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Evaluation of Support for Using Student Data to Inform Teachers' Instruction

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EXECUTIVE SUMMARY

As part of their improvement efforts, schools have increasingly turned to the use of data to improve instruction. This is due in part to the increasing availability of student assessment data throughout the school year. The strategy of using assessment and other data to inform teachers' instruction is often called data-driven instruction (DDI). Under DDI, teachers analyze student data to better understand students' learning needs and to identify and improve instructional practices to address those needs.

Research on the effectiveness of DDI is limited. Overall, the research has found that DDI does not consistently change what teachers do in the classroom or improve student achievement. Different studies of DDI examined different kinds of interventions. The earliest studies examined interventions that largely focused on getting data to teachers in a usable form, with less emphasis on providing supports for teachers' data use. This study contributes to a body of more recent research examining interventions that placed more emphasis on supporting data use. These interventions provided supports to school leaders or teachers on how to analyze data and select appropriate instructional strategies through training, coaching, or facilitated collaboration with others.

Specifically, this study examined a DDI intervention that provided substantial training and support to school leaders *and* teachers to help teachers use data effectively to improve their instruction and increase student achievement. The study examined the following questions:

1. How did support for data-driven instruction affect teachers' use of data and instructional strategies?
2. How did support for data-driven instruction affect students' achievement?

Box ES.1. How Was the Study Conducted?

Study Method: The study used a random assignment design. Schools were selected to participate in the study based on their interest in DDI and willingness to be in the study. Schools were randomly assigned to the treatment group or the control group. The treatment schools implemented DDI in grades 4 and 5 from December 2014 through June 2016. DDI effects were measured as differences in outcomes between treatment and control schools after 1.5 years.

Study participants: A total of 102 schools in 12 districts and 8 states participated in the study. The study districts were medium to large in size, located throughout the United States, economically disadvantaged, and demographically diverse.

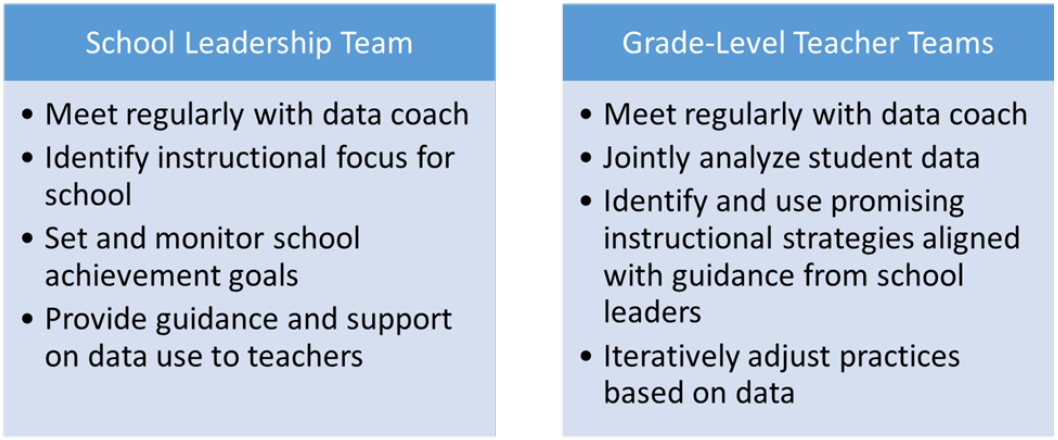
Data Sources: Three types of data were used in the study: (1) information collected from data coaches in the treatment group on the frequency and nature of coaching activities through interviews and logs; (2) spring 2016 surveys of principals and teachers in treatment and control schools on the supports provided to teachers from coaches and school leaders, the frequency and nature of data analysis and use, and teachers' instructional practices; and (3) student-level administrative data on student characteristics and achievement in the treatment and control groups.

Outcomes: The primary outcomes of interest are student achievement in math and English/language arts. Intermediate outcomes include: (1) use of data by teachers and school leaders to set and monitor student progress; and (2) teacher reports of adjustments to instructional practice to address student needs and improve achievement.

The Professional Development Program to Support Data-Driven Instruction Intervention

The DDI intervention included two key supports, a half-time data coach for each school and consultants from a DDI provider. Consultants provided school leaders and data coaches with professional development and ongoing technical assistance. The professional development included a two-day introductory session and six subsequent one-day sessions, which mostly occurred during spring 2015 so that treatment schools would be ready to fully implement DDI during the 2015-16 school year. The ongoing technical assistance began in spring 2015 and continued throughout the 2015-16 school year. The intervention also encouraged school-level structures and activities to promote and support school leaders and teachers in increasing data use throughout the school year. As shown in Figure ES.1, the structures included a *school leadership team* as well as *grade-level teacher teams* in 4th and 5th grades.

Figure ES.1. Activities Expected of School Leadership Team and Grade-Level Teacher Teams Under Data-Driven Instruction



Key Findings

Most aspects of the intervention were implemented as planned. Hiring data coaches, providing them professional development on DDI, and holding regular data-focused meetings among school leadership and grade-level teacher teams were all key to implementing the intervention as intended. All treatment schools hired experienced educators as half-time data coaches, but only 36 percent of data coaches had previous coaching experience and it was rare for them to have previously worked as a data coach. Data coaches and school leaders largely participated in the expected professional development; depending on the session, participation ranged from 87 to 97 percent for data coaches and 75 to 89 percent for principals. Even so, about one-fifth (22 percent) reported that their training either did not prepare them or prepared them to carry out some but not all data coach tasks by the end of the study period.

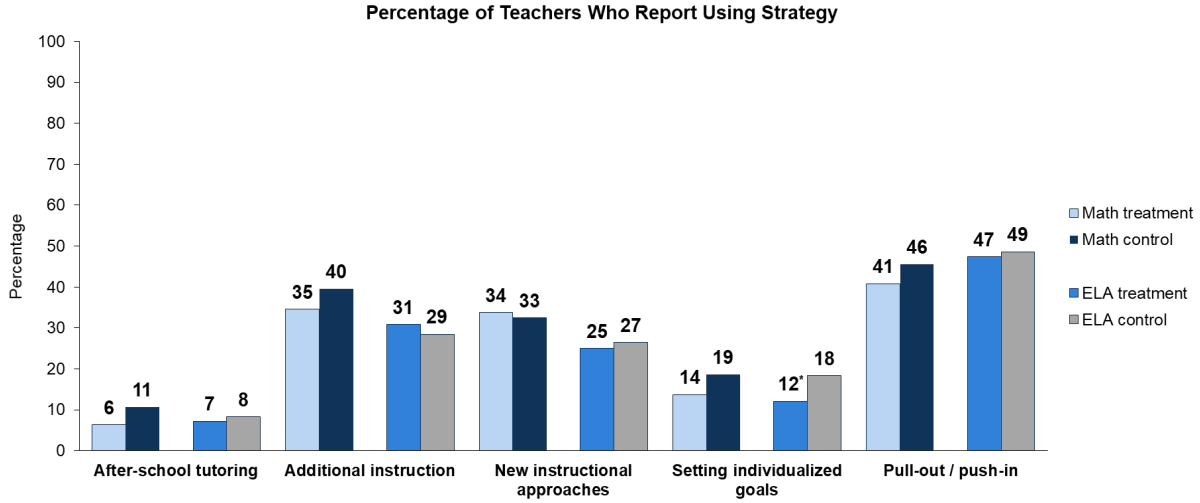
Principals were expected to meet weekly with data coaches to strategize for DDI implementation, allocate time and resources to support DDI, and set expectations and provide guidance on data use by teachers. Most principals (59 percent) met with data coaches at least three times per month to monitor and support DDI, and most (at least 66 percent, depending on the type of guidance) provided overall guidance on DDI. Within this context, more teachers in treatment than control schools worked one-on-one with a data coach or school leader on data-related activities; for example, 69 percent of treatment teachers compared with 56 percent of

control teachers reported at least monthly one-on-one interactions on analyzing or interpreting student data. Most treatment schools also established grade-level teams of teachers that met regularly with the data coach (77 percent of treatment teachers reported at least monthly guidance on using and analyzing data compared with 61 percent of control teachers). More teachers in treatment than control schools reported receiving coaching on data-related activities in collaboration with other teachers during common planning periods; for example, 52 percent of treatment teachers compared to 34 percent of control teachers reported at least monthly training or coaching on how to analyze and interpret student data.

Despite additional resources and emphasis placed on data-related activities, the support for data-driven instruction intervention did not increase key data-related activities. Teachers were expected to work together in teams to examine data in order to understand individual student needs at least twice per month. However, similar percentages of teachers in treatment and control schools reported data-related activities during common planning time; for example, 79 percent of treatment teachers and 73 percent of control teachers reported jointly analyzing data to understand student needs at least monthly. These activities were fairly common among teachers in control schools even without the additional resources provided as part of the DDI intervention.

The support for data-driven instruction intervention did not increase teachers' data use or change their instructional practices. The intervention was intended to increase data analysis and collaboration with other teachers, which would then lead teachers to change their instructional practices in order to appropriately address student needs. Because the intervention did not increase data-related activities, it is consistent that similar percentages of teachers in treatment and control schools reported using each of nine data practices. For example, 38 percent of treatment teachers and 35 percent of control teachers reported monitoring student progress, and 43 percent of treatment teachers and 44 percent of control teachers reported planning individualized instruction, daily or several times per week, in math. There were also no treatment-control differences in English/language arts. Nor did the intervention lead teachers to report more frequent use of any of five instructional practices potentially associated with DDI that were examined (figure ES.2).

Figure ES.2. Percentage of 4th and 5th grade teachers who used instructional practices daily or several times per week during 2015-2016



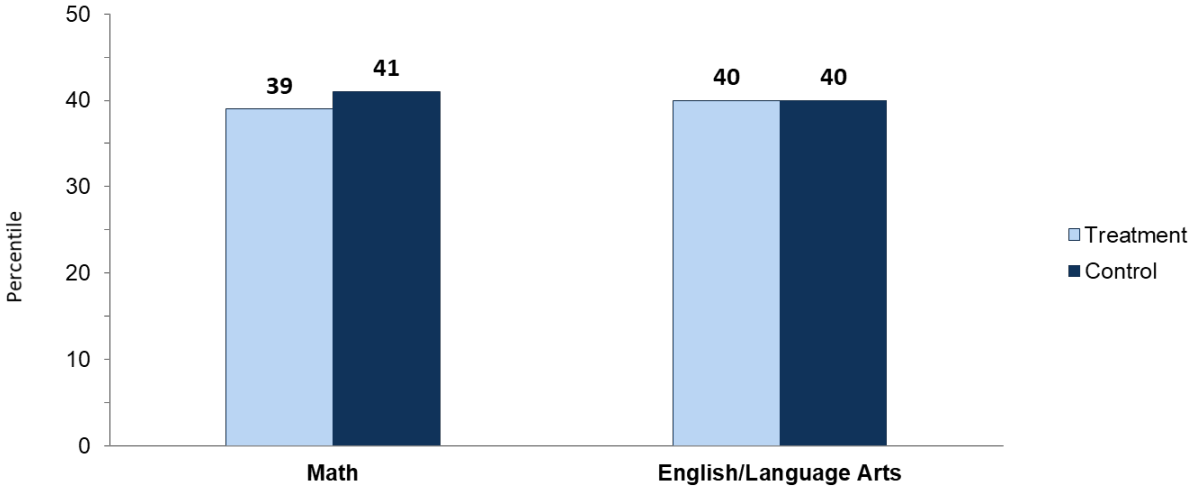
Source: Teacher survey (n = 397-411).

ELA = English/language arts.

*Difference is statistically significant at the .05 level, two-tailed test.

The support for data-driven instruction intervention did not affect students' achievement. On average, 4th and 5th grade students in treatment and control schools had similar achievement in math and English/language arts (figure ES.3). Students in each group scored at about the 40th percentile on state assessments in each subject, on average. The study also found that support for DDI did not improve achievement for any subsets of students examined, such as students with different prior achievement levels. Nor did the study find that DDI consistently improved achievement for any of the subsets of schools examined, such as schools with greater readiness to implement DDI.

Figure ES.3. Mean student achievement on 2016 state assessments in math and English/language arts



Source: District student records (n = 12,018-12,036).
Neither difference is statistically significant at the .05 level, two-tailed test.

Concluding Thoughts

This study is part of a growing body of research on how DDI affects teacher practices and student achievement. While early studies focused on the effects of giving teachers greater access to data, this study contributes to more recent evidence focused on the effects of giving teachers more support in their efforts to use data to improve instruction. The DDI intervention being examined in this study was designed to give teachers support from a half-time data coach, actively engaged school leaders, and fellow teachers in a group setting.

The treatment schools implemented most aspects of DDI as planned, and teachers in these schools reported receiving more support from coaches and school leaders than those in control schools. But support for DDI did not increase teachers' data use or change how often they used a set of instructional practices related to DDI. Most importantly, support for DDI did not affect student achievement. These findings are similar to those of other recent studies. As a strategy to improve student achievement, DDI relies on: (1) using a data-focused approach to identify areas for instructional focus, (2) finding appropriate strategies to improve instruction, and (3) implementing teacher practices that improve student performance in the focused area. This study's findings in conjunction with other recent studies suggest that simply giving teachers more support in their data use is not sufficient, on its own, to improve student achievement. Future research might turn to other possible ways of improving DDI interventions, such as improving the quality of data-use support provided to teachers or changing the nature of this support by placing greater emphasis on how teachers use data to identify and implement effective instructional practices.

I. INTRODUCTION

As part of school improvement efforts, educators have increasingly turned to the use of data to improve their instruction. Although federal policy does not require schools to use data regularly to make instructional decisions, it does indirectly encourage the use of student assessment data in school accountability efforts. For example, the Every Student Succeeds Act of 2015 requires each state to annually assess and publicly report on multiple measures of school success, including academic indicators for all students and subgroups of students, based in part on student assessments. The U.S. Department of Education has also provided guidance on data use in schools with a What Works Clearinghouse practice guide, *Using Data to Support Instructional Decision Making* (Hamilton et al. 2009).

The increasing use of student assessments throughout the school year has also contributed to a rise in the use of student data in school improvement efforts (Datnow and Hubbard 2015; Datnow and Park 2014; U.S. Department of Education 2010). These include less formal assessments—homework assignments, quizzes, or end-of-unit tests—and more formal interim assessments—standardized tests administered at different points throughout the year and designed to measure mastery of key standards covered in the curriculum.

The literature suggests the value of data use, but the evidence is not strong. Among high-performing charter schools, for example, frequent data use is a common feature (Hoxby et al. 2009; Angrist et al. 2013; Dobbie and Fryer 2013; Chabrier et al. 2016). However, little rigorous research exists about whether formal efforts to promote teachers' data use lead to better instruction and improved student achievement.

Data-driven instruction (DDI) involves the use of data by schools and teachers to inform teachers' instructional practices. Because the student data can show different levels of mastery on different topics and among different students, teachers can tailor their instruction accordingly. For example, Hamilton et al. (2009) describe changes to instruction that teachers might make under DDI, including (but not limited to) spending more time on certain topics, differentiating instruction by grouping or regrouping students to receive additional help in certain areas, or using new ways of teaching difficult material based on best practices identified by teaching colleagues. DDI interventions are systematic efforts to ensure that teachers have access to the right kinds of data and support in using the data effectively to improve their instruction.

This study examines one such DDI intervention, designed to train and support teachers and school leaders in using data to improve instructional practices and, ultimately, student achievement. The study has two goals. The first is to examine whether the intervention was implemented in schools as expected based on the intervention design. The second is to test whether the intervention led to changes in teachers' instructional practices and improvements in student achievement.

Previous Research on DDI Interventions

Although the literature on DDI is growing, no consensus exists on its effectiveness in raising student achievement or which features of DDI interventions are most important. The most rigorous studies have used an experimental design, in which implementation of a DDI-focused intervention is randomly assigned to one set of schools or districts, which are then compared with another set randomly assigned to not implement DDI.

The experimental research on DDI illustrates that the nature of the interventions being studied has evolved over the period covered by the studies. The early studies (Carlson, Borman, and Robinson 2011; Cordray et al. 2012; Slavin et al. 2013; Konstantopoulos, Miller, and van der Ploeg 2013; Konstantopoulos et al. 2016) examined DDI interventions implemented before 2010, which focused primarily on providing schools with interim assessments, along with software that produced reports summarizing assessment data in ways that teachers could easily understand. By contrast, later studies were conducted at a time when it was more common to administer interim assessments and for teachers to have access to the data. These studies (Cavaluzzo et al. 2014; West, Morton, and Herlihy 2016) examined DDI interventions that focused on supporting teachers in their efforts to interpret and use the data to improve their instruction. Examples of these supports included the following:

- Periodic *data coaching* for teachers by an external provider or instructional specialist to help them analyze student data and understand what the data mean about their students' understanding of key concepts and where the teachers' instructional practice may and may not be succeeding
- *Engagement of school leaders* to ensure that teachers have sufficient time and resources to work with the data and provide them with guidance and feedback on what sources of data to use, how to analyze the data, what aspects of the curriculum on which to focus, and what evidence-based instructional strategies to consider using
- *Professional learning communities or other teacher collaboration* around data use so teachers can support one another in understanding what the data mean regarding their students and what sorts of instructional strategies might be successful in these situations

The experimental research provides little evidence that DDI leads to changes in teachers' instructional practices. None of the three studies that examined teachers' use of differentiated instruction or other instructional practices found significant positive impacts of DDI (Konstantopoulos, Rafiullah Miller, and van der Ploeg 2013; Cordray et al. 2012; West, Morton, and Herlihy 2016). Two studies did find that DDI led to more data use among teachers (Cavaluzzo et al. 2014; West, Morton, and Herlihy 2016). However, it was not clear what changes—if any—occurred in their classroom instruction as a result.

This research also provides no consistent evidence that DDI leads to improved student achievement. Cordray et al. (2012), Cavaluzzo et al. (2014), and West, Morton, and Herlihy (2016) each found that the DDI intervention did not have a statistically significant impact on student achievement. Other studies reported mixed findings. Konstantopoulos, Miller, and van der Ploeg (2013) and Konstantopoulos et al. (2016) found negative impacts of DDI among younger students (K-2) for one cohort and nonsignificant impacts for the other cohort; among older students (grades 3-8), they found positive impacts for one cohort and nonsignificant impacts for the other. Carlson, Borman, and Robinson (2011) and Slavin et al. (2013) each examined a single DDI intervention and found positive impacts in some grades and years, but not others.

Several of these studies note that the lack of consistent student impacts may be because teachers were unable to take the step from analyzing data to changing instructional practices or differentiating instruction for struggling students (Cordray et al. 2012; Slavin et al. 2013; Cavaluzzo et al. 2014). Several also indicated that these DDI initiatives were not the only source of support for teachers, so it might be that the availability of professional development or other

ongoing assistance may have reduced the possible influence of the DDI program the researchers examined (Cordray et al. 2012; Konstantopoulos, Miller, and van der Ploeg 2013; Konstantopoulos et al. 2016). Other studies indicated that DDI programs may act more in the long-term, so the one- to two-year studies did not observe impacts (Cavaluzzo et al. 2014; Konstantopoulos, Miller, and van der Ploeg 2013). Relatedly, West, Morton, and Herlihy (2016) found that impacts were positive for schools that had the right structures in place and where leadership was ready to prioritize the work, but there were no or negative impacts in other schools. This suggests that a DDI program might not be successful in a broad set of schools but could be successful in schools that were most ready from the outset to put the program in place.

Taken as a whole, previous experimental research on DDI interventions is limited, but suggests that past efforts to provide teachers with assessment data and in some cases support their data use have not been sufficient to change what the teachers do in the classroom and, ultimately, improve student achievement. However, most of the DDI interventions studied thus far have focused primarily on getting data to teachers in an accessible form, and less on supporting their use of data to improve instruction (Carlson, Borman, and Robinson 2011; Slavin et al. 2013; Konstantopoulos, Miller, and van der Ploeg 2013; Konstantopoulos et al. 2016). The early interventions studied previously provided little direct support to teachers beyond professional development around the analysis of data from the specific assessment being evaluated.

DDI interventions examined in more recent studies incorporated some supports to teachers but perhaps not as intensively as needed. Cavaluzzo et al. (2014) studied the Using Data initiative, which included school-based instructional specialists as data coaches and emphasized teacher collaboration, but did not systematically engage school leaders to support teachers' data use. The Achievement Network program studied by West, Morton, and Herlihy (2016) included using data coaches and engaging school leaders to support teachers' data use. However, the Achievement Network data coaches' main emphasis was to "build school leaders' capacity to support instructional data use in their schools" rather than directly coach and support teachers in their data use. The Achievement Network program also did not explicitly include teacher collaboration within schools.[1]

In this study, we hypothesize that a key to the success of DDI may be not only to provide formal professional development on data use but also to ensure that teachers get intensive data-related support from multiple sources—data coaches, school leaders, and other teachers who are peers. In other words, we assume that teachers need additional support in using data to understand the needs of their students and improve their instruction, and are not already using data effectively (Means et al. 2011). The hypothesis motivating the study also assumes that most teachers already have access to student data, including assessment data, attendance, and examples of student work. Thus, they do not need additional forms of student data as part of a DDI intervention. Instead, what they really need is help and support in figuring out what to do with the data they already receive. The DDI intervention in this study was designed to provide such support in the study's treatment schools. As a result, the study is designed to test whether providing intensive data-related support for teachers is the key for DDI to improve teachers'

[1] There have also been studies of DDI using nonexperimental designs, which generally provide less rigorous evidence than experimental studies. Consistent with the experimental evidence, several non-experimental studies found little impact of DDI on student achievement (such as Quint et al. 2008; Henderson et al. 2007).

instructional practices and students' achievement. This study does not examine the effects of providing teachers with additional forms of student data.

Overview of the Support for DDI Intervention Examined in This Study

Taking into account the nature of previous DDI interventions, findings from the literature review, and input from a technical working group, this study examines a distinct DDI intervention. The key aim was to create the conditions within participating schools that would be most likely to foster success: coaching for teachers on data use, active support from school leaders, and collaboration among teachers. The study team subcontracted with Focused Schools (formerly Focus on Results), an organization that works with districts and schools in the United States and Canada on DDI and school reform, to implement this DDI intervention in study schools.[2] The intervention was implemented for roughly a year and a half, from December 2014 through June 2016.

A logic model (figure I.1) illustrates the intervention's supports, services and activities, and intended effects. The DDI intervention involved two key supports: a half-time data coach for each school and consultants from Focused Schools who worked with the schools. Together, these individuals engaged in two types of activities and services intended to build schools' capacity to conduct DDI: (1) professional development and technical assistance for data coaches and school leaders, and (2) targeted school-level activities designed to support school leaders and teachers in increasing data use. The assistance to school staff was based on an underlying assumption that they needed more than just access to data and analysis tools. The staff also needed help and support in the process of analyzing data to better understand their students' needs, and in identifying and implementing the instructional practices that might best address those needs. The study covered the costs to schools of the DDI training and technical assistance, as well as the salaries of the half-time data coach for each treatment school for two full years. This report describes the DDI intervention's supports, services, and activities in detail below.

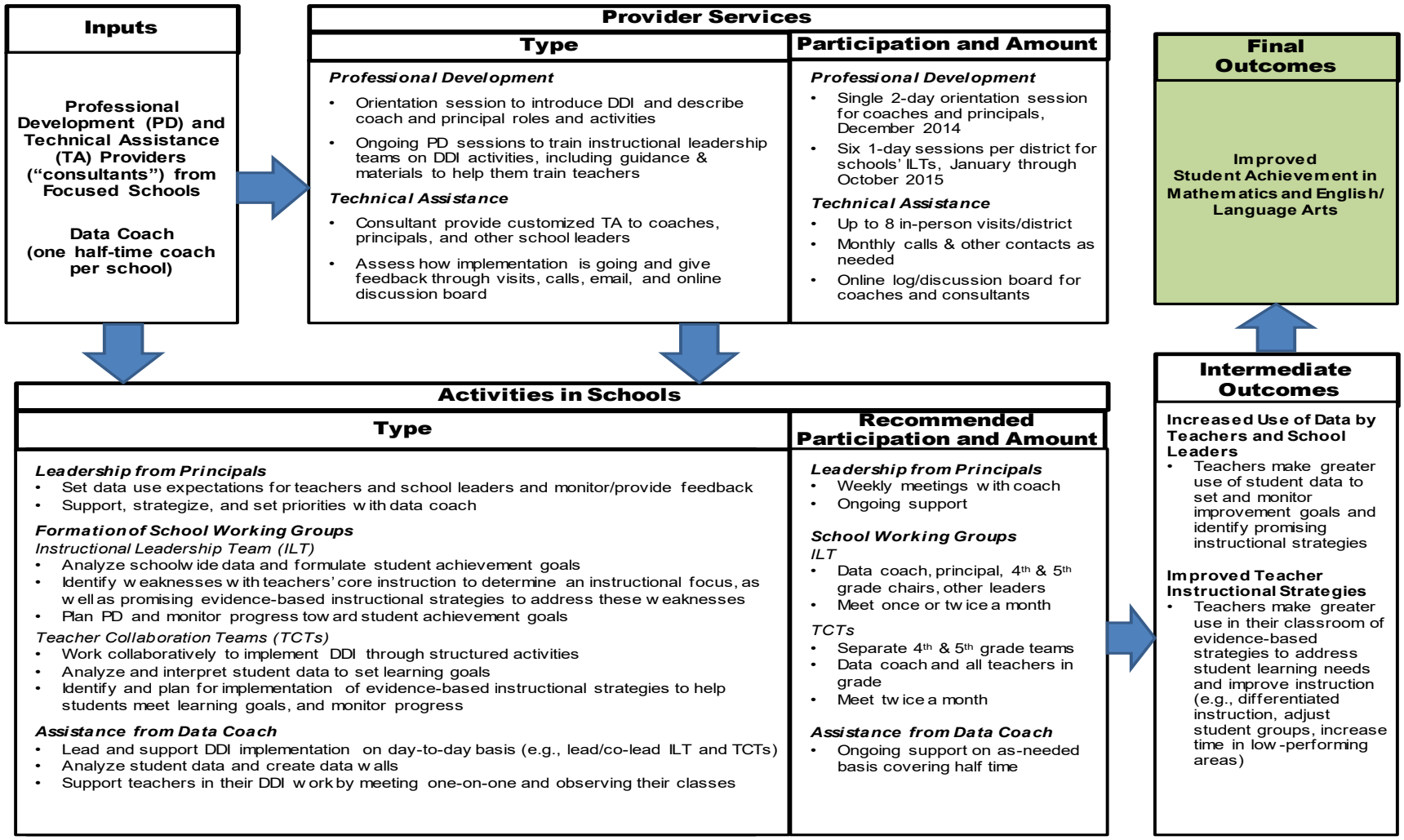
The study team's hypothesis was that these supports, services, and activities, if implemented with fidelity, would improve teacher practices, in turn improving student achievement. In the near term, fourth- and fifth-grade teachers were expected to make greater use of student data to set and monitor improvement goals, and identify promising instructional strategies. If the intervention engaged school leaders appropriately, school principals' data use was also expected to increase.

The DDI intervention did not require that teachers implement specific instructional approaches, but they were generally expected to make greater use of evidence-based instructional strategies, such as reviewing and adjusting students' small-group assignments, using differentiated instruction, re-teaching difficult material, and increasing time spent on instruction. However, the idea was that the specific instructional strategies teachers used would be determined by the study data. If the data indicated that most students were struggling on a

[2] The intervention was based on Focused Schools' usual approach toward assisting schools, in terms of the content and activities of the professional development and technical assistance. These activities were put into a package that could be implemented during the evaluation period. Focused Schools developed professional development materials (or used existing materials) that set expectations about what schools needed to do to put the intervention into place, with the objective that schools implement key aspects of the intervention by fall 2015 so that treatment schools would have the full intervention in place for nearly the entire 2015-2016 school year.

particular topic, for example, teachers might make changes to instruction that would affect all of their students (such as re-teaching a particular lesson or skill using a different strategy). Alternatively, if the data showed that subsets of students were having difficulty in a particular area, teachers might group students based on their mastery of the concepts in that area and use different strategies for these different groups—that is, use differentiated instruction. They might provide additional instruction on these subjects for the struggling students. If the data helped teachers use more effective strategies for the students in the class who most needed help, the team hypothesized that the students would subsequently perform better in math and English/language arts.

Figure I.1. Logic model for the support for DDI intervention



Focused Schools Consultants' Services

Consultants from Focused Schools provided services through professional development and technical assistance. Both types of services reflect the intervention's train-the-trainers approach, in which the trained data coach and school leaders would then work with teachers to use DDI techniques to inform their instructional practices.

The overall focus of the professional development and technical assistance was to help schools put in place and effectively support a central feature of DDI—the collaborative cycle for data analysis. The initial stage of the cycle involves setting schoolwide or grade-level student achievement goals and analyzing data to assess progress toward those goals. Careful interpretation of this data analysis allows teachers and school leaders to diagnose the specific topics of concern or standards that students are struggling to grasp, as well as whether they are problem areas for all or particular groups of students. This approach allows them to identify current instructional practices that are not working as well as they should and need to be improved, and to collaboratively identify evidence-based instructional practices to address these problem areas. With the support of the coach, teachers then implement these practices and monitor the results of the implementation by again analyzing student data, and the cycle then repeats.

Professional development. Professional development began with a two-day orientation session in December 2014. The session introduced data coaches, principals, and selected district administrators to DDI, including the approach to using student data to improve instruction, the roles they would play in the intervention, and prepared them to begin implementing DDI in their schools.

The intervention also included ongoing professional development sessions. The sessions were intended to deepen school leaders' understanding of DDI and help them implement it in their schools. Specifically, the ongoing professional development aimed to guide data coaches and other school leaders in their analysis of student data (Box 1) and, based on this analysis, their approach to selecting evidence-based instructional strategies (Box 2). Six one-day sessions were held in each district—four in spring 2015 and two in fall 2015. Each session focused on a different DDI topic (table I.1). All instructional leadership team members from each school were expected to participate in all of the sessions. The attendees typically included the school's principal, data coach, chair or lead teacher in fourth and fifth grades, and other school leaders.

Box 1. What were schools trained to do with student data?

Focused Schools' approach to training professional development participants was intentionally simple and straightforward, based on a belief that this approach would be most likely to lead to successful implementation. The basic approach involved dividing students into three color-coded groups based on their understanding of a particular concept or standard: those who were proficient (green), those who were approaching proficiency (yellow), and those who were well below proficiency (red). This analysis approach was intended to be applied to different types of data to shed light on student understanding of different topics or standards—for example, to a single component of a formal interim assessment. It also could be applied to more informal formative assessments, such as quizzes or homework assignments. Dividing students into these groups for different topics or standards ideally would help schools identify specific areas of weakness, either across the school (or grade level) or for individual teachers.

The Focused Schools' professional development materials guided teachers to look at achievement data at the group level—the grade level or school as a whole—as well as at the individual student level. Focusing on groups would help schools identify issues with their core instructional practices. Proficiency rates that were high for most standards but consistently low for one or two of them (and these standards were covered in the curriculum) might suggest a weakness in instruction in that area. At the individual level, the green/yellow/red data analysis would help individual teachers target any changes in their instructional practices to specific concepts and to those students most in need of help. The materials also encouraged teachers to analyze data separately for key student subgroups (such as those in different socioeconomic categories) to identify any achievement gaps.

Finally, the professional development materials encouraged schools to look at student work, and not only at data indicating whether students mastered particular concepts or answered questions correctly. By examining student work collaboratively, teachers may better understand how their students approached their work or what obstacles may have prevented them from mastering the content. A major section of one session was devoted to this topic, guiding participants through an example of "looking at student work." The basic approach here mirrored the approach discussed above, focusing on understanding differences between the work of students at different levels of proficiency.

Box 2. What information was given to schools on evidence-based strategies to improve instruction?

Focused Schools encouraged schools to use evidence-based instructional strategies in two ways. First, a major focus of one of the professional development sessions involved selecting evidence-based instructional strategies. Materials from that session included a summary of instructional strategies with some research evidence of effectiveness. One source of possible instructional strategies teachers might operationalize was drawn from the work of John Hattie, Professor of Education and Director of the Melbourne Education Research Institute at the University of Melbourne, Australia (Hattie 2009).[1]

Second, Focused Schools encouraged data coaches to compile additional resources related to evidence-based instructional strategies on their own. As part of the implementation of the intervention in schools, data coaches were to develop resource rooms for fourth- and fifth-grade teachers. These rooms might include materials that help teachers understand data, identify evidence-based practices (for example, Hattie's research), or include professional development materials on implementing specific instructional strategies.

Overall, the intervention placed particular emphasis on two instructional strategies—differentiated/small group instruction and maximizing instructional time. For example, one strategy mentioned in the training materials to maximize instructional time was "bell-to-bell teaching," to reduce any dead time during blocks devoted to key areas of instruction. Strategies that combined differentiated/small group instruction with maximizing instructional time included using homeroom or lunch periods as "viable options for quick-hit interventions" for students struggling in particular areas, and staggering literacy blocks across classrooms so some students could get a double dose of a given skill in different classrooms. The materials explained that this practice should target a specific subset of students struggling to reach proficiency, so it would be a form of differentiating instruction across students while maximizing instructional time in a given subject.

The professional development materials did not offer explicit guidance on how teachers or other school staff should go about selecting a specific instructional strategy for their situation. The implicit approach conveyed in the materials is that teachers should collaboratively decide which specific strategy they should select, given their specific data. The professional development sessions were structured to engage participants in collaborative activities. Although a consultant from Focused Schools led these sessions, the idea was that participants would go back to their schools and conduct the same activities, either in teacher collaboration team meetings or in more general professional development sessions for teachers at the school. This collaboration was expected to lead to the selection of appropriate evidence-based instructional practices to boost student achievement in a classroom or school. As part of the ongoing data cycle, after trying out these practices, the teachers would use later team meetings to examine student data and discuss whether they thought the approach was successful.

Note

1. Hattie, John. (2008). *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement.* Abingdon, United Kingdom: Routledge.

Table I.1. Ongoing professional development schedule and topics

Session	Date	Session title and topics addressed
1	January 2015	*Laying the Foundation for DDI* Brief DDI overview for grade-level chairs Best practices to promote working group productivity Setting up data walls in classrooms, public spaces, and in the data/resource room Collaborative cycle for data analysis Analyzing student data to assess core instruction and identify an instructional focus Activities: Discussing how data-driven school leadership and teacher collaboration teams can function successfully using focused meetings and clear roles; learning and applying a data protocol to analyze student data and identify an appropriate instructional focus for improvement efforts; and discussing the purpose and examples of data walls.
2	February 2015	*Looking at Student Data and Setting Goals* Key activities of the ILT Understanding summative, interim, and formative assessments Using evidence to identify effective instructional practices for different situations Activities: Discussing different types of assessments; reviewing descriptions of school leadership teams to identify strengths and weaknesses; learning a process for using data to identify standards and select instructional practices to support them; reviewing John Hattie's research and completing an exercise on planning for implementation of evidence-based teaching practices (e.g., modeled writing, reciprocal teaching, mini-lessons).
3	March 2015	*Using Best Practices in Teachers' Classrooms* Moving from identifying to implementing evidence-based instructional practices Looking at student work to drive instruction Handling conflict within teacher collaboration teams Activities: Answering and discussing questions about how teams move from identifying to implementing evidence-based practices to strengthen core instruction; reviewing strategies for dealing with conflict in teams; and practicing how to use a protocol for looking at student work as data to make instructional decisions.
4	April 2015	*School Walkthroughs* Assessing implementation of key DDI activities: setting goals, instructional focus, best instructional strategies, ILT functioning, effective analysis of data Using school walkthroughs to provide effective feedback and coaching to teachers Activities: Reviewing walkthroughs (reflective walkthroughs, peer coaching, learning walk, schoolwide walkthrough); team planning time to create detailed short- and long-term plans to ensure work continued for the remainder of the school year and into the fall.
5	September 2015	*Refresher/Orientation, Goal Setting, and Planning Professional Development* Brief DDI overview for new ILT members Plans for professional development on evidence-based instructional practices Reviewing new end-of-year data to set new grade-level student achievement goals Using grade-level goals as lead-in to student goal setting Activities: Completing a three-month professional development planner showing how the school will build teacher capacity around selected evidence-based practices; analyzing early data to determine SMARTe (Specific, Measurable, Attainable and challenging, Relevant, Time bound, and touch Every student) goals for the school and grade levels.

Table I.1. (continued)

Session	Date	Session title and topics addressed
6	October 2015	*Sustaining the Work* Reviewing professional development plan to build expertise on DDI Ensuring use of evidence-based instructional best practices Student goal setting Planning for the sustainability of DDI Activities: Working with peers to share progress and opportunities for growth with emphasis on their roles as data-driven leaders; discussing to sustainability.

Source: Compiled by study team based on materials provided by Focused Schools.

Technical assistance. Focused Schools consultants also provided customized technical assistance to data coaches, principals, and other instructional leadership team members. The consultants were expected to visit each school eight times between winter 2015 and spring 2016 to provide assistance in person. In addition, Focused Schools offered customized technical assistance to data coaches and school staff through monthly phone calls, and additional phone calls or e-mails as needed. Finally, data coaches could receive additional technical assistance and support through a web-based SharePoint site, designed to facilitate information sharing among the data coaches and consultants. The SharePoint site featured an online discussion board designed to facilitate discussions among the data coaches across all treatment schools.

Data Coaches and Their Roles in Treatment Schools

With input and support from Focused Schools and the study team, each district hired data coaches to work with fourth- and fifth-grade teachers in treatment schools. Focused Schools was involved in screening candidates in most districts, but ultimately district staff made the hiring decisions. To be qualified, individuals did not need previous experience as a data coach but were supposed to have experience working with student data and be experienced educators. It was hoped the original hires would stay throughout the two years. Each data coach worked half-time with a given school and thus could work with one or two schools in a district. As leaders of DDI implementation, data coaches were charged with conducting the following types of activities.

Work in partnership with school principals. Data coaches were expected to help the principal lead DDI activities and establish a culture of data use in their schools. It was assumed that if the initiative were to succeed, it would depend substantially on principals taking a leading role in supporting their teachers and generally guiding the DDI activities in their schools. Coaches were supposed to meet weekly with principals.

Set up and help lead an instructional leadership team in each school. This team, which included the data coach, principal, and other school leaders, was charged with guiding the school's adoption of DDI. They were expected to meet once to twice a month, and their work was to analyze schoolwide data to formulate student achievement goals, identify an instructional focus for improvement efforts that would address identified weaknesses in the school's instruction in grades 4 and 5, select evidence-based promising instructional strategies (best practices) to address the instructional focus they had selected, and monitor students' progress toward the achievement goals.

Set up and lead two teacher collaboration teams in each school. These teacher collaboration teams—one each for teachers in fourth and fifth grades—were supposed to operate

like professional learning communities, in which teachers would work collaboratively to implement DDI. The teams were charged with undertaking structured activities to analyze and interpret student data for their grade and individual classes; setting learning goals for their students based on this data analysis; identifying and implementing instructional strategies to help students meet the learning goals; and monitoring students' progress toward the goals. By working collaboratively in these teams, the hope was that a teacher struggling with a particular topic or subset of students could identify best practices from their teaching colleagues who had been more successful in similar situations, as suggested by Hamilton et al. (2009). All teachers in the target grade levels were supposed to participate in their respective teacher collaboration team. Teams were expected to meet once or twice a month.

Provide direct support to teachers. In addition to their work in leading the teacher collaboration teams, data coaches were charged with providing other supports to teachers working to implement DDI strategies. They were expected to meet one on one with teachers as needed to help them interpret student data and implement evidence-based instructional strategies, and also to provide feedback on their progress. They could also conduct school walkthroughs and classroom observations. Finally, data coaches were expected to support teachers' efforts by providing physical resources such as (1) a professional development area or resource room containing DDI materials and (2) data walls, which are visual displays of student data posted in classrooms or workrooms where teachers could track the progress of students relative to benchmarks. The data walls were intended to support teachers' efforts to use data to improve their instruction and boost student achievement.[3]

Research Questions

To describe the implementation and impacts of the support for DDI intervention, this study addressed four research questions:

1. To what extent was support for DDI implemented as planned in treatment schools?
2. What differences existed between treatment and control schools in key DDI-related supports, services, and activities?
3. How did support for DDI affect teachers' and principals' use of data and teachers' instructional strategies?
4. How did support for DDI affect students' achievement?

[3] Coaches created and encouraged teachers to create data walls in public spaces to identify school-wide achievement goals and celebrate and build momentum towards those goals. Data walls in non-public spaces (such as the resource room in which teacher teams met) were intended to highlight differences in student achievement across classrooms to allow the team to identify strengths and weaknesses in the teaching practices of individual members, and encourage teachers to discuss their different teaching approaches. Data walls were also meant to help teachers group students for differentiated instruction and show how students were progressing over time. These walls were updated after interim assessments to help students see their growth, and teachers were encouraged to maintain the confidentiality of students when displaying data in a public manner.

Chapter II of the report describes our approach to addressing these questions. Chapter III describes the results of our implementation analysis. We used data collected primarily from data coaches to address the first research question and data from surveys of teachers and principals in study schools to address the second research question. Chapter IV describes the results of our impact analysis, in which we used data from the teacher and principal surveys to estimate the impacts of DDI on how teachers and principals used data and which instructional strategies teachers implemented (research question 3), and district administrative records to measure student achievement and estimate the impacts of DDI on student achievement in math and English/language arts (research question 4).

II. STUDY SAMPLE, DESIGN, DATA, AND METHODS

This chapter gives an overview of the key components of the evaluation—our study sample, experimental design, data collection, and analytic approach. Appendix A provides additional details.

Study Sample

The sample for the study consists of principals, teachers, and students within a set of schools and districts. We first describe how we selected the study districts and schools within those districts, and then characterize the samples of principals, teachers, and students in those schools from which we collected data.

District and School Samples

To implement the study of DDI, in spring/summer 2014, we recruited 12 districts that regularly administered interim and summative assessments, and regularly provided student assessment results and other types of data to teachers. We selected the districts and schools for this study purposefully, targeting those that currently did not have data-use initiatives in place but would be well suited to implement DDI. As a result, the study sample consists of districts and schools that otherwise might have been interested in implementing DDI, although it is not statistically representative of a broader group of districts or schools serving fourth- and fifth-graders nationally.

Two key eligibility criteria guided the selection of districts in the spring and summer of 2014. To effectively implement DDI, teachers and administrators in participating schools would need to be able to monitor student achievement on a regular basis using student data from both summative end-of-year and interim assessments (the latter are given to students periodically during the year to evaluate their learning progress). Thus, the first criterion was that districts had to plan to uniformly administer summative and interim assessments during the 2014-2015 and 2015-2016 school years. These assessments are commonly administered and this requirement did not substantially reduce the pool of districts eligible for the study.

The study relied on each district's existing interim and summative assessments. Because the intervention was designed to help teachers use data from interim assessments to modify their instruction in order to improve students' summative assessment scores, each participating district was required to administer reasonably well-aligned assessments, ideally by the same test developer. To meet this alignment goal, the study team targeted their recruiting efforts to states and districts in the Smarter Balanced Assessment Consortium. The tests developed by this consortium were designed to measure student achievement relative to Common Core standards, so we expected the consortium's interim and summative assessments to be aligned with one another. When a district used assessments from different test publishers, we would consider including that district if both their interim and summative assessments were aligned to the same common set of standards (often state-defined standards).

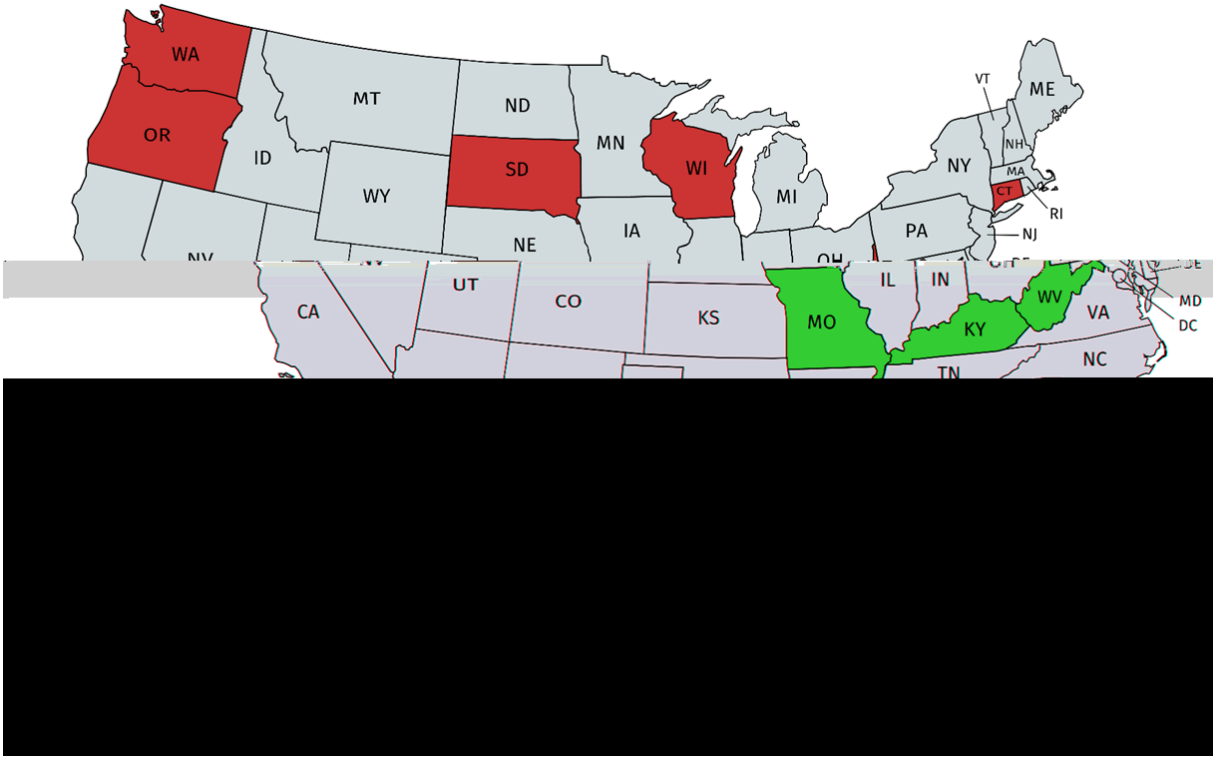
The second key criterion was that the district could not have an ongoing DDI intervention or plans to begin one within the intervention period, so we could ensure a clear difference between

the treatment and control schools regarding the presence of DDI. This approach would allow us to address the question of what impact DDI would have in a school that had not used this strategy before.

Once we identified districts that met the above criteria, we identified a subset of eligible schools within them. The schools we selected met the following criteria: (1) they were willing to implement DDI and (2) they had no school-specific data-use initiatives in place. In addition, we wanted to ensure that a substantial proportion of the students served by study schools within a given district were low-income students, which we defined on the basis of eligibility for free or reduced-price meals. We did not require that schools meet a specific threshold for the proportion of low-income students, but in determining which schools within a district would be included in the study, we favored those with larger proportions.

The final sample included 12 districts and 102 schools within those districts. The districts were medium sized and large, ranging from 9,409 to 52,834 students (with a median enrollment of 17,821 students per district). The districts were geographically diverse, located within eight states representing the East, South, Midwest, and West (figure II.1).

Figure II.1. States represented by districts in study sample



Note: Study districts were located in states shaded in red.

Students in study schools were also economically disadvantaged and demographically diverse. Nearly two-thirds of students (64 percent) in study schools were low income—eligible for free or reduced-price school meals—and just over half of the students were White. The study

districts were similar to all districts in the United States in race, poverty, and the presence of English language learners. The study schools had a similar proportion of students who were White and races other than White relative to the national average; however, a larger percentage of students in the sample were low income. Appendix table A.1 includes additional information on students' characteristics in study schools and districts.

Principal, Teacher, and Student Samples

The principal, teacher, and student samples were representative of the schools and grades included in the evaluation. The study team collected data from the full set of principals in all 102 study schools as of spring 2016. For teachers, the initial random sample included 501 full-time fourth- and fifth-grade math and English/language arts teachers who taught in study schools during 2015-2016. The initial teacher rosters provided by the district included 546 teachers. From this frame, the team included teachers in study schools with four or fewer teachers in these grades in the study sample with certainty (n=138) and randomly selected teachers within each school that had five or more teachers, such that a minimum of four teachers would be included in the initial sample from each of these schools. After dropping teachers determined to be ineligible because they were not currently teaching at the school or did not teach the targeted grades or subjects, the final teacher sample size was 470.

The student sample included all 12,535 fourth- and fifth-grade students in study schools as of spring 2016. Although we would not expect the DDI intervention to affect student mobility, and hence the composition of students in treatment schools, we conducted a sensitivity test using an alternative student sample (see appendix A for more detail). This sample included students enrolled in second and third grades in study schools as of spring 2014, before random assignment.

Data Coach Sample

All coaches who participated in the intervention were included in the sample of coaches. Coaches were asked to complete weekly logs about their coaching activities and to participate in one-on-one interviews during the fall and spring semesters. Coaches who were assigned to more than one school were asked to complete separate logs and interviews for each of the schools. The data coach sample included 39 coaches assigned to 50 schools in 2015-2016, including 11 coaches who were assigned to two schools. At one school, the 2014-2015 data coach did not return for the 2015-2016 school year and was not replaced.

Experimental Design to Estimate the Impact of Support for DDI

To ensure that the study's findings on the impacts of support for DDI can be attributed solely to the intervention described in Chapter I, we used an experimental design in which we randomly assigned schools within each study district to treatment and control groups. Schools in the treatment group received the half-time data coach and DDI professional development and technical assistance from Focused Schools, and implemented DDI. Schools in the control group proceeded with business as usual. We then followed each group of schools over a year-and-a-half follow-up period and compared outcomes measured at the end of this period.

Approach to Random Assignment

We randomly assigned schools rather than individual students because we implemented a school-level intervention (in fourth and fifth grades). To improve the precision of the impact estimates, we used a matched pair design (Imai et al. 2009). We first identified pairs of schools within each district that had similar prior test scores and demographic and socioeconomic characteristics. We then randomly assigned one school within each pair to the treatment group and the other to the control group. Overall, we formed 51 matched pairs of schools in the 12 study districts, resulting in 51 treatment and 51 control schools.[4] The study design gives it enough statistical power to detect effects on student outcomes that are 0.12 standard deviations (SD) or larger and effects on teacher and principal outcomes of 0.33 SD and 0.59 SD, respectively. (See appendix A for more detail.)

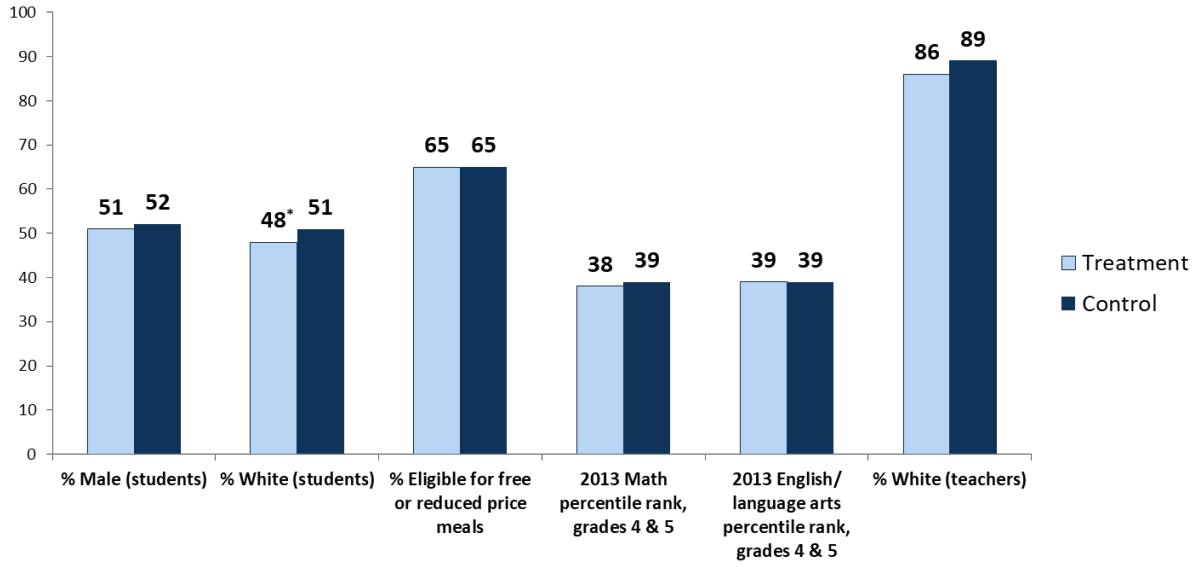
Baseline Characteristics of Treatment and Control Schools

An important consideration for this matched pair experimental design is that treatment and control schools needed to be similar at the beginning of the study; therefore, the only systematic difference was that schools in the treatment group received the DDI intervention, whereas those in the control group did not. By starting from the same point, we could attribute any later differences in outcomes between the two groups to the impacts of support for DDI.

As expected, the characteristics of schools, students, and teachers in the treatment group were similar to those in the control group in most dimensions. Figure II.2 shows selected baseline characteristics of students and teachers assigned to schools in the treatment and control groups. Additional comparisons are presented in appendix A. There were no statistically significant differences between the two groups in the schools' fourth- and fifth-grade achievement scores, or in most of the other characteristics of students and teachers. For example, teachers in treatment and control schools had similar amounts of prior teaching experience and similar educational credentials. We did find differences in students' racial/ethnic composition, with students in treatment schools less likely than those in control schools to be White and Hispanic, and more likely to be Black (appendix table A.3). We also found that students in treatment schools were less likely to be English language learners. These differences did not translate into a significant difference in baseline student achievement, however.

[4] As described in appendix A, we initially randomly assigned 104 schools in 52 pairs, but later dropped one pair from the study sample. The school assigned to the treatment group within this pair received the DDI intervention for the full evaluation period. However, during this period (between the 2014-2015 and 2015-2016 school years) the school assigned to the control group began serving only kindergarten through second grades. Because this school no longer served the grades that were the focus of the intervention—fourth and fifth—we dropped the pair from the study sample.

Figure II.2. Baseline characteristics of treatment and control students and teachers



Source: District student records, teacher survey, 2012-2013 Common Core of Data, State Departments of Education and websites.

Note: N = 12,036 students, 421-435 teachers, 102 schools.

*Impact is statistically significant at the .05 level, two-tailed test.

Data Sources

Three types of data formed the basis of the analysis for the study. First, we collected information from data coaches as part of the study team's monitoring of DDI implementation in treatment schools. Second, we conducted surveys of the principals and teachers in both treatment and control schools to describe the implementation further and measure key intermediate outcomes. Third, we obtained student-level administrative data from participating districts to measure student characteristics and achievement. Table II.1 summarizes these data sources and presents response rates.

Table II.1. Data sources for the DDI study

Data source	Sample	Type of information	Response rate (%)
Program monitoring data			
Coach logs	Data coach at each treatment school	Key DDI activities during week at school	88[a]
Fall 2015 data coach interview	Data coach at each treatment school	Summary of DDI implementation in the school	90
Spring 2016 data coach interview	Data coach at each treatment school	Summary of DDI implementation in the school	92
Principal and teacher data			
Principal survey	Principal at each study school in spring 2016	Professional development and data-related activities in schools	95
Teacher survey	Sample of fourth- and fifth-grade teachers at each study school in spring 2016	Professional development, data-related activities in schools, and teacher collaboration during common planning times at school	93
Student data			
District administrative records	Fourth- and fifth-grade students at each study school in spring 2016	Student characteristics and performance on state assessments, 2013-2014 through 2015-2016	100[b]

Note: Survey response rates are shown for treatment and control groups combined (where appropriate). None of the differences in response rates between the treatment and control groups were statistically significant.

[a] We obtained at least some completed coach logs from each of the data coaches, representing their work at all treatment schools. During the 2015-2016 school year, the coach in the average treatment school completed 31.7 weekly logs, or 88 percent of the number that would be completed if a coach completed a log for each week of a 36-week school year.

[b] This is a school-level response rate, indicating that we received administrative records on fourth- and fifth-grade students for each study school as of spring 2016. Information on the percentage of students enrolled in spring 2016 for whom we received district administrative records on their test scores is presented in Appendix Table A.4, and indicates that we received scores for 96 percent of enrolled students.

Two types of program monitoring data allowed us to describe the implementation of the DDI intervention and assess whether intervention activities took place as expected. The data coaches working at each treatment school were asked to complete weekly work logs to describe the DDI intervention activities they completed that week, as well as summarize the overall status of implementation at the school at that time.[5] In addition, the study team interviewed the data coaches in fall 2015 and spring 2016. In these interviews, the data coaches reported on the status of implementation activities in their schools. Response rates on the data coach interviews were 90 percent in fall 2015 and 92 percent in spring 2016.

Surveys of school principals and the fourth- and fifth-grade teachers in both treatment and control schools provided information about data-related professional development and activities in schools. We conducted these surveys in spring 2016 and used the data to describe

[5] Although different data coaches completed different numbers of logs, we obtained completed logs for most of the weeks during the 2015-2016 school year for a majority of schools in the treatment group. In particular, the coaches at 35 percent of schools completed 36 or more weekly logs, 80 percent completed at least 27 logs, and 94 percent completed 18 or more logs.

implementation of DDI, and whether and how it led to differences in data-related activities between schools in the treatment and control groups. We also used data from the principal and teacher surveys to collect background information about educators, and measure intermediate outcomes that the logic model indicates DDI should affect, including principals' and teachers' data use, and teachers' instructional practices. The response rates of 95 percent on the principal survey and 93 percent on the teacher survey did not differ significantly between the treatment and control groups.

Finally, we collected data from study district administrative records on fourth and fifth grade students enrolled in treatment and control schools in spring 2016. The data included information on students' characteristics and their scores on state assessments in math and English/language arts, covering the 2013-2014 through 2015-2016 school years. We used the data to estimate the impact of DDI on student achievement, as well as describe the student sample and compare characteristics between students in treatment and control schools.

Analytic Approach

The study included both an implementation and an impact analysis. We designed the implementation analysis to describe the DDI activities implemented in treatment schools and characterize the resulting differences between treatment and control schools in their data-related activities. The analysis relied on data from the data coach logs and interviews as well as the principal and teacher surveys. The analytic approach was primarily descriptive.

The impact analysis examined the support for DDI intervention effects on a set of intermediate outcomes, along with the ultimate outcome of interest—student achievement. We first estimated impacts on intermediate outcomes reflecting principal and teacher practices that DDI was expected to influence according to the logic model. The logic model posited that changes in the intermediate outcomes, in turn, would lead to improvements in student achievement.

The study's random assignment design allowed us to estimate the impacts of support for DDI by measuring differences in outcomes between principals, teachers, and students in treatment and control schools. We used a linear regression model to compare outcomes of the two groups while accounting for the random assignment design, including the assignment of schools rather than students and the pairing of schools that were similar before random assignment. For student outcomes, the model included covariates to improve the precision of the estimates and account for any baseline differences between students in treatment and control schools. These covariates also improved the precision of the student-level model. For principal and teacher outcomes, the model did not include covariates other than matched-pairs indicators.[6]

[6] With treatment status and matched-pair indicators included in the model, there were limited degrees of freedom remaining for any additional covariates in the principal model because there was only one observation per school. For the teacher model, we ran analyses on 15 key outcomes both with and without covariates. For teachers, the model with covariates included race, education level, certification type, sex, lead teacher role, and years of teaching experience. We found that including these additional covariates did not explain much of the variation in teacher outcomes, with an average increase in the adjusted r-square of .01 across all models. We also found that the

Thus, the model's impact estimates reflect simple treatment-control differences. For each model, we used sampling weights that gave equal weight to each study school, ensuring that the estimates reflected the impact of DDI in the average study school. When testing the statistical significance of estimated impacts on teacher and student outcomes, we calculated standard errors and p-values that account for the clustering of students and teachers within schools. Appendix A provides more details on analysis methods.

We also examined the impacts of support for DDI separately for selected subgroups of students or schools. This approach allowed us to measure whether the DDI intervention was more effective for some groups of students or schools than others. For example, because the intervention was implemented in fourth and fifth grades over a year and a half (December 2014 through the 2015-2016 school year), the students in the two grades could have been influenced over different periods of time. In particular, the fifth-grade student cohort—students in fifth grade in 2015-2016—had the possibility of being directly affected by DDI over one-and-a-half school years, whereas the fourth-grade cohort could have been affected only during a single school year. Because of the longer possible exposure to DDI among fifth-graders, we estimated impacts separately by grade.

We also estimated impacts separately by students' baseline levels of achievement. The nature of the DDI intervention suggests that teachers may revise their instructional practices differently for different groups of students in their classrooms. For example, they may provide additional one-on-one instruction for students struggling to master certain topics. Thus, we hypothesized that the impact of DDI may have been different for students at different baseline achievement levels.

Among schools, we examined just one set of subgroups. We hypothesized that because the DDI intervention was complex, it would be implemented more effectively in those schools more ready to do so at the beginning of the implementation period. For instance, schools that already had instructional leadership teams and grade-level teacher collaboration teams that were using student data were defined as being more ready to implement DDI. These schools may have been better positioned to immediately support teachers in their efforts to analyze data and improve their instructions than schools that did not have the those structures in place. If so, DDI may have led to greater improvements in student achievement in those schools with high levels of implementation readiness. Thus, we estimated impacts separately for schools with higher versus lower readiness levels, with each matched pair of schools classified into a readiness category based on our assessment of implementation readiness in the treatment school in the pair (since we did not have implementation readiness information for the control school).

estimated treatment effect was similar with or without the additional control variables, and that including the covariates did not increase the precision of our measurement of the effect, as the standard errors of the treatment coefficient slightly increased on average in the expanded model. Therefore, we present results from the simple model including only treatment status and matched pairs.

III. IMPLEMENTATION OF THE PROFESSIONAL DEVELOPMENT PROGRAM TO SUPPORT DATA-DRIVEN INSTRUCTION INTERVENTION

This chapter describes the implementation of the support for data-driven instruction (DDI) intervention this study has examined. The intervention aimed to build capacity for DDI in treatment schools through key supports, provider services, and school-level activities. Chapter I described in detail these three key components of the DDI intervention as it was designed. This chapter first describes how these key components of the intervention were implemented in the treatment schools, with a focus on fidelity to the intended model. Next, it describes how the intervention affected data-related activities, using data from the study's treatment and control schools. It concludes with a summary of key implementation findings.

The Intervention as Implemented

In examining the implementation of the DDI intervention in treatment schools, we focused on the three key components: (1) supports provided to the treatment schools as part of the DDI intervention, including data coaches assigned to the schools and the intervention provider; (2) professional development and technical assistance services from the provider; and (3) school-level activities expected to occur as part of a treatment school's study participation. Together, these three components were expected to build school capacity for implementing DDI in the treatment schools, which in turn was expected to increase the use of data by teachers and school leaders, improve teachers' instructional strategies, and ultimately improve student achievement, as illustrated by the logic model presented in Chapter I. Focused Schools, an experienced provider of DDI services, was the external service provider responsible for providing and guiding implementation of intervention-related services in the treatment schools. In this section, we report on the extent to which treatment schools were successful in implementing key intervention components.

Implementation of Intervention Supports

Intervention supports were provided as planned to the vast majority of study schools and districts throughout the study period. Two key supports were provided to treatment schools as part of the study: (1) professional development and technical assistance consultants, and (2) data coaches. Eight consultants from Focused Schools provided services in the 12 study districts. All consultants were former principals with experience in data-driven instruction and school turnaround initiatives. Each treatment school was provided with a half-time data coach to work primarily with teachers in grades 4 and 5. Data coaches were the key support that made the DDI intervention possible in treatment schools. Each study district identified, screened, and hired them, with input and support from the study team and Focused Schools.

During the 2014-15 school year, the districts hired data coaches who worked in all 51 of the study's treatment schools. In 2015-16, half-time data coaches were present in 50 of the 51 schools. In one school, the original coach left in summer 2015, and the district was not able to hire a replacement. Most schools had the same data coach in both study years, as well as the same principal (appendix figure B.1). Data coaches, on average, were experienced educators, but most did not have previous data coach experience. Such experience was not a required qualification but could have been related to their effectiveness as data coaches. All 2015-16 data

coaches were former teachers, but only 36 percent had previous coaching experience and few had worked as a data coach previously. Nevertheless, coaches reported having more than a dozen years of experience working with student data, on average, regardless of their previous roles (appendix table B.1).

Implementation of Provider Services

The DDI support provider, Focused Schools, delivered support to schools through professional development to each district as planned, in most respects. As detailed in Chapter 1, professional development provided by Focused Schools included an up-front orientation to DDI in December 2014 and additional training sessions during 2015. Consultants from Focused Schools held six professional development sessions in each study district for coaches and school leaders throughout the study period, as planned (table I.1). It was expected that data coaches and principals would attend all of the sessions offered by the consultants.

Although Focused Schools conducted all required professional development sessions, participant attendance at these sessions from the treatment schools was high but not perfect, especially for principals. Principals' participation decreased over time, from 89 percent at the first session to 75 percent at the sixth and final session (appendix table B.2).[7] Data coach participation was higher than that of principals but also lower than expected by the intervention design, ranging from 87 to 97 percent across the six sessions. Nevertheless, most coaches reported some benefits from the professional development and technical assistance provided as part of the intervention, with more than three-quarters of them (78 percent) reporting that their training had prepared them to carry out most or all of their tasks by spring 2016. Still, about one-fifth (22 percent) reported that their training either did not prepare them or prepared them to carry out some but not all tasks by the end of the study period (appendix table B.3).[8]

Focused Schools consultants conducted most, but not all, of the expected technical assistance visits to treatment schools. The consultants were expected to visit each school eight times between January 2015 and March 2016, with visits coinciding, when possible, with professional development sessions. These visits provided an opportunity to check on progress, offer advice, and answer any questions. On average, treatment schools received 6.6 visits from

[7] Despite principals' attendance at PD sessions being lower than teachers, principals who attended these sessions gave the sessions a slightly higher average rating on the quality of the sessions than other participants. The average rating from principals was 4.77 on a scale of 1 to 5, compared with an overall average rating among all participants of 4.72.

[8] Among coaches who reported that the training did not prepare them to carry out all tasks, some provided further explanation. The issues they cited were varied, although one theme was that the training was not specific enough. For example, one coach said that the "DDI expectations feel vague." Others reported sometimes being "a little confused about the purpose of different activities" or that the training should provide "a more developed understanding of what DDI is." Another issue raised by coaches involved the timing of the material covered in the training—that it was not aligned with what was going on in their school at the time.

their consultants during the study period—fewer than the expected 8. However, most schools (76 percent) either met the target of eight visits or fell one or two visits short.[9]

Although Focused Schools delivered technical assistance primarily during regularly scheduled school visits, other forms of help were also available to data coaches and other staff in treatment schools. For example, consultants were expected to communicate at least monthly with data coaches, either through email or phone. In addition, data coaches and consultants could share information using a web-based SharePoint site hosted by the study team. For the most part, consultants communicated with data coaches as expected. Nearly all data coaches (94 percent) reported at least monthly email or phone contacts with their consultant.

Implementation of School-Level Activities

Within the treatment schools, each school's leaders, data coaches, and teachers were expected to engage in the intervention through a variety of activities (see Chapter I). Principals were expected to provide overall leadership for data use, set expectations for teachers, and work consistently with the data coach. Two different types of working groups were to be formed in the treatment schools as part of building school capacity to analyze and use data effectively: (1) an instructional leadership team and (2) fourth- and fifth-grade teacher collaboration teams. In addition, data coaches were expected to analyze student data and support teachers in their DDI work through activities such as one-on-one meetings and classroom observations. As described below, most of these school-level activities were implemented as expected in the majority of treatment schools, although some schools did not implement all expected activities early enough to be in place for the full 2015-16 school year.

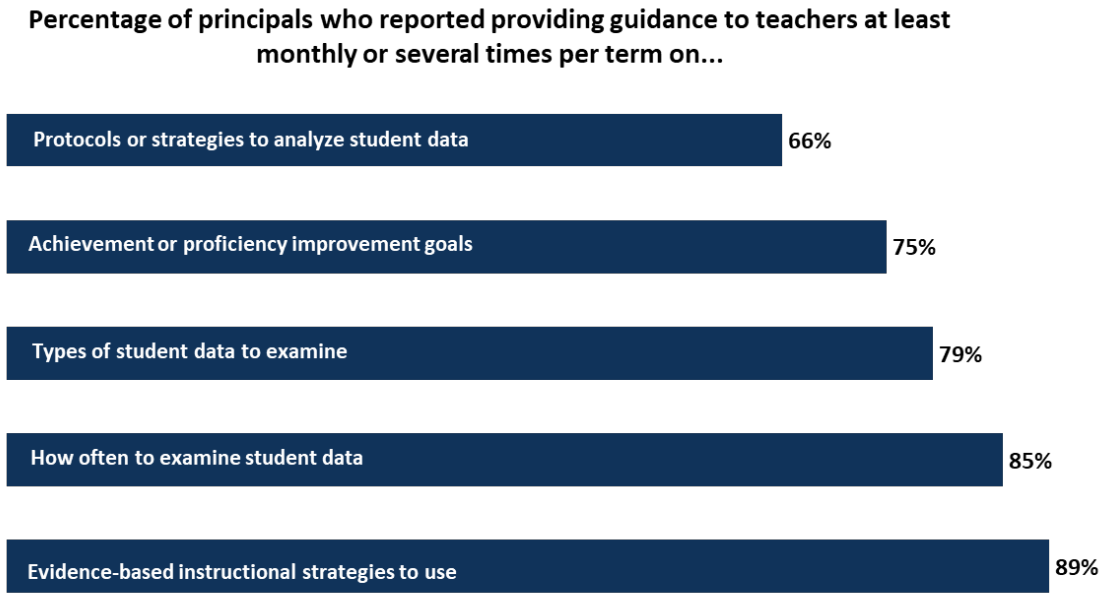
Most treatment school principals were actively engaged in the intervention, providing overall leadership for DDI and supporting their data coaches. As their schools' main instructional leader, principals were expected to play a crucial role in establishing DDI implementation and data use more generally as a priority. They were expected to meet one on one with the data coach each week to strategize for DDI implementation, allocate time and resources to support DDI, and set expectations and provide guidance on data use by teachers. Most principals met regularly with data coaches, although they typically did not fully meet the expectation of weekly meetings. A majority (59 percent) met at least three times a month, whereas only 8 percent met less than twice a month (appendix figure B.2). Data coaches generally viewed principals as being supportive, with 72 percent giving the principals the highest score on a five-point scale rating their support (appendix table B.4).

Most principals also set expectations and provided guidance on data use by teachers as expected. Principals had discretion over how to provide this guidance, and how often (that is, Focused Schools did not specify how principals should provide guidance). Between two-thirds and 90 percent of principals reported providing guidance to teachers at least monthly or several

[9] School visits were recorded in consultant logs, which did not provide information on the reasons a school did not receive a visit. It is possible consultants occasionally forgot to record a school visit, visited with the coach of two schools at only one school site, and/or encountered difficulties when scheduling visits with coaches.

times per term on a variety of data use topics (figure III.1)[10]. For example, principals commonly provided guidance to teachers on the types of student data to examine (79 percent), how often they should examine these data (85 percent), and what evidence-based instructional strategies to use (89 percent).

Figure III.1. Percentage of principals in treatment schools providing guidance to teachers on aspects of data-driven instruction



Source: Principal survey (n = 92-94).

Most treatment schools had actively involved school leaders through an instructional leadership team. Each treatment school was expected to establish an instructional leadership team composed of the principal, data coach, grade 4 and 5 chairs, and any other key school leaders seen as important for establishing leadership and a culture of data use. In most schools, these teams had been established and met the intervention target of meeting once or twice per month during the 2015-16 school year. Nearly all treatment schools (91 percent, according to data coaches) had established instructional leadership teams by fall 2015, the expected time frame. In fact, data coaches at more than half the schools (56 percent) indicated that a team similar to an instructional leadership team predated the intervention. However, they also noted that the composition of the team and the focus of their work or frequency of meetings were modified to meet the expectations of the intervention—for example, 95 percent of schools with a team reported a greater emphasis on data use as a result of the intervention.

[10] While this section focuses on principals of treatment schools, comparisons between treatment and control school principals are provided in appendix B. Principals in control schools were less likely than those in treatment schools to provide guidance to teachers about data-driven instruction (appendix figure B.4).

Instructional leadership teams in most treatment schools had engaged in the types of activities expected of them under the support for DDI intervention, although some were delayed in doing so. Instructional leadership teams were expected to select an instructional focus, schoolwide improvement goals, and best practices as part of the DDI intervention. In most treatment schools, instructional leadership teams completed these activities. The teams in a majority of schools met each of these DDI expectations in both fall 2015 and spring 2016 (figure III.2). However, the teams in a substantial minority of treatment schools completed these activities well into the intervention period. In fall 2015, for example, more than a quarter of schools had failed to select an instructional focus, and somewhat larger percentages had failed to set schoolwide improvement goals and best practices. As a result, the full implementation was not in place in these treatment schools during the full 2015-16 school year. The study team conducted the fall interviews with data coaches in late September and early October, so some of the schools that had not met expectations by the interview date may have done so later in the fall. By spring 2016, instructional leadership teams in 93 percent of treatment schools had selected an instructional focus.[11] Some coaches reported challenges in working with their schools' instructional leadership teams (appendix table B.6), such as consistency in member participation and attendance (38 percent), following through on decisions (38 percent), and balancing DDI work with other school priorities and responsibilities (36 percent). These challenges, reported in spring 2016, may have contributed to a lack of implementation progress in some treatment schools.

Based on the logic of the support for DDI intervention, instructional leadership teams were not told what instructional focus, schoolwide improvement goals, or best practices they should put in place. Instead, the teams should have selected them on the basis of the situation in their school, and in particular, on the basis of student data. Box 3 provides examples of treatment schools' choices of an instructional focus and best practices. Most schools (70 percent) selected an instructional focus in the area of English/language arts (figure III.3).[12]

[11] The instructional leadership teams at some schools had not met specific expectations of the intervention by spring 2016. In particular, 7 percent had not selected an instructional focus, 14 percent had not selected schoolwide improvement goals, and 24 percent had not selected instructional best practices at the school level (figure III.2).

[12] This estimate includes in the category of English/language arts schools that selected an instructional focus in reading, reading and writing, reading and math, writing, and vocabulary.

Figure III.2. Percentage of schools in which instructional leadership teams had completed key components of the data-driven instruction intervention, fall 2015* and spring 2016**

*First set of data bubbles; colored blue

**Second set of data bubbles; colored red

Source: Data coach interviews (n = 45-46).

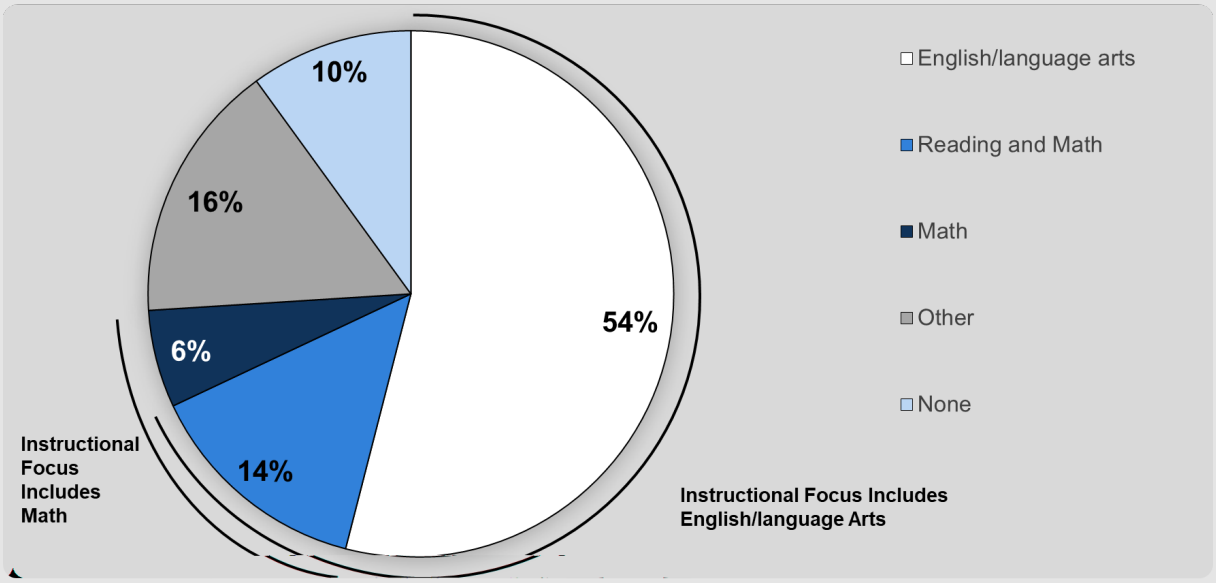
Note: Blue dots with no shadow represent the percentage of schools that had completed the intervention component by the fall 2015 interview; red dots with a shadow represent the percentage that had completed the component by the spring 2016 interview.

Box 3. What kinds of instructional focus and best practices did instructional leadership teams choose?

Among treatment schools, 68 percent selected an instructional focus related to the content area of English/language arts (figure III.3), including those that selected a focus in vocabulary. According to the data coaches, schools most commonly selected reading as their focus for instruction within the English/language arts area. Only 6 percent of treatment schools opted to focus exclusively on math, whereas 14 percent selected an instructional focus in both math and reading. Notably, 16 percent of schools selected an instructional focus not associated with a content area (for example, academic vocabulary, increasing student engagement, improving classroom discussion, differentiated instruction) and 10 percent had not selected any instructional focus.

Most treatment schools with an instructional focus also selected at least one instructional best practice, such as using text-based evidence or guided reading. The leadership teams reported a variety of instructional best practices across the schools (appendix table B.5). Many of the best practices identified were content related and aligned with a school's instructional focus (for example, selecting math mindsets pedagogy as a best practice with a math instructional focus), but not always. Some best practices were not content-specific but rather more general, such as having reading as the instructional focus coupled with differentiated instruction and selecting appropriate goals for student achievement as the instructional best practices.

Figure III.3. Percentage of schools that selected an instructional focus in different areas, 2015-16



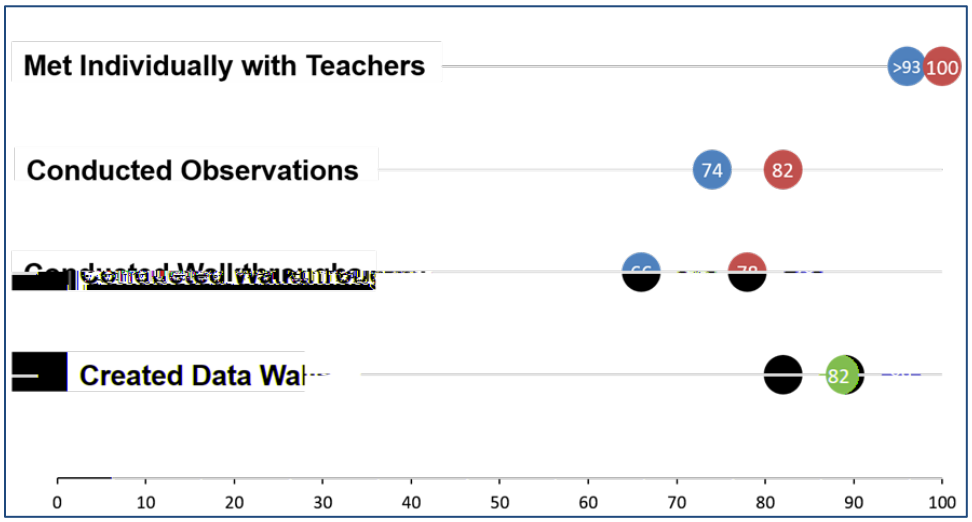
Source: Data coach interviews for 50 treatment schools.

Most treatment schools established teacher collaboration teams in grades 4 and 5 that met at least twice per month and engaged in some data-related activities. Each treatment school was expected to establish two teacher collaboration teams—one for grade 4 and one for grade 5—consisting of the data coach and all teachers in that grade. Much of the on-the-ground work of DDI was expected to be done by these teams, as they were to meet at least every other week and act as professional learning communities, in which participating teachers work collaboratively under the leadership of the data coach. Nearly all treatment schools had established teams that met at least monthly by fall 2015, and two-thirds (65 percent in grade 4 and 69 percent in grade 5) met at least twice a month (appendix figure B.3). Most treatment schools already had teacher teams in place before the intervention, but 88 percent of those with

preexisting teams had to make changes to their responsibilities or composition as part of the intervention, including a greater emphasis on data use. In working with teacher collaboration teams, data coaches reported challenges similar to but even more frequent than those they reported in working with instructional leadership teams. These challenges included follow through on meeting decisions (57 percent), balancing DDI work with other work and priorities (52 percent), consistent participation of members during team meetings (41 percent), and maintaining focus on data and instructional improvement (32 percent).

Data coaches in most treatment schools regularly supported teachers in a variety of DDI activities outside of the instructional leadership team or teacher collaboration teams, as expected by the intervention. As part of their responsibilities, data coaches were expected to create data walls, conduct school walkthroughs, and support grade 4 and 5 teachers during one-on-one sessions and through informal classroom observations. Most coaches regularly engaged in these expected activities, with increases in the prevalence of the activities between fall 2015 and spring 2016 (figure III.4). By spring 2016, for example, data coaches in all treatment schools met individually with teachers, about 80 percent conducted observations and walkthroughs, and nearly 90 percent had created data walls. Coaches reported data walls were located in hallways and classrooms. The most commonly and consistently displayed data were interim and formative assessment results, followed by summative assessment results and attendance data.[13]

Figure III.4. Percentage of schools in which data coach engaged in different activities, fall 2015* and spring 2016**



*First set of data bubbles; colored blue

**Second set of data bubbles; colored red

Source: Coach interviews, fall 2015 and spring 2016 (n = 45-46).
< or > indicates that we have withheld the exact percentage to protect respondents' confidentiality in accordance with National Center for Education Statistics statistical standards, but that the percentage is less than or greater than the number following the < or > symbol (U.S. Department of Education 2012).

[13] Data coaches faced challenges related to data walls—40 percent of data coaches reported difficulties finding time to create or update the data walls. Overcoming teacher reservations about displaying data was also reported as a challenge by nearly one-third of the coaches.

Data coaches in treatment schools reported engaging in a variety of activities during teacher collaboration team meetings, not all of which were focused on using data to improve instruction. Student data guided many of the activities in which the teacher collaboration teams engaged, but information collected through the weekly data coach logs indicated that team activities differed substantially from school to school and across different periods of the school year. Some teacher collaboration teams focused on analyzing student data and implications for instruction, whereas others focused on other activities such as curriculum planning, onboarding new teachers, or scheduling schoolwide testing. In other words, based on data coach logs, schools appeared to differ in the extent to which teacher collaboration teams analyzed data, discussed links between data and instruction, and identified evidence-based instructional practices to put into place in their classrooms. The data from the weekly coach logs were not sufficiently and consistently detailed for us to report on exactly how specific data-related activities of these teams varied across treatment schools. However, the next section presents evidence on teacher collaboration activities more generally in treatment and control schools.

Contrast Between Treatment and Control Schools in Data-Related Supports and Activities

To the extent that the support for DDI intervention was implemented as planned, it should have resulted in clear differences between the treatment and control schools in the presence and use of certain supports, practices, and activities in schools. In particular, the intervention should have led to more of three kinds of activities in treatment schools than in control schools: (1) principals and teachers receiving data-related professional development; (2) teachers receiving guidance and support on data use from coaches and school leaders; and (3) teachers collaborating on data-related activities. These differences were expected to be apparent during the 2015-16 school year as a precursor to the intervention having an intended short-term effect on data use and teachers' instructional strategies, as well as intended longer-term effects on student achievement.

Data-Related Professional Development

Focused Schools provided a key component of the intervention in the form of professional development on DDI. As described in the previous section, all principals and those teachers who were grade-level chairs in treatment schools were required to attend the professional development sessions, and other teachers in the school should have received this training indirectly (although it may have been in the form of informal support and guidance, either as part of the teacher teams or outside of collaboration time). Thus, principals and teachers in treatment schools were expected to receive larger amounts of data-related professional development than those in control schools.

Principals in treatment schools received more professional development on data-related topics than those in control schools. All treatment school principals reported receiving formal professional development on data-related topics during 2015-16, compared with 73 percent of control school principals (table III.1). The amount of data-related professional development also differed, with treatment school principals reporting more than twice as many

days as control school principals of professional development focused on topics related to how to use and analyze data to inform instructional practices (5.6 versus 2.7 days). The data-related training received by treatment school principals would presumably have included the two days of formal DDI sessions but would also include any other data-related professional development the principals received.

Table III.1. Principal professional development during 2015-2016

Receipt of Professional Development	Treatment	Control	Difference	*p*-value
Received any professional development (percentages)	100.0	89.1	10.9*	0.02
Total days of professional development over school year (average)	12.5	9.9	2.6*	0.04
Received professional development focused on topics related to how to use and analyze data to inform instructional practices (percentages)	100.0	73.3	26.7*	0.00
Days of professional development focused on topics related to how to use and analyze data to inform instructional practices (average)	5.6	2.7	3.0*	0.00
Professional Development Topics (percentages who reported topic was a major focus)				
How to analyze or interpret various types of student data to understand student needs	34.0	<6.7	>27.3*	0.00
How to use data to set individual learning goals for students	38.3	8.5	29.8*	0.00
How to change instruction based on data	38.3	<6.7	>31.6*	0.00
How to use student data to monitor student progress toward meeting learning goals	43.5	10.9	32.6*	0.00
How to use evidence-based instructional strategies to help students meet learning goals	44.7	10.6	34.0*	0.00
Number of Principals—Range[a]	**45-47**	**45-47**	**90-94**	

Source: Principal survey.

Notes: The difference between the treatment and control estimates may not equal the impact shown in the table because of rounding.

[a] Sample sizes are presented as a range based on the data available for each row in the table.

* Difference is statistically significant at the .05 level, two-tailed test.

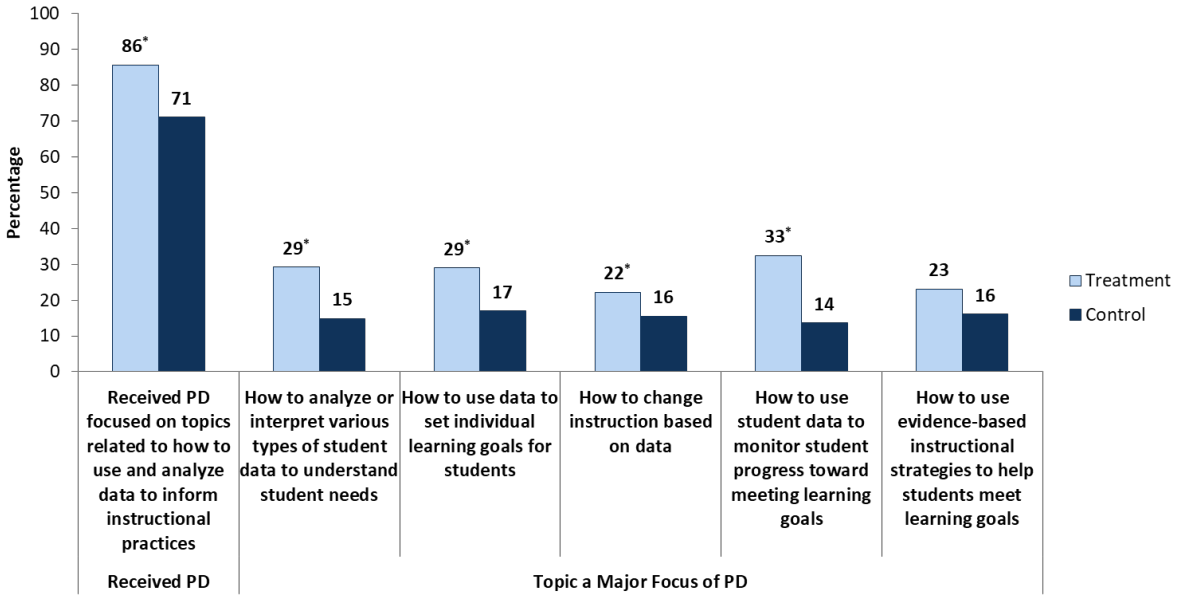
< or > indicates that we have withheld the exact percentage to protect respondents' confidentiality in accordance with National Center for Education Statistics statistical standards, but that the percentage is less than or greater than the number following the < or > symbol (U.S. Department of Education 2012).

Teachers in treatment schools were more likely than those in control schools to receive professional development on how to use and analyze data to inform instructional practices. Teachers in treatment schools reported receiving an average of 4 more hours (12.6 versus 8.3 hours) of formal professional development on data-related topics during the 2015-16 school year than did control school teachers (appendix table B.7). Teachers in treatment schools were more likely to report receiving professional development on four data-related topics (figure III.5). In particular, they were more likely to receive professional development on how to use various types of student data to understand student needs (29 versus 15 percent), set individual learning goals for students (29 versus 17 percent), change instruction based on data (22 versus 16 percent), and monitor student progress toward meeting learning goals (33 versus 14 percent).

In interpreting these results, it is worth noting that most teachers in treatment schools (those who were not grade-level chairs) did not participate in the formal Focused Schools professional development sessions. They may have received that training indirectly or informally from data

coaches or other participants, but would not necessarily have interpreted it as formal professional development when responding to the survey questions. This aspect of the intervention implementation plan may explain why fewer than half of teachers in treatment schools reported receiving professional development on the specific data-related topics shown in figure III.5. That is, if teachers had reported both the formal and informal data-related training and professional development they received, it is possible that those percentages would have been higher, especially among teachers in treatment schools.[14]

Figure III.5. Teacher professional development (PD) during 2015-2016



Source: Teacher survey (n = 426-433).

*Difference is statistically significant at the .05 level, two-tailed test.

[14] To explore the possibility that these differences were driven primarily by grade-level chairs, we also examined treatment and control differences in professional development separately for grade-level chairs versus other teachers (appendix table B.7). In general, we found similar patterns for both types of teachers. For instance, 93 percent of grade-level chairs in treatment schools had DDI-focused professional development, compared to 77 percent of grade-level chairs in control schools. Among other teachers, the percentages were 83 percent and 73 percent, respectively. The number of hours of DDI-focused professional development was approximately 4 hours higher in treatment schools for both types of teachers, although this difference was not statistically significant for grade-level chairs. Differences in the topics addressed in the DDI-focused professional development varied somewhat by teacher type. The treatment-control difference in how to analyze data was only statistically significant for other teachers (27 percent versus 15 percent), while the gap in using data to set goals was only statistically significant among grade-level chairs (48 percent versus 11 percent). Within the full sample, there was no statistically significant difference between treatment and control teachers in the topic of evidence-based instructional practices. However, grade-level chairs in treatment schools were statistically significantly more likely than those in control schools to have had professional development with this focus (38 percent versus 19 percent).

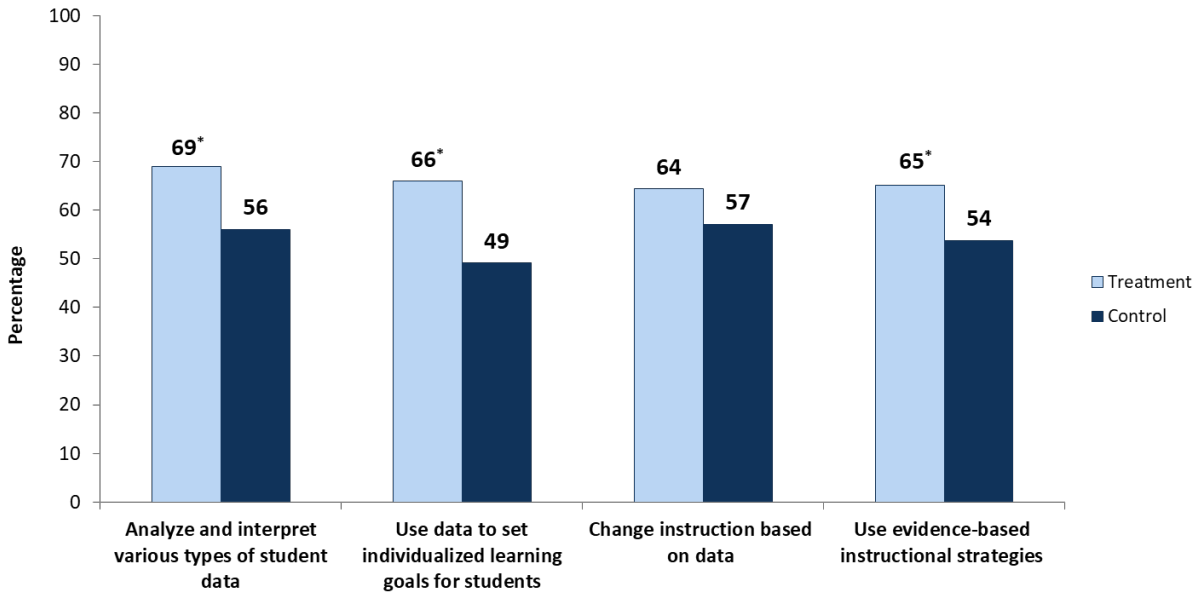
Guidance and Support From Coaches and School Leaders in Data Use Activities

We expected that the support for DDI intervention would lead to more data-related guidance and support for teachers from school leaders and data coaches in treatment schools than control schools. As noted earlier, school leaders, including the principal and instructional leadership team, were expected to promote a culture of data use and support teachers in their efforts to use data to improve their instruction in spring 2016. The data coaches were expected to work with teachers, both one on one and in teacher collaboration team meetings, on various aspects of data use. This coaching was intended to be the primary way to provide teachers with information about how to change instructional practices to improve student achievement, and therefore was critical to the implementation of DDI. Below, we document the treatment-control difference in the presence of a data coach and examine differences in the extent to which teachers in treatment versus control schools received data-related guidance and support from coaches or other school leaders.

Treatment schools were more likely than control schools to have a data coach. Nearly all treatment schools had a data coach/staff person available on site to help teachers use data to improve instruction, compared with 36 percent of control schools. The presence of a data coach in more than one-third of the control schools is one sign that many of these schools encouraged teachers' data use to some extent. Below, we describe in greater detail the specific kinds and amount of data-related support that teachers received in treatment and control schools.

Teachers in treatment schools received more data-related support and guidance from school leaders on various aspects of data use. The most intensive way teachers could receive support on data use was through one-on-one interaction with a coach or school leader. Larger percentages of teachers in treatment than control schools reported working one on one with a coach or school leader on various aspects of data use at least monthly or several times per term (figure III.6). The support for DDI intervention may have led to even more frequent one-on-one support in treatment schools, and as a result the additional support may have been more likely to affect teachers' instructional practices and student achievement. Thus, we also examined the percentage of teachers who reported receiving these types of support at least weekly or several times per month. While smaller percentages of both groups reported this more frequent support, teachers in treatment schools were more likely than those in control schools to report frequently receiving each form of support, and the differences were larger (appendix figure B.5).

Figure III.6. Percentage of teachers who reported working one-on-one with a coach or school leader at least monthly on different aspects of data use during 2015-2016



Source: Teacher survey (n = 432–433).

*Difference is statistically significant at the .05 level, two-tailed test.

Most notably, teachers in treatment schools were more likely than those in control schools to receive support on analyzing and interpreting student data (69 versus 56 percent) and use data to set individualized learning goals for students (66 versus 49 percent). The difference in the percentage of teachers receiving support to change instruction based on data was not statistically significant, consistent with the similar rates of professional development on changing instruction based on the data noted above.

A somewhat less intensive form of support to teachers involved guidance and feedback from school leaders on data use that was not necessarily one-on-one. Teachers in treatment schools were more likely than those in control schools to receive this sort of support from school leaders. A larger percentage of teachers in treatment than control schools reported receiving guidance and feedback from school leaders on student goals at least monthly or several times per term.[15] For example, 77 percent of teachers in treatment schools reported receiving at least monthly guidance on strategies to use to analyze student data, compared with 61 percent of teachers in control schools (table III.2). Teachers in treatment schools were also at least 15 percentage points more likely to report receiving feedback on their data analysis and use of data to guide instruction (75 versus 55 percent), guidance on setting goals for students (77 versus 62 percent), and feedback on student progress toward meeting those goals (75 versus 57 percent).

[15] It is also the case that a larger percentage of teachers in treatment than control schools reported receiving this guidance at least weekly or several times per month (appendix table B.9).

Table III.2. Percentage of teachers who reported guidance or feedback from school leaders on data-related topics at least monthly or several times per term during 2015-2016

	Treatment	Control	Difference	*p*-value
Guidance on:				
How often to examine student data	89.9	76.8	13.1*	0.00
Types of student data to examine	85.5	76.8	8.6*	0.01
Protocols or strategies to use to analyze student data	77.0	60.5	16.5*	0.00
Achievement or proficiency improvement goals for students	76.5	61.5	15.0*	0.00
Evidence-based instructional strategies (best practices) to use	77.0	63.1	13.9*	0.00
Feedback on:				
Data analysis and use of data to guide instruction	74.6	54.9	19.7*	0.00
Implementation of evidence-based instructional strategies (best practices)	70.7	57.0	13.7*	0.00
Student progress toward meeting achievement of proficiency improvement goals	74.6	57.1	17.5*	0.00
Number of teachers (range)[a]	218-219	214-215	432-434	

Source: Teacher survey.

Notes: The difference between the treatment and control estimates may not equal the impact shown in the table because of rounding.

[a]Sample sizes are presented as a range based on the data available for each row in the table.

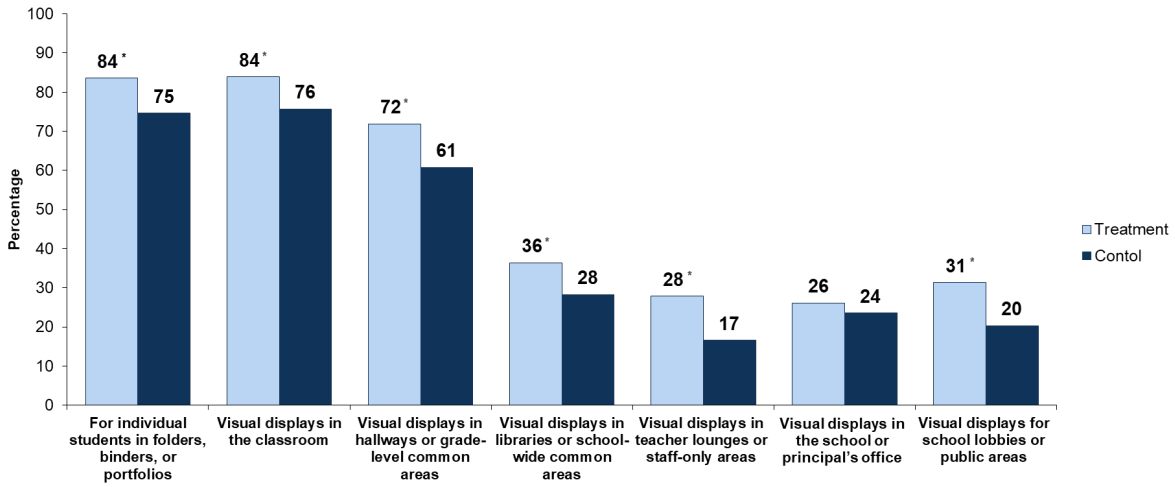
*Treatment-control difference is statistically significant at the .05 level, two-tailed test.

Instructional leadership teams were more likely to engage in a variety of data-related activities in treatment than control schools. Just as teachers reported receiving more guidance and support from school leaders in treatment than control schools, the treatment school principals were more likely to report that school leaders—through the instructional leadership teams—were engaged in the kinds of activities that would support their teachers' data use. Among the 15 different data-related activities examined, instructional leadership teams in treatment schools were more likely than those in control schools to engage in 14 of these activities at least monthly (appendix table B.8). For example, instructional leadership teams in treatment schools were more likely to do the following: set achievement or proficiency improvement goals (72 versus 47 percent); identify evidence-based instructional strategies teachers should use (85 versus 51 percent); provide guidance on the types of student data teachers should examine (83 versus 35 percent); and develop or plan data-related professional development for teachers (83 versus 45 percent).

Teachers in treatment schools were more likely than those in control schools to analyze and document student progress for visual displays throughout their schools. While common in both groups of schools, teachers in treatment schools were more likely to develop and update analyses of student progress at least monthly or several times per term. For example, 72 percent of teachers in treatment schools reported developing or updating visual displays in hallways or grade-level common areas, compared with 61 percent in control schools (figure III.7). Teachers in treatment schools were also more likely to develop and update analyses of student progress for the following: visual displays in the classroom (84 versus 76 percent); individual students in

folders, binders, or portfolios (84 versus 75 percent); visual displays in teacher lounges or staff-only areas (28 versus 17 percent); visual displays for school lobbies or public areas (31 versus 20 percent); and visual displays in libraries or school-wide common areas (36 versus 28 percent).

Figure III.7. Percentage of teachers who developed and updated analyses of student progress at least monthly or several times per term during 2015-2016



Source: Teacher survey (n = 421-422).

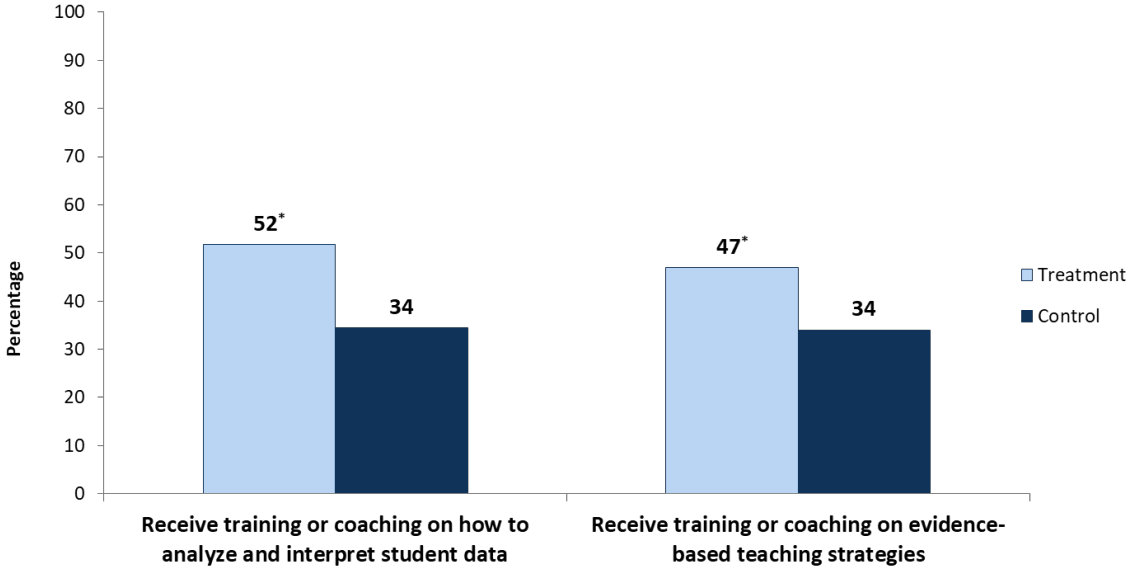
*Difference is statistically significant at the .05 level, two-tailed test.

Teacher Collaboration on Data-Related Activities

The support for DDI intervention was designed to provide teachers with dedicated time to engage in collaborative activities with other teachers related to data use. Unless similar efforts took place in control schools, this design should have led to more collaboration among teachers in treatment than control schools on various aspects of data use.

Teachers in treatment schools received more training and coaching on data-related topics during common planning time. About half of the teachers in treatment schools reported receiving at least monthly or several times per term training or coaching during common planning time on how to analyze and interpret student data (52 percent) and on evidence-based teaching strategies (47 percent) (figure III.8). A lower percentage of teachers in control schools (34 percent) reported receiving each of these types of training at least monthly.[16]

Figure III.8. Percentage of teachers who reported receiving training or coaching on data-related activities in collaboration with other teachers during common planning periods at least monthly during 2015-2016



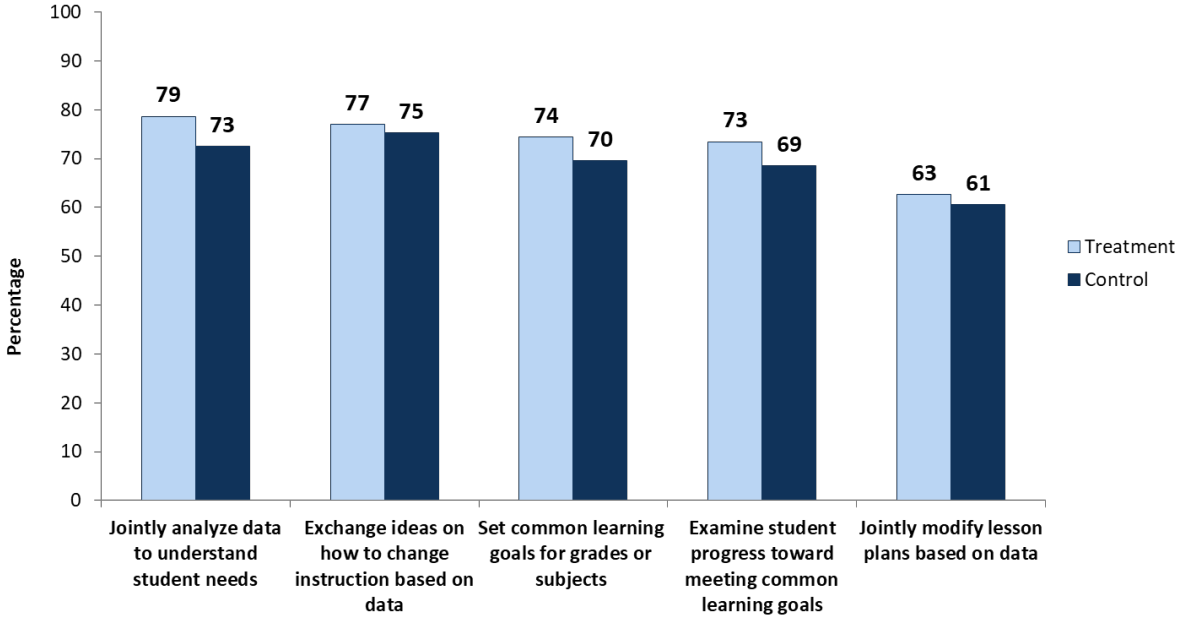
Source: Teacher survey (n = 421-422).
*Difference is statistically significant at the .05 level, two-tailed test.

Teachers in treatment schools were no more likely than those in control schools to regularly engage in most data-related activities during common planning time. In treatment and control schools, teachers were similarly likely to report engaging in several data-related

[16] A larger percentage of teachers in treatment than control schools reported receiving this type of coaching or training at least weekly or several times per month (appendix figure B.7).

common planning time activities at least monthly or several times per term.[17] These activities included the key aspects of DDI the intervention aimed to promote, including jointly analyzing data to understand student needs, setting common learning goals, examining student progress toward these goals, exchanging ideas on how to change instruction based on data, and jointly modifying lesson plans based on data (figure III.9).

Figure III.9. Percentage of teachers who reported engaging in data-related activities with other teachers during common planning periods at least monthly during 2015-2016



Source: Teacher survey (n = 421-422).

Note: None of the treatment control differences was statistically significant at the .05 level, two-tailed test.

Levels of collaborative data-related activities were high, even in control schools. In both groups of schools, many teachers worked collaboratively on these activities. For example, 79 percent of teachers in treatment schools and 73 percent of those in control schools jointly analyzed data during common planning time to understand student needs. Teachers also frequently reported using this time to discuss changing instruction based on data, setting and monitoring student goals, and jointly modifying lesson plans based on the data. For example, 63 percent of those in treatment schools and 61 percent in control schools reported engaging in this last activity at least monthly (figure III.9).

[17] Teachers in treatment and control schools were also similarly likely to report engaging in these activities at least weekly or several times per term, with one exception (appendix figure B.8). Teachers in treatment schools were more likely to report frequently jointly analyzing data to understand student needs (48 versus 36 percent).

Summary of Implementation Findings

The professional development program to support the intervention aimed to build capacity for DDI in treatment schools through implementation of key supports, provider services, and school-level activities. For schools to fully implement the intervention, they first had to hire a half-time data coach and agree to work with a consultant from Focused Schools, the study's technical assistance provider. Second, the Focused Schools consultant had to deliver professional development and technical assistance to the schools as planned. Third, school leaders and data coaches had to engage in a set of activities in the schools designed to support teachers in using student data to improve their instruction. In most respects, the key aspects of the intervention were implemented as planned. Nevertheless, little evidence suggests that the intervention led to increased teacher collaboration around analyzing data or using data to adjust instructional practices.

The DDI intervention successfully provided the key supports and services of data coaching and professional development or technical assistance on data use.

- All treatment schools hired half-time data coaches, and these schools were much more likely than control schools to have data coaches during the 2015-16 school year. The data coaches that treatment schools hired were experienced educators, although most did not have prior experience in being a data coach.
- Focused Schools delivered professional development and technical assistance as expected in most respects. Planned professional development sessions were held, and attendance of data coaches and other school staff was high. This resulted in the principals and teachers in treatment schools receiving more data-related professional development than those in control schools.

The intervention was successful in engaging school leaders in treatment schools, who performed the key DDI activities supporting teachers as planned, although some began implementing these activities later than others.

- Most principals met with data coaches regularly to monitor and support implementation of the intervention, and data coaches perceived them as supportive of DDI. Broader groups of school leaders became involved in DDI through instructional leadership teams. In most treatment schools, these teams met regularly and engaged in key DDI activities, such as selecting an instructional focus. As a result, teachers in treatment schools were more likely than those in control schools to report receiving guidance and feedback from school leaders on data-related topics.
- Most treatment schools established teacher collaboration teams that met regularly, but there is little evidence to suggest that the intervention led to greater teacher collaboration around analyzing data or using data to adjust instructional practices. Teachers in treatment and control schools reported a similar frequency of data-related activities during common planning time, such as jointly analyzing data or jointly adjusting lesson plans based on data.

IV. IMPACTS OF PROFESSIONAL DEVELOPMENT IN SUPPORT OF DATA-DRIVEN INSTRUCTION

As described in the logic model (figure I.1), the support for data-driven instruction (DDI) intervention examined in this report provided schools with a data coach and professional development, and involved school leaders and teacher collaboration teams in supporting teachers' data use. These additional resources and supports were intended to help teachers analyze and interpret student data in ways that would allow them to improve their instructional practices. Although the intervention did not specify exactly what practices teachers should use, the idea was that through teacher collaboration and with the support of trained data coaches and school leaders, teachers would be able to use data to determine the instructional practices that would most benefit their students. And by leading to improved instruction, the intervention aimed ultimately to boost student achievement. This chapter assesses the impacts of DDI on both the intermediate outcomes of teachers' data use and instructional practices and the ultimate outcome of student achievement.

Impacts of Support for DDI on Teachers' Practices

Schools adopt DDI in hopes that by making greater use of data, teachers will better understand students' learning needs in at least two ways. First, the data should tell teachers which concepts students understand and which they do not. Second, the data should shed light on the characteristics of the students who are struggling the most. By pinpointing students' learning needs, DDI should help teachers figure out how to adjust their instruction, and who to target with those adjustments, to better address these needs. As noted above, DDI does not specify exactly what instructional strategies teachers should use, but common instructional strategies emphasized in the Focused Schools professional development and in the DDI research literature (Hamilton et al. 2009) include increasing instructional time on particular topics and individualized or differentiated instruction.

The goal of the DDI intervention was to support teachers in ways that made it easier for them to use data to improve their instruction. The data coaches, professional development provided by Focused Schools, involvement of school leaders, and use of teacher collaboration teams were the main ways that the intervention supported teachers. This section examines whether these supports were successful in increasing teachers' data use and leading to changes in their instructional practices. Although neither increased data use nor revised instructional practices would guarantee improvements in student achievement, they are key intermediate outcomes based on the logic of DDI.

Teachers' Data Use

Support for DDI had a limited impact on the extent to which grade 4 and 5 teachers reported using data to help guide their math and reading instruction. Despite the focus of DDI on teachers' data use, the intervention did not increase teachers' use of the data practices examined. Similar percentages of teachers in treatment and control schools reported using each of nine practices in each subject (figures IV.1 and IV.2). Among math teachers, for example, 50 percent of those in treatment schools and 47 percent in control schools reported using data at least several times per week to understand student learning needs. Teachers in treatment and control schools were also similarly likely to use data for small group instruction (44 versus 45 percent in math, 41 versus 38 percent in English/language arts) or to use data to adjust the time

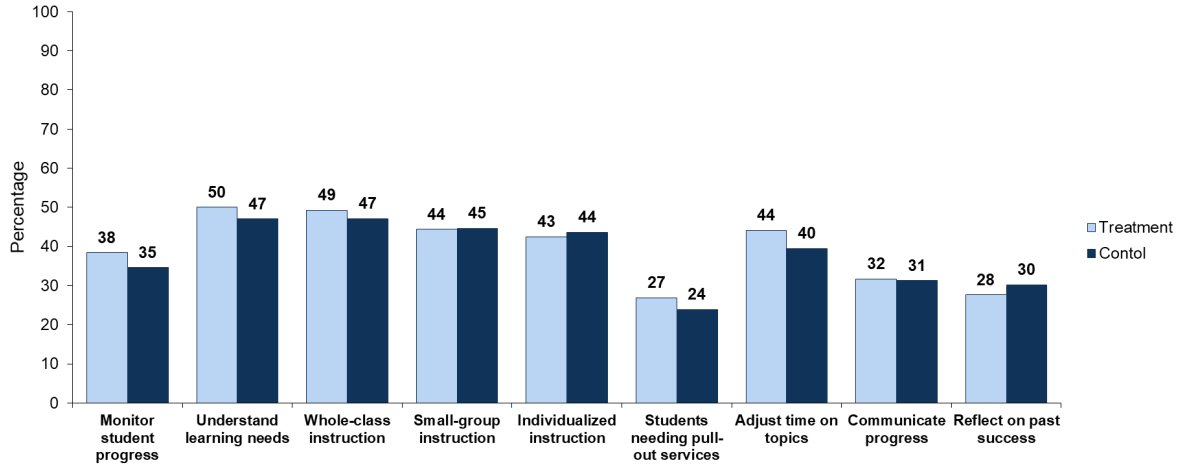
they spend on different topics (44 versus 40 percent in math, 32 versus 31 percent in English/language arts).[18]

Even if support for DDI did not increase teachers' use of specific data practices, professional development or coaching received in the intervention could have led teachers to use additional kinds of data or be more proficient in their data use. But we saw no evidence of this. Similar percentages of teachers in treatment and control schools reported having access to and using each of the specific types of student data we examined (appendix tables C.1 and C.2). We could not directly measure teachers' data use proficiency, but we did measure how useful teachers found data and their confidence in their ability to use data to guide instruction. Similar percentages of teachers in the two groups reported finding different types of data "very useful" when making instructional decisions (appendix table C.3). And similar percentages of teachers in treatment (79 percent) and control schools (77 percent) reported being confident or very confident in their data use abilities (appendix table C.4).[19]

[18] Figures IV.1 and IV.2 measure data use that occurred at least several times per week because the expectation of DDI was that teachers should use data on a regular basis. We also examined whether teachers used data with a looser definition of what constitutes regular data use—at least weekly or several times per month. A larger proportion of teachers in both groups of schools—about 60 to 90 percent—reported using data for various activities this frequently (appendix figures C.1 and C.2). Teachers in treatment were more likely than those in control schools to use data for two of the nine activities in each subject, but similarly likely to use data for the other seven activities.

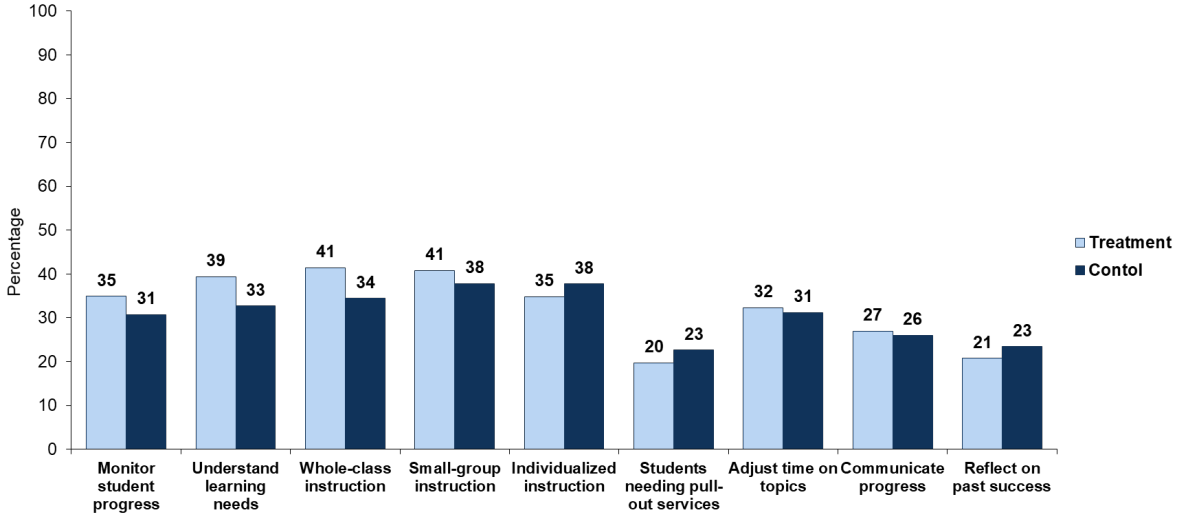
[19] Although data use by school principals is less directly connected with teachers' instructional practices and student achievement than data use by teachers, we found that DDI increased selected types of data use among principals (appendix figure C.3). Those in treatment schools were more likely than those in control schools to use data to monitor student progress toward learning goals at least several times per month (92 versus 75 percent) as well as to determine the professional development needs of teachers (83 versus 60 percent). Principals also were more likely to report using certain types of data including interim assessments (appendix table C.5) and had fewer barriers to data use (appendix table C.6). These findings are consistent with findings reported in Chapter III that the intervention led to greater involvement of school leaders in supporting DDI.

Figure IV.1. Percentage of grade 4 and 5 teachers who reported using data daily or several times per week for different purposes in math during 2015-2016



Source: Teacher survey (n = 396-398).
*Difference is statistically significant at the .05 level, two-tailed test.

Figure IV.2. Percentage of grade 4 and 5 teachers who reported using data daily or several times per week for different purposes in English/language arts during 2015-2016



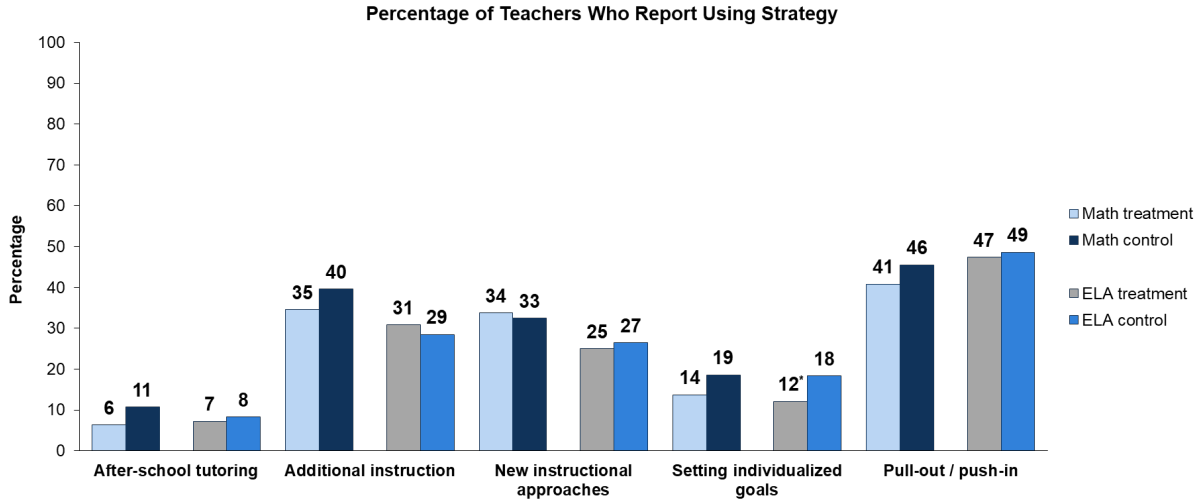
Source: Teacher survey (n = 408-411).
*Difference is statistically significant at the .05 level, two-tailed test.

Teachers' Instructional Strategies

Support for DDI did not increase teachers' use of instructional strategies associated with DDI. Grade 4 and 5 teachers could potentially use data to alter their usual instructional approach by employing various strategies. We asked about five possible strategies they could have used more commonly as a result of DDI: (1) after-school tutoring for selected students, (2) additional instruction on specific topics, (3) new instructional approaches on difficult or complex concepts, (4) working with students to set and monitor individualized learning goals, and (5)

using pull-out or push-in services by a specialist. Similar percentages of teachers in treatment and control schools reported frequently—every day or several times per week—using each of these instructional strategies in both math and English/language arts (figure IV.3). In fact, the only significant difference indicates that teachers in treatment schools were *less* likely than those in control schools to frequently set individualized learning goals for students in English/language arts.[20]

Figure IV.3. Percentage of grade 4 and 5 teachers who reported using instructional practice daily or several times per week for different purposes in English/language arts and math during 2015-2016



Source: Teacher survey (n = 397-411).

ELA = English/language arts.

*Difference is statistically significant at the .05 level, two-tailed test.

Impacts of Support for DDI on Student Achievement

Despite the fact that support for DDI did not affect teachers' data use or instructional practices, the intervention could still have positively affected student achievement. For example, DDI may have improved the *quality* of teachers' data use or instructional practices in ways not captured by the measures examined above, which focused on frequency of practices. In other words, the intervention could have led teachers to be more effective in using data to improve their existing instructional practices. In addition, schools had the freedom to tailor DDI for the particular needs of their students by selecting an area of instructional focus. DDI may have affected teacher practices and student achievement in a given subject, but only for schools that chose an area of instructional focus within that subject.

More generally, even if DDI did not affect student achievement in the average school, it may have been successful for some students or in some contexts. In addition to examining how DDI

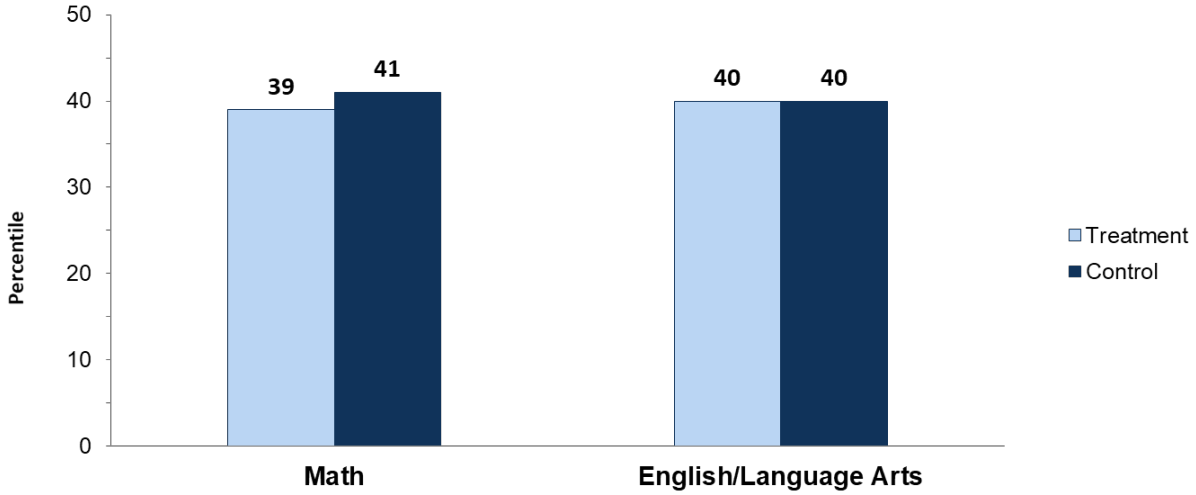
[20] This significant difference may not indicate an important impact of DDI on teachers' instructional practices. When we examined teachers' use of instructional practices using a looser definition of regular use of the practice—every week or several times per month, we found the reverse—that teachers in treatment schools were *more* likely than those in control schools to set individualized learning goals for students in English/language arts, with no other significant differences in either subject (appendix figure C.4).

affected student achievement in the average school, we also examined how the impacts of DDI differed for different groups of students or in different types of schools. In particular, we focused on whether the intervention was more successful in schools that seemed most well-prepared for DDI at the outset of the study, in terms of having the basic infrastructure in place. These schools might have had a useful head start in putting into place what was a complex intervention.

Average Impacts on Student Achievement

Support for DDI had no impact on student achievement in math or English/language arts. On average across the study sample, fourth- and fifth-grade students in treatment and control schools had similar achievement levels in math and English/language arts as measured by state end-of-year assessments in spring 2016 (figure IV.4).[21] In each subject, students in both groups of schools performed below the state average, which is consistent with the types of districts and schools the study team targeted during recruiting. In math, students in treatment schools were at the 39th percentile of the state distribution for their grade, whereas those in control schools were at the 41st percentile, on average. In English/language arts, both groups scored at the 40th percentile. These estimated impacts were equivalent to -0.04 student standard deviation units in math and -0.01 standard deviation units in English/language arts.[22]

Figure IV.4. Mean student achievement on 2016 state assessments in math and English/language arts



Source: District student records (n = 12,018-12,036).
Neither difference is statistically significant at the .05 level, two-tailed test.

[21] We also estimated the impact of DDI on student achievement in spring 2017 and found no evidence of impacts on achievement in that year. See Appendix Table C.7.

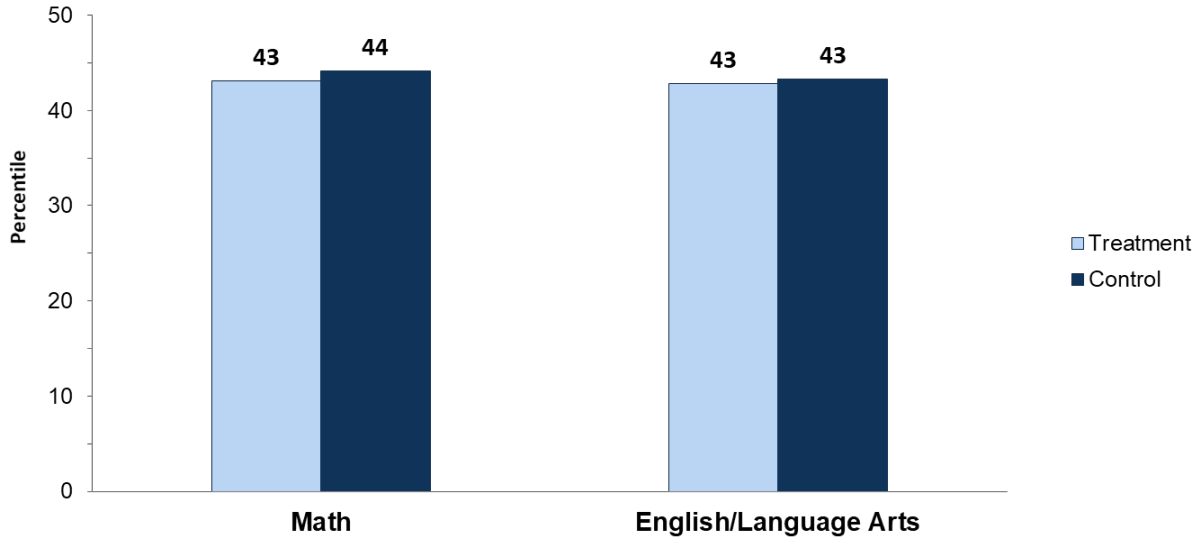
[22] The study was designed to reliably detect impacts of 0.12 standard deviations, based on an analysis of the study's statistical power described in Appendix A (Table A.2). We also conducted a series of sensitivity tests and found that the estimated impacts of the DDI intervention were not sensitive to the approach used (appendix tables C.8 and C.9). These tests assessed whether attrition, our approach to controlling for students' prior achievement, and the assumptions made in the impact model affected the results. We also examined student behavior, and found no evidence that DDI affected students' school attendance or suspensions (appendix table C.10).

One concern about measuring the average impact of support for DDI on student achievement in a given subject across all schools is that different schools focused their DDI implementation activities on different subjects. As described in Chapter III, schools were free to choose an area of instructional focus, and most chose to focus on an area within English/language arts or within math, but not both. To allow for the possibility that DDI improved student achievement only in the area of instructional focus, we examined impacts on student achievement in a given subject only among those schools that had chosen an area of instructional focus within that subject alone. Because few schools chose to focus on math alone, we examined impacts on student achievement in English/language arts among schools that selected an area of instructional focus within English/language arts.[23] This analysis also examined impacts on student achievement in math among these schools, to determine whether the effects of the intervention may have spilled over into the subject that was not the area of focus.

Support for DDI did not affect student achievement in English/language arts in the average school with an instructional focus in that subject. In these schools, students in both the treatment and control groups were at the 43rd percentile on the state distribution (figure IV.5). Although these scores were slightly higher than the score of students in the average study school overall, the impact of DDI on students' English/language arts achievement was the same among schools that focused on this subject as it was among all study schools. Nor did DDI affect student achievement in math among schools with an instructional focus in English/language arts.

[23] This analysis did not include seven schools that chose areas of instructional focus in both math and reading, since the benefits of focusing implementation activities may have been diminished if multiple areas were selected in unrelated subjects. We also conducted a sensitivity analysis that examined the impacts of the intervention on student achievement among schools that focused either on English/language arts alone or on both English/language arts and math. The estimated impacts within that set of schools were similar to those within schools that focused on English/language arts alone (see appendix figure C.5).

Figure IV.5. Mean student achievement on 2016 state assessments in math and English/language arts, among schools with an instructional focus in an area of English/language arts



Source: District student records (n = 6,691 – 6,710).
Neither difference is statistically significant at the .05 level, two-tailed test.

We also examined whether support for DDI was more or less effective for particular kinds of students—whether there were differences in impacts among students in different grades or with different prior achievement levels. Impacts could have been stronger among fifth-graders than among fourth-graders in 2015-2016 because of the timing of DDI. The intervention began in December 2014 and targeted just those two grades. Thus, fifth-graders could have been affected by DDI in two school years (2014-2015 and 2015-2016), while fourth-graders could have been affected only in 2015-2016 since they would have been third graders in 2014-2015. We examined impacts separately for students with low versus high prior achievement because DDI activities focused largely on identifying struggling students and implementing instructional practices that could help those students. Thus, DDI may have been more successful for the low-achieving group.[24]

The impacts of support for DDI did not differ for students in different grades or with different levels of prior achievement. We found that the impacts of DDI on student achievement did not differ between fourth- and fifth-graders or between students at different levels of proficiency on their spring 2015 assessment (appendix figures C.6 and C.7). For each of

[24] Alternatively, the intervention could have led teachers to target students near the threshold that distinguishes proficient and non-proficient students—sometimes called "bubble students." Teachers aiming to increase the number of proficient students might have focused on this group if they believed that focusing on students well below proficiency would require too much effort. We did not investigate this hypothesis because prior achievement data were from the previous year's state assessments, whereas teachers would likely have used interim assessments from the current year to identify bubble students.

these subgroups, the DDI intervention did not affect student achievement in math or English/language arts.

Variation in the Impacts of Support for DDI across Schools

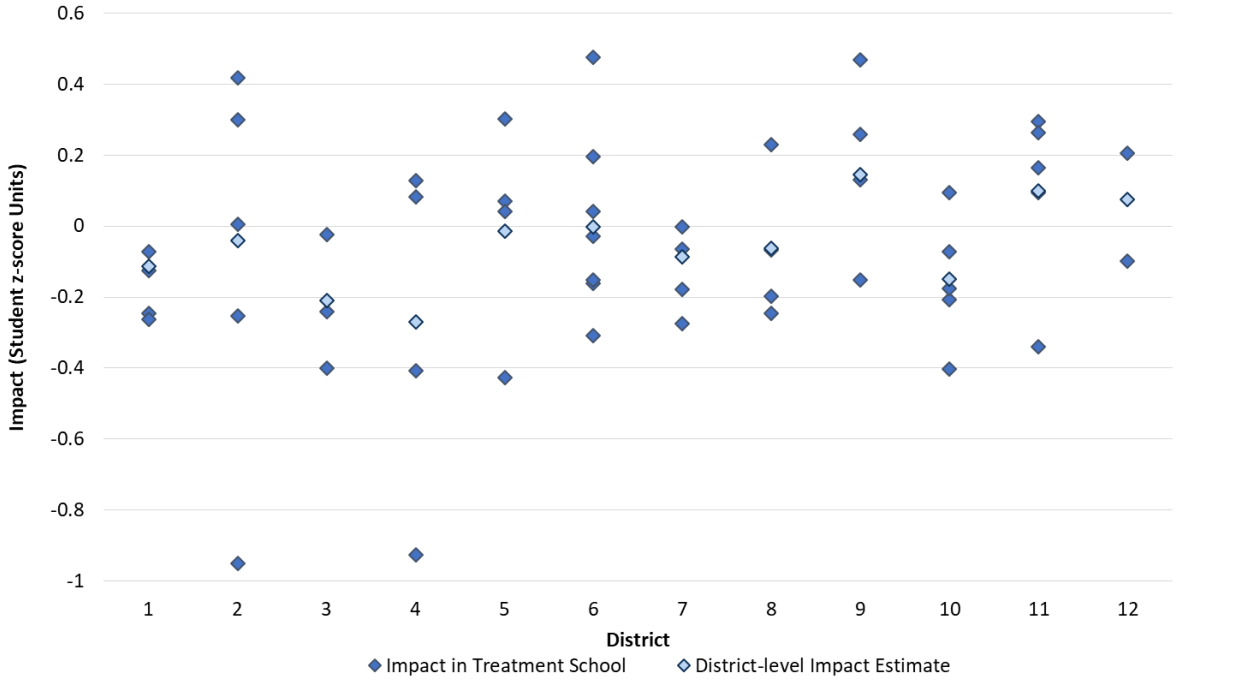
While support for DDI did not affect student achievement in the average school, it may have been more successful in some schools than others. The intervention was complex, and successful implementation required both teachers and school leaders to be willing and able to put into place a number of different structures and practices related to DDI. As described in Chapter III, some study schools may have been unwilling or unable to put these structures in place, while others were slow to do so. In such schools, DDI would be unlikely to lead to improved student achievement by spring 2016. On the other hand, some schools already had the infrastructure required for DDI prior to the beginning of the intervention, and would not have to spend time doing so during the intervention period. This would leave the schools with more time for DDI activities—using data to better understand their students' learning needs and identifying and implementing instructional strategies that might address those needs. Past research suggests that DDI is more likely to positively affect student achievement in schools with greater "implementation readiness" (West, Morton, and Herlihy 2016).

We first examined whether there was meaningful variation in impacts across study schools. Because schools were matched into pairs and then randomly assigned, we could estimate the impacts of DDI separately in each matched pair of schools. Comparing how different these estimated impacts were in different study schools allowed us to assess variation in how DDI affected student achievement. The more the impacts differed from school to school, the greater the chances that the intervention may have been successful in an identifiable subset of schools, even though the average impacts were not positive.

The impacts of support for DDI on students' math and English/language arts achievement differed across schools. In both subjects, the estimated impacts of DDI ranged from about -1.0 to 0.6 standard deviations of student achievement (figures IV.6 and IV.7). As a reminder, the average impact across all schools was -0.04 in math and -0.01 in English/ language arts. After accounting for random variation across schools in estimated impacts, the actual variation between schools in the impacts of DDI on student achievement in each subject was statistically significant.[25] There were also differences between districts in how DDI affected student achievement among schools in each subject (appendix figures C.8 and C.9).

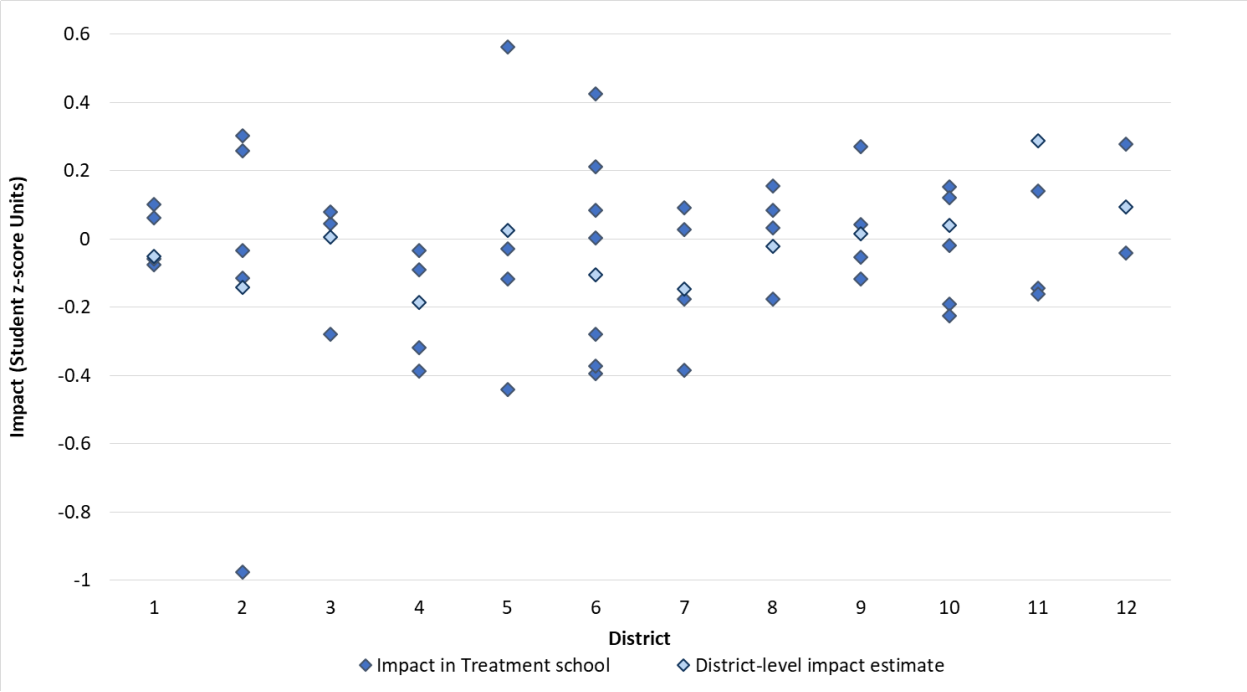
[25] The range of impact estimates across schools was influenced both by true differences between schools in how DDI affected student achievement and by some random variation resulting from the fact that the impact in each matched pair was based on a comparison of student achievement in one treatment school versus one control school. The standard deviation of estimated matched-pair-level impacts was 0.29 in math and 0.30 in reading. Using a random-treatment effects model to distinguish the variation in matched-pair-level impacts from sampling error, we estimated that the true impacts of the DDI intervention on student test scores in each subject had a standard deviation of 0.21.

Figure IV.6. Estimated impact of Support for DDI on student achievement on 2016 state assessments in math, by matched school pair



Source: District student records (n = 12,036).
Variation in estimated impacts across matched pairs is statistically significant at the .05 level, two-tailed test.

Figure IV.7. Estimated impact of Support for DDI on student achievement on 2016 state assessments in English/language arts, by matched school pair



Source: District student records (n = 12,018).
Variation in estimated impacts across matched pairs is statistically significant at the .05 level, two-tailed test.

Given that another study of DDI (West, Morton, and Herlihy 2016) found impacts among schools with high levels of readiness, we next examined whether the positive impacts on student achievement were in schools that were more ready to implement DDI at the beginning of the intervention. Our measure of readiness was based on a count of four indicators of whether schools had key intervention structures in place prior to December 2014 (see box 4). A second measure of readiness required that schools have teacher collaboration teams regularly meeting to discuss data use and at least one of the other two remaining indicators in place previously.[26]

[26] One caveat to this analysis is that we only could measure readiness in treatment schools and not in control schools. If readiness was related to student characteristics in ways that we did not account for in initially matching school pairs, the difference in impacts could have resulted from this preexisting difference between treatment and control schools in student characteristics. We assessed the likelihood of this possibility by measuring the treatment-control difference in schools' 2013 test scores among those with high readiness to implement DDI versus those with low readiness. We found that treatment-control differences in 2013 scores were similar in matched pairs in the high-readiness group as in the matched pairs in the low-readiness group. This finding suggests that any differences in impact estimates between high- and low-readiness schools would not be caused by preexisting differences between students in treatment versus control schools.

Box 4. Were the impacts of support for DDI in a school related to implementation readiness?

Because the DDI intervention included many different components and may have been challenging for schools to implement, we hypothesized that DDI had a larger impact in schools with greater implementation readiness at the beginning of the intervention. We defined readiness as having key school structures in place and having had some prior experience with data use in these structures.

The implementation readiness measure was based on a count of four indicators. Each indicator measured whether a particular structure or practice was in place in the school before December 2014. These indicators were:

(1) Presence of grade-level teacher collaboration teams in the school
(2) Presence of grade-level teacher collaboration teams that had been regularly using data
(3) Presence of an instructional leadership team
(4) Presence of data walls (that is, visual displays of student data in the school)

The primary measure of a school's readiness to implement DDI defined schools to have high readiness if they had at least three of the four readiness indicators in place prior to December 2014, according to data coaches. Schools with two or fewer indicators were defined to have low readiness. Based on this measure, 27 percent of schools in the study sample were defined as high-readiness schools; the rest were defined as having low readiness. We estimated the impacts of DDI on student achievement separately for these two groups of schools.

We also tested the sensitivity of the results to an alternative definition of DDI readiness based on the notion that the four indicators were not equally important. This definition of DDI readiness *required* that schools have teacher collaboration teams in place that engaged in data use to some extent prior to December 2014, based on the recommendation from Hamilton et al. (2009) that to implement DDI it is important for schools to "dedicate structured time for staff collaboration" and to have a "facilitator who meets with teacher teams to discuss data." These schools also had to have at least one of the other two indicators in place to be defined as high-readiness schools. Schools with teacher collaboration teams that rarely or never used data were defined as low readiness schools, since any advantage to having teacher collaboration teams might be offset by the need to change the teams' activities to focus primarily on data use (with the possibility that teachers might resist such a change). Based on this definition, 20 percent of schools in the study sample were defined as high-readiness schools.

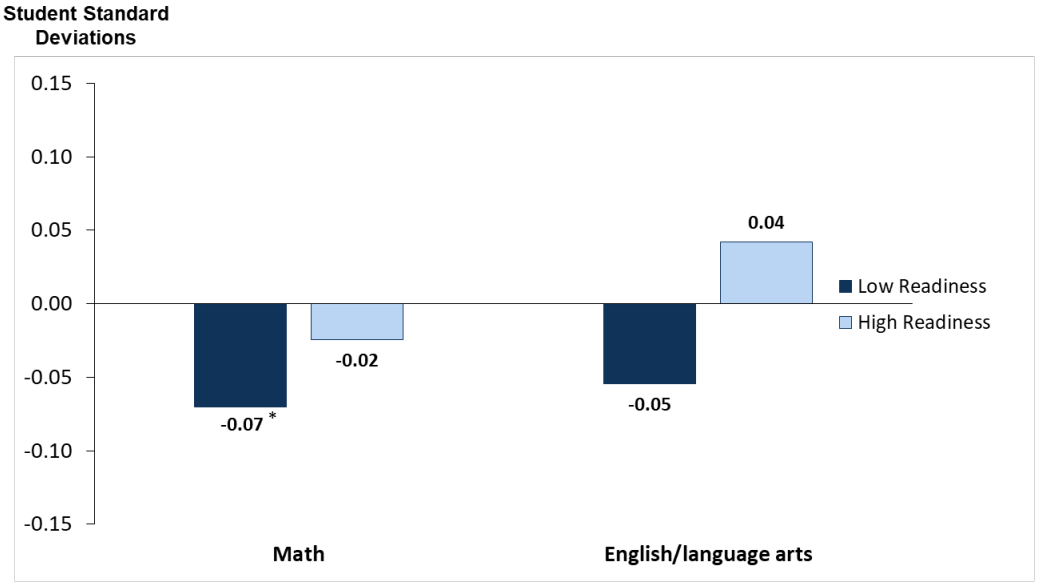
Support for DDI did not consistently improve student achievement or increase teachers' data use practices in schools with greater readiness to implement DDI. Based on the primary measure of DDI readiness, the estimated impact of DDI on students' English/language arts achievement was 0.04 standard deviations in high-readiness schools and -0.05 in low-readiness schools, but not statistically significant in either group (figure IV.8).[27] In math, the estimated impact of DDI was negative in both groups of schools and statistically significant in low-readiness schools. Under the alternative readiness measure, there was a more striking difference in impacts between high- and low-readiness schools. For example, the estimated impact of DDI on students' English/language arts achievement was 0.12 in high-readiness schools and -0.06 in low-readiness schools, and each estimate was statistically significant (appendix figure C.10).

Since evidence that the intervention had positive impacts was strongest among schools defined as having high DDI readiness based on one of two definitions, we examined whether the intervention also affected the intermediate outcomes in these schools. We found that DDI did not lead to an increase in the measures of teachers' practices, such as frequency of data use.[28] In other words, these findings are not consistent with how the logic model would suggest that DDI leads to improved student outcomes.

[27] The difference between high-readiness and low-readiness schools in the estimated impact of DDI on student achievement in English/language arts was marginally significant (p=0.10).

[28] We measured the total number of data practices teachers reported frequently using out of the nine listed in Figures IV.1 and IV.2, as well as the total number of instructional practices associated with DDI out of the five listed in Figure IV.3. DDI was estimated to lead teachers to use 1.4 *fewer* data practices in math and 1.5 *fewer* data practices in English/language arts, although these impacts were not statistically significant. Similarly, the estimated impacts of the intervention on teachers use of instructional practices associated with DDI was negative but not significant.

Figure IV.8. Estimated impact of support for DDI on student achievement on 2016 state assessments in math and English/ language arts, by school's implementation readiness



Source: District student records (n = 9,693 – 9,708); data coach interviews.

*Estimated impact within subgroup is statistically significant at the .05 level, two-tailed test.

Neither difference in impact estimates between subgroups is statistically significant at the 0.05 level, two-tailed test.

We also assessed whether support for DDI improved student achievement or teachers' data use practices among schools in which coaches themselves appeared to have higher levels of readiness. We measured whether data coaches had any prior experience as a coach (although the vast majority had no experience as a data coach, 36 percent had prior experience as an instructional coach) and whether they reported that the training they received through DDI prepared them to carry out most or all of the tasks associated with being a data coach. Neither of these measures consistently identified schools with more positive impacts on student achievement and teacher practices (appendix tables C.11 and C.12). In some cases, prior experience as an instructional coach was associated with negative impacts, while having no experience was associated with positive impacts. (The number of teachers with prior experience as a data coach was too small to analyze the association between impacts on outcomes and the most relevant type of prior experience.) Having a higher level of self-reported preparation was not significantly associated with any outcomes, but having a lower level was linked to some negative outcomes. Since neither of these dimensions of coach readiness were randomly assigned, their relationships with impacts could be due to other factors related to coach readiness, and so these findings should be interpreted with caution.

Concluding Thoughts

The professional development program to support the intervention examined in this report was built on the idea that the key to the success of DDI was to provide teachers with various forms of support to help them use data to improve their instruction. This support would come from data coaches, school leaders, and other teachers. According to the study's logic model, this support would enable and encourage teachers to more frequently use data to better understand their students' learning needs and identify instructional practices to better address those needs. For example, they might more frequently use differentiated instruction or spend more time on concepts their students were struggling to understand. These practices would, in turn, lead to improved student achievement.

Results from the study's implementation analysis showed that the intervention succeeded in providing more support to teachers in the form of data-related professional development, data coaching, and guidance from school leaders. While teachers in control schools did receive some of these supports for data use, those in treatment schools received significantly more supports. However, the study's impact analysis showed that this additional support did not lead to more frequent data use by teachers, nor did it lead to more frequent use of the instructional practices associated with DDI. Consistent with those findings, the support for DDI intervention did not lead to improved student achievement.

These results are consistent with other recent studies focused on giving teachers support in analyzing student data to improve instruction and student achievement. The results suggest either that the intervention described in the study's logic model was not effectively implemented, or that the theory underlying the logic model was wrong or incomplete. With respect to implementation, the study found the professional development sessions were held as planned but did not assess the quality of these sessions. Nor did the study assess the quality of data coaches or their content knowledge, although we did find that they had little previous experience as data coaches. Within schools, implementation was effective in engaging school leaders, but less effective in promoting teacher collaboration around analyzing or using data. The teams collaborated on data no more frequently than in control schools. One challenge to the effectiveness of the teacher collaboration teams may have been teachers' other responsibilities in the school. Data coaches reported difficulties within these teams related to follow-through on meeting decisions and balancing DDI work with other responsibilities, challenges consistent with other DDI interventions and likely to be present in most schools that might attempt to implement DDI (Cavalluzzo et al. 2014; Slavin et al. 2013).[29] On balance, however, the study did not identify major problems with the implementation of the support for DDI intervention in study schools.

Given this, one possible explanation for the absence of impacts on teachers' data use or associated instructional practices is that even with successful implementation of study supports, teachers experienced difficulty engaging in these practices during the study period. From the perspective of teachers, the intervention was complex and had a lot of moving pieces. Teachers had to analyze student data, diagnose potential issues in their instructional practices based on this data analysis, identify more effective approaches, and put them into place in their classrooms.

[29] Some of the additional challenges noted in the literature include staff turnover (Cavalluzo et al. 2014), a lack of capacity to implement training sessions and assessments (Cordray et al. 2012), and teachers' lack of flexibility to reorganize their instruction in order to account for areas of need in their student data (West et al. 2016).

The difficulty individuals experience when adopting new approaches to their work, sometimes referred to as the "implementation dip" (Fullan 2007) or "performance dip" (Eastwood and Louis 1992), could explain the lack of impacts on key teacher practices encouraged by DDI supports. The approach examined in this study of providing support for DDI may have required more time than the year-and-a-half follow-up period teachers had to put it into place in their classrooms.

The theory underlying the logic model emphasized the importance of teachers being supported in their data use, and the intervention accordingly focused on facilitating that support.[30] While teachers in treatment schools did receive more supports than those in control schools, another possible explanation for the lack of impacts is that this contrast between the supports received by treatment and control schools was not large enough to affect teachers' instructional practices or student achievement. For example, teachers in one-third of control schools also had data coaches. While teachers in nearly all treatment schools had data coaches, few of them had previous experience in that role. Thus, the coaching received by teachers in the two groups of schools may not have been different enough to lead to better outcomes in the treatment group.

The logic model also implied that the work of selecting instructional practices appropriate for individual teachers would occur largely within teacher collaboration teams. The intervention focused less on identifying the specific instructional practices teachers should put into place given their circumstances. Thus, one possible limitation of the theory behind the logic model is that while providing general support and guidance to teachers is important, it may not be sufficient. Teachers may also need more specific expert input into which instructional strategies would be most effective for them in light of their student data. If so, then future work in developing DDI interventions could explore different ways of providing teachers with this input on exactly how they should change their instructional practices. This study shows that an intervention that focused primarily on providing additional support to teachers from trained data coaches and school leaders was not enough to improve student achievement.

[30] Since all study districts received student data, the study was not designed to test whether providing a new or different form of student data would be the key to the success of DDI.

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DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

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