

Connected Mathematics, 2nd Edition
A Three-Year Study of Student Outcomes

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INTRODUCTION

The first edition of the Connected Mathematics Project curriculum (Lappan, Fey, Fitzgerald, Friel, & Phillips, 1998) was one of 13 K–12 mathematics curricula—including five targeting middle school—developed in the 1990s with support from the National Science Foundation. The 13 curriculum projects, like the *Curriculum and Evaluation Standards for School Mathematics* (National Council of Teachers of Mathematics, 1989) were a response to calls for reform in documents like *A Nation at Risk* (National Commission on Excellence in Education, 1983). The need to improve the rigor and quality of content in U.S. mathematics curricula, and to improve the effectiveness of pedagogy implied by those curricula, was reemphasized by the generally poor performance of U.S. students on the Second International Math Study (SIMS). Much of the blame for this performance was placed on U.S. mathematics curricula, which were characterized as redundant, unchallenging, and lacking in deep development of material (McKnight et al., 1987). Results from the Third International Mathematics and Science Study (TIMSS) conducted in 1994–95 were similar to those of SIMS, and shallow, redundant, and incoherent U.S. mathematics curricula were again blamed (Schmidt, McKnight, & Raizen, 1996).

The NCTM curriculum and evaluation standards, and the associated *Professional Standards for Teaching Mathematics* (National Council of Teachers of Mathematics, 1991), called for more attention to in-depth understanding of mathematics. Hiebert (1999) characterized NCTM *Standards*-based programs as including the following features:

- Building directly on students’ entry knowledge and skills;
- Providing opportunities for both invention and practice;
- Focusing on the analysis of (multiple) methods; and
- Asking students to provide explanations.

The Connected Mathematics Project curriculum (CMP) is organized as a series of “investigations” that incorporate these features. Each lesson is designed to help students learn a particular set of mathematical ideas. The lessons incorporate an explicit “Launch-Explore-Summarize” model that implements the problem- and discourse-centered pedagogy advocated by the *Professional Standards for Teaching Mathematics*. This approach is in contrast to the more traditional Model/Guided Practice/Independent Practice pedagogy commonly found in U.S. mathematics classrooms (Stigler & Hiebert, 1997; Hiebert, 1999). The revisions made for the 2nd edition (Lappan, Fey, Fitzgerald, Friel, & Phillips, 2006) of the materials (CMP2) were intended to streamline and update the units, provide more practice with important concepts and procedures, and raise the level and focus of the mathematics in the units, especially in the areas of number and algebra.

With funding from the developer, Horizon Research, Inc. (HRI) conducted a longitudinal, quasi-experimental study of the efficacy of the CMP2 curriculum. The three-year study compared schools that adopted CMP2 to schools using more conventional mathematics curricula. The goal of this study was to examine what impacts, if any, use of CMP2 has on student achievement and attitudes toward mathematics. Specifically, the study sought to answer the following research questions, in each case controlling for prior achievement and student, teacher, and school characteristics:

1. What are the relative impacts of CMP2 and conventional middle school mathematics curricula on student mathematics achievement and attitudes toward mathematics?
2. How does variation in extent of implementation of CMP2 relate to student achievement and attitudes?
3. What are the relative impacts of CMP2 and conventional middle school mathematics curricula on any existing “gaps” in achievement and attitudes among demographic groups of interest?

Data were collected from participating schools for the 2006–07, 2007–08, and 2008–09 school years.

INSTRUMENTS

The study examined three sets of student outcomes.

1. *Mathematics scores from state assessments.*

Student achievement data on 6th, 7th, and 8th grade state tests were collected each year. In addition, students’ scores on the previous year’s state mathematics assessment, and student demographics, were gathered.

2. *Balanced Assessment in Mathematics (BAM).*

Because state mathematics assessments vary widely in terms of the types of mathematical knowledge and skills they attempt to measure, the study also included an alternative assessment.

The BAM is a series of assessments for students in grades 3–10 that were developed by the Mathematics Assessment Resource Service, with support from the National Science Foundation. The content assessed is aligned with the National Council of Teachers of Mathematics’ *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000); the content reflects a broad spectrum of mathematics topics and focuses on higher-order thinking skills. Content is grade-specific and the assessments are not vertically scaled

The grade-appropriate BAM was administered to the same cohort of students at the end of each year of the study: 6th graders during 2006–07, 7th graders during 2007–08, and 8th graders during 2008–09. All students in the targeted grade in each CMP2 and comparison school were asked to take the assessment each year, regardless of whether they had been in the school the prior year.

3. *Attitudes toward mathematics survey.*

The items for this survey came from two established instruments administered surveys (Fennema & Sherman, 1976; Midgely et. al., 2000). Factor analysis was used to identify

four scales (see Appendix A): confidence in studying mathematics; beliefs about the usefulness of mathematics; intrinsic motivation to study mathematics; and enjoyment of mathematics.

The survey was administered to the same cohort of students as was the BAM. However, to establish a baseline, the survey was administered to 6th grade students at the beginning of the 2006–07 school year. The survey was administered at the end of these students' 7th and 8th grade years.

THE SAMPLE

In order to examine the relative impacts of the CMP2 curriculum, it was necessary to identify and recruit both CMP2 schools and a comparable set of schools using conventional textbooks. The process started with identifying candidate CMP2 schools. In an attempt to minimize selection bias, schools that participated in the field testing of the CMP2 were excluded from the study. Although the study did not want to include schools that were atypical, neither did it want to include schools that were brand new to the approach to teaching mathematics embodied in CMP2 as it would be highly unlikely that teachers in these schools could implement the materials with any semblance of fidelity. Thus, schools that would be implementing CMP2 for the first time during Year One of the study and had not previously used the first edition of the materials were excluded.

As candidate CMP2 schools were identified, regression analysis was used to rank order potential matching schools in the same state based on their similarities to the CMP2 school on a set of matching variables known to be associated with student achievement (see for example, Darling-Hammond, 2000):

- Student achievement in the year prior to the one in which the treatment school adopted the original CMP materials; and
- School demographics:
 - race/ethnicity;
 - metropolitan status;
 - percent of students eligible for free/reduced-price lunch; and
 - percent of students classified as English-language learners.

HRI then attempted to contact the best matches to gather information about the school's mathematics program, including the instructional materials used and instructional time devoted to mathematics. If the school was a good match (both using a conventional textbook and devoting a similar amount of instructional time to mathematics, as did the CMP2 school), HRI attempted to recruit the school for the study. As an incentive for participation, schools were offered a yearly honorarium of \$1,200 plus \$15 per class of students completing the BAM and student attitudes survey. Through this process, HRI recruited 52 schools for the study, 26 using CMP2 and 26 using conventional textbooks.

Although every effort was made to ensure full participation of schools in the study, a small number of schools did not provide all of the requested data. In addition, a few schools dropped out of the study. When attrition occurred in Year One, HRI attempted to recruit replacement schools. Table 1 shows the schools completing each element of data collection.

Table 1
School Participation, by Year

State	School	Year One			Year Two			Year Three		
		BAM	Att. Surv.	State Data	BAM	Att. Surv.	State Data	BAM	Att. Surv.	State Data
CO	CMP2 A	x	x	x	x	x	x	x	x	x
	Match A	x	x	x	x	x	x	x	x	x
IL	CMP2 B	x	x	x	x	x	x	x	x	x
	Match B	x	x	x	x	x	x	x	x	x
	CMP2 C	x	x	x	x	x	x	x	x	x
	Match C	x	x	x	x	x	x	x	x	x
	CMP2 D.1 [†]	x	x	x						
	Match D.1	x	x	x	x	x	x	x	x	x
	CMP2 D.2 [†]	x	x	x	x	x	x	x	x	x
	Match D.2	x	x	x	x	x	x	x	x	x
	CMP2 E	x	x	x	x	x	x	x	x	x
	Match E	x	x	x	x	x	x	x	x	x
	CMP2 F	x	x	x	x	x	x	x	x	x
	Match F				x	x	x	x	x	
	CMP2 G	x	x	x	x	x	x	x	x	x
	Match G	x	x	x	x	x	x	x	x	x
	CMP2 H	x	x	x	x	x	x	x	x	x
	Match H [‡]				x	x	x	x	x	
CMP2 I	x	x	x	x	x	x	x	x	x	
Match I	x	x	x	x	x	x	x	x	x	
MA	CMP2 J	x	x	x	x	x	x	x	x	x
	Match J	x	x	x	x	x	x	x	x	x
	CMP2 K	x	x	x	x	x	x	x	x	x
	Match K	x	x		x	x	x	x	x	
MI	CMP2 L	x	x	x	x	x	x	x	x	x
	Match L	x	x	x	x	x	x	x	x	x
	CMP2 M	x	x	x	x	x	x	x	x	x
	Match M	x	x	x	x	x	x	x	x	x
NJ	CMP2 N	x	x	x	x	x	x	x	x	x
	Match N	x	x	x	x	x	x	x	x	x
NY	CMP2 O	x	x	x	x	x	x	x	x	x
	Match O	x	x	x	x	x	x	x	x	x
NM	CMP2 P	x	x	x			x	x	x	x
	Match P	x	x	x	x	x	x	x	x	x
WI	CMP2 Q	x	x	x	x	x	x	x	x	x
	Match Q	x	x	x	x	x	x	x	x	x
WI	CMP2 R	x	x	x	x	x	x	x	x	x
	Match R	x	x	x	x	x	x	x	x	x
	CMP2 S	x	x	x	x	x	x	x	x	x
	Match S	x	x	x	x	x	x	x	x	x
	CMP2 T	x	x	x	x	x	x	x	x	x
	Match T		x	x	x	x	x	x	x	x
	CMP2 U	x	x	x	x	x	x	x	x	x
	Match U	x	x	x	x	x	x	x	x	x
	CMP2 V	x	x	x	x	x	x	x	x	x
	Match V.1 [◊]	x	x	x	x	x	x	x	x	x
	Match V.2				x	x	x	x	x	x
	CMP2 W	x	x	x	x	x	x	x	x	x
	Match W	x	x	x	x	x	x	x	x	x
	CMP2 X	x	x	x	x	x	x	x	x	x
Match X	x	x	x	x	x	x	x	x	x	
WV	CMP2 Y [▲]	x	x	x	x	x		x	x	
	Match Y	x	x	x	x	x	x	x	x	x

[†] After Year One of the study, CMP2 D.1 and D.2 merged to become one school. Both Match D.1 and D.2 were retained for the study.

[‡] Match H did not send state test and demographic data for any year of the study; thus, their data could not be used in the analyses.

[◊] After Year One of the study, Match V.1 adopted CMP2 making them unsuitable for the study. To honor its commitment to the school, HRI continued to include the school in data collection, but recruited Match V.2 as a replacement for the study.

[▲] CMP2 Y did not send state test and demographic data in Years Two and Three of the study; thus their data were not used in the analyses.

Tables 2–4 show the characteristics of the schools and their students participating in the study. Overall, the students in the two sets of schools are fairly similar, though CMP2 schools are more likely to be located in urban settings and comparison schools are more likely to be suburban. The schools serve about the same number of students on average, though school size varies more within the comparison group. In both groups, the schools are almost equally female and male and about 70 percent of students are white. On average, the CMP2 schools contain slightly more students classified as Asian/Pacific Islander than the comparison schools, and fewer Hispanic/Latino students. In regards to special services, the CMP2 schools have slightly more students eligible for free/reduced-price lunch (FRL) and receiving special education services. The two groups have similar percentages of English-language learners (ELL).

Compared to public schools containing grades 6–8 nationally, study schools are fairly representative, though they tend to be somewhat larger, serve a greater proportion of white students, and have fewer students eligible for FRL. Because schools in both groups volunteered to participate in this study, it is important to note that the results may not be representative of all schools.

Table 2
School Community Type

	Percent of Schools		
	CMP2 Schools (N = 24)	Comparison Schools (N = 25)	Nationwide with Grades 6–8 [†] (N = 20,268)
City	46	20	28
Rural	25	32	36
Suburban	21	40	24
Town	8	8	12

[†] Nationwide data are from the 2006–07 Common Core of Data provided by the National Center for Education Statistics, part of the U.S. Department of Education.

Table 3
Number of Grades 6–8 Students[†]

	CMP2 Schools (N = 24)	Comparison Schools (N = 25)	Nationwide with Grades 6–8 [‡] (N = 20,268)
Minimum	179	54	3
Maximum	1,043	1,200	3,549
Mean	618.75	507.80	400.24
Standard Deviation	224.39	294.46	379.76

[†] Data are from Year One of the study to avoid counting students multiple times as they move from grade to grade.

[‡] Nationwide data are from the 2006–07 Common Core of Data provided by the National Center for Education Statistics, part of the U.S. Department of Education.

Table 4
Grades 6–8 Student Demographics in Study Schools[†]

	Percent of Students		
	CMP2 (N = 13,503)	Comparison (N = 11,890)	Nationwide Grades 6–8 [‡] (N = 7,866,178)
Gender			
Female	49	49	49
Male	51	51	51
Race/Ethnicity			
American Indian/Alaskan Native	1	0	1
Asian/Pacific Islander	5	2	4
Black/African-American	13	12	19
Hispanic/Latino	10	16	20
White	71	69	55
Multi-racial	1	1	—
Free/Reduced-Price Lunch Eligible	43	38	48
English-Language Learner	4	4	—
Special Education	15	14	—

[†] Data are from Year One of the study to avoid counting students multiple times as they move from grade to grade.

[‡] Nationwide data are from the 2006–07 Common Core of Data provided by the National Center for Education Statistics, part of the U.S. Department of Education. Multi-racial, English-Language Learner, and Special Education statistics were not reported.

A questionnaire administered to teachers collected information about their background and use of instructional materials in the classes in the study. Table 5 shows the percentage of CMP2 and non-CMP2 classes at each grade taught by teachers with various characteristics. Teacher experience using the designated instructional materials is fairly similar between CMP2 and comparison school classes, with the modal response being 2–5 years. However, teachers of CMP2 classes have, on average, received much more professional development on the instructional materials than teachers of comparison classes. This finding is not unexpected as CMP2 calls for a different approach to teaching mathematics than typical instructional programs, and its adoption is often accompanied by training on the approach.

In the 6th grade, CMP2 classes tended to be taught by teachers with less mathematics teaching experience than comparison classes, though the groups were fairly similar in 7th and 8th grade. Quite a few classes in each group were taught by teachers without a degree in mathematics or mathematics education.

Table 5
Teacher Characteristics of Classes in the Study

	Percent of Classes					
	6 th Grade		7 th Grade		8 th Grade	
	CMP2 (N = 193)	Comparison (N = 157)	CMP2 (N = 177)	Comparison (N = 177)	CMP2 (N = 192)	Comparison (N = 174)
Experience Using Instructional Materials						
First Year	23	22	14	18	8	15
2–5 Years	57	48	57	63	69	55
More than 5 Years	20	30	30	20	23	30
Professional Development on Instructional Materials						
None	3	32	6	44	3	35
Less than 6 hours	11	55	7	48	11	42
6–15 hours	22	9	20	6	26	11
16–35 hours	23	3	21	1	19	8
More than 35 hours	40	1	45	1	41	4
Experience Teaching Mathematics						
1–2 Years	23	13	12	11	8	11
3–5 Years	22	23	20	24	18	25
6–10 Years	18	24	28	28	26	21
11–15 Years	13	20	14	12	20	12
16–20 Years	10	4	16	11	13	6
21–25 Years	8	5	8	6	4	15
26 or more Years	6	11	3	9	9	11
Degree						
Mathematics without Mathematics Education	9	16	7	20	11	26
Mathematics Education with out Mathematics	20	14	29	18	29	33
Both Mathematics and Mathematics Education	11	9	22	6	15	6
Neither Mathematics nor Mathematics Education	59	61	41	57	46	35

Teachers were also asked the duration of their mathematics class periods. Across grades and between CMP2 and comparison schools, the amount of instructional time was very similar. (See Table 6.)

Table 6
Instructional Time per Day Spent on Mathematics (in Minutes)

	Minimum	Maximum	Mean	Standard Deviation
CMP2				
Grade 6	40	75	48.27	7.84
Grade 7	42	70	49.36	7.27
Grade 8	40	75	49.79	8.37
Comparison				
Grade 6	38	75	47.98	9.66
Grade 7	40	65	47.25	5.88
Grade 8	38	60	47.26	4.95

ANALYSIS AND RESULTS

The study consists of two main sets of analyses. The first set examines state assessment scores for all students in grades 6–8 in the schools across the three years of the study. For these analyses, a three-level hierarchical model (Bryk & Raudenbush, 1992) was utilized with time points nested within students, and students nested within schools. The models included both linear and quadratic growth terms, and controls for student and school demographic data.

The second set examines all of the outcomes over time for the cohort of students who were in 6th grade in Year One of the study (2006–07). A three-level, cross-classified hierarchical model was utilized. The first level included the outcome variable measured at each time point. The second level included students cross-classified with class. The third level was schools. In addition to controlling for prior achievement and student and school demographic data, these models examined the relationship between a number of teacher/classroom characteristics and student outcomes.

Both sets of models utilized a similar model-building process. First, an unspecified model was run to examine the distribution of variance in the outcome variable across the levels of nesting. Predictor variables, including covariates such as student and school demographics, were added to the model. Random effects were included when variation across time points, students or classes remained. Finally, distributions of residuals were examined to confirm the appropriateness of the models, and sensitivity analyses were conducted to ensure that extreme values did not unduly influence the results.

Results of these analyses follow, organized by research question.

➤ **What are the relative impacts of CMP2 and conventional middle school mathematics curricula on student mathematics achievement and attitudes toward mathematics?**

State Assessments

Each of the states represented by the schools in this study administers its own state mathematics assessments. In order to combine data across states, HRI converted students' scale scores to standardized scores, which puts the data on the same scale while maintaining the original distribution properties. This process was done by state, so that a student who received the state-wide average score on the state assessment would have a standardized score of "0," regardless of which state the student came from. Similarly, a student who scored one standard deviation above the mean in the state would receive a standardized score of "1" and the score of a student who scored one standard deviation below the statewide mean would be a "-1." Table 7 shows average standardized scores for students in the study; overall, average scores of students in both groups are close to the average for their states.

Table 7
Standardized State Assessment Scores

	CMP2		Comparison	
	Mean	Standard Deviation	Mean	Standard Deviation
Grade 5	0.07	0.99	0.04	0.95
Grade 6	-0.04	0.96	-0.04	0.94
Grade 7	-0.05	0.96	-0.05	0.94
Grade 8	-0.04	0.95	-0.06	0.91

Two different models were used to address this research question. One used data only from the main cohort of students that was followed for three years. The second used data from all grades 6–8 students in the study schools across all three years. This second model includes a much greater number of students than the first, though most of these students have incomplete data by design. For example, students who were 6th graders in Year Three of the study would have only their 5th and 6th grade test scores included in the model. There are pros and cons of each approach. The second model has greater statistical power than the first model, but does not include teachers/classroom effects. The opposite is true for the first model.

Results from the first model indicate that, controlling for 5th grade achievement, student demographics, and teacher and school characteristics, the growth trajectories of students in schools using CMP2 and students in schools using conventional textbooks were significantly different. (See Figure 1.) Scores of students in schools using conventional textbooks exhibited a negative trend in test scores over time, while the trend in CMP2 schools was positive. Although statistically significant, the difference is relatively small—approximately four one-hundredths of a standard deviation per year. None of the apparent differences between the two groups at any particular time point are significant. Of all the factors in the model, 5th grade achievement was the strongest predictor of achievement in grades 6–8; a one standard deviation difference in 5th grade scores was related to a 0.71 standard deviation difference in grades 6–8 scores. (Complete regression results for all models can be found in Appendix B.)

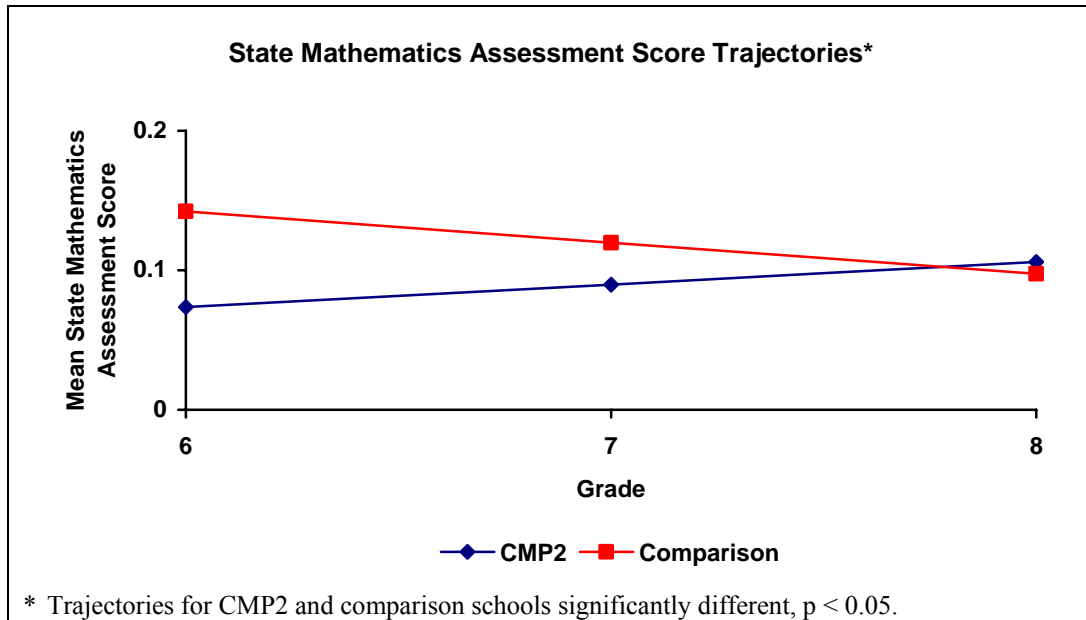


Figure 1

In the second model, there was no significant difference in scores between CMP2 and non-CMP2 students in terms of overall mean score or growth trajectory. This difference in findings between the two models is likely due to a cohort effect—that the main cohort of students examined in the first model was different than the other cohorts of students. A follow-up analysis of the all-student model found that the main cohort of students has a slightly more positive growth trajectory than the other cohorts and that the trajectory is steeper in CMP2 schools than comparison schools (in essence, confirming the results of the main cohort model).

Balanced Assessment of Mathematics

The grade-level appropriate Balanced Assessment of Mathematics (BAM) was administered to the main cohort of students tracked in this study at the end of their 6th, 7th, and 8th grades. The maximum score on the BAM is 40 points and four scoring categories are typically reported. (See Figure 2).

BAM Performance Levels	
Level 1	The student’s response shows few of the elements of performance that the tasks demand.
Level 2	The student’s response shows some of the elements of performance that the tasks demand and some signs of a coherent attack on the core of some of the problems. However, the shortcomings are substantial and the evidence suggests that the student would not be able to produce high-quality solutions without significant further instruction.
Level 3	For most tasks, the student’s response shows the main elements of performance that the tasks demand, organized as a coherent attack on the core of the problems. There are errors or omissions, some of which may be important, but of a kind that the student could well fix, with more time for checking and revision and some limited help.
Level 4	The student’s response meets the demands of nearly all of the tasks, with few errors. With some more time for checking and revision, excellent solutions would seem likely.

Figure 2

Table 8 shows the score ranges for each performance level, by grade.

Table 8
BAM Scores for each Performance Level

	Grade 6	Grade 7	Grade 8
Level 1	0–11	0–11	0–11
Level 2	12–18	12–17	12–18
Level 3	19–28	18–28	19–27
Level 4	29–40	29–40	28–40

Raw scores on the BAM from each administration are shown in Table 9. The average scores for both groups of schools in grades 6 and 7 fall in the Level 2 category; in grade 8 the average scores are in the lowest performance category. The generally low scores may be due to the low-stakes nature of the assessment (i.e., students knew the assessment did not “count” for their grades).

Table 9
BAM Scores

	CMP2		Comparison	
	Mean	Standard Deviation	Mean	Standard Deviation
Grade 6	15.35	8.05	14.75	7.77
Grade 7	14.91	6.50	13.98	6.43
Grade 8	9.34	5.88	8.67	5.77

Because the BAM is not equated across years (i.e., a “30” on one year’s test does not necessarily mean the same thing as a “30” on another year’s test), it is inappropriate to compare raw scores. Therefore, it was decided to standardize BAM scores to allow for comparisons over time. Controlling for student, teacher, and school characteristics, there were no significant differences in mean BAM scores or trajectories for students in CMP2 schools vs. non-CMP2 schools. In other words, students in the two groups performed similarly in each year. (See Figure 3.)

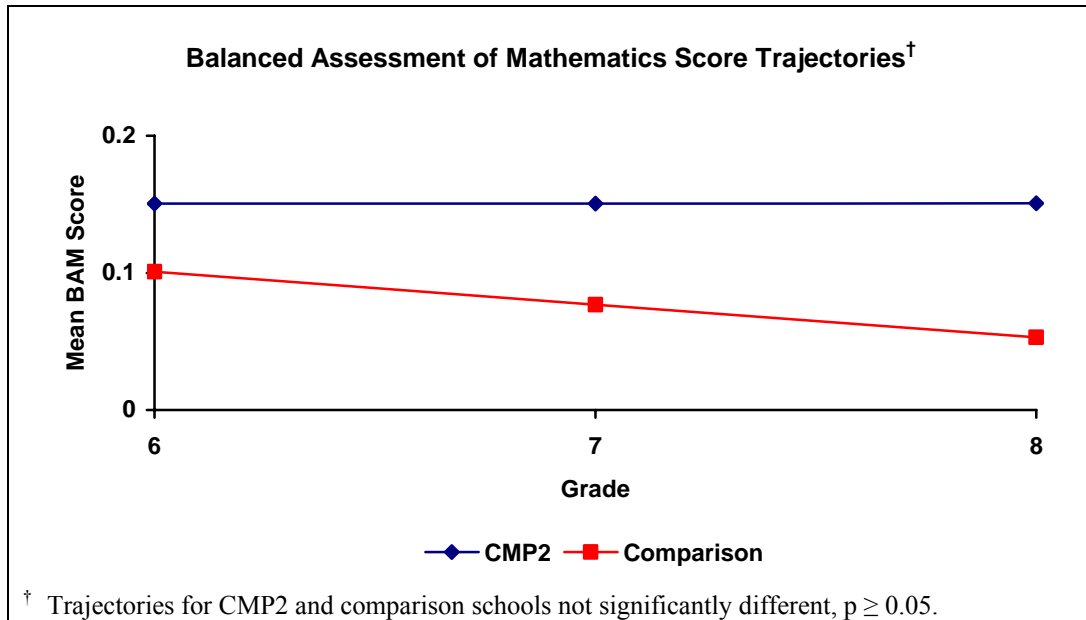


Figure 3

As was the case with the state assessment data, of all of the predictor variables included in the model, 5th grade achievement on the state mathematics assessment was by far the most influential; a one standard deviation difference in 5th grade scores was associated with a 0.62 standard deviation difference in BAM scores.

Student Attitudes

The student attitudes survey was administered at the beginning of 6th grade, and then again at the ends of 7th and 8th grades. Four attitudinal outcomes were examined for the main cohort of students:

1. Confidence in studying mathematics;
2. Beliefs about the usefulness of mathematics;
3. Intrinsic motivation to study mathematics; and
4. Enjoyment of mathematics.

Responses to items associated with each attitudinal outcome were combined into a composite scale variable to reduce the unreliability associated with individual survey items.¹ Each composite has a minimum possible score of 0 and a maximum possible score of 100. A score of 0 would indicate that a student selected the lowest response option for each item in the composite, whereas a score of 100 would indicate that a student selected the highest response option for each item. Table 10 shows mean scores on these composite variables by treatment group and grade level. The apparent downward trend from grade 6 to grade 8 is consistent with prior research on student attitudes (Fredricks & Eccles, 2002).

Table 10
Student Attitude Composite Scores

	CMP2		Comparison	
	Mean	Standard Deviation	Mean	Standard Deviation
Confidence in studying mathematics				
Grade 6	65.74	20.05	68.12	20.09
Grade 7	63.52	21.86	67.25	20.96
Grade 8	62.25	21.99	64.78	20.95
Beliefs about the usefulness of mathematics				
Grade 6	78.91	17.04	80.14	16.37
Grade 7	77.63	18.37	77.71	18.08
Grade 8	75.63	19.10	75.96	18.40
Intrinsic motivation to study mathematics				
Grade 6	76.18	16.03	76.63	16.43
Grade 7	69.48	18.63	70.12	18.47
Grade 8	67.17	18.77	68.03	18.35
Enjoyment of mathematics				
Grade 6	54.85	23.89	54.80	24.36
Grade 7	47.18	24.15	49.44	24.48
Grade 8	45.23	24.17	47.30	24.49

On the confidence outcome, controlling for student, teacher, and school characteristics, students in CMP2 schools scored nearly four points lower initially than students in comparison schools (a difference of 0.18 standard deviations). However, the trajectories for CMP2 and non-CMP2 schools were the same, with scores decreasing about 1.3 points per year (0.06 standard deviations per year). (See Figure 4.)

¹ Definitions of the composites and reliability information are included in Appendix A.

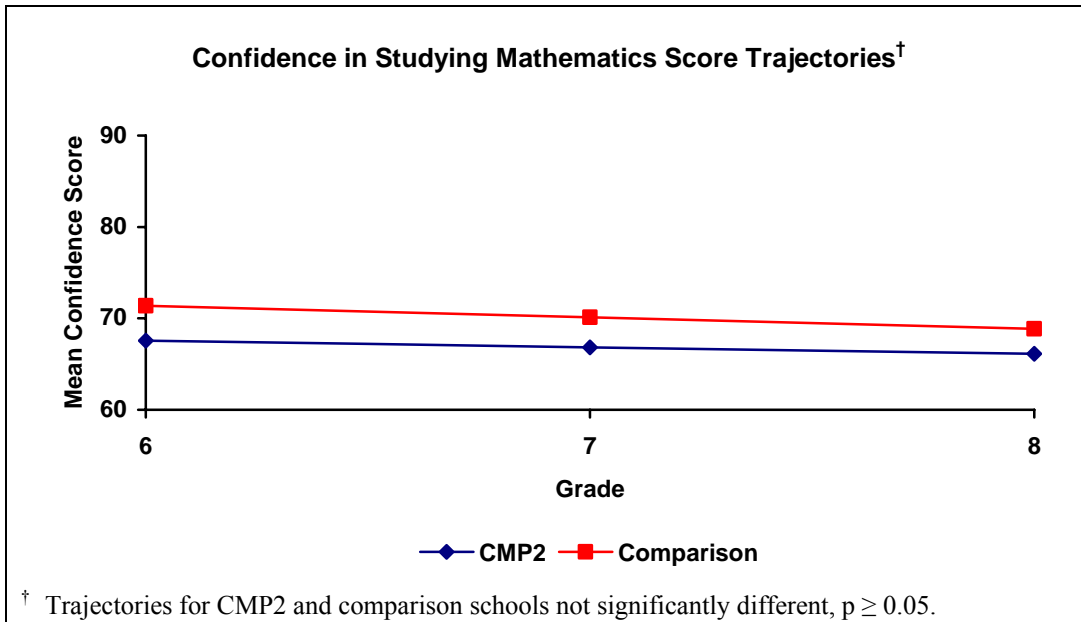


Figure 4

There was a significant difference in the trajectories between the two sets of schools on the usefulness of mathematics composite after controlling for student, teacher, and school characteristics. (See Figure 5.) Although scores decreased in both sets of schools over time, the decline was not as rapid in CMP2 schools. In non-CMP2 schools, scores fell about 1.8 points (0.10 standard deviations) per year; in CMP2 schools, scores fell by about 1.2 points (0.07 standard deviations) per year.

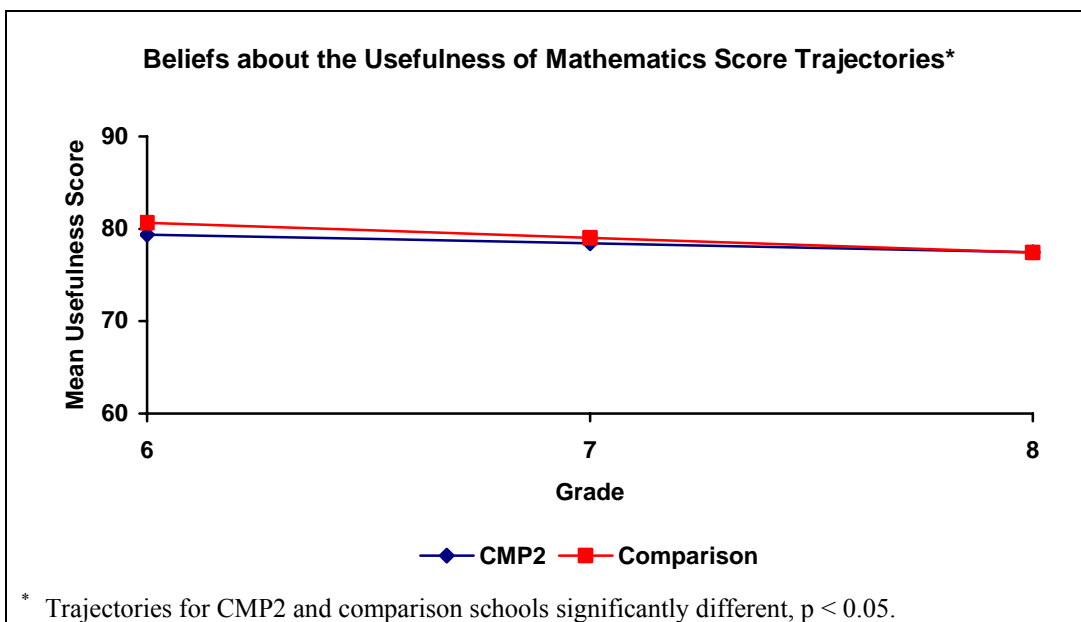


Figure 5

Controlling for student, teacher, and school characteristics, scores on the other two composites exhibited a downward trajectory for both sets of schools. However, there were no significant differences between CMP2 and non-CMP2 schools in terms of initial status or change over time. (See Figures 6 and 7.)

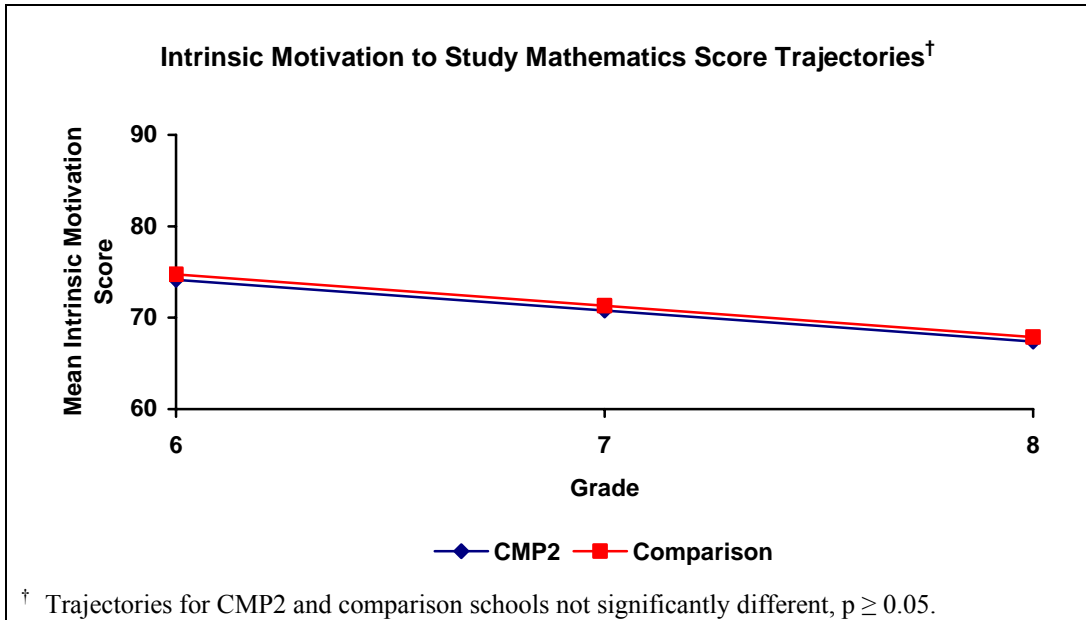


Figure 6

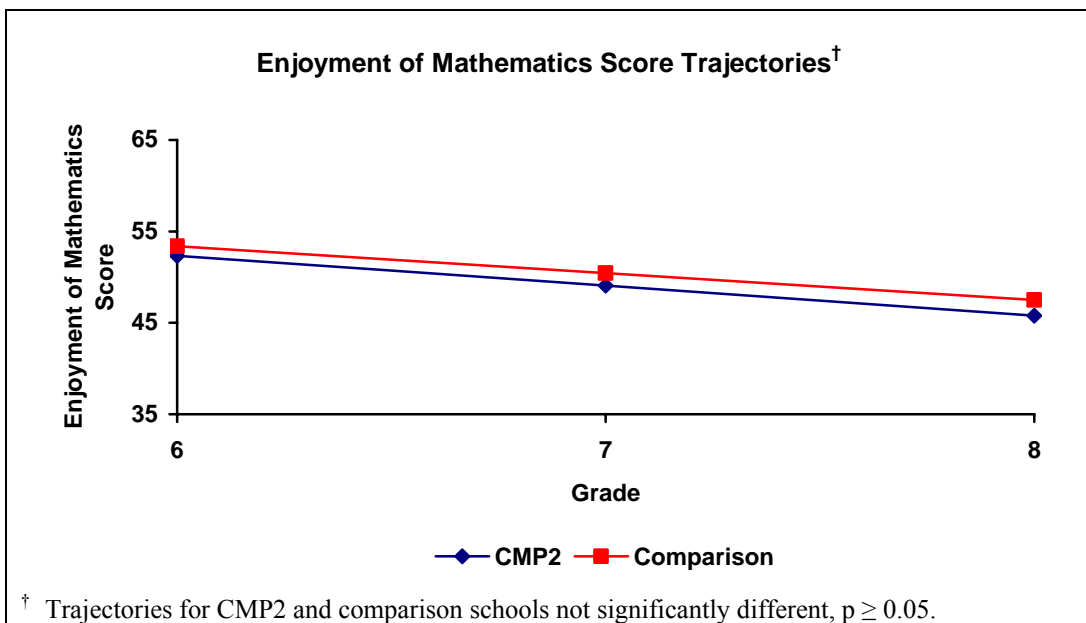


Figure 7

➤ **How does variation in extent of implementation of CMP2 relate to student achievement and attitudes?**

The questionnaire administered to teachers of the main cohort of students at the end of each year asked a number of items about their use of their mathematics instructional materials. As can be seen in Table 11, the percentage of instructional materials covered during the year was similar in CMP2 and comparison classes; however, CMP2 classes tended to base slightly more of their instruction on the CMP2 materials than comparison classes did on their primary textbook. (Data on the instructional materials used in CMP2 and comparison classes can found in Appendix C.)

**Table 11
Textbook Coverage**

	Percent of Classes				
	Less than 25%	25–49%	50–74%	75–90%	More than 90%
Estimated percent of textbook covered during school year					
CMP2	4	5	31	47	13
Comparison	1	6	34	49	10
Estimated percent of instruction based on primary textbook					
CMP2	1	2	8	36	53
Comparison	1	4	13	53	29

Teachers were also asked how often they used their primary instructional materials for different purposes. As can be seen in Table 12, there are a number of reported differences between CMP2 and comparison classes. Teachers of CMP2 classes were more likely to report that CMP2 guided the structure of the course and was used to plan lessons. Teachers of CMP2 classes were also more likely to indicate following the CMP2 materials page by page. Within the units that were addressed, teachers of comparison classes were more likely to pick and choose from their textbook, and supplement instruction with other activities and practice problems. CMP2 classes also were more likely to have students use their textbook during class.

Table 12
Frequency of Use of Textbook for Various Purposes

	Percent of Classes				
	Never or Almost Never	Rarely (About ¼ of Lessons)	Sometimes (About ½ of Lessons)	Frequently (About ¾ of Lessons)	All or Nearly All Lessons
Textbook guides structure of course					
CMP2	1	1	8	31	60
Comparison	7	7	18	47	22
Teacher uses textbook to plan lessons					
CMP2	1	3	12	35	48
Comparison	31	14	21	25	8
Teacher reads/reviews suggestions from teacher guide to plan lessons					
CMP2	5	9	28	26	31
Comparison	12	25	31	20	12
Teacher follows textbook page by page					
CMP2	3	8	21	41	27
Comparison	12	15	26	36	11
Teacher picks what is important from textbook and skips the rest					
CMP2	30	32	15	17	6
Comparison	6	20	21	36	16
Teacher incorporates activities from other sources to supplement what textbook lacks					
CMP2	22	41	19	12	7
Comparison	7	36	34	19	6
Teacher incorporates practice problems from other sources to supplement textbook					
CMP2	21	40	19	13	6
Comparison	7	36	28	22	7
Teacher assigns homework from textbook					
CMP2	4	5	12	28	49
Comparison	0	4	12	49	34
Students use textbook during lesson					
CMP2	3	2	13	28	54
Comparison	5	15	25	28	28
Students use their textbook for background reading					
CMP2	15	25	24	20	17
Comparison	19	37	21	13	9

CMP2 uses a Launch-Explore-Summarize learning cycle, and the questionnaire asked CMP2 teachers to estimate how much time they devoted to each during instruction. As can be seen in Table 13, teachers of CMP2 classes reported spending about 15 percent of instructional time on the Launch phase, 50 percent on Explore, and just under 20 percent on Summarize. They also reported spending over 15 percent of time on other activities.

Table 13
Percentage of Instructional Time in
CMP2 Classrooms Spent on Various Activities

	Minimum	Maximum	Mean	Standard Deviation
Launch	0	50	14.94	7.64
Explore	10	80	49.65	14.54
Summarize	0	70	18.63	10.30
Other	0	90	16.79	11.18

Cluster analysis was used to categorize teachers in each group of schools into relatively high and low extent of implementation groups. Cluster analysis identifies subgroups of cases (in this instance, teachers of mathematics classes) that responded similarly to a set of questions. As can be seen in Table 14, a greater proportion of CMP2 classes were categorized as high extent of implementation than were classes in the comparison schools. (Descriptive statistics on the variables that were used in the cluster analysis, by extent of implementation and treatment status are located in Appendix D.)

Table 14
Extent of Implementation

	Percent of Classes					
	6th Grade		7th Grade		8th Grade	
	CMP2 (N = 193)	Comparison (N = 157)	CMP2 (N = 177)	Comparison (N = 177)	CMP2 (N = 192)	Comparison (N = 173)
High	73	52	76	53	65	55
Low	27	48	24	47	35	45

State Assessments

A significant interaction between extent of implementation and treatment status was found on the state mathematics assessment, controlling for student, teacher, and school characteristics. Students in low extent of implementation classrooms in CMP2 schools had lower scores in 6th grade, but had a positive growth trajectory. In contrast, students in low extent of implementation classrooms in comparison schools had similar 6th grade scores to students in high extent of implementation classrooms in CMP2 and comparison schools, but had a negative growth trajectory relative to other students. (See Figure 8.) The trajectories of students in high extent of implementation classrooms were similar, regardless of treatment status.

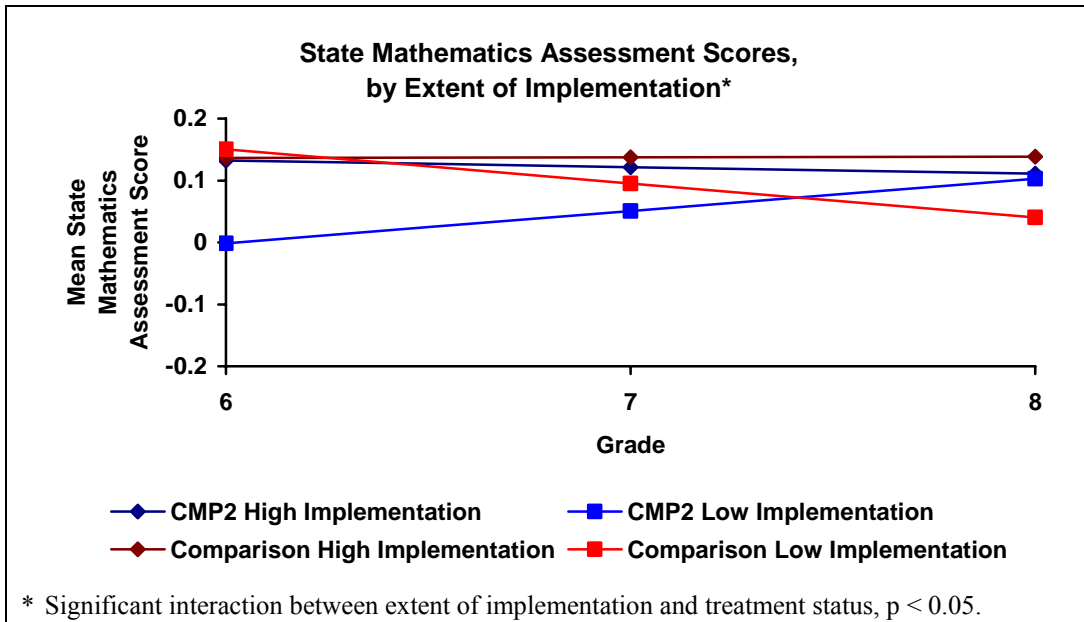


Figure 8

Balanced Assessment of Mathematics

Controlling for student, teacher, and school characteristics, a similar, significant interaction between extent of implementation and treatment status was also found on the BAM. Students in low extent of implementation classrooms in CMP2 schools had relatively low BAM scores in 6th grade, but had a positive growth trajectory. In contrast, students in low extent of implementation classrooms in comparison schools had similar 6th grade scores to students in high extent of implementation classrooms in CMP2 and comparison schools, but had a negative growth trajectory. (See Figure 9.) The trajectories of students in high extent of implementation classrooms in CMP2 and non-CMP2 schools were relatively similar.

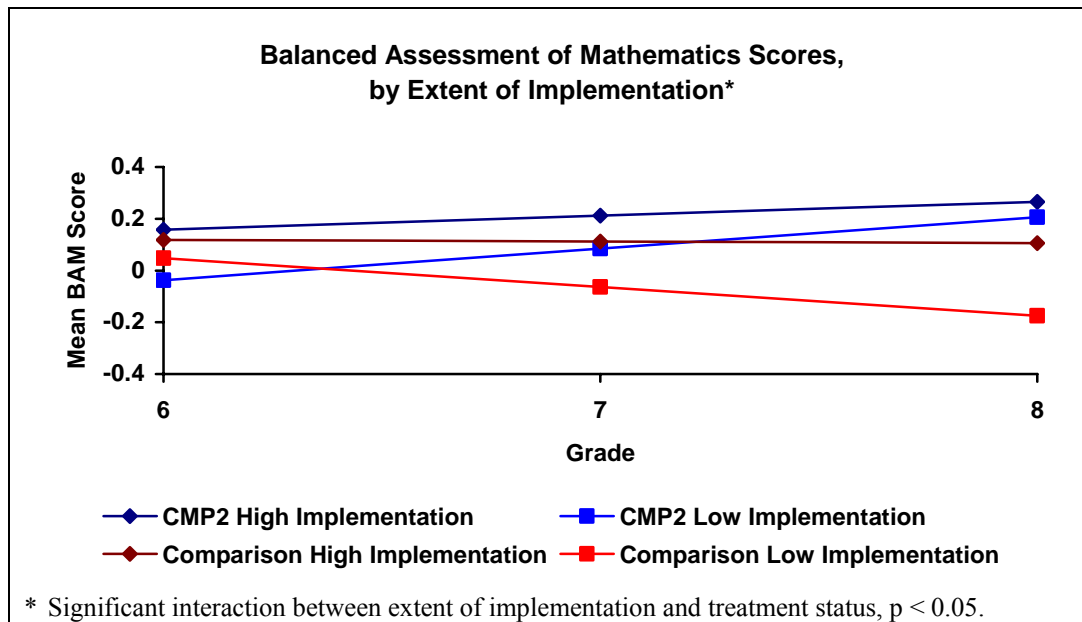


Figure 9

Student Attitudes

Controlling for student, teacher, and school characteristics, students in low extent of implementation classes tended to have higher scores on the confidence in studying mathematics scale than students in high extent of implementation classes in both CMP2 and comparison schools. On both the intrinsic motivation and enjoyment of mathematics scales, students in high extent of implementation CMP2 classes scored tended to score lower than students in high extent of implementation comparison classes; in contrast, students in low extent of implementation CMP2 classes tended to score higher on these outcomes than students in low extent of implementation comparison classes. All of these differences were relatively small and were fairly stable across time points.

- **What are the relative impacts of CMP2 and conventional middle school mathematics curricula on any existing “gaps” in achievement and attitudes among demographic groups of interest?**

In addition to examining growth trajectories for treatment and comparison schools, the analyses also provided information about differences in the outcomes for different subgroups of students. In particular, student race/ethnicity, gender, free/reduced-priced lunch eligibility, English-language learner status, and special education status were examined. There were a number of differences on the outcomes for subgroups, but few changed over time and only one had a different rate of change in CMP2 and comparison schools. It is important to note that all student demographic variables were included in the analysis; thus, any “gaps” represent the unique contribution of a variable above and beyond the contribution of the other variables in the model.

State Assessments

Both models (the one following a single cohort and the one including all students) showed that black students scored significantly lower than white students after controlling for student,

teacher, and school characteristics. For the single cohort analysis, the difference was very small (0.11 standard deviations), did not change over time, and did not vary between CMP2 and comparison schools. For the all-student analysis, the initial gap was larger (0.49 standard deviations). In this analysis, the gap did not widen as much between grade 6 and grade 8 in CMP2 schools as it did in comparison schools, though the effect was small (0.05 standard deviations per year). (See Figure 10.)

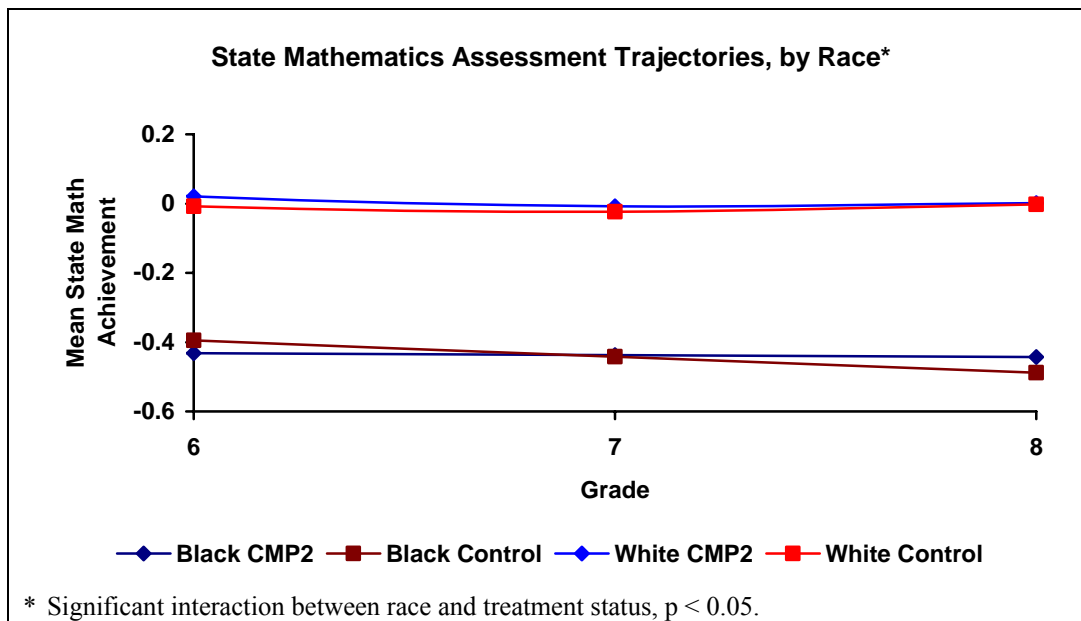


Figure 10

No significant differences were found in comparisons between white students and those in race/ethnicity categories other than black students. FRL eligible students scored slightly lower on state assessments than students not eligible for lunch assistance. English-language learners and special education students also tended to score lower than students without these designations. These gaps were the same in CMP2 and comparison schools, and fairly stable from grade 6 to grade 8.

Balanced Assessment of Mathematics

Controlling for student, teacher, and school characteristics, there were a number of differences on BAM performance for various subgroups of students, though all were relatively small and none varied by whether or not the school used CMP2. Black and Hispanic students scored slightly lower than white students (0.21 and 0.10 standard deviations, respectively), though black students had more positive growth trajectories than white students did (a difference of 0.06 standard deviations per year). Females scores 0.12 standard deviations higher than males in 6th grade, but had slightly lower growth rates (0.05 standard deviations per year). Students eligible for FRL and those classified as ELL scored slightly lower than students not in those categories (0.09 standard deviations for both groups). Special education students scored 0.34 standard deviations lower than non-special education students in 6th grade, but had a higher growth rate (0.07 standard deviations per year).

Student Attitudes

As with the BAM, there were a number of differences among subgroups on the attitude scales after controlling for student, teacher, and school characteristics. All of the differences were small and there were no significant differences in the gaps between student groups in CMP2 and non-CMP2 schools. Black students scored slightly higher (about 0.20 standard deviations) than white students on 3 of the 4 scales: confidence in studying mathematics; intrinsic motivation to study mathematics; and enjoyment of mathematics. Females scored lower than males on the confidence scale, but higher on the usefulness and intrinsic motivation scales. FRL eligible students scored lower on the confidence and usefulness scales than non-FRL eligible students (differences of 0.10 and 0.08 standard deviations, respectively).

ELL students scored higher on the confidence and intrinsic motivation scales (0.18 standard deviations). They scored slightly lower on the usefulness scale as well, though this difference decreased over time (an initial difference of 0.20 standard deviations and a narrowing of 0.09 standard deviations per year). This pattern was also seen on the enjoyment scale, though the initial difference was larger (0.46 standard deviations initially, narrowing by 0.07 standard deviations per year). Special education students scored somewhat lower on the confidence scale (0.06 standard deviations), but higher on the enjoyment scale than non-special education students (a difference of about 0.07 standard deviations).

SUMMARY

This study utilized a quasi-experimental matched-group longitudinal design to compare student outcomes in schools using CMP2 versus those using conventional textbook programs. Schools were matched on student demographics, community type, prior achievement, and instructional time devoted to mathematics. Of the 52 schools recruited for the study, 49 schools (24 using CMP2 and 25 using conventional textbooks) provided usable data for the study.

Multiple outcomes were examined: scores from state mathematics assessments; scores on the Balanced Assessment of Mathematics; and scores on four student attitudinal scales. Data collection focused primarily on the cohort of 6th grade students in 2006–07 school year, following these students through the end of the 8th grade. State assessment data for all grades 6–8 students in these schools were also collected each year.

Hierarchical regression was used to model student outcomes. For the main cohort of students, three-level cross-classified models were utilized; time points were nested with student-class combinations, which were also nested within schools. A number of student covariates were also incorporated in the models, including race/ethnicity, gender, free/reduced-price lunch status (FRL), English-language learner status (ELL), special education status, and 5th grade mathematics achievement. Classroom level covariates included teacher experience, overall and with the adopted mathematics program, amount of professional development the teacher received on the instructional materials, and amount of instructional time for mathematics. School level covariates included school size, community type, and racial/ethnic composition of the student body. For the analysis involving all students in the schools, a three-level model with time points

nested within students nested within schools was used. Student and school characteristics were entered into this model as covariates as well.

Results of the analyses provide some evidence that students experiencing CMP2 perform just as well, if not better, than students receiving mathematics instruction from conventional textbooks. On state assessments, the main cohort of students in CMP2 schools had a more positive trajectory of achievement scores than did their peers in comparison schools. Although this pattern was not detected in the analysis including all students, this latter analysis found that the achievement gap between black and white students widened less rapidly in CMP2 schools than in comparison schools.

The study examined how extent of teacher use of the designated instructional materials related to student outcomes. For both the state assessments and the BAM, low extent of implementation of CMP2 was related to a more positive growth trajectory than low extent of implementation of conventional textbooks. There were no significant differences on test scores between high extent of implementation of CMP2 and comparison schools. Also, there were no substantive differences in attitudinal measures by extent of implementation.

Finally, the analysis found that BAM scores of students in CMP2 schools were parallel to those of students in comparison schools. In regards to student attitudes toward mathematics, in both sets of schools scores on all four scales decreased over time, as is generally found with middle school students. However, on the beliefs about the usefulness of mathematics scale, scores of students in CMP2 schools decreased at a slower rate than did scores of students in comparison schools. For the other three scales, the rate of decrease did not differ between CMP2 and comparison schools.

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Appendix A

Analysis of the Psychometric Structure of the Student Attitudes Survey

The analysis of the psychometric structure of the Student Attitudes Toward Mathematics Survey consisted of both exploratory and confirmatory factor analyses performed on Year One data. To avoid performing multiple analyses on the same data (a practice that may capitalize on chance and lead to spurious results), the full dataset (N = 8,255) was randomly split into two samples, one dataset for exploratory factor analyses (N = 4,128) and one dataset for confirmatory factor analyses (N = 4,127).

Exploratory factor analyses were performed using SPSS 14.0. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (0.972) and Bartlett's test of sphericity ($\chi^2(561) = 57022.803, p < 0.001$) indicated that the correlation matrix was factorable. The scree plot suggested between two and four factors, and there were three eigenvalues greater than one. Using principal-axis factoring and oblimin rotation to allow for correlated factors, the two-factor, three-factor, and four-factor solutions were run.

The four-factor solution provided the best fit to the data in terms of achieving a simple structure (e.g., variables with zero loadings on several factors, several high loadings per factor, etc.) and having few items with moderate to high loadings on multiple factors. The four-factor solution was determined to make the most sense conceptually as well. Table A-1 shows the factor loadings from this solution, and Table A-2 shows the factor correlations.

Table A-1
Student Attitudes Survey Factor Loadings

Item [†]	Factor			
	1	2	3	4
Q1: I like math work best when it really makes me think.	.227	.152	.007	.416
Q2: Math does not matter in my life. [§]	.078	.119	.424	.116
Q3: I like math work if I'll learn from it, even if I make a lot of mistakes.	-.022	.387	.107	.206
Q4: I think I could handle more difficult math.	.630	-.041	-.008	.143
Q5: For some reason, even though I study, math seems unusually hard for me. [§]	.786	-.058	-.018	.075
Q6: I usually feel at ease (OK) during math tests.	.607	.078	-.094	-.016
Q7: I have a lot of self confidence when it comes to math (I feel that I can do math pretty well).	.665	.044	-.001	.166
Q8: In math class, one of my goals is to master or learn a lot of new skills.	.004	.645	-.028	.083
Q9: When working on math, my mind goes blank and I am unable to think clearly. [§]	.685	.044	.023	-.074
Q10: I do my math work because I'm interested in it.	.148	.156	.050	.601
Q11: An important reason why I do my work in math class is because I want to get better at it.	-.083	.642	-.003	.128
Q12: I don't think I could do advanced math. [§]	.615	-.062	.005	.100
Q13: I'm not the type to do well in math. [§]	.718	-.022	.073	.108
Q14: Generally I have felt secure about attempting math.	.510	.201	.023	-.004
Q15: Most subjects I can handle OK, but I have a knack for messing up math. (I get mixed up). [§]	.752	-.105	.025	.020
Q16: I'm no good at math. [§]	.668	-.042	.160	.091
Q17: Knowing math will help me earn a living after high school.	-.076	.166	.499	.041
Q18: An important reason why I do my math work is because I like to learn new things. [‡]	.046	.505	-.034	.404
Q19: I can get good grades in math.	.534	.029	.201	.023
Q20: Taking math is a waste of time. [§]	.110	.262	.409	.156
Q21: Math has been my worst subject. [§]	.625	-.064	.084	.217
Q22: Math makes me feel uneasy and confused. [§]	.781	-.019	.031	.059
Q23: I study math because I know how useful it is. [‡]	-.008	.366	.320	.105
Q24: One of my goals in math class is to learn as much as I can.	.011	.759	.003	.038
Q25: In math class, it is important to me that I improve my math skills.	.029	.717	.053	-.106
Q26: Math usually makes me feel uncomfortable and nervous. [§]	.817	.018	-.012	-.050
Q27: In math class, it is important to me that I learn a lot of new concepts.	.074	.653	.094	.048
Q28: I am sure that I can learn math.	.386	.263	.207	-.050
Q29: A math test would scare me. [§]	.682	.041	-.042	-.092
Q30: I will use math in many ways as an adult.	-.056	.055	.666	.069
Q31: An important reason why I do my math work is because I enjoy it.	.211	.083	.097	.629
Q32: Math is a worthwhile and necessary subject.	.102	.184	.468	.038
Q33: It's important to me that I thoroughly understand my math work.	.123	.512	.190	-.070
Q34: I see math as a subject I will rarely use in daily life. [§]	.111	-.117	.534	-.096

[†] Items were rated on a 5-point scale, from strongly disagree to strongly agree.

^{*} Item was not included in the computation of any composites due to the double loadings.

[§] These items had a negative polarity (i.e., agreement indicated a lack of the construct being measured); thus, responses to these items were reverse-coded prior to analysis.

Table A-2
Student Attitude Survey Factor Correlations

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1.000	—	—	—
Factor 2	0.294	1.000	—	—
Factor 3	0.504	0.558	1.000	—
Factor 4	0.391	0.539	0.246	1.000

The final composite definitions are shown in Table A-3.

Table A-3
Student Attitude Survey Composite Definitions

	Items
1. Confidence in Studying Mathematics	4, 5 [§] , 6, 7, 9 [§] , 12 [§] , 13 [§] , 14, 15 [§] , 16 [§] , 19, 21 [§] , 22 [§] , 26 [§] , 28, 29 [§]
2. Intrinsic Motivation to Study Mathematics	3, 8, 11, 24, 25, 27, 33
3. Beliefs about the Usefulness of Mathematics	2 [§] , 17, 20 [§] , 30, 32, 34 [§]
4. Enjoyment of Doing Mathematics	1, 10, 31

[§] These items had a negative polarity (i.e., agreement indicated a lack of the construct being measured); thus, responses to these items were reverse-coded prior to analysis.

A confirmatory factor analysis was performed on the second dataset using MPLUS 4.2. Overall, the four-factor model provided an adequate fit to the data. Although the chi-square value was statistically significant ($\chi^2(458) = 54233$, $p < 0.001$), this goodness of fit measure is not very reliable as it is overly sensitive to sample size. The RMSEA (0.056), TLI (0.906), CFI (0.910), and SRMR (0.057) all indicate adequate fit.

Internal consistency reliability analyses were also performed on the four composites using Cronbach's alpha. Table A-4 shows the reliability of the composites for each year of the study. Most of the reliabilities are very good (i.e., above 0.80); all are acceptable.

Table A-4
Student Attitudes Survey Composite Reliabilities

	Year One	Year Two	Year Three
1. Confidence in Studying Mathematics	0.94	0.95	0.95
2. Intrinsic Motivation to Study Mathematics	0.85	0.89	0.89
3. Beliefs about the Usefulness of Mathematics	0.75	0.82	0.85
4. Enjoyment of Doing Mathematics	0.80	0.82	0.83

Appendix B

HLM Regression Coefficients and Standard Errors

Table B-1
HLM Regression Coefficients and Standard Errors
for Treatment vs. Comparison Analysis—All Students

	Coeff.	SE
Intercept	-0.09	0.03
School uses CMP2	0.00	0.05
Percent of Hispanic students in school	0.34	0.18
Percent of black students in school	0.43*	0.17
Percent of other minority students in school	1.78*	0.68
Percent of FRL students in school	-0.68*	0.16
<i>Community type^a</i>		
Suburb	-0.14*	0.06
Town	-0.18	0.09
Rural	-0.18*	0.07
School size	-0.03*	0.01
Student is female	-0.09*	0.01
<i>Student's race/ethnicity^b</i>		
Black	-0.53*	0.02
Hispanic	-0.26*	0.02
Other Minority (i.e., Asian., Native American, multi-racial)	0.18*	0.02
ELL student	-0.48*	0.02
FRL student	-0.34*	0.01
Special Education student	-0.87*	0.01
Time	0.04	0.02
Time*CMP2	-0.03	0.04
Time*Percent of students in school who are female	-1.42	0.82
Time*Percent of Hispanic students in school	0.04	0.14
Time*Percent of black students in school	-0.02	0.13
Time*Percent of other minority students in school	1.70*	0.53
Time*Percent of FRL students in school	0.12	0.12
Time* <i>Community type^a</i>		
Time*Suburb	0.05	0.05
Time*Town	0.03	0.07
Time*Rural	0.03	0.05
Time*School size	-0.01	0.01
Time*Student is female	-0.03*	0.01
Time* <i>Student's race/ethnicity^b</i>		
Time*Black	-0.06*	0.01
Time*Hispanic	-0.04*	0.01
Time*Other Minority (i.e., Asian., Native American, multi-racial)	0.04	0.02
Time*ELL student	0.13*	0.02
Time*FRL student	-0.00	0.01
Time*Special Education student	0.03*	0.01
Time ² *	0.02*	0.01
Time ² *CMP2	-0.01	0.01
Time ² *Percent of students in school who are female	-0.48	0.24
Time ² *Percent of Hispanic students in school	0.03	0.04
Time ² *Percent of black students in school	0.02	0.04
Time ² *Percent of other minority students in school	0.41*	0.15
Time ² *Percent of FRL students in school	0.01	0.03
Time ² * <i>Community type^a</i>		
Time ² *Suburb	0.01	0.01
Time ² *Town	0.04	0.02
Time ² *Rural	0.02	0.01
Time ² *School size	0.00	0.00
Time ² *Student is female	-0.01*	0.00
Time ² * <i>Student's race/ethnicity^b</i>		
Time ² *Black	-0.02*	0.00
Time ² *Hispanic	-0.01	0.00
Time ² *Other Minority (i.e., Asian., Native American, multi-racial)	0.00	0.01
Time ² *ELL student	0.02*	0.01
Time ² *FRL student	0.00	0.00
Time ² *Special Education student	0.01*	0.00

* p < 0.05.

Note: All variables were grand-mean centered except "CMP2" and Time which are uncentered. Time was coded with 8th grade = 0, 7th grade = -1, 6th grade = -2, and 5th grade = -3.

^a Versus city schools.

^b Versus white students.

Table B-2
HLM Regression Coefficients and Standard Errors
for Gender Achievement Gap Analysis—All Students

	Coeff.	SE
Intercept	-0.09	0.03
School uses CMP2	-0.00	0.05
Percent of Hispanic students in school	0.34	0.18
Percent of black students in school	0.43*	0.17
Percent of other minority students in school	1.77*	0.68
Percent of FRL students in school	-0.68*	0.16
<i>Community type^a</i>		
Suburb	-0.14*	0.06
Town	-0.17	0.09
Rural	-0.18*	0.07
School size	-0.03*	0.01
Student is female	-0.10*	0.01
Female*CMP2	0.02	0.02
Female*Percent of Hispanic students in school	0.20*	0.08
Female*Percent of black students in school	0.20*	0.07
Female*Percent of other minority students in school	0.35	0.28
Female*Percent of FRL students in school	-0.09	0.07
Female* <i>Community type^a</i>		
Female*Suburb	-0.02	0.03
Female*Town	-0.05	0.04
Female*Rural	0.02	0.03
Female*School size	-0.00	0.00
<i>Student's race/ethnicity^b</i>		
Black	-0.53*	0.02
Hispanic	0.26*	0.02
Other Minority (i.e., Asian, Native American, multi-racial)	0.18*	0.02
ELL student	-0.48*	0.02
FRL student	-0.34*	0.01
Special Education student	-0.87*	0.01
Time	0.03	0.03
Time*CMP2	-0.01	0.04
Time*Percent of Hispanic students in school	0.02	0.14
Time*Percent of black students in school	0.02	0.13
Time*Percent of other minority students in school	1.47*	0.53
Time*Percent of FRL students in school	0.10	0.12
Time* <i>Community type^a</i>		
Time*Suburb	0.05	0.05
Time*Town	0.02	0.07
Time*Rural	0.04	0.05
Time*School size	-0.01	0.01
Time*Student is female	-0.02	0.01
Time*Female*CMP2	-0.02	0.02
Time*Female*Percent of Hispanic students in school	0.07	0.07
Time*Female*Percent of black students in school	0.00	0.07
Time*Female*Percent of other minority students in school	0.22	0.26
Time*Female*Percent of FRL students in school	-0.06	0.06
Time*Female* <i>Community type^a</i>		
Time*Female*Suburb	-0.01	0.02
Time*Female*Town	-0.04	0.03
Time*Female*Rural	0.00	0.02
Time*Female*School size	-0.00	0.00
Time* <i>Student's race/ethnicity^b</i>		
Time*Black	-0.06*	0.02
Time*Hispanic	-0.04*	0.02
Time*Other Minority (i.e., Asian, Native American, multi-racial)	0.04	0.02
Time*ELL student	0.12*	0.02
Time*FRL student	-0.00	0.01
Time*Special Education student	0.03*	0.01
Time ²	0.02	0.01
Time ³ *CMP2	0.00	0.01
Time ² *Percent of Hispanic students in school	0.03	0.04
Time ² *Percent of black students in school	0.04	0.04
Time ² *Percent of other minority students in school	0.33*	0.15
Time ² *Percent of FRL students in school	0.01	0.04

Time ² *Community type ^a		
Time ² *Suburb	0.01	0.01
Time ² *Town	0.03	0.02
Time ² *Rural	0.03	0.02
Time ² *School size	0.00	0.00
Time ² *Student is female	-0.01	0.00
Time ² *Female*CMP2	-0.01	0.01
Time ² *Female*Percent of Hispanic students in school	0.04	0.02
Time ² *Female*Percent of black students in school	0.01	0.02
Time ² *Female*Percent of other minority students in school	-0.03	0.08
Time ² *Female*Percent of FRL students in school	-0.03	0.02
Time ² *Female*Community type ^a		
Time ² *Female*Suburb	-0.01	0.01
Time ² *Female*Town	-0.01	0.01
Time ² *Female*Rural	0.00	0.01
Time ² *Female*School size	0.00	0.00
Time ² *Student's race/ethnicity ^b		
Time ² *Black	-0.02*	0.00
Time ² *Hispanic	-0.01	0.00
Time ² *Other Minority (i.e., Asian, Native American, multi-racial)	0.00	0.01
Time ² *ELL student	0.02*	0.01
Time ² *FRL student	0.00	0.00
Time ² *Special Education student	0.01*	0.00

* p < 0.05.

Note: All variables were grand-mean centered except "CMP2" and Time which are uncentered. Time was coded with 8th grade = 0, 7th grade = -1, 6th grade = -2, and 5th grade = -3.

^a Versus city schools.

^b Versus white students.

Table B-3
HLM Regression Coefficients and standard errors
for Special Education Achievement Gap Analysis—All Students

	Coeff.	SE
Intercept	-0.09	0.03
School uses CMP2	0.00	0.05
Percent of Hispanic students in school	0.34	0.18
Percent of black students in school	0.42*	0.17
Percent of other minority students in school	1.80*	0.69
Percent of FRL students in school	-0.67*	0.16
<i>Community type^a</i>		
Suburb	-0.14*	0.06
Town	-0.17	0.09
Rural	-0.17*	0.07
School size	-0.03*	0.01
Student is female	-0.09*	0.01
<i>Student's race/ethnicity^b</i>		
Black	-0.54*	0.02
Hispanic	-0.25*	0.02
Other Minority (i.e., Asian., Native American, multi-racial)	0.18*	0.02
ELL student	-0.49*	0.02
FRL student	-0.34*	0.01
Special Education student	-0.90*	0.04
Special Education student*CMP2	0.03	0.06
Special Education student*Percent of Hispanic students in school	-0.20	0.22
Special Education student*Percent of black students in school	0.20	0.20
Special Education student*Percent of other minority students in school	-1.32	0.81
Special Education student*Percent of FRL students in school	0.36	0.19
Special Education student* <i>Community type^a</i>		
Special Education student*Suburb	0.06	0.08
Special Education student*Town	0.01	0.11
Special Education student*Rural	0.11	0.08
Special Education student*School size	0.02	0.01
Time	0.03	0.02
Time*CMP2	-0.01	0.04
Time*Percent of Hispanic students in school	0.02	0.14
Time*Percent of black students in school	0.03	0.13
Time*Percent of other minority students in school	1.45*	0.52
Time*Percent of FRL students in school	0.11	0.12
Time* <i>Community type^a</i>		
Time*Suburb	0.05	0.05
Time*Town	0.01	0.07
Time*Rural	0.04	0.05
Time*School size	-0.01	0.01
Time*Student is female	-0.03*	0.01
Time* <i>Student's race/ethnicity^b</i>		
Time*Black	-0.06*	0.02
Time*Hispanic	-0.04*	0.02
Time*Other Minority (i.e., Asian., Native American, multi-racial)	0.04	0.02
Time*ELL student	0.13*	0.02
Time*FRL student	-0.01	0.01
Time*Special Education student	0.01	0.04
Time*Special Education student*CMP2	0.04	0.05
Time*Special Education student*Percent of Hispanic students in school	-0.37	0.20
Time*Special Education student*Percent of black students in school	-0.51*	0.18
Time*Special Education student*Percent of other minority students in school	-0.44	0.73
Time*Special Education student*Percent of FRL students in school	0.24	0.17
Time*Special Education student* <i>Community type^a</i>		
Time*Special Education student*Suburb	-0.03	0.07
Time*Special Education student*Town	-0.10	0.10
Time*Special Education student*Rural	-0.03	0.07
Time*Special Education student*School size	0.02	0.01
Time ²	0.02*	0.01
Time ² *CMP2	-0.00	0.01
Time ² *Percent of Hispanic students in school	0.03	0.04
Time ² *Percent of black students in school	0.04	0.04
Time ² *Percent of other minority students in school	0.32*	0.15
Time ² *Percent of FRL students in school	0.01	0.04

Time ² *Community type ^a		
Time ² *Suburb	0.01	0.01
Time ² *Town	0.03	0.02
Time ² *Rural	0.03	0.02
Time ² *School size	0.00	0.00
Time ² *Student is female	-0.01*	0.00
Time ² *Student's race/ethnicity ^b		
Time ² *Black	-0.02*	0.00
Time ² *Hispanic	-0.01	0.00
Time ² *Other Minority (i.e., Asian., Native American, multi-racial)	0.00	0.01
Time ² *ELL student	0.02*	0.01
Time ² *FRL student	0.00	0.00
Time ² *Special Education student	0.01	0.01
Time ² *Special Education student*CMP2	0.01	0.01
Time ² *Special Education student*Percent of Hispanic students in school	-0.11*	0.05
Time ² *Special Education student*Percent of black students in school	-0.17*	0.05
Time ² *Special Education student*Percent of other minority students in school	0.01	0.20
Time ² *Special Education student*Percent of FRL students in school	0.06	0.05
Time ² *Special Education student*Community type ^a		
Time ² *Special Education student*Suburb	-0.00	0.02
Time ² *Special Education student*Town	-0.03	0.03
Time ² *Special Education student*Rural	-0.01	0.02
Time ² *Special Education student*School size	0.00	0.00

* p < 0.05.

Note: All variables were grand-mean centered except "CMP2" and Time which are uncentered. Time was coded with 8th grade = 0, 7th grade = -1, 6th grade = -2, and 5th grade = -3.

^a Versus city schools.

^b Versus white students.

Table B-4
HLM Regression Coefficients and standard errors
for Free and Reduced Lunch Achievement Gap Analysis—All Students

	Coeff.	SE
Intercept	-0.10	0.03
School uses CMP2	-0.01	0.05
Percent of Hispanic students in school	0.35	0.18
Percent of black students in school	0.35*	0.17
Percent of other minority students in school	1.80*	0.66
Percent of FRL students in school	-0.70*	0.16
<i>Community type^a</i>		
Suburb	-0.16*	0.06
Town	-0.17	0.09
Rural	-0.19*	0.07
School size	-0.03*	0.01
Student is female	-0.09*	0.01
<i>Student's race/ethnicity^b</i>		
Black	-0.50*	0.02
Hispanic	-0.25*	0.02
Other Minority (i.e., Asian., Native American, multi-racial)	0.18*	0.02
ELL student	-0.46*	0.02
FRL student	-0.31*	0.03
FRL*School uses CMP2	-0.06	0.05
FRL*Percent of Hispanic students in school	-0.36*	0.17
FRL*Percent of black students in school	-0.33*	0.16
FRL*Percent of other minority students in school	-0.57	0.64
FRL*Percent of FRL students in school	0.67*	0.16
<i>FRL*Community type^c</i>		
FRL*Suburb	0.11	0.06
FRL*Town	0.08	0.08
FRL*Rural	0.13	0.06
FRL*School size	0.02	0.01
Special Education student	-0.87*	0.01
Time	0.03	0.02
Time*CMP2	-0.01	0.04
Time*Percent of Hispanic students in school	0.02	0.14
Time*Percent of black students in school	0.02	0.13
Time*Percent of other minority students in school	1.51*	0.53
Time*Percent of FRL students in school	0.10	0.12
<i>Time*Community type^d</i>		
Time*Suburb	0.05	0.05
Time*Town	0.02	0.07
Time*Rural	0.04	0.05
Time*School size	-0.01	0.01
Time*Student is female	-0.03*	0.01
<i>Time*Student's race/ethnicity^e</i>		
Time*Black	-0.06*	0.02
Time*Hispanic	-0.04*	0.02
Time*Other Minority (i.e., Asian., Native American, multi-racial)	0.04	0.02
Time*ELL student	0.13*	0.02
Time*FRL student	-0.00	0.01
Time*FRL*CMP2	-0.01	0.01
Time*FRL*Percent of Hispanic students in school	-0.01	0.03
Time*FRL*Percent of black students in school	-0.02	0.03
Time*FRL*Percent of other minority students in school	-0.02	0.12
Time*FRL*Percent of FRL students in school	0.05	0.03
<i>Time*FRL*Community type^f</i>		
Time*FRL*Suburb	0.00	0.01
Time*FRL*Town	-0.01	0.01
Time*FRL*Rural	0.01	0.01
Time*FRL*School size	0.00	0.00
Time*Special Education student	0.03*	0.01
Time ²	0.02*	0.01
Time ² *CMP2	-0.00	0.01
Time ² *Percent of Hispanic students in school	0.03	0.04
Time ² *Percent of black students in school	0.04	0.04
Time ² *Percent of other minority students in school	0.34*	0.15
Time ² *Percent of FRL students in school	0.01	0.04
<i>Time²*Community type^g</i>		
Time ² *Suburb	0.01	0.01
Time ² *Town	0.03	0.02

Time*Rural	0.03	0.02
Time ² *School size	0.00	0.00
Time*Student is female	-0.01*	0.00
Time* <i>Student's race/ethnicity</i> ^b		
Time ² *Black	-0.02*	0.00
Time ² *Hispanic	-0.01	0.00
Time ² *Other Minority (i.e., Asian, Native American, multi-racial)	0.00	0.01
Time*ELL student	0.02*	0.01
Time*FRL student	0.00	0.00
Time*Special Education student	0.01*	0.00

* p < 0.05.

Note: All variables were grand-mean centered except "CMP2" and Time which are uncentered. Time was coded with 8th grade = 0, 7th grade = -1, 6th grade = -2, and 5th grade = -3.

^a Versus city schools.

^b Versus white students.

Table B-5
HLM Regression Coefficients and standard errors
for Race Achievement Gap Analysis—All Students

	Coeff.	SE
Intercept (Pre-Test Score)	-0.07	0.03
School uses CMP2	0.01	0.05
Percent of Hispanic students in school	0.39*	0.18
Percent of black students in school	0.37*	0.18
Percent of other minority students in school	1.55*	0.68
Percent of FRL students in school	-0.69*	0.16
<i>Community type^a</i>		
Suburb	-0.15*	0.06
Town	-0.13	0.09
Rural	-0.19*	0.07
School size	-0.04*	0.01
Student is female	-0.09*	0.01
<i>Student's race/ethnicity^b</i>		
Black	-0.49*	0.05
Black*CMP2	0.04	0.06
Black*Percent of Hispanic students in school	0.03	0.24
Black*Percent of black students in school	-0.37*	0.17
Black*Percent of other minority students in school	-0.30	0.72
Black*Percent of FRL students in school	0.33	0.18
Black*Community type ^c		
Black*Suburb	0.08	0.07
Black*Town	0.13	0.10
Black*Rural	0.08	0.07
Black*School size	-0.00	0.01
Hispanic	-0.20*	0.04
Hispanic*CMP2	-0.01	0.05
Hispanic*Percent of Hispanic students in school	-0.67*	0.20
Hispanic*Percent of black students in school	-0.45*	0.21
Hispanic*Percent of other minority students in school	-0.49	0.70
Hispanic*Percent of FRL students in school	0.73*	0.19
Hispanic*Community type ^a		
Hispanic*Suburb	0.09	0.06
Hispanic*Town	0.47*	0.12
Hispanic*Rural	0.19*	0.07
Hispanic*School size	0.02	0.01
Other Minority (i.e., Asian, Native American, multi-racial)	0.12	0.06
Other Minority*CMP2	0.10	0.09
Other Minority*Percent of Hispanic students in school	-0.07	0.34
Other Minority*Percent of black students in school	0.76*	0.31
Other Minority*Percent of other minority students in school	-1.37	1.17
Other Minority*Percent of FRL students in school	-0.46	0.31
Other Minority*Community type ^c		
Other Minority*Suburb	-0.13	0.11
Other Minority*Town	-0.23	0.16
Other Minority*Rural	-0.21	0.12
Other Minority*School size	-0.02	0.02
ELL student	-0.45*	0.03
FRL student	-0.32*	0.01
Special Education student	-0.87*	0.01
Time	0.03	0.03
Time*CMP2	-0.00	0.04
Time*Percent of Hispanic students in school	0.04	0.14
Time*Percent of black students in school	0.04	0.13
Time*Percent of other minority students in school	1.42*	0.53
Time*Percent of FRL students in school	0.10	0.12
Time*Community type ^a		
Time*Suburb	0.05	0.05
Time*Town	0.03	0.07
Time*Rural	0.04	0.05
Time*School size	-0.01	0.01
Time*Student is female	-0.03*	0.01
Time*Student's race/ethnicity ^b		
Time*Black	-0.09*	0.02
Time*Black*CMP2	0.05*	0.02
Time*Black*Percent of Hispanic students in school	0.13	0.08
Time*Black*Percent of black students in school	-0.02	0.05

Time*Black*Percent of other minority students in school	-0.05	0.23
Time*Black*Percent of FRL students in school	-0.01	0.06
Time*Black*Community type ^a		
Time*Black*Suburb	0.02	0.02
Time*Black*Town	0.01	0.03
Time*Black*Rural	0.01	0.02
Time*Black*School size	-0.00	0.00
Time*Hispanic	-0.03	0.02
Time*Hispanic*CMP2	0.01	0.01
Time*Hispanic*Percent of Hispanic students in school	-0.14*	0.05
Time*Hispanic*Percent of black students in school	-0.14*	0.06
Time*Hispanic*Percent of other minority students in school	0.05	0.19
Time*Hispanic*Percent of FRL students in school	0.13*	0.05
Time*Hispanic*Community type ^a		
Time*Hispanic*Suburb	0.03*	0.02
Time*Hispanic*Town	0.07	0.04
Time*Hispanic*Rural	0.01	0.02
Time*Hispanic*School size	0.00	0.00
Time*Other Minority (i.e., Asian, Native American, multi-racial)	0.04	0.02
Time*Other Minority*CMP2	0.03	0.02
Time*Other Minority*Percent of Hispanic students in school	-0.01	0.08
Time*Other Minority*Percent of black students in school	0.08	0.07
Time*Other Minority*Percent of other minority students in school	-0.53*	0.25
Time*Other Minority*Percent of FRL students in school	-0.01	0.07
Time*Other Minority*Community type ^b		
Time*Other Minority*Suburb	0.01	0.02
Time*Other Minority*Town	-0.04	0.04
Time*Other Minority*Rural	-0.02	0.03
Time*Other Minority*School size	-0.01	0.00
Time*ELL student	0.13*	0.02
Time*FRL student	-0.00	0.01
Time*Special Education student	0.03*	0.01
Time ²	0.02*	0.01
Time ² *CMP2	0.00	0.01
Time ² *Percent of Hispanic students in school	0.02	0.04
Time ² *Percent of black students in school	0.04	0.04
Time ² *Percent of other minority students in school	0.33*	0.15
Time ² *Percent of FRL students in school	0.01	0.04
Time ² *Community type ^c		
Time ² *Suburb	0.01	0.01
Time ² *Town	0.03	0.02
Time ² *Rural	0.03	0.02
Time ² *School size	0.00	0.00
Time ² *Student is female	-0.01*	0.00
Time ² *Student's race/ethnicity ^b		
Time ² *Black	-0.02*	0.00
Time ² *Hispanic	-0.01	0.00
Time ² *Other Minority (i.e., Asian, Native American, multi-racial)	0.00	0.01
Time ² *ELL student	0.02*	0.01
Time ² *FRL student	0.00	0.00
Time ² *Special Education student	0.01*	0.00

* p < 0.05.

Note: All variables were grand-mean centered except "CMP2" and Time which are uncentered. Time was coded with 8th grade = 0, 7th grade = -1, 6th grade = -2, and 5th grade = -3.

^a Versus city schools.

^b Versus white students.

Table B-6
HLM Regression Coefficients and Standard Errors for Treatment vs. Comparison Model
Main Cohort (2006–07 6th Graders)

	State Mathematics Assessment		BAM		Confidence in Studying Mathematics		Beliefs about Usefulness of Mathematics		Intrinsic Motivation to Study Mathematics		Enjoyment of Mathematics	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Intercept	0.14	0.05	0.10	0.07	71.36	1.32	80.64	0.96	74.74	0.97	53.38	1.56
Time	-0.02*	0.01	-0.02	0.02	-1.26*	0.24	-1.61*	0.20	-3.43*	0.20	-2.94*	0.28
School uses CMP2	-0.07	0.05	0.05	0.08	-3.81*	1.40	-1.28	1.00	-0.58	1.01	-1.03	1.64
Time*CMP2	0.04*	0.01	0.02	0.02	0.54	0.33	0.67*	0.28	0.06	0.27	-0.35	0.38
Student is female	0.00	0.01	0.07*	0.01	-2.97*	0.38	1.31*	0.34	3.11*	0.35	0.15	0.48
<i>Student's race/ethnicity^d</i>												
American Indian	-0.02	0.07	-0.06	0.09	-0.95	2.72	-2.35	2.42	1.03	2.49	2.37	3.40
Asian	0.17*	0.03	0.10*	0.04	2.92*	1.15	2.53*	1.02	3.89*	1.05	6.31*	1.45
Black	-0.11*	0.02	-0.16*	0.03	4.43*	0.81	2.77*	0.72	4.47*	0.74	5.71*	1.02
Hispanic	-0.00	0.02	-0.09*	0.02	-0.50	0.77	-0.10	0.68	1.34	0.70	2.79*	0.97
Multi-racial	-0.03	0.05	-0.07	0.06	1.18	1.90	-1.40	1.68	1.48	1.73	2.95	2.39
ELL Student	-0.14*	0.03	-0.09*	0.04	3.38*	1.24	-1.46	1.09	3.82*	1.13	9.11*	1.55
FRL Student	-0.09*	0.01	-0.09*	0.02	-2.04*	0.48	-1.38*	0.42	-0.68	0.44	-0.28	0.60
Special Education student	-0.22*	0.02	-0.28*	0.02	-1.27	0.65	-3.44*	0.58	-0.62	0.59	1.72*	0.82
5 th grade state math score	0.71*	0.01	0.62*	0.01	10.36*	0.25	4.15*	0.22	0.67*	0.23	4.64*	0.32
<i>Teacher Degree^e</i>												
Both Math and Math Education	0.04*	0.02	-0.02	0.03	0.19	0.70	-0.01	0.58	-0.24	0.57	0.20	0.81
Math only	-0.05*	0.02	-0.03	0.03	-0.71	0.62	-0.48	0.52	-0.66	0.51	0.07	0.73
Math Education only	0.03	0.02	-0.03	0.03	1.01	0.57	1.34*	0.47	0.93*	0.46	1.18	0.66
Years of experience teaching K–12 math	0.00	0.00	0.02*	0.00	-0.41*	0.09	-0.07	0.08	-0.08	0.08	-0.24*	0.11
Minutes per day on math	-0.00	0.00	—	—	—	—	—	—	—	—	—	—
Days taught prior to BAM	—	—	-0.00	0.00	—	—	—	—	—	—	—	—
Percent of instruction based on textbook	—	—	0.02	0.01	-1.07*	0.27	-0.48*	0.22	-0.35	0.22	-1.18*	0.31
Percent of female students in school	0.00	0.01	0.00	0.02	0.28	0.32	0.12	0.23	0.04	0.23	-0.09	0.38
Percent of Hispanic students in school	-0.00	0.00	-0.00	0.00	-0.06	0.06	-0.01	0.04	0.02	0.04	0.00	0.07
Percent of black students in school	0.00	0.00	-0.00	0.00	0.00	0.04	-0.01	0.03	0.01	0.03	-0.04	0.05
Percent of other minority students in school	0.00	0.01	-0.00	0.01	-0.04	0.17	-0.11	0.12	-0.08	0.12	-0.14	0.20
Percent of ELL students in school	0.00	0.00	0.01	0.01	0.18	0.13	0.04	0.09	0.01	0.09	-0.04	0.15
Percent of FRL students in school	-0.00	0.00	-0.01*	0.00	0.01	0.04	0.03	0.03	0.03	0.03	0.06	0.05
Percent of special education students in school	0.00	0.01	0.01	0.01	0.10	0.18	-0.06	0.13	-0.06	0.13	-0.04	0.21
School size	-0.00*	0.00	-0.00	0.00	-0.00	0.00	-0.00*	0.00	-0.00	0.00	-0.01*	0.00
<i>Community type^c</i>												
City	0.08	0.06	0.00	0.10	0.11	1.68	-0.63	1.18	-0.23	1.20	1.36	1.99
Rural	-0.15*	0.06	-0.18	0.10	-2.29	1.65	0.05	1.16	0.05	1.18	-0.61	1.95
Town	-0.14	0.08	-0.06	0.13	-0.27	2.29	1.27	1.61	0.19	1.64	0.86	2.71

* p < 0.05.

Note: All continuous variables are mean centered; all dichotomous variables are binary; all nominal variables are included via dummy coding with a reference category.

^a Versus white students.

^b Versus teachers with neither mathematics nor mathematics education degrees.

^c Versus suburban schools.

Table B-7
HLM Regression Coefficients and Standard Errors for Achievement Gaps Model
Main Cohort (2006–07 6th Graders)

	State Mathematics Test		BAM Test		Confidence in Studying Mathematics		Beliefs about Usefulness of Mathematics		Intrinsic Motivation to Study Mathematics		Enjoyment of Mathematics	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Intercept	0.15	0.05	0.09	0.07	71.31	1.33	80.88	1.00	74.47	0.98	53.53	1.60
Time	-0.03	0.01	-0.02	0.02	-1.24*	0.26	-1.84*	0.23	-3.23*	0.21	-2.79*	0.31
School uses CMP2	-0.07	0.05	0.05	0.08	-3.72*	1.40	-1.01	1.06	-0.63	1.01	-1.59	1.70
Time*CMP2	0.04*	0.01	0.02	0.02	0.48	0.33	0.65*	0.31	0.09	0.27	-0.36	0.42
Student is female	0.00	0.01	0.12*	0.02	-2.97*	0.38	1.30*	0.34	3.11*	0.35	0.17	0.48
Female*Time	—	—	-0.05*	0.01	—	—	—	—	—	—	—	—
<i>Student's race/ethnicity^a</i>												
American Indian	-0.02	0.07	-0.08	0.11	-2.86	3.46	-9.04	5.30	1.01	2.49	-3.96	7.24
Asian	0.16*	0.03	0.05	0.05	2.48	1.41	-0.25	2.60	3.92*	1.05	1.93	3.56
Black	-0.11*	0.02	-0.21*	0.03	3.69*	0.98	0.01	1.46	4.45*	0.74	4.94*	2.03
Hispanic	-0.00	0.02	-0.10*	0.03	0.40	0.91	-0.42	1.13	1.33	0.70	1.83	1.56
Multi-racial	-0.03	0.05	-0.06	0.08	-2.06	2.33	-2.24	3.14	1.47	1.73	1.69	4.28
<i>Student's race/ethnicity^a*CMP2</i>												
American Indian*CMP2	—	—	—	—	—	—	10.07	6.66	—	—	10.42	9.05
Asian*CMP2	—	—	—	—	—	—	1.68	2.99	—	—	5.91	4.09
Black*CMP2	—	—	—	—	—	—	1.25	1.79	—	—	1.33	2.48
Hispanic*CMP2	—	—	—	—	—	—	0.53	1.56	—	—	3.58	2.16
Multi-racial*CMP2	—	—	—	—	—	—	-1.99	4.31	—	—	-0.03	5.90
<i>Student's race/ethnicity^a*Time</i>												
American Indian*Time	—	—	0.03	0.07	1.28	1.44	6.04*	2.36	—	—	4.76	2.98
Asian*Time	—	—	0.06	0.03	0.32	0.59	1.40	1.13	—	—	0.03	1.45
Black*Time	—	—	0.06*	0.02	0.55	0.41	1.45*	0.62	—	—	-0.11	0.81
Hispanic*Time	—	—	0.01	0.02	-0.65	0.36	0.05	0.47	—	—	-0.40	0.61
Multi-racial*Time	—	—	-0.01	0.05	2.38*	1.00	-0.18	1.43	—	—	-1.68	1.82
<i>Student's race/ethnicity^a*Time*CMP2</i>												
American Indian*Time*CMP2	—	—	—	—	—	—	-8.66*	2.96	—	—	-7.45*	3.76
Asian*Time*CMP2	—	—	—	—	—	—	-0.55	1.33	—	—	0.09	1.70
Black*Time*CMP2	—	—	—	—	—	—	-0.06	0.80	—	—	-0.03	1.04
Hispanic*Time*CMP2	—	—	—	—	—	—	-0.01	0.69	—	—	-0.37	0.90
Multi-racial*Time*CMP2	—	—	—	—	—	—	2.89	1.97	—	—	4.60	2.52
ELL Student	-0.22*	0.04	-0.09*	0.04	3.33*	1.24	-3.63*	1.40	3.81*	1.13	11.19*	1.91
ELL*Time	0.09*	0.02	—	—	—	—	1.58*	0.64	—	—	-1.79*	0.82
FRL Student	-0.09*	0.01	-0.09*	0.02	-2.03*	0.48	-1.40*	0.42	0.11	0.53	-0.31	0.60
FRL*Time	—	—	—	—	—	—	—	—	-0.56*	0.22	—	—
Special Education student	-0.22*	0.02	-0.34*	0.03	-1.29*	0.65	-1.59	0.83	-0.61	0.59	1.73*	0.82
Special Education*Time	—	—	0.07*	0.02	—	—	—	—	—	—	—	—
Special Education*CMP2	—	—	—	—	—	—	-3.47*	1.10	—	—	—	—
5 th grade state math score	0.71*	0.01	0.62*	0.01	10.36*	0.25	4.16*	0.22	0.67*	0.23	4.66*	0.32
<i>Teacher Degree^b</i>												
Both Math and Math Education	0.04*	0.02	-0.01	0.03	0.27	0.70	0.10	0.59	-0.29	0.57	0.27	0.82
Math only	-0.06*	0.02	-0.03	0.03	-0.66	0.62	-0.47	0.52	-0.71	0.51	0.11	0.73
Math Education only	0.03	0.02	-0.02	0.03	1.02	0.57	1.39*	0.47	0.92*	0.46	1.16	0.66
Years teaching math	0.00	0.00	0.02*	0.00	-0.42*	0.09	-0.07	0.08	-0.09	0.08	-0.25*	0.11
Minutes per day on math	-0.00	0.00	—	—	—	—	—	—	—	—	—	—
Days taught prior to BAM	—	—	-0.00	0.00	—	—	—	—	—	—	—	—

Percent of instruction based on textbook	—	—	0.02	0.01	-1.07*	0.27	-0.49*	0.22	-0.37	0.22	-1.19*	0.31
Percent of female students in school	0.00	0.01	0.00	0.02	0.27	0.32	0.13	0.23	0.04	0.23	-0.06	0.38
Percent of Hispanic students in school	-0.00	0.00	-0.00	0.00	-0.06	0.06	-0.01	0.04	0.02	0.04	0.02	0.07
Percent of black students in school	-0.00	0.00	-0.00	0.00	0.00	0.04	-0.01	0.03	0.01	0.03	-0.02	0.05
Percent of other minority students in school	0.00	0.01	-0.00	0.01	-0.04	0.17	-0.11	0.12	-0.08	0.12	-0.14	0.20
Percent of ELL students in school	0.00	0.00	0.01	0.01	0.18	0.13	0.04	0.09	0.00	0.09	-0.05	0.15
Percent of FRL students in school	-0.00	0.00	-0.01*	0.00	0.01	0.04	0.03	0.03	0.03	0.03	0.06	0.05
Percent of special education students in school	-0.00	0.01	0.01	0.01	0.10	0.18	-0.06	0.13	-0.06	0.13	-0.03	0.21
School size	-0.00*	0.00	-0.00	0.00	-0.00	0.00	-0.00*	0.00	-0.00	0.00	-0.01*	0.00
<i>Community type^e</i>												
City	0.07	0.06	-0.01	0.10	0.12	1.69	-0.68	1.21	-0.22	1.21	1.44	2.01
Rural	-0.15*	0.06	-0.18	0.10	-2.27	1.66	-0.01	1.18	0.03	1.18	-0.59	1.96
Town	-0.15	0.08	-0.06	0.13	-0.26	2.30	1.35	1.64	0.18	1.64	1.05	2.73

* $p < 0.05$.

Note: All continuous variables are mean centered; all dichotomous variables are binary; all nominal variables are included via dummy coding with a reference category.

^a Versus white students.

^b Versus teachers with neither mathematics nor mathematics education degrees.

^c Versus suburban schools.

Table B-8
HLM Regression Coefficients and Standard Errors for Extent of Implementation Model
Main Cohort (2006–07 6th Graders)

	State Mathematics Test		BAM Test		Confidence in Studying Mathematics		Beliefs about Usefulness of Mathematics		Intrinsic Motivation to Study Mathematics		Enjoyment of Mathematics	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
	Intercept	0.15	0.05	0.05	0.09	72.36	1.39	80.29	1.10	73.82	1.14	53.47
Time	-0.05*	0.02	-0.11*	0.03	-1.29*	0.26	-1.88*	0.23	-3.32*	0.21	-2.83*	0.31
School uses CMP2	-0.15*	0.06	-0.09	0.11	-3.85*	1.48	-0.88	1.18	1.53	1.29	0.23	1.99
Time*CMP2	0.11*	0.02	0.23*	0.05	0.51	0.34	0.72*	0.31	0.09	0.27	-0.36	0.42
Student is female	-0.00	0.01	0.12*	0.02	-2.98*	0.38	1.31*	0.34	3.11*	0.35	0.19	0.48
Female*Time	—	—	-0.05*	0.01	—	—	—	—	—	—	—	—
<i>Student's race/ethnicity^a</i>												
American Indian	-0.02	0.07	-0.05	0.11	-3.56	3.52	-9.26	5.31	0.86	2.51	-4.14	7.23
Asian	0.16*	0.03	0.06	0.05	2.66	1.41	-0.43	2.61	3.86*	1.05	1.80	3.57
Black	-0.10*	0.02	-0.17*	0.03	3.78*	0.99	0.15	1.47	4.39*	0.74	5.44*	2.03
Hispanic	-0.00	0.02	-0.08*	0.03	0.25	0.92	-0.43	1.13	1.33	0.71	1.85	1.56
Multi-racial	-0.03	0.05	-0.05	0.08	-2.17	2.33	-2.40	3.14	1.36	1.73	1.60	4.28
<i>Student's race/ethnicity^a*Time</i>												
American Indian*Time	—	—	0.00	0.08	1.52	1.45	6.20*	2.36	—	—	4.95	2.98
Asian*Time	—	—	0.05	0.03	0.27	0.59	1.46	1.14	—	—	0.09	1.45
Black*Time	—	—	0.03	0.02	0.64	0.41	1.45*	0.62	—	—	-0.15	0.81
Hispanic*Time	—	—	-0.01	0.02	-0.52	0.36	0.10	0.47	—	—	-0.32	0.61
Multi-racial*Time	—	—	-0.02	0.05	2.47*	1.00	-0.13	1.43	—	—	-1.64	1.82
<i>Student's race/ethnicity^a*CMP2</i>												
American Indian*CMP2	—	—	—	—	—	—	10.38	6.73	—	—	11.38	9.14
Asian*CMP2	—	—	—	—	—	—	1.83	3.00	—	—	5.86	4.10
Black*CMP2	—	—	—	—	—	—	0.95	1.81	—	—	0.37	2.49
Hispanic*CMP2	—	—	—	—	—	—	0.72	1.58	—	—	3.41	2.18
Multi-racial*CMP2	—	—	—	—	—	—	-1.87	4.32	—	—	-0.52	5.90
<i>Student's race/ethnicity^a*Time*CMP2</i>												
American Indian*Time*CMP2	—	—	—	—	—	—	-8.66*	2.98	—	—	-7.90*	3.78
Asian*Time*CMP2	—	—	—	—	—	—	-0.60	1.33	—	—	0.09	1.70
Black*Time*CMP2	—	—	—	—	—	—	-0.02	0.80	—	—	0.16	1.05
Hispanic*Time*CMP2	—	—	—	—	—	—	-0.16	0.70	—	—	-0.38	0.91
Multi-racial*Time*CMP2	—	—	—	—	—	—	2.82	1.98	—	—	4.81	2.52
ELL Student	-0.22*	0.04	-0.10*	0.04	3.16*	1.24	-3.63*	1.41	3.90*	1.13	11.40*	1.92
ELL*Time	0.09*	0.02	—	—	—	—	1.57*	0.64	—	—	-1.89*	0.82
FRL Student	-0.08*	0.01	-0.09*	0.02	-1.98*	0.48	-1.35*	0.42	-0.14	0.54	-0.31	0.60
FRL*Time	—	—	—	—	—	—	—	—	-0.40	0.22	—	—
Special Education student	-0.22*	0.02	-0.31*	0.03	-1.20	0.65	-1.57	0.83	-0.62	0.60	1.63*	0.82
Special Education*Time	—	—	0.04*	0.02	—	—	—	—	—	—	—	—
Special Education*CMP2	—	—	—	—	—	—	-3.48*	1.11	—	—	—	—
5 th grade state math score	0.71*	0.01	0.64*	0.01	9.45*	0.36	4.11*	0.22	0.23	0.28	4.68*	0.32
5 th grade state math score*Time	—	—	-0.06*	0.01	—	—	—	—	0.28*	0.13	—	—
5 th grade state math score*CMP2	—	—	0.05*	0.02	1.69*	0.47	—	—	—	—	—	—
<i>Teacher Degree^b</i>												
Both Math and Math Education	0.05*	0.02	-0.02	0.03	0.24	0.70	0.24	0.59	-0.31	0.56	0.45	0.82
Math only	-0.05*	0.02	-0.01	0.03	-0.86	0.63	-0.43	0.53	-0.67	0.50	-0.03	0.73
Math Education only	0.03	0.02	-0.03	0.03	0.86	0.57	1.39*	0.48	0.80	0.45	1.11	0.66
Years teaching math	0.00	0.00	0.02*	0.01	-0.44*	0.10	-0.13	0.09	-0.11	0.08	-0.35*	0.12

Minutes per day on math	-0.00	0.00	—	—	—	—	—	—	—	—	—	—
Days taught prior to BAM	—	—	-0.00	0.00	—	—	—	—	—	—	—	—
Percent of instruction based on textbook	—	—	-0.02	0.01	-0.62*	0.30	-0.64*	0.25	-0.40	0.24	-0.90*	0.35
Fidelity of Implementation	-0.01	0.03	0.07	0.05	-1.36*	0.52	0.78	0.44	1.44*	0.54	0.36	0.79
Fidelity of Implementation*Time	0.06*	0.02	0.10*	0.04	—	—	—	—	—	—	—	—
Fidelity of Implementation*CMP2	0.15*	0.04	0.12	0.07	—	—	—	—	-2.18*	0.78	-2.68*	1.12
Fidelity of Implementation*Time*CMP2	-0.12*	0.03	-0.17*	0.05	—	—	—	—	—	—	—	—
Experience using textbook	0.03*	0.01	0.02	0.02	1.02	0.73	1.47*	0.40	1.04*	0.39	2.25*	0.56
Experience using textbook*Time	—	—	—	—	0.04	0.39	—	—	—	—	—	—
Experience using textbook*CMP2	-0.05*	0.02	—	—	-3.02*	1.01	-1.84*	0.60	-1.44*	0.59	-3.13*	0.83
Experience using textbook*Time*CMP2	—	—	—	—	1.58*	0.56	—	—	—	—	—	—
Amount of PD received on textbook	-0.01	0.01	0.03	0.02	0.00	0.22	-0.08	0.19	0.12	0.27	0.14	0.26
Amount of PD*Time	—	—	-0.06*	0.01	—	—	—	—	—	—	—	—
Amount of PD*CMP2	—	—	—	—	—	—	—	—	-0.84*	0.36	—	—
Percent of female students in school	0.00	0.01	0.00	0.02	0.22	0.32	0.17	0.24	0.12	0.25	0.02	0.39
Percent of Hispanic students in school	-0.00	0.00	-0.00	0.00	-0.07	0.06	-0.01	0.05	0.03	0.05	0.03	0.07
Percent of black students in school	-0.00	0.00	-0.00	0.00	-0.00	0.04	0.00	0.03	0.02	0.03	-0.03	0.05
Percent of other minority students in school	0.00	0.01	-0.00	0.01	-0.03	0.17	-0.11	0.13	-0.12	0.13	-0.14	0.20
Percent of ELL students in school	0.00	0.00	0.01	0.01	0.18	0.13	0.04	0.09	-0.02	0.10	-0.06	0.15
Percent of FRL students in school	0.00	0.00	-0.01*	0.00	0.03	0.04	0.02	0.03	0.04	0.03	0.06	0.05
Percent of special education students in school	-0.00	0.01	0.01	0.01	0.08	0.18	-0.07	0.13	-0.08	0.14	-0.04	0.21
School size	-0.00	0.00	0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.01*	0.00
<i>Community type^c</i>												
City	0.05	0.06	0.00	0.11	-0.35	1.67	-0.78	1.27	-0.14	1.29	1.33	2.01
Rural	-0.16*	0.06	-0.20	0.10	-2.18	1.63	-0.04	1.24	-0.08	1.27	-0.59	1.97
Town	-0.17*	0.08	-0.05	0.14	-0.62	2.27	1.04	1.72	0.17	1.76	0.65	2.73

* p < 0.05.

Note: All continuous variables are mean centered; all dichotomous variables are binary; all nominal variables are included via dummy coding with a reference category.

^a Versus white students.

^b Versus teachers with neither mathematics nor mathematics education degrees.

^c Versus suburban schools.

Appendix C

Instructional Materials Used

Table C-1
Number of Investigations Covered for Each CMP2 Unit

	Percent of Classes					
	None	1	2	3	4	5
6th grade						
Prime Time	14	0	1	2	19	64
Bits and Pieces I	11	3	1	4	82	—
Shapes and Designs	10	0	1	16	73	—
Bits and Pieces II	3	1	6	5	86	—
Covering and Surrounding	15	3	5	9	23	45
Bits and Pieces III	34	3	7	8	25	24
How Likely Is It?	55	7	14	8	16	—
Data About Us?	42	5	17	36	—	—
7th grade						
Variables and Patterns	13	0	2	7	26	52
Stretching and Shrinking	12	1	5	10	17	55
Comparing and Scaling	6	2	1	18	73	—
Accentuate the Negative	12	0	2	6	80	—
Moving Straight Ahead	50	1	5	5	39	—
Filling and Wrapping	35	0	4	28	15	18
What do you Expect?	26	7	22	18	27	—
Data Distributions	63	5	8	8	17	—
8th grade						
Thinking with Mathematical Models	6	1	19	73	—	—
Looking for Pythagoras	1	0	3	22	74	—
Growing, Growing, Growing	21	0	13	6	24	36
Frogs, Fleas, and Painted Cubes	56	9	8	15	12	—
Kaleidoscopes, Hubcaps, and Mirrors	51	2	7	21	11	8
Say it with Symbols	31	3	24	17	18	7
The Shapes of Algebra?	59	8	14	8	5	7
Samples and Populations	64	3	11	10	12	—

Table C-2
Number of Other CMP2 Units Covered

	Percent of Classes		
	6 th grade	7 th grade	8 th grade
None	87	48	34
1 Unit	3	31	43
2 Units	7	11	14
3 Units	1	6	7
4 Units	1	2	1
5 Units	1	1	34
6 Units	1	1	0

**Table C-3
Instructional Materials Used by Comparison Classes**

Publisher	Title	Percent of Classes
6th Grade		
Glencoe McGraw-Hill	<i>Mathematics Applications and Concepts</i>	34
Pearson Prentice Hall	<i>Mathematics</i>	25
SRA McGraw Hill	<i>SRA Math - Explorations and Applications</i>	13
Everyday Learning Corp/McGraw Hill	<i>Impact Mathematics</i>	11
McDougal Littell	<i>Math</i>	10
Scott Foresman - Addison Wesley	<i>Middle Grades Math</i>	3
McDougal Littell	<i>Passport to Mathematics</i>	3
McDougal Littell	<i>Gateways to Algebra and Geometry</i>	1
Houghton Mifflin	<i>Mathematics Structure and Method</i>	1
Pearson Prentice Hall	<i>Algebra 1</i>	1
7th Grade		
Pearson Prentice Hall	<i>Mathematics</i>	28
Glencoe McGraw Hill	<i>Mathematics: Applications and Concepts</i>	27
McDougal Littell	<i>Math</i>	12
Glencoe McGraw Hill	<i>Pre- Algebra</i>	12
Everyday Learning Corp/McGraw Hill	<i>Impact Mathematics</i>	11
Houghton Mifflin	<i>Intermediate Algebra: Graphs and Functions</i>	2
McDougal Littell	<i>Passport to Mathematics</i>	2
McDougal Littell	<i>Pre-Algebra</i>	2
Holt Rinehart & Winston	<i>Mathematics</i>	1
McDougal Littell	<i>Algebra 1</i>	1
McDougal Littell	<i>Mathematics Structure & Method</i>	1
Glencoe McGraw Hill	<i>Algebra 1</i>	1
Houghton Mifflin	<i>Pre-Algebra</i>	1
Kaplan	<i>Kaplan</i>	1
Pearson Prentice Hall	<i>Pre-Algebra</i>	1
8th Grade		
Glencoe McGraw Hill	<i>Algebra 1</i>	22
Pearson-Prentice Hall	<i>Mathematics</i>	21
McDougal Littell	<i>Pre-Algebra</i>	11
Glencoe McGraw Hill	<i>Mathematics Applications and Concepts</i>	7
Glencoe McGraw Hill	<i>Pre Algebra</i>	5
Pearson-Prentice Hall	<i>Algebra 1</i>	5
McDougal Littell	<i>Algebra 1</i>	4
Everyday Learning Corp/McGraw Hill	<i>Impact Mathematics</i>	2
Houghton Mifflin	<i>Intermediate Algebra Graphs and Functions</i>	2
McDougal Littell	<i>Math</i>	2
Pearson-Prentice Hall	<i>Pre Algebra</i>	2
College Prep Mathematics	<i>Algebra Connections</i>	2
College Prep Mathematics	<i>Mathematics</i>	2
McDougal Littell	<i>Passport to Algebra and Geometry</i>	2
McDougal Littell	<i>Algebra Structure and Method</i>	2
Voyager Expanded Learning Inc	<i>V Math</i>	2
Harcourt	<i>Saxon Math Course 3</i>	1
Holt, Rinehart and Winston	<i>Mathematics</i>	1
Key Curriculum	<i>Discovering Geometry an Investigative Approach</i>	1
Pearson-Prentice Hall	<i>Connected Mathematics 2</i>	1
AGS Publishing	<i>Basic Math Skills</i>	1
Fearon	<i>Basic Mathematics Pacemaker</i>	1
McDougal Littell	<i>Integrated Algebra</i>	1

Appendix D

Extent of Implementation Data

Table D-1
Textbook Coverage, by Extent of Implementation: CMP2 Classes

	Percent of Classes				
	Less than 25%	25-49%	50-74%	75-90%	More than 90%
Estimated percent of textbook covered during school year					
Low	7	9	44	37	4
High	2	4	27	52	16
Estimated percent of instruction based on primary textbook					
Low	3	7	22	53	16
High	0	1	2	29	68

Table D-2
Textbook Coverage, by Extent of Implementation: Comparison Classes

	Percent of Classes				
	Less than 25%	25-49%	50-74%	75-90%	More than 90%
Estimated percent of textbook covered during school year					
Low	2	9	47	41	0
High	0	3	23	56	18
Estimated percent of instruction based on primary textbook					
Low	3	8	25	57	8
High	0	0	3	49	48

Table D-3
Frequency of Use of Textbook for
Various Purposes, by Extent of Implementation: CMP2 Classes

	Percent of Classes				
	Never or Almost Never	Rarely (About ¼ of Lessons)	Sometimes (About ½ of Lessons)	Frequently (About ¾ of Lessons)	All or Nearly All Lessons
Textbook guides structure of course					
Low	2	3	23	42	30
High	0	1	2	26	72
Teacher uses textbook to plan lessons					
Low	1	6	32	41	20
High	1	2	5	33	59
Teacher reads/reviews suggestions from teacher guide to plan lessons					
Low	16	21	37	16	11
High	1	5	24	30	40
Teacher follows textbook page by page					
Low	11	26	43	18	2
High	0	0	12	51	37
Teacher picks what is important from textbook and skips the rest					
Low	5	9	32	38	16
High	40	42	7	9	2
Teacher incorporates activities from other sources to supplement what textbook lacks					
Low	5	19	26	28	22
High	28	50	16	6	1
Teacher uses suggested questions in teacher guide during instruction					
Low	14	32	40	11	3
High	1	9	27	36	26
Teacher incorporates practice problems from other sources to supplement textbook					
Low	5	19	22	34	19
High	28	48	18	5	1
Teacher assigns homework from textbook					
Low	13	14	30	30	13
High	1	2	4	29	64
Students use textbook during lesson					
Low	10	7	32	36	15
High	0	1	5	25	70
Students use their textbook for background reading					
Low	31	38	15	15	1
High	8	20	28	22	23

**Table D-4
Frequency of Use of Textbook for
Various Purposes, by Extent of Implementation: Comparison Classes**

	Percent of Classes				
	Never or Almost Never	Rarely (About ¼ of Lessons)	Sometimes (About ½ of Lessons)	Frequentl y (About ¾ of Lessons)	All or Nearly All Lessons
Textbook guides structure of course					
Low	14	10	32	40	5
High	2	4	5	53	37
Teacher uses textbook to plan lessons					
Low	32	13	29	22	3
High	30	15	14	28	13
Teacher reads/reviews suggestions from teacher guide to plan lessons					
Low	21	26	32	16	5
High	5	24	30	24	17
Teacher follows textbook page by page					
Low	25	26	34	15	0
High	0	5	18	55	21
Teacher picks what is important from textbook and skips the rest					
Low	0	5	30	41	24
High	11	34	14	32	9
Teacher incorporates activities from other sources to supplement what textbook lacks					
Low	0	14	41	33	12
High	12	55	27	6	0
Teacher incorporates practice problems from other sources to supplement textbook					
Low	0	16	35	37	11
High	13	54	22	8	2
Teacher assigns homework from textbook					
Low	1	8	24	50	18
High	0	0	2	49	49
Students use textbook during lesson					
Low	8	21	38	24	9
High	2	9	13	30	45
Students use their textbook for background reading					
Low	29	45	21	4	1
High	11	30	22	21	16

Table D-5
Percentage of Instructional Time in CMP2 Classrooms
Spent on Various Activities, by Extent of Implementation

	Minimum	Maximum	Mean	Standard Deviation
Launch				
Low	0	40	13.44	8.40
High	0	50	15.56	7.23
Explore				
Low	10	80	46.06	16.75
High	12	80	51.13	13.27
Summarize				
Low	0	70	17.94	12.02
High	0	60	18.91	9.50
Other				
Low	0	90	22.55	16.11
High	0	36	14.41	7.11