Research-Practice Partnerships to Support the Development of High Quality Mathematics Instruction for All Students

Brooks Rosenquist
Erin C. Henrick
Vanderbilt University
Thomas M. Smith
University of California, Riverside

Submitted to Journal for Education of Students Placed at Risk special issue on researcher-school district partnerships, Spring 2015

Acknowledgements: The analysis reported in this manuscript was supported by the National Science Foundation under grants ESI-0554535, DRL-0830029, and DRL-1119122. The empirical data that we present in this article are based on research conducted in collaboration with Paul Cobb, Ilana Horn, Kara Jackson, Amanda B. Klafehn, and other personnel listed at http:vanderbiltmist
Abstract: The gap in achievement in mathematics between at-risk students and their more advantaged counterparts is a persistent problem of the U.S. education system. While some research-based curricula and pedagogy has demonstrated promise in supporting students from diverse backgrounds to develop conceptual understanding and procedural fluency in mathematics, scaling up instructional change across a district organization is a significant challenge. The Middle School Mathematics and the Institutional Setting of Teaching (MIST) Project is a research-practice partnership seeking to understand how large urban school districts can support the development of rigorous and equitable middle-school mathematics instruction at scale. This paper enumerates the goals and design of this multi-year, multi-district partnership, and describes one illustrative example of how our partnership activities informed and supported one district’s efforts to improve mathematics instruction over multiple years. General recommendations for district-researcher partnerships are discussed.
Introduction

There is an urgent need to improve educational opportunities for at-risk students, and nowhere is the problem more salient than large urban school districts which enroll large numbers of low-income and minority students. The scale of the problem is national: the gap between African American and white students has narrowed very little since the 1990s (Corcoran & Evans, 2008), and the achievement gap between economically advantaged students and those who are not has continued to grow (Reardon, 2011). The No Child Left Behind Act of 2001 (NCLB, 2002) put into effect accountability policies with the intent of closing these gaps and raising the performance of traditionally underperforming groups. Subsequently, schools with high concentrations of low-income and minority students who have traditionally scored poorly on standardized tests have experienced the greatest difficulty in meeting NCLB’s targets for adequate yearly progress (Balfanz, Legters, West, & Weber, 2007; Kim & Sunderman, 2005).

At the same time, research evidence shows that certain approaches to mathematics instruction have had success in improving learning opportunities for children from a range of backgrounds (Boaler & Humphreys. 2005; Norton, 2006; Pfannkuch, 2011; Stein, Grover, & Henningsen, 1996; Stephan & Akyuz, 2012). In many of these cases, this type of instruction has been characterized by the term ambitious instruction, which is to say that it is aimed not only at enabling students to memorize terms and formulas and apply mathematical procedures and algorithms, but also aims for more ambitious learning goals for all students, including student conceptual understanding, reasoning, problem-solving, and communication skills (Lampert, Beasley, Ghousseini, Kazemi, & Franke,
2010). However, despite repeated and persistent calls to move towards this kind of teaching and learning, including the most recent Common Core State Standards for Mathematics (NCTM, 1989, 1991, 2000, National Governors’ Association, 2010), successful enactment of these practices are typically found only in isolated pockets of practice. As a whole, the bulk of classroom instruction in the US continues to emulate more traditional forms and practices which emphasize the memorization and application of mathematical definitions, formulae, procedures, and algorithms (Jacobs et al., 2006; Weiss, Pasley, Smith, Banilower, & Heck, 2003). We sought to address these issues by partnering with four districts to support their work in assisting teachers to successfully implement these innovative curricular and instructional practices.

In the field of education, the research-practice partnership holds promise as an approach that capitalizes on the expertise of both researchers and practitioners to support the kind of large-scale instructional change described above. The Institute of Education Science (IES) and other funding agencies advocate for researcher-district partnerships, citing that the knowledge they generate is more likely to be useful and relevant (Easton, 2014). Coburn, Penuel, and Geil (2013) reinforce this view, defining research-practice partnerships at the district level as: “Long-term, mutualistic collaborations between practitioners and researchers that are intentionally organized to investigate problems of practice and solutions for improving district outcomes” (p. 2). Coburn and colleagues describe an approach to organizing research and development focused on problems of practice. *Design-based implementation research* (DBIR), as defined by Penuel, Fishman, Cheng, and Sabelli (2011), has four core principles:

- A focus on persistent problems of practice from multiple stakeholders’ perspectives,
• A commitment to iterative, collaborative design,
• A concern with developing theory related to both classroom learning and implementation through systematic inquiry, and
• A concern with developing capacity for sustaining change in systems. (p. 332)

As the potential advantages of research-practice partnerships become more apparent, it is important to learn from the work currently being done in this area to inform future partnerships and offer guidance for this type of collaboration. The Middle School Mathematics and the Institutional Setting of Teaching (MIST) project is a research-practice partnership currently in the 8th year seeking to understand how districts can support the development of ambitious and equitable middle school mathematics instruction at scale (Cobb & Smith, 2008). MIST has two primary goals. Pragmatically, we aim to provide leaders of each of our collaborating districts with feedback on how their district’s strategies for instructional improvement are playing out in their schools and to make actionable recommendations on how these strategies might be revised to make them more effective. We also want our collaborative design efforts to enhance the effectiveness of instructional supports in the districts. Theoretically, we aim to develop, test, and refine a generalizable theory of action for how large urban districts can support improvement in teachers’ instructional practices, and ultimately student achievement.

MIST is unusual in that it involves simultaneous partnerships with multiple districts sharing common instructional improvement goals. MIST is also uncommon in that it closely attends to the local and organizational context in which instructional reform is being implemented, including issues of equity and ensuring that all students have access to high quality instruction, which is not often the case in district level research (Trujillo, 2013).
Research-practice partnerships are challenging, requiring hard work, flexibility, and a willingness to compromise. In this paper, we emphasize two design principles that have allowed our collaborative partnership to effectively balance our pragmatic and theoretical goals: (1) purposeful and careful selection of partnering districts, and (2) a research design allowing for the kinds of iterative data collection and analyses which enabled us to address the above two goals adequately. In this paper, we first explain the criteria for selection of partnering districts and then describe the data collection and analysis cycles facilitated by our multi-district partnerships. We then provide an illustrative example of how our partnership has worked to increase equitable participation in problem-solving activities in one of our partnering districts, District B. Finally, we close with some suggestions for the formation and maintenance of successful partnerships between researchers and school districts drawn from our experience.

**Part 1: Alignment of vision: the importance of research-district fit**

Selection of partnering districts is a critically important first step when beginning to develop a successful research-practice partnership. Prior to selecting institutional partners, we established several non-negotiable criteria for district selection. We sought to partner with districts which (a) responded to accountability pressures by focusing on improving the quality of instruction; (b) shared our understanding of ambitious goals for student learning and mathematics instruction; (c) described a plan for improving instruction through strategies reflected in our initial theory of action; and (d) worked with a large number of students representing a diverse student body in an urban setting (Cobb & Smith, 2008).
Responding to accountability pressures through a focus on quality of teaching. Each of our initial partner districts had made improving student achievement in middle school mathematics a districtwide priority. Similar to most large urban districts in the US, our districts were facing extreme pressure from state and national accountability systems and were concerned with raising student achievement scores, as measured by state assessments, particularly in failing schools. Although many districts responded to accountability pressures to raise proficiency in middle-school mathematics by focusing efforts on "bubble students" near the cut-off scores (Booher-Jennings, 2005, p. 233) or by broadly teaching to the test, we sought districts responding to these accountability pressures by attempting to improve the rigor and quality of the math instruction received by all students. Focusing on instructional improvement not only positions students to perform well on end-of-year accountability tests, but also provides students with the opportunities to learn skills and habits of mind necessary to motivate more rigorous course taking and continued success in higher education and beyond (Boaler & Greeno, 2000).

Moreover, we sought to work with districts that framed the problem of instructional improvement as one of teacher learning. This is to say that we sought to partner with district leaders who were attempting to realize their vision of high quality instruction in mathematics though investing in teachers and providing them with supports, such as high quality professional development (Darling-Hammond & Richardson, 2009), in order to encourage teachers' instructional change. Improving the quality of instruction by changing teachers' existing practice is an enormous challenge (Kazemi, Franke, & Lampert, 2009); observation of classroom practice has revealed that,
even among teachers who report a strong familiarity with and commitment to non-
traditional approaches to math instruction, classroom practice largely mirrors traditional
teaching methods (Spillane & Zeuli, 1999). It was important that our partners had the
resources and will to put these supports in place.

**Sharing goals for student learning and shared vision of high quality**

**Mathematics instruction.** We also sought to partner with districts which shared our
vision of high quality mathematics instruction (as described above) and were
implementing a rigorous, and inquiry-based style of math curriculum (e.g., where the
development was funded by the National Science Foundation) that offered students
greater opportunities to develop conceptual understanding and skills of communication,
problem-solving, reasoning, and justification.

**Implementing policies reflected in our provisional theory of action.** Early in
the planning of the MIST project, we conceptualized a provisional theory of action for
instructional improvement at scale. Consulting the research literature, we formulated a
number of initial conjectures regarding interrelated district-level organizational policies
and characteristics likely to provide both support and accountability measures for the
implementation of ambitious instructional practices in mathematics. These policies and
characteristics include a shared vision for mathematics instruction, instructional
leadership, alignment of efforts across district offices, a focus on providing equitable
learning opportunities for all students, and teacher support through professional
development learning communities and informal networks (Cobb & Smith, 2008).

Choosing potential partner districts at random would make it unlikely that the
theory of action underlying our instructional improvement framework would be
applicable in those contexts. All of our partner districts were implementing district-wide supports for instructional improvement that were aligned with our research team’s initial hypotheses and conjectures around supports that could lead to improvement. Each of the four districts was devoting significant resources to teacher supports, implementing different combinations of instructional coaching, classroom observation and feedback from administrators, professional learning communities, and more traditional professional development approaches. Three of the four initial districts were collaborating with the Institute for Learning, a national organization that works with urban school districts and focuses on improving instructional practices as a key lever for reform.

Addressing equity in the context of a large urban school district. As is characteristic of large urban districts, our partner districts have been dealing with challenges that can inhibit success for all students, such as high teacher turnover and a relatively large numbers of novice teachers. At the same time, the problems of educational equity and student achievement gaps are often very salient for urban school districts, which typically serve high proportions of minority and low-income students. Across settings, many teachers and student teachers have difficulty adjusting the intended curriculum to make it relevant to students in their own classrooms (Cochran-Smith, 2004; Gay & Howard, 2000) and are often at a loss when searching for the best ways to help struggling students from traditionally underserved groups (Jackson & Wilson, 2012). Although districts usually disaggregate and analyze data by subgroup to know which students and subgroups are underperforming, many districts struggle with how to increase the achievement of struggling students. Our partner districts were employing a variety of intervention supports to tackle the achievement gap, including identifying struggling
students to provide remediation, offering a second math class that would replace an elective, and enrolling struggling students in computer-based intervention programs, all without much success. By working with districts struggling to raise achievement with students from traditionally underserved groups, we hoped that the research produced by our partnerships would help to shed light on one of the most persistent problems in U. S. education: closing the gap in student achievement between students of different backgrounds.

An examination of some key descriptive variables from our districts illuminates the scope of some of the challenge in these specific contexts (Table 1). Like many large urban districts, our partnering districts enroll high percentages of low-income and minority students. Specifically, three districts enroll a proportion of English language learners that is much higher than the national average for large urban school districts. Furthermore, each of our four partnering districts consists of over 100 schools. In these expansive organizational contexts, scaling up instructional improvement -- or indeed, any significant organizational change -- becomes an issue of turning a metaphorical battleship (Olszyk & Kessler, 2008; Weinstein, 1993).
Table 1. Comparison of MIST participating school districts and national universe of all school districts and all urban school districts. Figures based on preK-12 enrollments for 2007-2008 school year. Source: U.S. Department of Education, National Center for Education Statistics (2010). Large urban school district defined here as one located in a “City, Large Territory inside an urbanized area and inside a principal city with population of 250,000 or more.”

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Schools</td>
<td>100</td>
<td>150</td>
<td>250</td>
<td>200</td>
<td>7.0</td>
<td>60.6</td>
</tr>
<tr>
<td>Teachers</td>
<td>2,000</td>
<td>5,000</td>
<td>12,000</td>
<td>6,000</td>
<td>220</td>
<td>2,201</td>
</tr>
<tr>
<td>Students</td>
<td>30,000</td>
<td>80,000</td>
<td>160,000</td>
<td>100,000</td>
<td>3,469</td>
<td>36,220</td>
</tr>
<tr>
<td>% Special Ed.</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>13.7</td>
<td>10.1</td>
</tr>
<tr>
<td>% ELL</td>
<td>20</td>
<td>30</td>
<td>15</td>
<td>5</td>
<td>17.1</td>
<td>11.8</td>
</tr>
<tr>
<td>% African American</td>
<td>40</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>7.8</td>
<td>24.1</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>15</td>
<td>60</td>
<td>65</td>
<td>5</td>
<td>11.3</td>
<td>39.6</td>
</tr>
<tr>
<td>% FRPL</td>
<td>65</td>
<td>70</td>
<td>85</td>
<td>55</td>
<td>38.3</td>
<td>61.0</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>13,593</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>200</td>
</tr>
</tbody>
</table>

Note: statistics for partnering districts are rounded in order to maintain district anonymity.

After describing the criteria for district selection, it is important to emphasize why these particular commonalities provided the groundwork for successful working relationships. Determining how to support teachers across an entire district to improve and change their instructional practices is, by itself, a considerable challenge. If we had partnered with districts where the researchers and practitioners disagreed on critical issues such as goals for students’ mathematical learning, strategies to improve student achievement, what counts as high quality instruction, or district reform priorities, our
collaborative improvement agenda might never have gotten off the ground. Given that our design for researcher-district partnership entailed providing district leaders with feedback, it was important that researchers and district leaders agreed on these critical issues so that our feedback would be understood and aligned with the districts’ information needs. Because all partners were concerned with improving the quality of math instruction by supporting the improvement of teachers instructional practices while also attending to issues of equity, we were able to establish a partnership that met the goals of all parties.

**Part 2: Research design priorities that support successful district-researcher partnerships**

The following section describes several key components of the design of the MIST partnership that laid the groundwork for a sustained collaborative focus and the development of a successful working relationship. We describe the nature of our design research methodology, namely that our design prioritizes problems of practice and works within district constraints, while also working to improve our theoretical understanding of instructional improvement at scale more generally.

**Design Research at the District Level**

Because our work aims to prioritize problems of practice and work within district constraints while also building a larger theoretical understanding of instructional improvement at scale, our approach to district partnerships is substantially different from more conventional research-practitioner relationships, which typically aim to pilot, refine, implement, or evaluate a researcher-designed intervention or program (Cobb, Jackson, Smith, Sorum, & Henrick, 2013). This approach is informed by a design research
perspective, where the process of conducting research on supports for individuals in an organization is integrated with the ongoing design and improvement of these supports (Henrick, Cobb, & Jackson, in press). In this way, we have been working to codesign supports for instructional improvement within the context of each district organization.

The research design approach allow us to simultaneously address two goals: influencing practice more directly through close consultation with our partnering districts and contributing to a theory of change in educational systems more generally. The first component is addressed through the district feedback and recommendation cycle, which we use to provide our districts with timely and empirically based feedback and recommendations to inform their planning for the upcoming year. The second component consists of synthesizing findings across multiple cycles of data collection and across the organizational context of our additional research partnerships – while taking account of the current body of research literature – to develop and refine theory regarding what it takes to realize systemwide instructional improvement and achievement of ambitious goals for learning more generally, beyond contexts of our partnering districts.

**District Feedback and Recommendation Cycle**

As described above, our research activities seek to provide the leaders of our partnering districts with timely and relevant feedback about how their improvement strategies are implemented and received in their schools, enabling them to revise the design or implementation of their improvement strategies. Similar to other DBIR approaches, ours entailed iterative cycles of design, analysis, and feedback. We begin each annual cycle by interviewing six to ten key district leaders in October to learn about current district initiatives, programs, and policies relevant to instructional improvement in
middle-school mathematics for the current school year. We analyze and synthesize data from these interviews so that, in December, we are able to share a 3-5 page district design document that describes the district’s plan for instructional improvement in middle school mathematics. This document outlines (1) the district vision, strategies, and policies for improving instruction in middle school mathematics in the current year; (2) what district leaders described as the function of each role group (teacher, coach, or school leader) in enacting the policies and practices for instructional improvement; (3) what learning supports and accountability mechanisms were in place to enable and encourage each role group's change in practices; and, (4) district leaders' rationale for how and why the supports and accountability mechanisms in place would lead to change in practices in these different role groups. We ask district leaders to read the document to let us know if we got it right, serving as a member check (Lincoln & Guba, 1985, p. 314) to ensure the accuracy and validity of our interpretation.

This district design document is valuable to our partnership for several reasons. First, it provides the district leaders with a concise summary of their plan for the year, along with district leaders’ stated rationale behind each strategy, while requiring a relatively short contribution of time from a small number of district leaders. For researchers, the final document serves as a key reference throughout the design research cycle, as it not only provides a focus for what we would look for and measure during data collection, but also supplies the expectation for what we will address in the district feedback report at the end of the design research cycle. The document also plays an important role in supporting our theoretical goals to understand district policies and practices more generally, as these documents help us begin to compare the design and
implementation of policies and practices across our four partner districts and to describe and understand the trajectories of individual policies and practices within a district over time.

Although the large urban school districts in our study each oversee approximately 20 to 35 different schools serving students in the middle grades (6 through 8), we worked with district leaders to select a subsample of six to 10 middle schools which might, in terms of capacity for instructional improvement, be representative of the district as a whole. In the following January, we conducted site visits to these six to 10 middle schools in each district, interviewing approximately 30 teachers, 15-20 school leaders ( principals, assistant principals, and math coaches), and 10-15 district leaders in each of the four districts to find out how the strategies are playing out. Participants were interviewed using a semistructured protocol tailored to each role group, with questions focusing on the participants’ experience of the implementation of the district’s strategies to support instructional improvement described in the district design document. For example, we asked teachers about the professional development activities in which they participated, their understanding of the district’s goals and policies for mathematics instruction, the people to whom they are accountable, their informal professional networks, the official sources of assistance upon which they draw, and the curricular materials they use and how they use them in the classroom.

Shortly after each interview was completed, the interviewing researcher would complete an interview summary form (ISF) for each interviewee, which provided a condensed outline of the interviewee's experience of each district policy, along with interviewee reports of key aspects of the school setting. After data collection in the field
was complete, our research team members reviewed the ISFs for all of the participants within a given school – teacher, administrator, and instructional coach – and aggregated and reported these findings in a school summary form (SSF). In addition to aggregating findings at the school level, we also created three midlevel summary forms to synthesize and describe views and experiences across participating members of a district-level role group: a teacher summary form (TSF); coach summary form (CSF) and principal summary form (PSF). This process allows us to summarize sizeable quantities of qualitative evidence in a timely manner from interviews and justify the resulting claims by backtracking through the various levels of the analysis.

Using these summaries, the research team completed gap analyses (Brown & Swartz, 1989) to uncover and describe discrepancies between each district's intended strategies and the enacted strategies as realized at the school level. After completing this gap analysis, our research team drew on our knowledge of each school district's context and capacity, along with our knowledge of the existing research literature and our own provisional theories of district-level instructional improvement, to develop recommendations for how district leaders might revise their improvement strategies for increased effectiveness in the coming school year.

For each district in each year, our findings and recommendations were articulated in a fifteen-page District Feedback and Recommendations Report (DFRR) (for a sample DFRR, see MIST Project (2011, May)). This report built explicitly upon the content and structure of the district design document drafted earlier in the school year. To the description of each envisioned district improvement strategy or policy detailed in the district design document, we added a description of how the policy was enacted in our
case study schools. Because our case study schools were chosen to be representative of the improvement capacity of the district as a whole, our findings represent a range of implementation efforts. While keeping participating educators and schools anonymous, we also provided evidence to explain how and why the enactment of these policies, supports, and accountability measures coincided with or departed from the planned implementation and its intended effect, as articulated in the fall by district leaders. Finally, we outlined our recommendations for revising district policy and implementation in order to support each district’s efforts to improve mathematics instruction.

We scheduled a meeting with district leaders in May of each year to discuss our findings and recommendations in the DFRR report; this timeline allowed for the subsequent discussion to be taken into consideration by district leaders as they revised their district programs and policies for the coming school year. A key panel of district leaders received the District Feedback and Recommendation Report approximately one week before meeting with our lead research staff. District leaders typically attending these meetings included the head of the curriculum and instruction department, the head of the district's mathematics department, district mathematics specialists who oversee instructional coaching and professional development for math teachers, and representatives from the district's leadership department (e.g., area superintendents), who support and evaluate school leaders. In several instances, the superintendent attended feedback sessions. In these meetings, senior researchers would discuss meeting norms and expectations, briefly summarize findings and recommendations regarding each improvement strategy in the report, provide necessary clarification, and participate in an open dialogue about the implications of the feedback and recommendations for district
policy. Additionally, lead researchers in this meeting would collaborate with district leaders in interpreting the data to identify adjustments that might make the district’s improvement plan for middle school mathematics more effective.

**Retrospective Data Analyses**

The interviews conducted each year provided rich description of policy implementation as enacted at the school level and furnished the bulk of the data that informed district feedback, allowing us to address our practical goal of providing accurate, timely, and relevant feedback to district leaders. However, in order to more fully address our theoretical goal of developing and revising our theory of action for instructional improvement at scale, we needed deeper analysis of interviews and additional forms of data. During the spring of each school year, we collected additional data to better understand the policy processes and outcomes in our participating schools. Each participating teacher, coach, and principal completed an online survey that asked the participant about district and school level supports for instructional improvement in mathematics. All math teachers at participating schools were also asked to complete a shorter survey asking them about the teachers, coaches, and principals from whom they sought advice and assistance, enabling us to reconstruct and describe changes in practitioners' informal support networks within each school. Each participating teacher completed an assessment designed to measure educators' pedagogical content knowledge (the Math Knowledge for Teaching (MKT) instrument; Hill, Schilling, & Ball, 2004).

We video-recorded two consecutive classroom lessons for each participating teacher, recordings which were later coded by our research team using the Instructional Quality Assessment (IQA) rubrics (Boston, 2012; Matsumura, Garnier, Slater, & Boston, 2008).
We also video-recorded select district professional-development sessions and audio-recorded a subsample of teacher collaborative planning meetings. Finally, we collected student-level achievement data on state assessments matched to participating teachers, consisting of end-of-year test scores, a selection of prior-achievement scores, and background measures, allowing us to estimate covariate adjusted value-added measures of teacher effectiveness (McCaffrey, Lockwood, Koretz, & Hamilton, 2003).

We are currently pursuing several lines of research to better understand instructional improvement at scale (Cobb & Jackson, 2011). Areas of emphasis for our research include: 1) the coherent instructional system (which includes elements such as a coordinated curriculum and teacher professional development), 2) district leadership, 3) school leadership, 4) teacher networks, 5) instructional coaching, and 6) instructional practices. Because of the breadth of our inquiry, our research team includes scholars from different universities as well as different university departments within the School of Education. Because of the scope and types of our data collection, we also have researchers with expertise in a variety of methodologies, both quantitative and qualitative.

Although this discussion of our design cycle and retrospective analyses illustrates our methodology, the value of this work to research and practice can be more clearly seen through a concrete example. The section below will discuss our partnership work with District B regarding one strategy for instructional improvement in middle school mathematics: district-wide professional development.
Part 3: A Case of Working with District Leaders to Support the Improvement of District-Wide Professional Development in Middle School Mathematics

In the following section, we will describe how our partnership study and the DFRR cycle provided evidence for District B to make adjustments to support the improvement of district-wide professional development for mathematics teachers. We will share an example of a retrospective analysis that informed our recommendations in District B. From the onset of the MIST study, District B’s goals for middle school mathematics instruction included (1) successfully implementing a rigorous curriculum (Connected Mathematics Project 2; CMP2) and 2) improving instruction for low achieving groups of students. In District B, as in most districts, one of the primary strategies for accomplishing these two goals was professional development for teachers. When we began our work with the district, the professional-development (PD) plan included several district-led mandatory professional-development days each year where all middle school math teachers would convene at a single site and participate in various training sessions with others teaching the same grade. Topics were standardized across all content areas and included using the district-provided curricular resources, lesson planning, using district assessments, and interventions for underperforming groups of students. Each year of our partnership, we provided feedback on this mandatory PD in the DFRR as it related to the district accomplishing its improvement goals in mathematics in the middle grades.

One of the strengths of our partnership model is that we are able to draw upon several important resources when developing recommendations for each district. Although we gave District B feedback on their improvement initiatives using only
District B data, we formulated our recommendations by drawing upon not only data collected in District B, but also from what we were learning from the other participating districts, as well as any existing research literature available. For example, in our second year with District B, interview and survey data indicated that almost half of participating teachers did not find the mandatory district PD useful for their day-to-day practice; in contrast, teachers found the voluntary PD that focused on explicitly on planning a CMP2 lesson to be much more useful. When considering what to recommend to District B in this instance, we looked not only to research on teacher professional development, which gets thinner as we move out from the classroom (e.g. Borko, 2004; Garet, Porter, Desimone, Birman, & Yoon, 2001), but also to our data on how the three other districts organized district PD and determined PD topics (and how these initiatives were playing out in schools.) In this year, we recommended that the mandatory district PD in District B be (1) more closely connected to teachers’ classroom practices, (2) more frequent and sustained over time and (3) organized so that stable groups of participants could meet throughout the year.

The research team hoped that the findings and recommendations from the DFRR would be utilized when district leaders planned over the summer for the following year. The third year of the study, when interviewing district leaders to understand the changes made to the district improvement plan for middle school mathematics, we found that the district changed the PD plan slightly, by contracting with an outside organization to provide math-specific PD specific to the adopted curriculum, and relocating three of the mandatory PD sessions from a central location to teachers’ school sites.
Despite the continued concerted effort to support teachers to improve instructional practices in District B, in year 3, we found that teachers continued to struggle to implement the adopted curriculum, CMP2. This curriculum offers rigorous tasks, and each lesson is organized into three phases: the beginning of the lesson (launch), individual or group work (explore) and a concluding whole class discussion (summarize). Specifically, in the third year of the study, although teachers in District B were increasingly using the high level tasks as specified in the CMP2 curriculum, they tended to reduce the rigor of the tasks when teaching the lesson, and in most cases, classroom discussion was of low quality. For example, our analysis of classroom video revealed that the majority of teachers who included a whole class discussion at the conclusion of their lesson only discussed a single solution strategy and did not push students to make connections between mathematical concepts and ideas. For this reason, in our spring DFRR, we recommended that the district PD focus on specific teacher instructional routines for whole-class discussion specific to the content of the district’s adopted curriculum.

This finding around the challenges teachers face when implementing a rigorous curriculum was not specific to District B. In order to better understand instructional practices that are likely to support all students to learn, several members of our research team began conducting a retrospective analysis, the findings of which identified the launch phase of the lesson as a critical component in terms of students engaging productively in solving the task. Critical elements of a launch include leading an initial discussion of the key contextual features of the math task as well as the key mathematical ideas, developing common language to describe the key features of the math task, and
maintaining the cognitive demand of the math task (Jackson, Garrison, Wilson, Gibbons, & Shahan, 2013).

Additionally, Jackson et al. (2013) analyzed classroom instruction in classroom video of 165 middle-grades mathematics teachers across the four MIST school districts, focusing on systematic differences in how teachers introduced mathematical tasks to their students and the implications for students’ opportunities to learn mathematics in the concluding whole-class discussion. Findings from this analysis indicated that when introducing a math lesson, teachers can attend to several issues that will provide opportunities for all students to better understand the math task for the day, get started on the lesson, and participate fully in the concluding whole-class discussion.

In year 4 of our work in District B, we suggested that the district PD help teachers identify the cognitively demanding aspects of tasks in CMP2 and maintain the rigor of tasks through all three phases of the lesson: launch, explore, and summarize. We also recommended that the nature of our partnership and collaboration be strengthened by coplanning professional development during the summer between year 4 and year 5. Informed by our findings around the practice of launching a task during our summer planning session with the district, we decided that the topic of the coplanned professional development for year 5 would involve strengthening the introduction of the lesson to allow for opportunities for all students to participate.

In year 5, we worked directly with district leaders to develop, test, and refine a design for comprehensive teacher, coach, and school leader PD. Based on our recommendations from previous years, along with our findings regarding aspects of introducing a cognitively demanding task, the MIST team codeveloped three sessions for
instructional leaders on the components of a successful introduction of a rigorous math task. From this coplanned work, the district mathematics department then developed and led several sessions with teachers on the introduction of a lesson during the district-wide PD days. (For more information regarding this PD, please see Jackson and Cobb, 2013.)

The District B examples shared here illustrate the multifaceted nature of our partnership. Our work was informed by engaging in the DFRR cycle in multiple districts simultaneously, while also engaging in ongoing retrospective analyses focused on problems of practice. Because our retrospective analyses have focused on addressing critical issues our districts face, we have found that these analyses have been much more relevant and informative than the research literature. Importantly, we used this knowledge to provide each district with district-specific recommendations that are aimed to strengthen improvement initiatives given the district’s current organization and capacity.

**Part 4: Conclusion: What we learned about successful District-Research Partnerships**

For 8 years we have been working in close partnership with multiple districts. While the feedback that we have received from district leaders in each district regarding the accuracy and applicability of our annual feedback suggests that our partnership has been valuable to the districts, we have gained insight over time about aspects of our partnership that contribute to this success.

*Partnership work requires researchers to develop different skill sets.* As the number of research-practice partnerships that embody the principles of DBIR continue to increase, we suggest a few ideas when training doctoral students and early career
researchers to engage in this work. For example, we have explicitly developed a research team culture that prioritizes practitioner concerns and problems. In order to deeply engage in partnership work, problems of practice must become the focus of researcher investigation, requiring researchers to balance research priorities. Other important skills include interpersonal skills, communication skills, and the ability to be flexible and adaptable. Researchers and district leaders operate in two different worlds, with different timetables, priorities, and pressures. Recognizing and respecting these differences allows for trust to develop over time.

*Developing and maintaining district leadership relationships is critical for successful partnerships.* In one district, we have continued our partnership through three different superintendent transitions. In another district, we have experienced a complete overhaul of district leadership personnel, reinforcing for us the notion that our feedback needs to be broadly acceptable and useful to multiple stakeholder groups. Recognizing that researchers and practitioners have different sets of expertise to bring to the table ensures that the partnership is a true collaboration. We found that our repeated articulation to the district that the success of our work depends on how valuable the district finds our contributions has helped to build a working relationship built on trust. From the beginning of this work, we recognized the importance of building a solid relationship with our district partners and have committed a large amount of resources to ensuring that each *District Feedback and Recommendations Report* was of high quality: methodologically sound, organized around the district’s improvement plan, and clearly written for the district-leader audience. We have also found that a trusting relationship of
this nature is necessary in order for the district and research team to engage in open
dialogue when the research team presents findings and recommendations in May.

*Developing a process for quick and accurate data analysis is necessary in order
to successfully fit within district decision-making timelines:* District-level design studies
can present a special challenge in that substantial amounts of data need to be collected
and analyzed in a relatively short period of time in order to accomplish the pragmatic
goal of providing district leaders with accurate, timely, and relevant feedback regarding
policy implementation as it plays out in the district's schools and classrooms. Over the
past 7 years, we developed and refined an analysis method that allows our research team
to analyze large amounts of interview data quickly while maintaining a methodologically
sound analysis plan.

*This is challenging work, but is personally and professionally rewarding.* MIST
researchers agree that participating in a research-practice partnership has changed how
we view what counts as high quality research. Too often, education researchers’
conversations seems to take place in a metaphorical echo chamber, with researchers
talking only to other researchers about issues and problems only researchers find
important or interesting. Engaging in this kind of work keeps us grounded, close to the
problems and challenges the districts are facing on a daily basis, and communicating
regularly with practitioners. Perhaps most importantly, our partnership work is indirectly
but positively affecting the instruction of the thousands of at-risk students in these
districts’ care.
References


http://dx.doi.org/10.1353/hsj.2007.0022

http://dx.doi.org/10.3102/00028312038004915

http://dx.doi.org/10.1080/08878730009555246


http://dx.doi.org/10.1086/428763


Jackson, K., Garrison, A., Wilson, J., Gibbons, L., & Shahan, E. (2013). Exploring relationships between setting up complex tasks and opportunities to learn in concluding whole-class discussions in middle-grades mathematics instruction.


mathematics teaching. In M. K. Stein & L. Kucan (Eds.), *Instructional explanations in the disciplines* (pp. 129-141). New York: Springer.
http://dx.doi.org/10.1007/978-1-4419-0594-9_9


