UCHICAGO Consortium on School Research

Standards-Driven Instructional Improvement: Lessons Learned in Chicago

SUPPLEMENTAL APPENDIX MAY 2022

This document provides further details about the information shared in the corresponding report and journal articles for readers who would like additional information:[1]

1. **Data from teacher surveys** about how they used district resources for the Common Core State Standards (CCSS) and Next Generation Science Standards (NGSS), answering the questions:
   - **a.** To what extent did teachers report using different types of supports for standards implementation in the districtwide surveys?
   - **b**. How were the use of instructional resources in math related to the frequency with which teachers reported using standards-aligned practices?

2. **Figures that show how the district's implementation influenced equity in math experiences and outcomes,** information that is difficult to discern—or not available—from the tables in the journal articles and main report. These figures answer questions such as:
   - **a.** To what extent did instructional practices change for students with low initial test scores vs. those with high initial test scores in schools with more professional development around the standards?
   - **b.** To what extent did instructional practices change for students, based on the socioeconomic resources in students' communities?

3. **A more comprehensive analysis of the relationship between teacher and student reports of instructional practices at their schools and student gains on assessments** than was practical in the journal article, answering the question: How were student test score gains in math related to the school-wide instructional practices reported by students and teachers?

4. **Longer definitions of teacher-leader practices and school supports** than described in the main report.

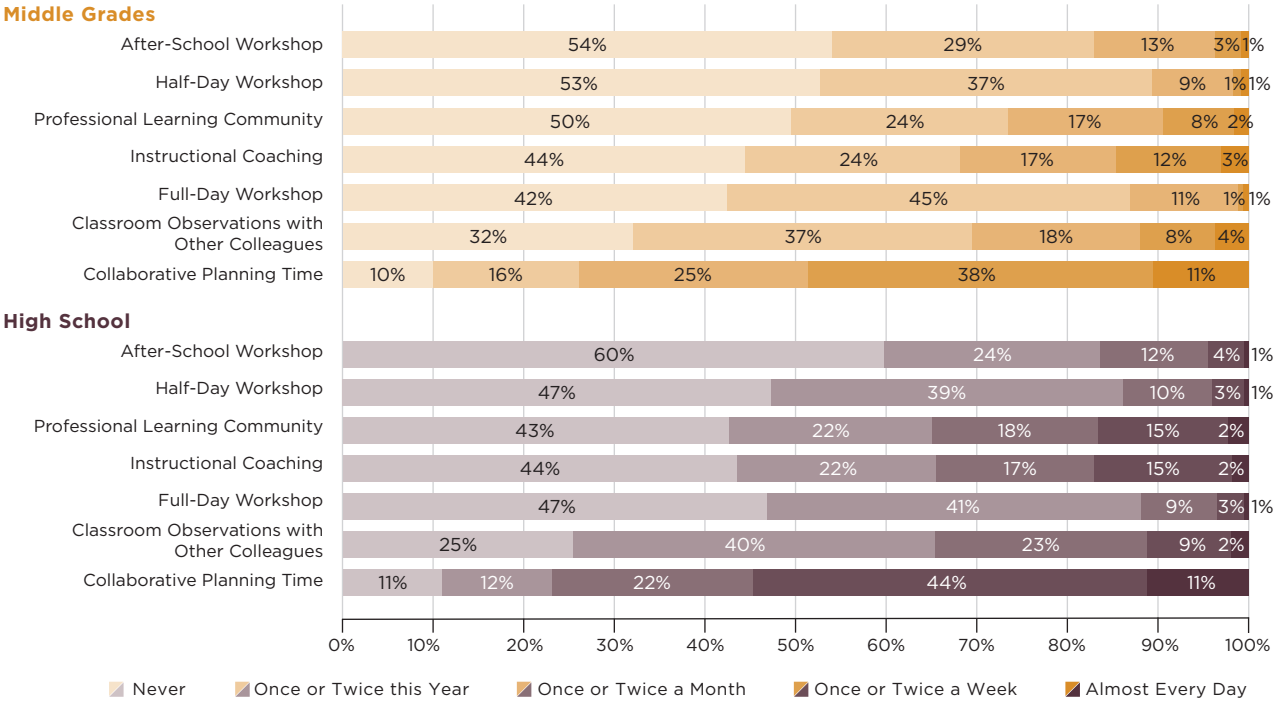
1 Allensworth, Cashdollar, & Gwynne (2021); Cassata & Allensworth (2021); Allensworth, Cashdollar, & Cassata (2022); Century, Cassata, & Leslie (2018).

1.A: To what extent did teachers report using different types of supports for standards implementation in the districtwide surveys?

Teacher reports on the 2017–18 *5Essentials* Survey aligned with the structure of the district plan, with the use of a teacher-leader model to build stronger instructional practices, and stronger use of resources curated at the district's Knowledge Center. The most frequent sources of professional learning came from interactions with school colleagues (**see Figures A.1. and A.2**). In both the middle grades and the high school grades, and in both math and science, many teachers reported frequently participating in collaborative planning time and classroom observations with other teachers. The district emphasis on instructional practices was also evident in teachers' survey reports of the content of their professional learning around the standards, with more teachers reporting that "developing high-quality instructional practice" was substantially emphasized over other topics (**see Figures A.3 and A.4**).

FIGURE A.1

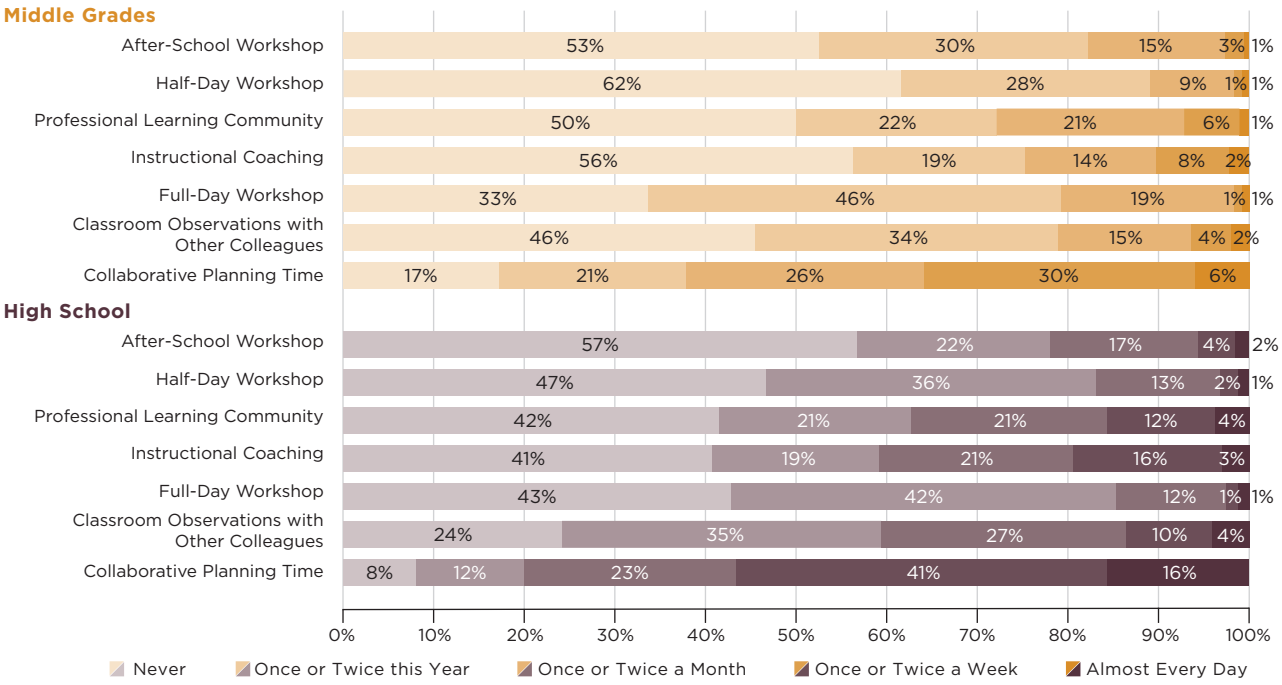
Math Teacher Participation in Professional Learning around the Standards



Note: Based on 1,723 middle grade and 919 high school teachers responding to questions about CCSS-M implementation in the spring 2018 survey. Component rates, as labeled, may not sum to 100 due to rounding.

FIGURE A.2

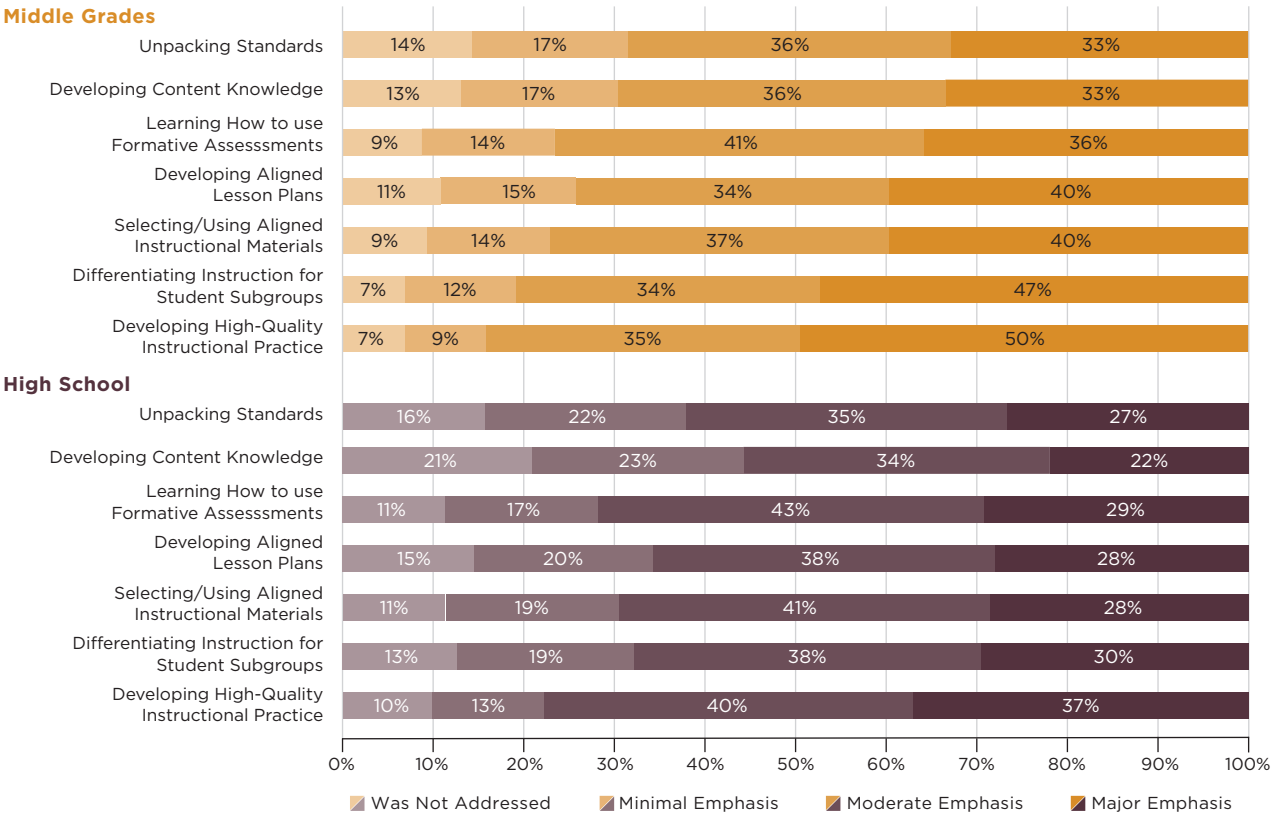
Science Teacher Participation in Professional Learning around the Standards



Note: Based on 782 middle grade and 685 high school teachers responding to questions about NGSS implementation in the spring 2018 survey. Component rates, as labeled, may not sum to 100 due to rounding.

FIGURE A.3

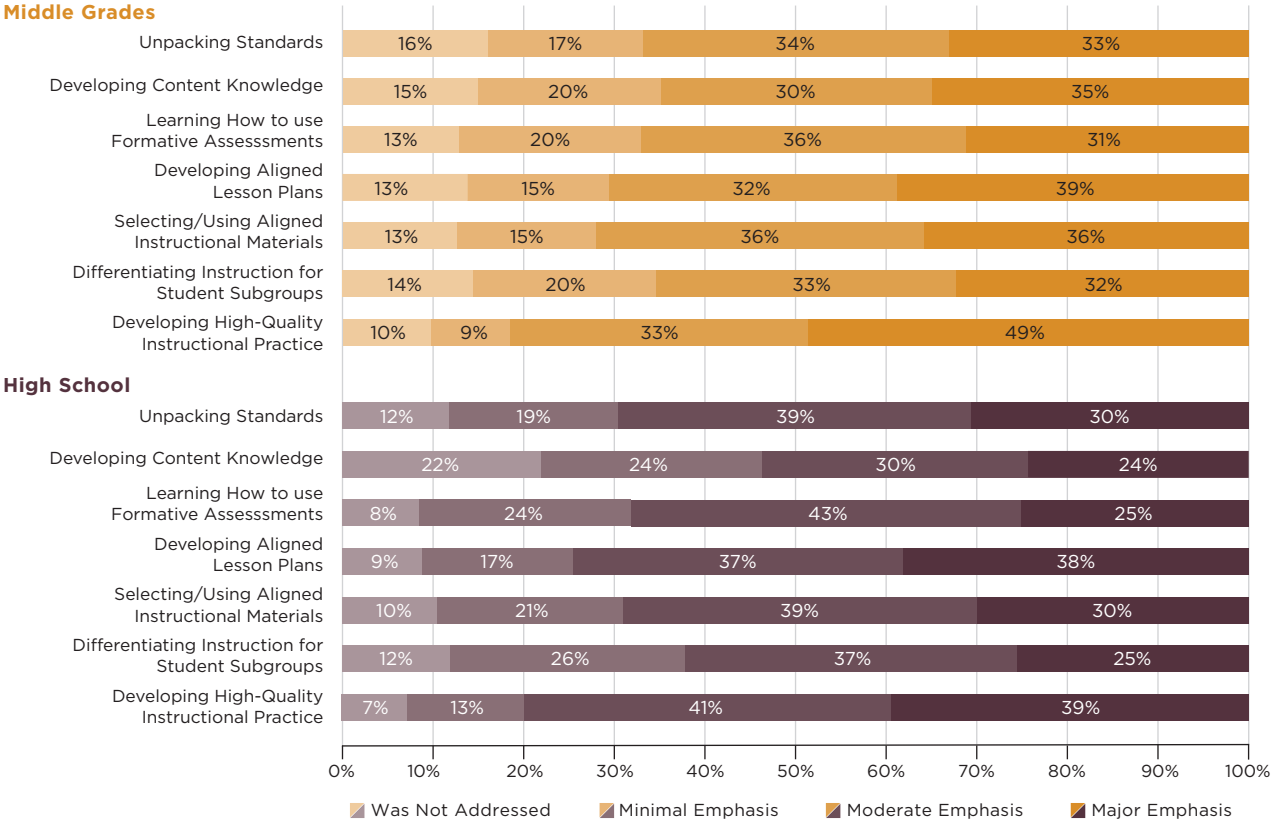
Math Teacher Reports of the Emphasis of their Professional Development around the CCSS-M



Note: Based on 1,723 middle grade and 919 high school teachers responding to questions about CCSS-M implementation in the spring 2018 survey. Component rates, as labeled, may not sum to 100 due to rounding.

FIGURE A.4

Science Teacher Reports of the Emphasis of their Professional Development around the NGSS



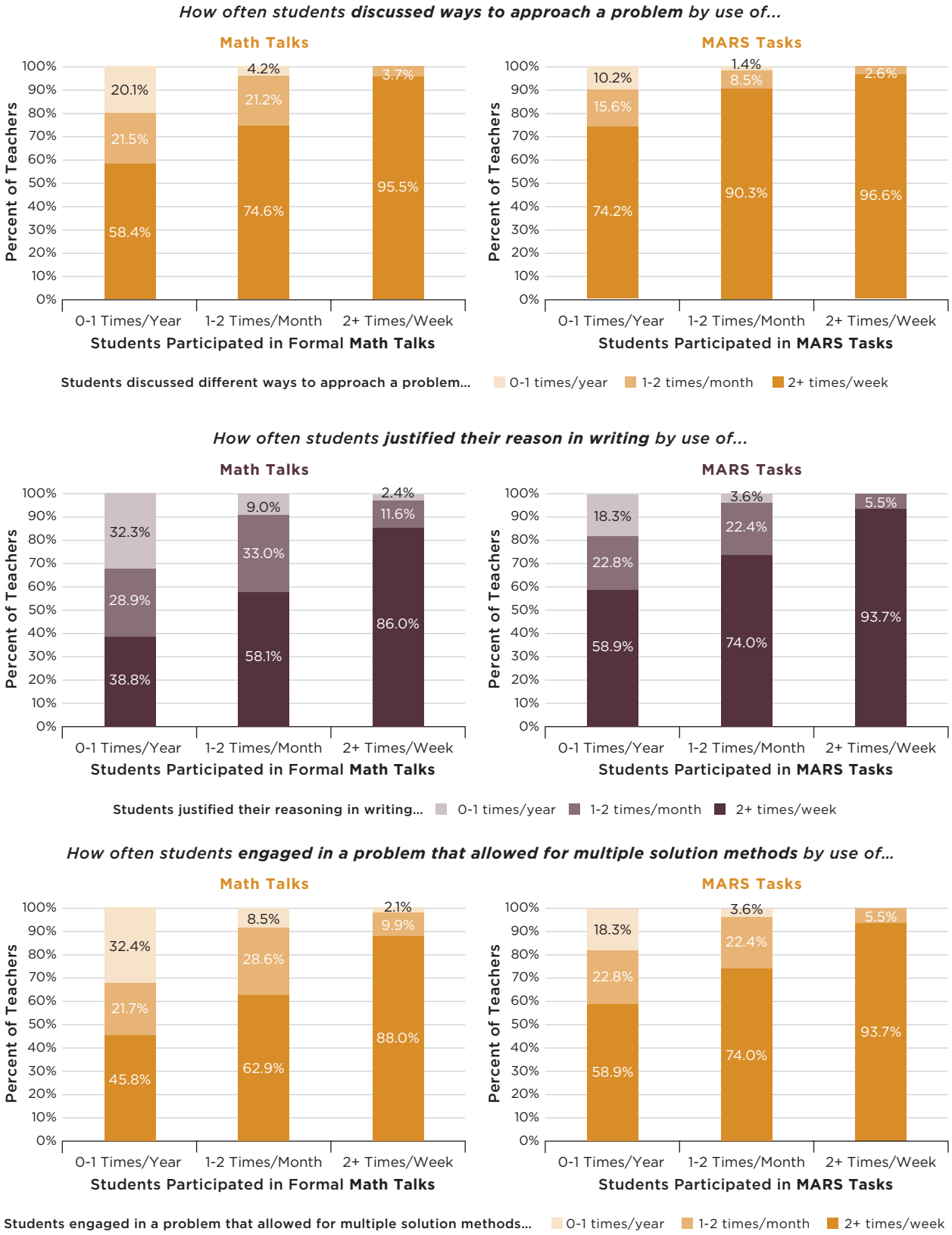
Note: Based on 782 middle grade and 685 high school teachers responding to questions about NGSS implementation in the spring 2018 survey. Component rates, as labeled, may not sum to the total rate due to rounding.

1.B: How were the use of instructional resources in math related to the frequency with which teachers reported using standards-aligned practices?

Math professional development encouraged the use of MARS tasks and Math Talks to facilitate standards-aligned practices. On the 2017–18 *5Essentials* Survey, teachers who reported more frequently using either MARS tasks or Math Talks also were more likely to report engaging in standards-aligned practices: having students discuss different ways to approach a problem, engaging in problems that allowed for multiple solutions, and having students justify their reasoning in writing (**see Figure A.5**). For example, 96 percent of teachers who used Math Talks two or more times a week also reported asking their students to discuss different ways to approach a problem two or more times a week. The relationships were stronger in the middle grades than in the high school grades; high school teachers were much less likely than middle grade teachers to use either resource.

Figure A.5

Teachers Who Used Math Talks and MARS Tasks Resources More Often Engaged in More Standards-Aligned Practices



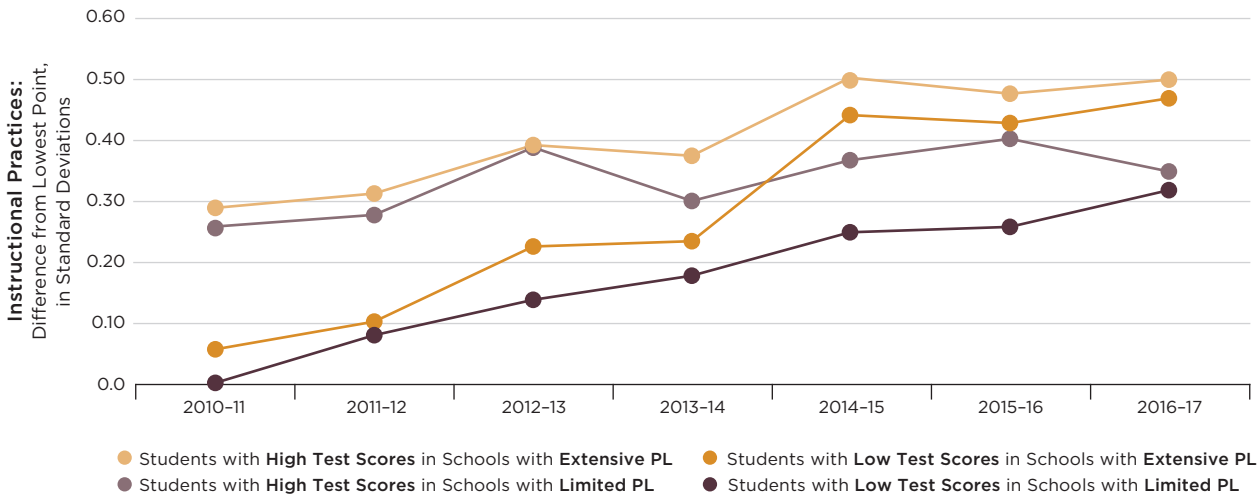
Note: Based on the responses of mathematics teachers to questions in the 2018 spring survey. Component rates, as labeled, may not sum to 100 due to rounding.

2.A: To what extent did instructional practices change for students with low initial test scores vs. high initial test scores in schools with more professional development around the standards?

Before standards implementation, students with high test scores reported using standards-aligned instructional practices significantly more often in their math classes than students with low test scores. As shown in **Figure A.6**, in 2010–11, student reports on the math instructional practices measure were about 0.3 standard deviations higher among students with high test scores than students with low test scores, with similar differences in schools that subsequently took up extensive professional learning around the standards as those that had more limited professional learning. Students with low test scores experienced improvements in math instruction over the next several years, with the biggest improvement occurring in 2014–15, the year the standards were implemented. By the 2016–17 school year, there had been improvements in the frequency of students' experiences with standards-aligned practices among both high- and low-testing students at schools with extensive professional learning, but the changes were largest for students who had low tested skills, relative to students at the same schools in prior years. Furthermore, in 2016–17, the reports of students with low test scores at the schools that had extensive professional learning around the standards in 2014–15 were higher than the reports of students with high test scores at the schools with limited professional learning around the standards.

FIGURE A.6

Changes in Students' Reports of Instructional Practices in Middle Grades Math by Teachers' Reports of their Professional Learning around the Standards in 2014–15



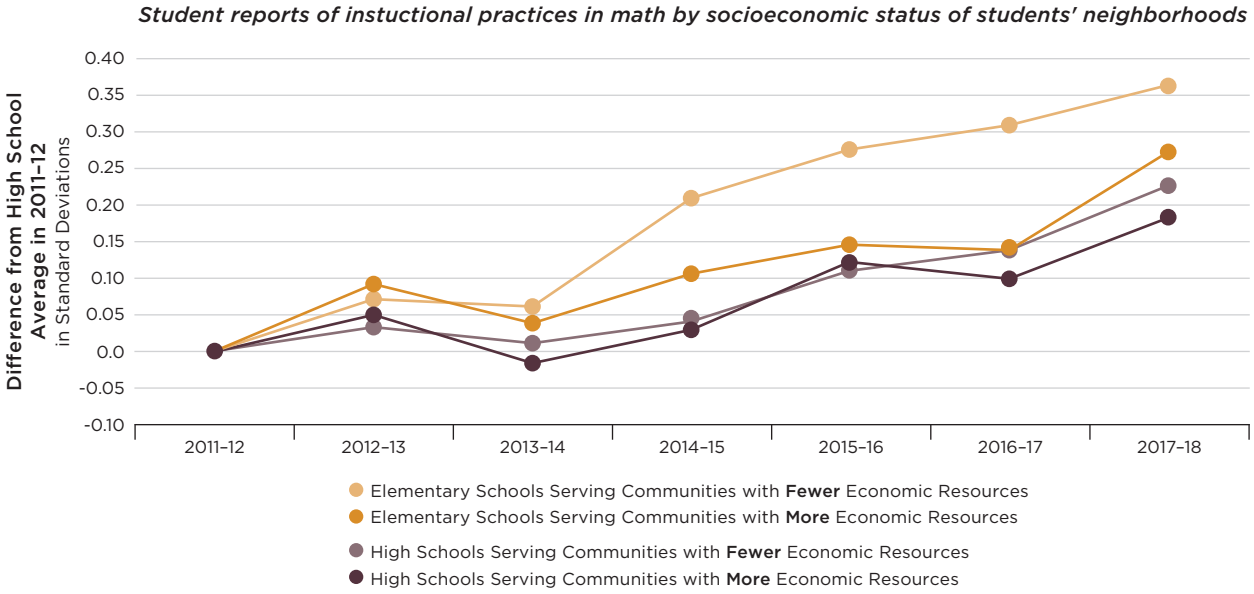
Note: Students were divided into groups based on ISAT or PARCC math scores in the prior year; students with high test scores were at least 0.5 standard deviations above the mean, while students with low test scores were at least 0.5 standard deviations below the mean. Values for 2014–15 come from regression models that control for student race, ethnicity, gender, neighborhood poverty level, neighborhood socioeconomic status, the type/s of math class in which the student was enrolled, and math score on the state assessment in the prior spring. Changes relative to 2013–14 are based on coefficients from models with school and year fixed-effects and the same covariates. The school fixed effects control for any differences in 2013–14 among schools attended by different students. Teacher reports of professional learning come from the 2014–15 teacher survey and are based on questions about how frequently they engaged in different types of professional learning around the standards. See Allensworth, Cashdollar, and Gwynne (2021) for more details.

2.B: To what extent did instructional practices change for students based on the socioeconomic resources in students' communities?

Students from all types of neighborhoods reported more frequently engaging in standards-aligned practices in their math classes in 2017–18 than 2011–21 (**see Figure A.7**). In elementary schools, improvement was especially large in the year the standards were to be fully implemented, 2014–15, with the largest changes coming in schools that served students living in neighborhoods with the fewest socioeconomic resources.

FIGURE A.7

Changes in Math Instructional Practices Were Largest in Schools Serving Students Living in Neighborhoods with the Fewest Socioeconomic Resources



Note: Community socioeconomic resources are based on the characteristics of students' residential neighborhoods: percentage of families below the poverty line and male unemployment, aggregated to the school level. Schools serving communities with more socioeconomic resources are in the lowest one-third of schools; schools serving communities with fewer resources are in the highest one-third of schools.

3. How were student test score gains in math related to the school-wide instructional practices reported by students and teachers?

To discern the relationships between teacher or student reports of instructional practices and students' test score gains, we used 2-level hierarchical linear models predicting students' gains on assessments at the student level with instructional practices at the school level. Instructional practices were calculated as the average of either teacher or student reports in the school in 2017–18. At the student level, we predicted each student's test score with their prior year score, as well as covariates for gender, race, IEP status, neighborhood poverty, and socioeconomic status. At the school level, we included variables for school average teacher/student reports of instructional practices, as well as school average test scores in the prior year, average socioeconomic status, and poverty levels of students, and school racial composition. Student and school covariates were included to be certain that the relationships were not influenced by any differences in the use of practices across schools serving students with different backgrounds or achievement levels. We also ran the analyses separately based on students' prior year achievement, with students divided into three equal groups, based on their prior scores. The models took the form:

$$2018\text{Score}_{ij} = \beta_{0j} + \beta_{1j}(2017\text{Score})_{ij} + \sum_{c=2}^{8} \beta_{cj}\,\text{StuCov}_{ij} + e_{ij}$$

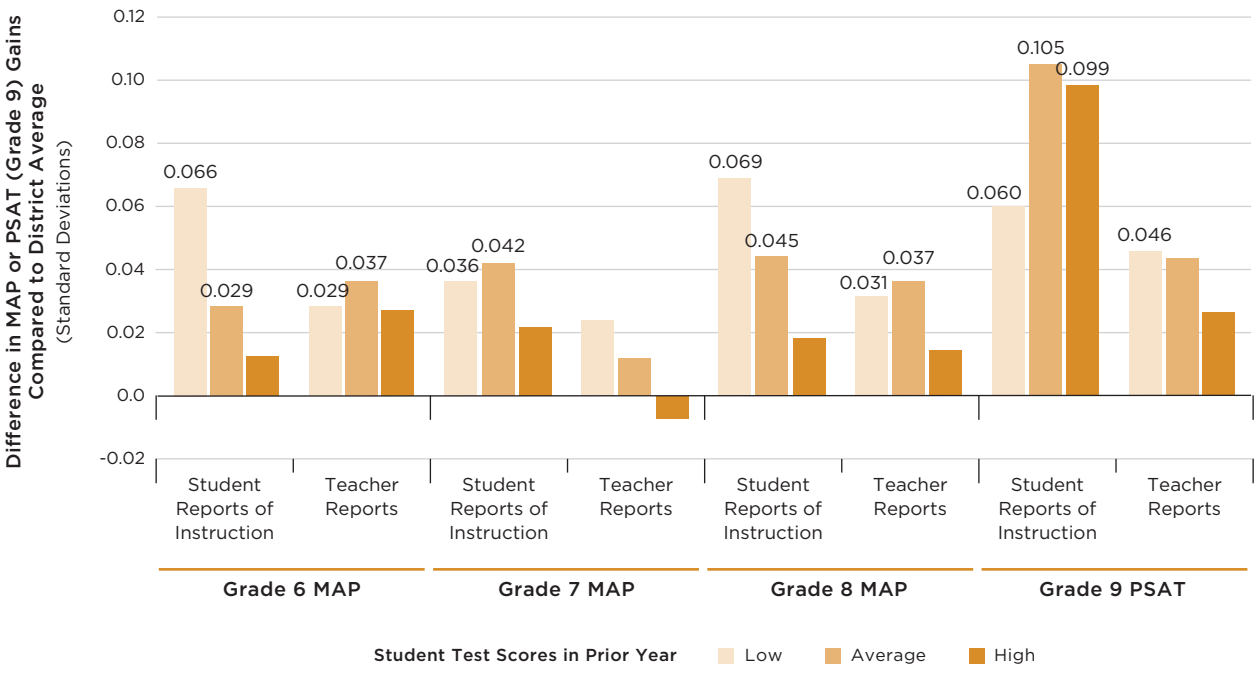
$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Instructional Practices})_{j} + \sum_{s=2}^{6} \gamma_{s}\,\text{SchlCov}_{j} + r_{j}$$

At the student level, the 2017–18 test score is modeled as a function of their prior year score, along with their gender, race, neighborhood poverty, socioeconomic status, and IEP status. β_{0j} represents the average gain in the school, controlling for student background characteristics. β_{0j} is predicted at level 2 with the measure of average reports of instructional practices, along with school-level covariates controlling for average prior year achievement, average poverty, and socioeconomic status of students, and school racial composition. γ_{01} provides the relationship of instructional practices with student average gains, net of any relationship of gains with the school covariates. Only the intercept is allowed to vary at the school level.

The results are shown in **Figure A.8** for the analyses that separated students into three groups based on their prior test scores. Each set of bars shows the difference in gains for a given achievement group in a given grade if at a school with frequent use of standards-aligned practices versus an average school in the district. The first group of bars for each grade uses student reports of instructional practices at the school as the independent variable, while the second group of bars uses teacher reports. Only relationships that are statistically significant are included. For students with low and average prior achievement, there were significant relationships between student reports of instructional practices at the school and test gains in grades 6-9, and with teacher reports there were significant relationships in grades 6-8, and in ninth grade for students with low test scores. For students with high prior achievement scores, the relationships between instructional practices and students' gains on math tests were nonsignificant at all middle grade levels, and only significantly related to student reports in ninth grade.

FIGURE A.8

Differences in Math Gains Relative to the District Average in Schools with Frequent Use of Standards-Aligned Practices, by Prior Student Achievement



Note: Bars with labels indicate gains that are significantly different from average at p<0.05 (most are significant at p<0.01). Schools with stronger standards-aligned practices are one standard deviation above the mean in terms of either student reports of practices in the school or teacher reports of practices in the school. Student survey reports are based on about 80 percent of students in a given grade level in the district, while teacher reports are based on about 60 percent of math teachers in the district. Gains are based on the 2018 NWEA-MAP in grades 6-8 and the PSAT in grades 9-10. Models control for student's score in the same subject test the prior year, with the exception of ninth grade where the student's eighth-grade NWEA-MAP score in math is used as the prior score. The models also control for students' race, ethnicity, socioeconomic background, special education status, and school economic composition (mean poverty and mean social status), school racial composition, and average test scores in the prior year.

4. Definitions of teacher-leader practices and school supports.

Teacher leaders described the practices they used to encourage greater use of standards-aligned instruction in their schools, as well as the supports that enabled them to more effectively support instructional change in their schools. Five practices and five supports emerged as important, based on interviews with 16 teacher leaders (seven in math and nine in science), representing 13 CPS schools located across Chicago.

TABLE A.1

Five Teacher Leader Practices and Descriptions

Advocating for Change	Works with school leadership to establish systems and monitor progress that support instructional change.
Providing Individual Support	Acts as a mentor; demonstrates instruction and offers suggestions about ways to change instruction.
Inspiring Others	Models an innovative practice and gets others curious to try it without the explicit intention to do so.
Sharing with Colleagues	Intentionally disseminates or exchanges information about resources and practices; such as demonstrating how to access and use standards-aligned instructional resources in the Knowledge Center.
Working in Collaboration	Works with one or more colleagues to create, test, and reflect on new resources, tools, and methods to address the new standards.

TABLE A.2

Five School Supports for Practices and Descriptions

School Administrator Support and Advocacy	**Administrators:** • Intentionally schedule time for teachers to receive school-based professional development and engage in collaborative work. • Contribute to teachers' collaborative work around standards-aligned instruction. • Support teacher leaders' professional growth.
Staff Commitment to the Change Effort	**Teachers:** • Are eager to try new instructional approaches that support standards-aligned instruction. • Believe that teaching in alignment with the new standards will improve student learning.
Trusting and Supportive Staff Relationships	**Teachers:** • Routinely engage in ongoing communication in and outside of structured meetings. • Make classroom instruction open and transparent. • Exchange ideas and resources in formal and informal settings, including on their own time, if necessary.
Dedicated Collaboration Time	**School:** • Provides dedicated time during the school day for teacher-led teams and committees to regularly meet. • Has established structures for peer observation and feedback.
Knowledgeable Colleagues	**Teachers:** • Are familiar with standards-aligned instruction. • Have begun making instructional shifts in alignment with new standards. • Are engaged in school initiatives that support standards-aligned instruction.