (Select **one** box for each line.)

	Yes, a major	Yes, a minor or special emphasis	No
a. Mathematics education	☐	☐	☐

b. Mathematics	☐	☐	☐
c. Other mathematics-related subject such as statistics	☐	☐	☐
d. Education (including secondary education)	☐	☐	☐

17. In the past two (2) years, have you participated in any professional development activities specifically addressing 8th grade mathematics?

☐Yes ☐No

18. If you answered Yes to question 17, approximately how many days of professional development addressing 8th grade mathematics have you participated in over the past two (2) years?

_____ DAYS

19. Date this survey was completed:

Month	Day	Year
		2012

Thank you very much for completing this survey!

Appendix D. Example Implementation Survey

Implementation Survey for Air Traffic Control

STEM Learning Opportunities Providing Equity

This survey is being administered by WestEd as part of the STEM Learning Opportunities Providing Equity project. This project is funded by the U. S. Department of Education.

STEM Learning Opportunities Providing Equity
Algebra I Implementation Survey: Air Traffic Control (RCT)

Dear teacher,

Thank you in advance for completing this survey! The purpose of this survey is to gather information on the implementation of the project-based math curriculum, the related Coaching & Collaboration, and the College Awareness Curriculum (CAC). All data you provide will remain confidential and will be used solely for this research study. No data you provide will be shared with your school principal or other school/district administrators or staff. If you have any questions about this survey, please contact Carol Whang at (415) 615-3346 or cwhang@wested.org.

1. Name: Please provide your first name, middle initial, and last name below.

First	M.I.	Last

2. Contact Information: Please provide your email address and phone number. We will only use this information to contact you if we have questions about any information you submit for this study.

Email address	Phone Number
	( )

3. Date you started teaching the Air Traffic Control unit (e.g. 9/3/07):_____/_____/____

The Air Traffic Control unit has 8 lessons. Questions 4-29 pertain to the Air Traffic Control lessons.

4. Did you use Lesson 1? Yes ☐ No

If your answer is No, skip questions 5 and 6, then go to question 7. ☐

5. Lesson 1 was anticipated to take 100 minutes (2 periods). Approximately how many minutes did you spend on Lesson 1?

_____minutes

6. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like.

Please tell us how much attention you gave to each step when teaching Lesson 1.

		Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a.	**Introducing** the unit and **showing videos**	☐	☐	☐	☐
b.	Working through **Delta 134** problem	☐	☐	☐	☐
c.	Working through **Southwest 190** problem	☐	☐	☐	☐
d.	Working through **American 722** problem	☐	☐	☐	☐
e.	Discussion of **x- and y-intercept**	☐	☐	☐	☐

7. Did you use Lesson 2?

Yes ☐ No ☐

If your answer is No, skip questions 8 and 9, then go to question 10.

8. Lesson 2 was anticipated to take 75 minutes (1.5 periods). Approximately how many minutes did you spend on Lesson 2?

_____minutes

9. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like.

Please tell us how much attention you gave to each step when teaching Lesson 2.

Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention

a.	Class discussion on **rate of change**	☐	☐	☐	☐
b.	Student pairs completing **Southwest 190** problem	☐	☐	☐	☐
c.	Reviewing **graphing rate of change homework**	☐	☐	☐	☐

10. Did you use Lesson 3? Yes ☐ No ☐

If your answer is No, skip questions 11 and 12, then go to question 13.

11. Lesson 3 was anticipated to take 100 minutes (2 periods). Approximately how many minutes did you spend on Lesson 3? _____minutes

12. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like. Please tell us how much attention you gave to each step when teaching Lesson 3.

		Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a.	Direct instruction on **slope**				
b.	Opening class work **Delta 134** problem				
c.	Student pairs completing **Delta 134** problem				
d.	Reviewing **calculating slopes homework**				
e.	Creation and display of **slope/rate of change posters**				

13. Did you use Lesson 4? Yes ☐ No ☐

If your answer is No, skip questions 14 and 15, then go to question 16.

14. Lesson 4 was anticipated to take 75 minutes (1.5 periods). Approximately how many minutes did you spend on Lesson 4? _____minutes

15. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like. Please tell us how much attention you gave to each step when teaching Lesson 4.	Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a. Discussion of **constant distance**	☐	☐	☐	☐
b. Student pairs completing **American 722** problem	☐	☐	☐	☐
c. Reviewing **parallel lines homework**	☐	☐	☐	☐

16. Did you use Lesson 5? ☐ Yes ☐ No

If your answer is No, skip questions 17 and 18, then go to question 19.

17. Lesson 5 was anticipated to take 75 minutes (1.5 periods). Approximately how many minutes did you spend on Lesson 5? _____minutes

18. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like.

Please tell us how much attention you gave to each step when teaching Lesson 5.

		Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a.	Introduction to **Safe Landings problem**				
b.	Individual work on **Safe Landings problem**				
c.	Reviewing **different solutions to Safe Landings**				

19. Did you use Lesson 6? Yes ☐ No ☐

If your answer is No, skip questions 20 and 21, then go to question 22.

20. Lesson 6 was anticipated to take 150 minutes (3 periods). Approximately how many minutes did you spend on Lesson 6? _____minutes

21. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like.

Please tell us how much attention you gave to each step when teaching Lesson 6.

	Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention

24. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like.	Did not do	Did and gave this step . . . only a little	some	a lot of
a. **Review of previous** in Lesson Introduction	☐	☐	☐	☐
b. Discussion on **slope and linear equation connection**	☐	☐	☐	☐
c. Reviewing **What Is Your Position problem**/Discussion of **calculation of slope from two points**	☐	☐	☐	☐
d. Introduction to **Big Picture /two variable problem**	☐	☐	☐	☐
e. Reviewing **Big Picture problem**	☐	☐	☐	☐
f. Student work on **graphing equations sheet (6.3)**	☐	☐	☐	☐
g. Reviewing **graphing equations sheet (6.3)**	☐	☐	☐	☐

22. Did you use Lesson 7? ☐ Yes ☐ No

If your answer is No, skip questions 23 and 24, then go to question 25.

23. Lesson 7 was anticipated to take 75 minutes (1.5 periods). Approximately how many minutes did you spend on Lesson 7? _____minutes

Please tell us how much attention you gave to each step when teaching Lesson 7.

	Did not do	only a little	some	a lot of
a. Independent work on **Which Form Is Best?** introduction	☐	☐	☐	☐
b. Discussion on **slope-intercept vs. standard form**	☐	☐	☐	☐

c.	Reviewing **What Is Your Position problem/**Discussion of **calculation of slope from two points**	☐	☐	☐	☐
	to give each step as much attention as you would like.	not do	only a		
d.	Finish and review **Which Form is Best?**	☐	☐	☐	☐
e.	Reviewing **Equivalent Forms sheet (7.2)**	☐	☐	☐	☐

25. Did you use Lesson 8? Yes ☐ No ☐

If your answer is No, skip questions 26 and 27, then go to question 28.

26. Lesson 8 was anticipated to take 150 minutes (3 periods). Approximately how many minutes did you spend on Lesson 8? _____minutes

27. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like.

Please tell us how much attention you gave to each step when teaching Lesson 8.

		Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a.	Showing **computer simulation**	☐	☐	☐	☐
b.	Introducing the **5 plane problem**	☐	☐	☐	☐
c.	Students work in groups to solve	☐	☐	☐	☐
d.	**Group presentations** on possible solutions				

28. Overall, across all lessons, to what extent was each of the following things a challenge for you when teaching the Air Traffic Control unit?

		Not a challenge				A major challenge
a.	The amount of content in the unit	☐	☐	☐	☐	☐
b.	The difficulty of the ideas and concepts in the unit	☐	☐	☐	☐	☐
c.	The amount of time it took to complete the unit	☐	☐	☐	☐	☐
d.	The classroom management demands of the unit	☐	☐	☐	☐	☐
e.	The physical materials management demands of the unit	☐	☐	☐	☐	☐
f.	Motivating students to engage seriously in the unit	☐	☐	☐	☐	☐
g.	Students with adequate reading and writing skills for the unit	☐	☐	☐	☐	☐
h.	Students with adequate prior math skills for the unit	☐	☐	☐	☐	☐
i.	Students with adequate self-management skills for the unit	☐	☐	☐	☐	☐
j.	Students with adequate teamwork skills for the unit	☐	☐	☐	☐	☐
k.	Students with adequate problem-solving skills for the unit	☐	☐	☐	☐	☐
l.	Too many students in the class(es)	☐	☐	☐	☐	☐

29. Please provide any other information about teaching this unit that you think would be useful. Use an additional page if necessary.

28. Overall, across all lessons, to what extent was each of the

Not a

A major

Questions 30-32 pertain to the weekly online Coaching & Collaboration support provided for this program.

30. How many hours of Coaching & Collaboration did you participate in for this unit?

Coaching & Collaboration Hours for Air Traffic Control
_____Hours

31. Please tell us how you spent your Coaching & Collaboration time for Air Traffic Control.

		Did not do	Did and gave this step . . . only a little time	some time	a lot of time
a.	Discussing implementation of the lessons	☐	☐	☐	☐
b.	Discussing common student misconceptions	☐	☐	☐	☐
c.	Reviewing student work and determining next steps	☐	☐	☐	☐
d.	Discussing math concepts used in the unit	☐	☐	☐	☐
e.	Discussing ways of engaging students	☐	☐	☐	☐
f.	Discussing ways to connect Drop-in Unit to textbook	☐	☐	☐	☐
g.	Discussing ways to enrich textbook lessons	☐	☐	☐	☐
h.	Discussing ways to assess student learning	☐	☐	☐	☐

32. Please provide any other information about the Coaching & Collaboration support for this unit that you think would be useful. Use an additional page if necessary.

Questions 33-38 pertain to the College Awareness Curriculum (CAC) for this unit.

33. How much time (number of minutes) did students spend engaged in College Awareness Curriculum (CAC) activities during this unit?

Total Number of Minutes Spent on CAC Activities This Unit
_____minutes

Please report on the two CAC activities/modules that you used. (Note: You may have implemented more than 2 CAC activities for this unit, however, we only require you to report on two.)

34. Name of one CAC activity/module used to reinforce instruction during this unit: _____

35. To what extent was each of the following a challenge for you when teaching the CAC activity you named in question 34?

		Not a challenge				A major challenge
a.	Relevance of the content of the activity to middle school students	☐	☐	☐	☐	☐
b.	Completing the activity within the 15 minute limit	☐	☐	☐	☐	☐
c.	Motivating students to engage in the activity	☐	☐	☐	☐	☐
d.	Integrating the activity with math instruction	☐	☐	☐	☐	☐
e.	Too many students in the class(es)	☐	☐	☐	☐	☐

36. Name of another CAC activity/module used to reinforce instruction during this unit: _____

37. To what extent was each of the following a challenge for you when teaching the CAC activity you named in question 36?

		Not a challenge				A major challenge

a.	Relevance of the content of the activity to middle school students	☐	☐	☐	☐	☐
b.	Completing the activity within the 15 minute limit	☐	☐	☐	☐	☐
c.	Motivating students to engage in the activity	☐	☐	☐	☐	☐
d.	Integrating the activity with math instruction	☐	☐	☐	☐	☐
e.	Too many students in the class(es)	☐	☐	☐	☐	☐

38. Please provide any other information about the College Awareness Curriculum (CAC) activities that you think would be useful. Use an additional page if necessary.

_____

THANK YOU VERY MUCH FOR COMPLETING THIS SURVEY!

Please place your completed survey in the business reply envelope (provided) and place the envelope in the mail (no postage is necessary). We appreciate you returning this survey as soon as you complete it.

Implementation Survey for Air Traffic Control

STEM Learning Opportunities Providing Equity

This survey is being administered by WestEd as part of the STEM Learning Opportunities Providing Equity project. This project is funded by the U. S. Department of Education.

STEM Learning Opportunities Providing Equity
Algebra I Implementation Survey: Air Traffic Control (RCT)

Dear teacher,

Thank you in advance for completing this survey! The purpose of this survey is to gather information on the implementation of the project-based math curriculum, the related Coaching & Collaboration, and the College Awareness Curriculum (CAC). All data you provide will remain confidential and will be used solely for this research study. No data you provide will be shared with your school principal or other school/district administrators or staff. If you have any questions about this survey, please contact Carol Whang at (415) 615-3346 or cwhang@wested.org.

1. Name: Please provide your first name, middle initial, and last name below.

First	M.I.	Last

2. Contact Information: Please provide your email address and phone number. We will only use this information to contact you if we have questions about any information you submit for this study.

Email address	Phone Number
	( )

3. Date you started teaching the Air Traffic Control unit (e.g. 9/3/07):_____/_____/____

The Air Traffic Control unit has 8 lessons. Questions 4-29 pertain to the Air Traffic Control lessons.

4. Did you use Lesson 1? Yes ☐ No ☐

If your answer is No, skip questions 5 and 6, then go to question 7.

5. Lesson 1 was anticipated to take 100 minutes (2 periods). Approximately how many minutes did you spend on Lesson 1? _____minutes

6. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like. Please tell us how much attention you gave to each step when teaching Lesson 1.	Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a. **Introducing** the unit and **showing videos**	☐	☐	☐	☐
b. Working through **Delta 134** problem	☐	☐	☐	☐
c. Working through **Southwest 190** problem	☐	☐	☐	☐
d. Working through **American 722** problem	☐	☐	☐	☐
e. Discussion of **x- and y-intercept**	☐	☐	☐	☐

7. Did you use Lesson 2? Yes ☐ No ☐

If your answer is No, skip questions 8 and 9, then go to question 10.

8. Lesson 2 was anticipated to take 75 minutes (1.5 periods). Approximately how many minutes did you spend on Lesson 2? _____minutes

9. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like. Please tell us how much attention you gave to each step when teaching Lesson 2.	Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a. Class discussion on **rate of change**	☐	☐	☐	☐
b. Student pairs completing **Southwest 190** problem	☐	☐	☐	☐
c. Reviewing **graphing rate of change homework**	☐	☐	☐	☐

10. Did you use Lesson 3? Yes ☐ No ☐

If your answer is No, skip questions 11 and 12, then go to question 13.

11. Lesson 3 was anticipated to take 100 minutes (2 periods). Approximately how many minutes did you spend on Lesson 3? _____minutes

12. Often, it is impossible to do all the steps in a lesson or Did Did and gave this step . . .

	to give each step as much attention as you would like. Please tell us how much attention you gave to each step when teaching Lesson 3.	not do	only a attention	some attention	a lot of attention
a.	Direct instruction on **slope**				
b.	Opening class work **Delta 134** problem				
c.	Student pairs completing **Delta 134** problem				
d.	Reviewing **calculating slopes homework**				
e.	Creation and display of **slope/rate of change posters**				

13. Did you use Lesson 4? Yes ☐ No ☐

If your answer is No, skip questions 14 and 15, then go to question 16.

14. Lesson 4 was anticipated to take 75 minutes (1.5 periods). Approximately how many minutes did you spend on Lesson 4? _____minutes

	15. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like. Please tell us how much attention you gave to each step when teaching Lesson 4.	Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a.	Discussion of **constant distance**	☐	☐	☐	☐
b.	Student pairs completing **American 722** problem	☐	☐	☐	☐
c.	Reviewing **parallel lines homework**	☐	☐	☐	☐

16. Did you use Lesson 5? Yes ☐ No ☐

If your answer is No, skip questions 17 and 18, then go to question 19.

17. Lesson 5 was anticipated to take 75 minutes (1.5 periods). Approximately how many minutes did you spend on Lesson 5? _____minutes

18. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like. Please tell us how much attention you gave to each step when teaching Lesson 5.	Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a. Introduction to **Safe Landings problem**				
b. Individual work on **Safe Landings problem**				
c. Reviewing **different solutions to Safe Landings**				

19. Did you use Lesson 6? Yes ☐ No ☐

If your answer is No, skip questions 20 and 21, then go to question 22.

20. Lesson 6 was anticipated to take 150 minutes (3 periods). Approximately how many minutes did you spend on Lesson 6? _____minutes

21. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like. Please tell us how much attention you gave to each step when teaching Lesson 6.	Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a. **Review of previous** in Lesson Introduction	☐	☐	☐	☐
b. Discussion on **slope and linear equation connection**	☐	☐	☐	☐
c. Reviewing **What Is Your Position problem**/Discussion of **calculation of slope from two points**	☐	☐	☐	☐
d. Introduction to **Big Picture /two variable problem**	☐	☐	☐	☐
e. Reviewing **Big Picture problem**	☐	☐	☐	☐
f. Student work on **graphing equations sheet (6.3)**	☐	☐	☐	☐
g. Reviewing **graphing equations sheet (6.3)**	☐	☐	☐	☐

22. Did you use Lesson 7? Yes ☐ No ☐

If your answer is No, skip questions 23 and 24, then go to question 25.

23. Lesson 7 was anticipated to take 75 minutes (1.5 periods). Approximately how many minutes did you spend on Lesson 7? _____minutes

24. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like. Please tell us how much attention you gave to each step when teaching Lesson 7.	Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a. Independent work on **Which Form Is Best?** introduction	☐	☐	☐	☐
b. Discussion on **slope-intercept vs. standard form**	☐	☐	☐	☐
c. Reviewing **What Is Your Position problem/**Discussion of **calculation of slope from two points**	☐	☐	☐	☐
d. Finish and review **Which Form is Best?**	☐	☐	☐	☐
e. Reviewing **Equivalent Forms sheet (7.2)**	☐	☐	☐	☐

25. Did you use Lesson 8? Yes ☐ No ☐

If your answer is No, skip questions 26 and 27, then go to question 28.

26. Lesson 8 was anticipated to take 150 minutes (3 periods). Approximately how many minutes did you spend on Lesson 8? _____minutes

27. Often, it is impossible to do all the steps in a lesson or to give each step as much attention as you would like. Please tell us how much attention you gave to each step when teaching Lesson 8.	Did not do	Did and gave this step . . . only a little attention	some attention	a lot of attention
a. Showing **computer simulation**	☐	☐	☐	☐
b. Introducing the **5 plane problem**	☐	☐	☐	☐
c. Students work in groups to solve	☐	☐	☐	☐
d. **Group presentations** on possible solutions				

28. Overall, across all lessons, to what extent was each of the following things a challenge for you when teaching the Air Traffic Control unit?

		Not a challenge				A major challenge
a.	The amount of content in the unit	☐	☐	☐	☐	☐
b.	The difficulty of the ideas and concepts in the unit	☐	☐	☐	☐	☐
c.	The amount of time it took to complete the unit	☐	☐	☐	☐	☐
d.	The classroom management demands of the unit	☐	☐	☐	☐	☐
e.	The physical materials management demands of the unit	☐	☐	☐	☐	☐
f.	Motivating students to engage seriously in the unit	☐	☐	☐	☐	☐
g.	Students with adequate reading and writing skills for the unit	☐	☐	☐	☐	☐
h.	Students with adequate prior math skills for the unit	☐	☐	☐	☐	☐
i.	Students with adequate self-management skills for the unit	☐	☐	☐	☐	☐
j.	Students with adequate teamwork skills for the unit	☐	☐	☐	☐	☐
k.	Students with adequate problem-solving skills for the unit	☐	☐	☐	☐	☐
l.	Too many students in the class(es)	☐	☐	☐	☐	☐

29. Please provide any other information about teaching this unit that you think would be useful. Use an additional page if necessary.

_____

_____

_____

Questions 30-32 pertain to the weekly online Coaching & Collaboration support provided for this program.

30. How many hours of Coaching & Collaboration did you participate in for this unit?

Coaching & Collaboration Hours for Air Traffic Control
_____Hours

31. Please tell us how you spent your Coaching & Collaboration time for Air Traffic Control.

		Did not do	Did and gave this step . . . only a little time	some time	a lot of time
a.	Discussing implementation of the lessons	☐	☐	☐	☐
b.	Discussing common student misconceptions	☐	☐	☐	☐
c.	Reviewing student work and determining next steps	☐	☐	☐	☐
d.	Discussing math concepts used in the unit	☐	☐	☐	☐
e.	Discussing ways of engaging students	☐	☐	☐	☐
f.	Discussing ways to connect Drop-in Unit to textbook	☐	☐	☐	☐
g.	Discussing ways to enrich textbook lessons	☐	☐	☐	☐
h.	Discussing ways to assess student learning	☐	☐	☐	☐

32. Please provide any other information about the Coaching & Collaboration support for this unit that you think would be useful. Use an additional page if necessary.

_____

_____

_____

Questions 33-38 pertain to the College Awareness Curriculum (CAC) for this unit.

33. How much time (number of minutes) did students spend engaged in College Awareness Curriculum (CAC) activities during this unit?

Total Number of Minutes Spent on CAC Activities This Unit
_____minutes

Please report on the two CAC activities/modules that you used. (Note: You may have implemented more than 2 CAC activities for this unit, however, we only require you to report on two.)

34. Name of one CAC activity/module used to reinforce instruction during this unit: _____

35. To what extent was each of the following a challenge for you when teaching the CAC activity you named in question 34?

		Not a challenge				A major challenge
a.	Relevance of the content of the activity to middle school students	☐	☐	☐	☐	☐
b.	Completing the activity within the 15 minute limit	☐	☐	☐	☐	☐
c.	Motivating students to engage in the activity	☐	☐	☐	☐	☐
d.	Integrating the activity with math instruction	☐	☐	☐	☐	☐
e.	Too many students in the class(es)	☐	☐	☐	☐	☐

36. Name of another CAC activity/module used to reinforce instruction during this unit: _____

37. To what extent was each of the following a challenge for you when teaching the CAC activity you named in question 36?

		Not a challenge				A major challenge
a.	Relevance of the content of the activity to middle school students	☐	☐	☐	☐	☐
b.	Completing the activity within the 15 minute limit	☐	☐	☐	☐	☐
c.	Motivating students to engage in the activity	☐	☐	☐	☐	☐
d.	Integrating the activity with math instruction	☐	☐	☐	☐	☐
e.	Too many students in the class(es)	☐	☐	☐	☐	☐

38. Please provide any other information about the College Awareness Curriculum (CAC) activities that you think would be useful. Use an additional page if necessary.

_____

_____

THANK YOU VERY MUCH FOR COMPLETING THIS SURVEY!

Please place your completed survey in the business reply envelope (provided) and place the envelope in the mail (no postage is necessary). We appreciate you returning this survey as soon as you complete it.

2012-2013 Measuring Fidelity of Implementation for Algebra I Drop-in Units: DEV11 (SLOPE)								
	Component Description	**Operational Definition**	**Data Collection Measure**	**Possible Implementation Range**	**Expected Teacher-level Implementation with Fidelity / Corresponding Score**	**Teacher-level Composite Score / Criterion for Adequate (implementation "with fidelity")**	**Program-level Criterion for Adequate (implementation "with fidelity")**	**Considered "with fidelity" for Year 1**
Component I. Curricular Materials								
1	Year 1 Materials	Teacher receives all curriculum materials for intervention	Receipt verification from implementation team	No or Yes	Received materials / No or Yes: 0-1	0-1 Adequate: 1	100% of teachers meet criterion	No or Yes
Component II. Algebra I PD-Year 1 (online)								
2	Year 1 PD for Algebra 1 (3 half-day online sessions) for all treatment teachers	Teacher attends training for implementing ConnectEd Algebra I curriculum	Attendance record/log from implementation team	0–12 hours	Attended all 12 hours / No or Yes: 0-1	0-2 Adequate: 2	80% of teachers met criterion	No or Yes
3	Year 1 Orientation workshop for Algebra I College Awareness (4 hours) for all treatment teachers	Teacher attends training for implementing RTF college awareness curriculum	Attendance record/log from implementation team	0–4 hours	Participated / No or Yes: 0-1			

Component III. Coaching (online)								
4	Y1 Algebra 1 Coaching and Collaboration for all treatment teachers (online sessions scheduled for 1-3 hours/week): Unit 1	Teacher discusses at least one issue with coach and/or interacts with coach and other teachers	Algebra I Implementation Survey for Puzzle Cube (Questions 19-21), and/or coaching log	0–3 hrs per week	Participated at least 1 hour per week / No or Yes: 0-1	0-3 Adequate: 3	80% of teachers met criterion	No or Yes
5	Y1 Algebra 1 Coaching and Collaboration for all treatment teachers (online sessions scheduled for 1-3 hours/week): Unit 2	Teacher discusses at least one issue with coach and/or interacts with coach and other teachers	Algebra I Implementation Survey for Air Traffic Control (Questions 28-30), and/or coaching log	0–3 hrs per week	Participated at least 1 hour per week / No or Yes: 0-1			
6	Y1 Algebra 1 Coaching and Collaboration for all treatment teachers (online sessions scheduled for 1-3 hours/week): Unit 3	Teacher discusses at least one issue with coach and/or interacts with coach and other teachers	Algebra I Implementation Survey for Catapult Game (Questions 19-21), and/or coaching log	0–3 hrs per week	Participated at least 1 hour per week / No or Yes: 0-1			

Components IV-a, IV-b, IV-c. Teacher Implementation of Classroom Intervention (Algebra I Units 1, 2, and 3 Respectively)								
	Component: 3 Algebra I units	**Operational Definition**	**Data Collection Measure**	**Possible Implementation Range**	**Expected Teacher-level Implementation with Fidelity / Corresponding Score**	**Teacher-level Composite Score / Criterion for Adequate (implementation "with fidelity")**	**Program-level Criterion for Adequate (implementation "with fidelity")**	**Considered "with fidelity" for Year 1**
7 IV-a	Y1 Algebra I: Implementation of Algebra Drop-in Unit 1	Teacher implements ConnectEd math curriculum as trained in PD	Algebra I Implementation Survey for Puzzle Cube (Questions 2-18)					
		a. Number of lessons used		a. 0–5 lessons	a. ≥ 80% of implementation range (i.e., 4 lessons) / No or Yes: 0-1	**0-16** Adequate: ≥ 75% of possible highest composite score; i.e., **the score for implementation with fidelity is at least 12** (this indicates that the minimal number of lessons to be taught is 4; no way to reach a score of 12 or above if teachers cover 3 or less lessons)	80% of teachers meet criterion	No or Yes
		b. Time spent on each lesson		b. 0–150 minutes (varies for each lesson)	b. ≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			
		c. Number of steps used within each lesson		c. 0–8 steps (varies for each lesson)	b. ≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			

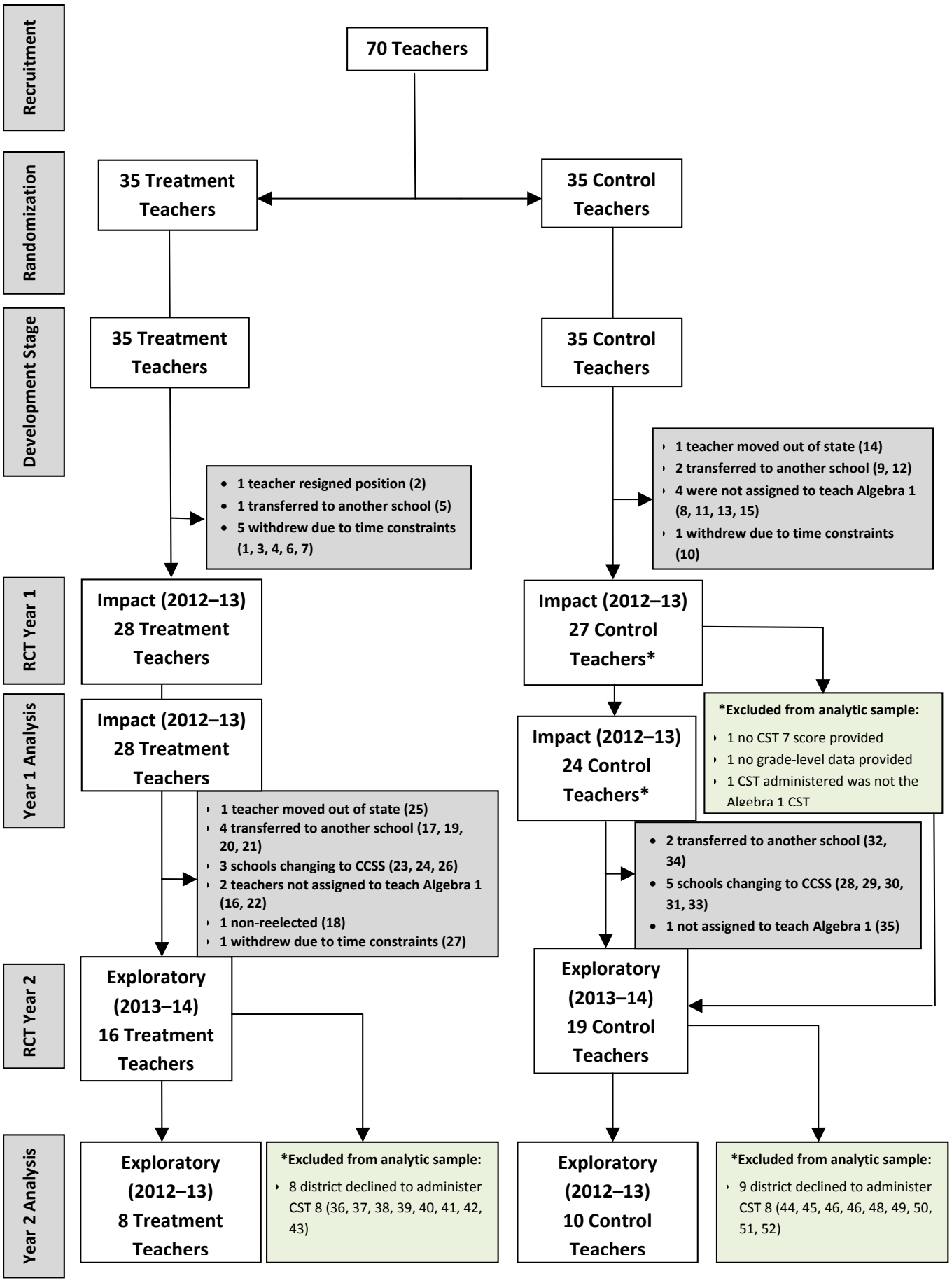
		d. Average level of attention given to used steps within each lesson		d. 1–3 (1 = gave only a little attention; 3 = gave a lot of attention)	d. ≥ 2 for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			
8 IV-b	Y1 Algebra I: Implementation of Algebra Drop-in Unit 2	Teacher implements ConnectEd math curriculum as trained in PD	Algebra I Implementation Survey for Air Traffic Control (Questions 2-27)					
		a. Number of lessons used		a. 0–8 lessons	a. ≥ 75% of implementation range (i.e., 6 lessons) / No or Yes: 0-1	**0-25** Adequate: ≥ 72% of possible highest composite score; i.e., **the score for implementation with fidelity is at least 18** (this indicates that the minimal number of lessons to be taught is 6; no way to reach a score of 18 or above if teachers cover 5 or less lessons)	80% of teachers meet criterion	No or Yes
		b. Time spent on each lesson		b. 0–150 minutes (varies for each lesson)	b. ≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-8 across all lessons)			
		c. Number of steps used within each lesson		c. 0–7 steps (varies for each lesson)	b. ≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-8 across all lessons)			
		d. Average level of attention given to each lesson		d. 1–3 (1 = gave only a little attention; 3 = gave a lot of attention)	d. ≥ 2 for each taught lesson / No or Yes: 0-1 for each taught lesson (0-8 across all			

					lessons)			
9 IV-c	Y1 Algebra I: Implementation of Algebra Drop-in Unit 3	Teacher implements ConnectEd math curriculum as trained in PD	Algebra I Implementation Survey for Catapult Game (Questions 2-18)					
		a. Number of lessons used		a. 0–5 lessons	a. ≥ 80% of implementation range (i.e., 4 lessons) / No or Yes: 0-1	**0-16** Adequate: ≥ 75% of possible highest composite score; i.e., **the score for implementation with fidelity is at least 12** (this indicates that the minimal number of lessons to be taught is 4; no way to reach a score of 12 or above if teachers cover 3 or less lessons)	80% of teachers meet criterion	No or Yes
		b. Time spent on each lesson / time spent across all lessons		b. 0–200 minutes (varies for each lesson)	b. ≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			
		c. Number of steps used within each lesson / number of steps used across all lessons		c. 0–9 steps (varies for each lesson)	b. ≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			
		d. Average level of attention given to each lesson / average level of attention		d. 1–3 (1 = gave only a little attention; 3 = gave a lot of attention)	d. ≥ 2 for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)			

		given across all lessons						

Components IV-d, IV-e, IV-f. College Awareness Curriculum (Units 1, 2, and 3 Respectively)								
	Component:3 College Awareness Curriculum units	**Operational Definition**	**Data Collection Measure**	**Possible Implementation Range**	**Expected Teacher-level Implementation with Fidelity / Corresponding Score**	**Teacher-level Composite Score / Criterion for Adequate (implementation "with fidelity")**	**Program-level Criterion for Adequate(implementation "with fidelity")**	**Considered "with fidelity" for Year 1**
10 IV-d	Y1 Algebra I: Implementation of CAC Unit 1	Teacher implements RTF college awareness curriculum (2 activities) as trained in PD	Algebra I Implementation Survey for Puzzle Cube (Questions 22-27)	0–30 minutes (no more than 15 minutes per activity)	≤ 30 minutes / No or Yes: 0-1	0-3 Adequate: 3	80% of teachers meet criterion	No or Yes
11 IV-e	Y1 Algebra I: Implementation of CAC Unit 2	Teacher implements RTF college awareness curriculum (2 activities) as trained in PD	Algebra I Implementation Survey for Air Traffic Control (Questions 31-36)	0–30 minutes (no more than 15 minutes per activity)	≤ 30 minutes / No or Yes: 0-1			
12 IV-f	Y1 Algebra I: Implementation of CAC Unit 3	Teacher implements RTF college awareness curriculum (2 activities) as trained in PD	Algebra I Implementation Survey for Catapult Game (Questions 22-27)	0–30 minutes (no more than 15 minutes per activity)	≤ 30 minutes / No or Yes: 0-1			

Teacher-Level Participation in i3 SLOPE Evaluation (2011–2014) Appendix F



Findings from Evaluator Study of Implementation: IMPLEMENTATION YEAR 1

Enter calendar year: Summer 2012 plus September 2012-June 2013

Intervention Components: Copy from list above	Implementation measure (total number of measurable indicators representing each component	Sample Size at the Sample Level (# of schools, districts, etc)	Representativeness of sample: Measured on All (A), Some (S), or None (N) of the units representing the intervention group in the impact analyses[b]	Component Level Threshold for Fidelity of Implementation for the Unit that is the Basis for the Sample-Level	Evaluator's Criteria for "Implemented with Fidelity" at Sample Level	Component Level Fidelity Score for the Entire Sample	Implemented with Fidelity? (Yes, No, N/A)
Planned Intervention Activities [i.e., key components]							
C.A.M.P. Curricular Materials	Teacher receives all curriculum materials for intervention	24 treatment teachers	A	Received materials / No or Yes: 0-1	100%	100%	Yes
C.A.M.P. Professional Development	Year 1 PD for Summer C.A.M.P. (5 full-day meetings) for treatment teachers Year 1 Orientation workshop for Summer C.A.M.P. College Awareness (4 hours) for all treatment College Awareness Instructors	24 treatment teachers	A	Teachers participated in all 5 days of PD for Summer C.A.M.P. AND College Awareness instructors participated in all four hours of CAC training.	80%	100%	Yes
C.A.M.P. Coaching	Y1 Pre-Algebra Coaching and Collaboration for all treatment teachers (online sessions scheduled for 1 hour/week): Units 1-3	23 treatment teachers	S	Teachers participated in a minimum of one hour of Coaching/ Collaboration time per week for EACH unit (units 1-3)	80%	78%	No
C.A.M.P. Teacher Implementation of Classroom Intervention: Unit 1	a. Number of lessons used (≥ 80% of implementation range i.e., 4 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons))	24 treatment teachers	A	Adequate: >= 75% of possible highest composite score; i.e., the score for implementation with fidelity is at least 12 (this indicates that the minimal number of lessons to be taught is 4; no way to reach a score of 12 or above if teachers cover 3 or less lessons)	80%	79%	No

	c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) d. Average level of attention given to each lesson (moderate level of attention for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons))						
C.A.M.P. Teacher Implementation of Classroom Intervention: Unit 2	a. Number of lessons used (≥ 70% of implementation range i.e., 5 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-7 across all lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-7 across all lessons)) d. Average level of attention given to each lesson (moderate level of attention for each	23 treatment teachers	S	Adequate: >= 72% of possible highest composite score; i.e., the score for implementation with fidelity is at least 16 (this indicates that the minimal number of lessons to be taught is 5; no way to reach a score of 16 or above if teachers cover 4 or less lessons)	80%	61%	No

	taught lesson / No or Yes: 0-1 for each taught lesson (0-7 across all lessons))						
C.A.M.P. Teacher Implementation of Classroom Intervention: Unit 3	a. Number of lessons used (≥ 80% of implementation range i.e., 4 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) d. Average level of attention given to each lesson (moderate level of attention for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons))	23 treatment teachers	S	Adequate: >= 75% of possible highest composite score; i.e., the score for implementation with fidelity is at least 12 (this indicates that the minimal number of lessons to be taught is 4; no way to reach a score of 12 or above if teachers cover 3 or less lessons)	80%	39%	No
C.A.M.P. College Awareness Curriculum	Teacher implements RTF college awareness curriculum as trained in PD: Units 1-3	24 treatment teachers	A	All three CAC units are presented in treatment classrooms	80%	74%	No
Algebra I Curricular Materials	Teacher receives all curriculum materials for intervention	28 treatment teachers	A	Received materials / No or Yes: 0-1	100%	100%	Yes

Algebra I Professional Development	Teacher attends training for implementing ConnectEd Algebra I curriculum Teacher attends training for implementing RTF college awareness curriculum	28 treatment teachers	A	Teachers participated in all 5 days of PD for Summer C.A.M.P. AND participated in all four hours of CAC training.	80%	96%	Yes
Algebra I Coaching	Y1 Algebra 1 Coaching and Collaboration for all treatment teachers (online sessions scheduled for 1-3 hours/week): Units 1-3	28 treatment teachers	A	Teachers participated in a minimum of one hour of Coaching/ Collaboration time per week for EACH unit (units 1-3)	80%	57%	No
Algebra I Teacher Implementation of Classroom Intervention: Unit 1	a. Number of lessons used (≥ 80% of implementation range i.e., 4 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) d. Average level of attention given to each lesson (moderate level of attention for each	28 treatment teachers	A	Adequate: ≥ 75% of possible highest composite score; i.e., the score for implementation with fidelity is at least 12 (this indicates that the minimal number of lessons to be taught is 4; no way to reach a score of 12 or above if teachers cover 3 or less lessons)	80%	89%	Yes

	taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons))						
Algebra I Teacher Implementation of Classroom Intervention: Unit 2	a. Number of lessons used (≥ 75% of implementation range i.e., 6 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-8 across all lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-8 across all lessons)) d. Average level of attention given to each lesson (moderate level of attention for each taught lesson / No or Yes: 0-1 for each taught lesson (0-8 across all lessons))	28 treatment teachers	A	Adequate: ≥ 72% of possible highest composite score; i.e., the score for implementation with fidelity is at least 18 (this indicates that the minimal number of lessons to be taught is 6; no way to reach a score of 18 or above if teachers cover 5 or less lessons)	80%	64%	No
Algebra I Teacher Implementation of Classroom Intervention: Unit 3	a. Number of lessons used (≥ 80% of implementation range i.e., 4 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught	28 treatment teachers	A	Adequate: ≥ 75% of possible highest composite score; i.e., the score for implementation with fidelity is at least 12 (this indicates that the minimal number of lessons to be taught is 4; no way to reach a score of 12 or above if	80%	75%	No

	lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) d. Average level of attention given to each lesson (moderate level of attention for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons))			teachers cover 3 or less lessons)			
Algebra I College Awareness Curriculum	Teacher implements RTF college awareness curriculum (2 activities) as trained in PD: Units 1-3	28 treatment teachers	A	Two activities (for a maximum of 30 minutes) are implemented in the treatment classrooms.	80%	29%	No

[a] Mediators refer to measurement of short-term outcomes, e.g., changes in student/teacher/parent behaviors or attitudes that are assumed to have a direct connection to long-term outcomes. If these mediators have been measured in both the treatment and comparison groups **and** are being reported as part of an exploratory contrast, they should not be entered here. If these mediators have been measured in the treatment group only or in both the treatment and the comparison group **and** are not being reported as part of an exploratory contrast, the findings for just the treatment group would be reported here. If evaluators believe they have findings on mediators to report, they should consult with their TA Liaison or the AR helpdesk to confirm that the findings are appropriate for this section of the Survey.

[b] *All*: If the intervention group in the impact analysis includes 10 schools and fidelity measurement includes these 10 schools, the evaluator would enter "A" indicating that All of the schools in the impact analysis are represented in the fidelity findings. *Some*: If the intervention group in the impact analysis includes teachers in grades K to 3 but fidelity is measured only for teachers in Kindergarten, the evaluator would enter "S" indicating that Some of the teachers in the impact analysis are represented in the fidelity findings. *None*: If the intervention group in the impact analysis includes grades 7 - 9 but fidelity is measured only for grades 5-6, the evaluator would enter "N" indicating that None of the grades in the impact analysis are represented in the fidelity findings.

Findings from Evaluator Study of Implementation: IMPLEMENTATION YEAR 2

Enter calendar year: Summer 2013 plus September 2013-June 2014

Intervention Components: Copy from list above	Implementation measure (total number of measurable indicators representing each component	Sample Size at the Sample Level (# of schools, districts, etc)	Representativeness of sample: Measured on All (A), Some (S), or None (N) of the units representing the intervention group in the impact analyses[b]	Component Level Threshold for Fidelity of Implementation for the Unit that is the Basis for the Sample-Level	Evaluator's Criteria for "Implemented with Fidelity" at Sample Level	Component Level Fidelity Score for the Entire Sample	Implemented with Fidelity? (Yes, No, N/A)
Planned Intervention Activities [i.e., key components]							
C.A.M.P. Curricular Materials	Teacher receives all curriculum materials for intervention	14 treatment teachers	S	Received materials / No or Yes: 0-1	100%	100%	Yes
C.A.M.P. Professional Development	Year 1 PD for Summer C.A.M.P. (5 full-day meetings) for treatment teachers Year 1 Orientation workshop for Summer C.A.M.P. College Awareness (4 hours) for all treatment College Awareness Instructors	14 treatment teachers	S	Teachers participated in all 5 days of PD for Summer C.A.M.P. AND College Awareness instructors participated in all four hours of CAC training.	80%	100%	Yes
C.A.M.P. Coaching	Y1 Pre-Algebra Coaching and Collaboration for all treatment teachers (online sessions scheduled for 1 hour/week): Units 1-3	14 treatment teachers	S	Teachers participated in a minimum of one hour of Coaching/ Collaboration time per week for EACH unit (units 1-3)	80%	36%	No
C.A.M.P. Teacher Implementation of Classroom Intervention: Unit 1	a. Number of lessons used (≥ 80% of implementation range i.e., 4 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all	14 treatment teachers	S	Adequate: >= 75% of possible highest composite score; i.e., the score for implementation with fidelity is at least 12 (this indicates that the minimal number of lessons to be taught is 4; no way to reach a score of 12 or above if teachers cover 3 or less lessons)	80%	21%	No

	lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) d. Average level of attention given to each lesson (moderate level of attention for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons))						
C.A.M.P. Teacher Implementation of Classroom Intervention: Unit 2	a. Number of lessons used (≥ 70% of implementation range i.e., 5 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-7 across all lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-7 across all lessons)) d. Average level of attention given to each lesson	14 treatment teachers	S	Adequate: >= 72% of possible highest composite score; i.e., the score for implementation with fidelity is at least 16 (this indicates that the minimal number of lessons to be taught is 5; no way to reach a score of 16 or above if teachers cover 4 or less lessons)	80%	21%	No

	(moderate level of attention for each taught lesson / No or Yes: 0-1 for each taught lesson (0-7 across all lessons))						
C.A.M.P. Teacher Implementation of Classroom Intervention: Unit 3	a. Number of lessons used (≥ 80% of implementation range i.e., 4 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) d. Average level of attention given to each lesson (moderate level of attention for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons))	14 treatment teachers	S	Adequate: >= 75% of possible highest composite score; i.e., the score for implementation with fidelity is at least 12 (this indicates that the minimal number of lessons to be taught is 4; no way to reach a score of 12 or above if teachers cover 3 or less lessons)	80%	21%	No
C.A.M.P. College Awareness Curriculum	Teacher implements RTF college awareness curriculum as trained in PD: Units 1-3	14 treatment teachers	S	All three CAC units are presented in treatment classrooms	80%	79%	No
Algebra I Curricular Materials	Teacher receives all curriculum materials	16 treatment teachers	S	Received materials / No or Yes: 0-1	100%	100%	Yes

	for intervention						
Algebra I Professional Development	Teacher attends training for implementing ConnectEd Algebra I curriculum Teacher attends training for implementing RTF college awareness curriculum	16 treatment teachers	S	Teachers participated in all 5 days of PD for Summer C.A.M.P. AND participated in all four hours of CAC training.	80%	88%	Yes
Algebra I Coaching	Y1 Algebra 1 Coaching and Collaboration for all treatment teachers (online sessions scheduled for 1-3 hours/week): Units 1-3	16 treatment teachers	S	Teachers participated in a minimum of one hour of Coaching/ Collaboration time per week for EACH unit (units 1-3)	80%	81%	Yes
Algebra I Teacher Implementation of Classroom Intervention: Unit 1	a. Number of lessons used (≥ 80% of implementation range i.e., 4 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) d. Average level of attention given to each lesson (moderate level of	16 treatment teachers	S	Adequate: ≥ 75% of possible highest composite score; i.e., the score for implementation with fidelity is at least 12 (this indicates that the minimal number of lessons to be taught is 4; no way to reach a score of 12 or above if teachers cover 3 or less lessons)	80%	94%	Yes

	attention for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons))						
Algebra I Teacher Implementation of Classroom Intervention: Unit 2	a. Number of lessons used (≥ 72% of implementation range i.e., 5 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-7 across all lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-7 across all lessons)) d. Average level of attention given to each lesson (moderate level of attention for each taught lesson / No or Yes: 0-1 for each taught lesson (0-7 across all lessons))	16 treatment teachers	S	Adequate: ≥ 72% of possible highest composite score; i.e., the score for implementation with fidelity is at least 16 (this indicates that the minimal number of lessons to be taught is 5; no way to reach a score of 16 or above if teachers cover 4 or less lessons)	80%	81%	Yes
Algebra I Teacher Implementation of Classroom Intervention: Unit 3	a. Number of lessons used (≥ 80% of implementation range i.e., 4 lessons / No or Yes: 0-1) b. Time spent on each lesson (≥ 70% of implementation range for each taught	16 treatment teachers	S	Adequate: ≥ 75% of possible highest composite score; i.e., the score for implementation with fidelity is at least 12 (this indicates that the minimal number of lessons to be taught is 4; no way to reach a score of 12 or above if	80%	50%	No

	lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) c. Number of steps used within each lesson (≥ 70% of implementation range for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons)) d. Average level of attention given to each lesson (moderate level of attention for each taught lesson / No or Yes: 0-1 for each taught lesson (0-5 across all lessons))			teachers cover 3 or less lessons)			
Algebra I College Awareness Curriculum	Teacher implements RTF college awareness curriculum (2 activities) as trained in PD: Units 1-3	16 treatment teachers	S	Two activities (for a maximum of 30 minutes) are implemented in the treatment classrooms.	80%	13%	No

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