How Research-practice Partnerships Learn to Develop Goals for Math and Identify Local Problems of Practice

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Abstract: Research-practice partnerships (RPPs) are an efficacious and increasingly common organizational approach for educational improvement. However, as RPPs learn to effectively engage in instructional improvement, they go through various stages. Several factors can influence the development of organizational learning across these stages. We describe how RPPs at their earliest stages in two school districts in the United States learned to develop goals for improving math teaching and learning, and identify local problems of practice with respect to these goals. We also highlight how district history, the engagement of "boundary spanners," and other key factors influence this process.

Introduction

RPPs are an efficacious and increasingly common organizational approach for educational improvement. They engage researchers and practitioners in joint work around local problems of practice and promote evidence-based inquiry into how such problems might be addressed (Penuel et al., 2011). RPPs can also be a productive approach for developing the capacities of its participants and respective organizations if they are deliberately designed with this goal in mind (Fishman et al. 2013). However, RPPs are different; they develop over time, across various stages, and require different types of organizational learning. Preliminary or initial developmental stages, in particular, have a significant impact on the life of RPPs (e.g., Law & Liang, 2019).

In this paper, we describe how RPPs at their earliest stages in two school districts in the United States learned to develop goals for improving math teaching and learning, and identify local problems of practice in relation to these goals. We also examine factors that potentially influenced such goal development and problem identification. As part of the CASPIR (Collaborating around Structures, Processes, and Instructional Routines) Math Project (referred to hereinafter as CASPIR), university researchers and professional developers formed an RPP with each school district. The goals of CASPIR are to co-develop and co-implement a multi-component professional development intervention designed to improve teachers', teacher leaders', and administrators' understanding of effective math teaching and learning, and to enhance the organizational capacities of schools and districts to support such instructional improvements in math. CASPIR employs a design-based implementation research (DBIR) process involving collaboration between researchers, professional developers, and district and school personnel. In the cases of both districts, district math leadership teams (DMLTs), in collaboration with the university team, constitute the organizational unit responsible for identifying the problems of practice and where CASPIR's efforts at developing structures for ongoing RPP work were focused.

The CASPIR Math Project Model

The CASPIR model is aimed at using a DBIR process to enhance organizational and stakeholder capacities to identify local problems of practice related to math teaching and learning and develop and implement strategies to address these problems. The model includes three components enacted across teacher, school, and district levels. First, DMLTs are formed with teachers, district/school administrators, and the university team. DMLTs then regularly meet and collaborate to co-develop a robust vision for math teaching and learning at the district level, which contributes to a "coherent instructional system" (Cobb et al., 2018, p. 11-12). Once the vision is articulated, the DMLT analyzes the district's strengths and needs, and develops district math goals and strategies to support math improvement in relation to local problems of practice. Second, professional development is co-designed and co-implemented by the DMLTs, and aimed at teachers, school leaders, and district leaders. This PD can attend to a range of issues, depending on the vision for math teaching and learning initially developed, and on the specific local problem of practice chosen by the DMLT. Third, iterative cycles of design and redesign are implemented annually—whereby data is collected, goals are set, strategies are implemented, strategies are assessed, and the cycle begins anew. This paper describes the initial stages of CASPIR.

Theoretical and Empirical Background

The key features of a DBIR approach include: (1) focusing on user-centric problems of practice; (2) iterative, collaborative design; (3) developing a theory of improvement through systematic inquiry; and (4) developing

capacity for sustaining change in systems (Penuel et al., 2011). Such an approach recognizes that "achieving successful change in complex work systems means recognizing that one cannot predict ahead of time all of the details that need to be worked through nor the negative consequences that might ensue" (Bryk et al., 2015, p. 7). Meanwhile, RPPs are directly aimed at learning to do such work not simply from an individual perspective but also organizationally. Routines and processes, shared insights and understandings, and information processing abilities, are foundational elements for building organizations that can effectively engage in DBIR (Basten & Haamann, 2018). However, RPPs do not simply work "out of the box." Rather, they develop over time and through various stages. For example, it can be efficacious for RPPs learning to engage in DBIR to begin their work by focusing a central team of researchers and practitioners on a discrete and user-centric problem of practice, like student skills and knowledge in a particular content domain (Fishman et al., 2003). Emphasizing the importance of shared understandings, Henrick et al. (2015) highlight the utility of specifying explicit, high-quality visions or goals for teaching and learning at the outset of DBIR work to serve as a target for learning. Grounded in this vision, a theory of action about supports for teacher learning in relation to this goal can be articulated and ultimately implemented. As RPPs participating in such a process mature, they engage in design, analysis, and feedback cycles, potentially guided by tools, routines, and procedures that are instituted to develop capacities to engage in such work sustainably. These early moves are key steps for organizations learning to engage in DBIR.

A key element of organizations developing such capacities at their earliest stages and learning to conduct such work are evaluators/researchers. Indeed, they can leverage practitioners' experiences to better understand local problems of practice (Dozios et al., 2010) by framing key issues and problems, introducing frameworks to guide meaning-making, identifying key indicators to guide data collection, and building stakeholder consensus. Conversely, several interrelated factors can influence how RPPs develop and learn to engage in DBIR over time. For instance, local district context and history constitute key factors, as they can drive the emergence of different problems of practice and make scaling up challenging across different contexts (e.g., Bryk et al., 2015). Certain elements of the RPP itself are also key factors influencing RPP development. Notably, boundary spanners (or brokers) are individuals that can help bridge differences across researchers and practitioners, such as goals, expectations and routines (Hopkins et al., 2019). Boundary objects (i.e. shared resources and ideas that facilitate coordination of activities) can promote productive researcher-practitioner communication (Hopkins et al., 2019).

Methods

Drawn from a larger multiple-embedded case study involving several school districts (Yin, 2013), data for this study come from DMLTs in two districts—Washington and Hamilton (pseudonyms). Washington has four primary schools, and Hamilton has three. During the 2020-21 school year, we collected two data sources across both DMLTs: semi-structured interviews with all DMLT members (N = 64), and observations of all DMLT meetings to-date (N = 53). All data sources were recorded and transcribed.

We developed a different analytic procedure for interviews and observations, followed by triangularization across both data sources. Beforehand, training and interrater reliability (IRR) were conducted. For the semi-structured interviews, we first developed an inductive coding scheme based on extant research that captured perceptions about instructional improvement, role of the DMLT, and data-driven decision making. After achieving a Cohen's Kappa of 0.80 or higher, a group of eight researchers from the university team live coded all interviews. DMLT meetings were scored using a graded rubric across various elements including membership, roles/responsibilities, mission/vision, and data-driven decision making to track DMLT progress towards goal development for math improvement/learning.

Findings

Washington DMLT

Washington had a history with the university team prior to the start of CASPIR. For the five years prior, the district participated in extensive teacher and administrator professional development activities, and received regular instructional coaching support. With the exception of one of these years, the district had a DMLT that met between 2-3 times during the school year, generally discussed teacher professional development efforts, and had ongoing discussions about how to support peer classroom observations among teachers in the district. However, the DMLT did not engage in any systematic data collection or iterative cycles of instructional improvement.

CASPIR began its collaboration with Washington in AY20-21. At the first meeting, the CASPIR team introduced CASPIR as well as its goals related to supporting the district in learning how to engage in data-driven improvement cycles. To prepare the DMLT for defining a problem, CASPIR personnel facilitated DMLT discussions on articulating a vision of math teaching and learning in the district. They started with a vision board and then generated descriptive statements. DMLT members generated descriptions of their idealized visions of

what teachers and students should be doing in schools and classrooms. They categorized and connected these statements into a web depicting a draft of the Washington vision for math teaching and learning. The district vision includes statements about students engaging in productive struggle and using tools such as manipulatives and high-quality tasks, and teachers creating learning environments in which students are respected. The DMLT's analysis of the vision determined that the least well-developed category included "tools"—i.e., written materials and tasks that support high-quality instruction. Using interview data collected from DMLT members, there was significant consensus around how to describe a high-quality task that aligned well with what research says.

After identifying tasks that support high-quality instruction as a potential focus for a first improvement cycle, the DMLT designed and implemented an exploration of the problem space related to such tasks. This exploration resulted in a list of potential problems presented as questions. At the same time, several DMLT members had concerns about how the district would determine and agree to which tasks would be deemed as supporting high-quality instruction. This led to the DMLT's use of various research sources (e.g., math standards, educational research articles) to build from DMLT members' interview comments and develop a draft framework for analyzing tasks. This process occurred over the last four DMLT meetings. At the end of Year 1, the DMLT was developing a plan to collect data on the types of math tasks present in the math curricula, and a plan to improve teachers' and administrators' understanding of different types of tasks. Overall, in Year 1, the Washington DMLT developed a robust, research-based vision for math teaching and learning. The team then used this vision to identify a potential focus are for a first improvement cycle.

Hamilton DMLT

Hamilton had an uneven history with the university team prior to the start of CASPIR. In the two years prior to CASPIR, the district initiated a DMLT that met between 2-3 times during the school year that generally discussed a vision for math teaching and learning, reviewed math curriculum materials, set a teacher professional development plan for the year, and explored curriculum analysis tools. The DMLT meetings were facilitated by district representatives, with some support provided by the university, and consisted of only math teachers. The DMLT did not engage in any systematic data collection or improvement cycles.

CASPIR began its collaboration with Hamilton in AY20-21. At the first meeting, the CASPIR team introduced CASPIR and its goals related to supporting the district in learning how to engage in data-driven improvement cycles. The team also discussed the need to build a collaborative vision for high-quality math teaching and learning across the districts, and possible areas of focus to inform the math improvement cycles. However, the district math lead on the DMLT pushed back on the need to develop a vision for math teaching and learning beyond the current version, citing "We already have a vision." At subsequent DMLT meetings, the district math lead proposed a possible focus area for math instructional improvement, namely number sense. As she stated, "We can be pretty confident in saying our students have struggled with number sense." While this decision was not based on any systematic data collection, there was general agreement from other district representatives on the team, and the DMLT agreed on this focus area for a first improvement cycle. As another member reiterated, "I am one hundred percent behind [number sense]. I have felt there is a huge deficit in our district."

For the remainder of the DMLT meetings in Year 1, the team drew from various research-based documents related to students developing number sense (e.g., math standards, research articles from practitioner journals). As part of these discussions, the CASPIR math coach presented a framework for the multiple dimensions of students' number sense that ultimately served as the guiding framework for how the DMLT defined number sense. The focus of the last four DMLT meetings of Year 1 involved developing a shared understanding of number sense according to this framework and discussing the development of a common assessment system for number sense that could be used across schools and grade levels. At the end of Year 1, the DMLT developed a plan to revise existing assessments for the common assessment system over the summer, with the goal of administering the revised assessments in the next school year. So, in contrast to Washington's DMLT, Hamilton's DMLT quickly narrowed its focus to a problem of practice without devoting significant attention to goal development and understanding associated evaluative frameworks.

Discussion

Although the Washington and Hamilton DMLTs were both RPPs at their earliest stages engaging in similar work, their learning about goal development and problem identification took very different trajectories. Where Washington's problem was grounded in strongly articulated goals for teaching and learning and primed for systematic data collection, Hamilton's problem was not and mainly anecdotal. Looking across both cases, our initial analyses highlight key factors influencing the trajectory of both DMLTs (see Table 2).

Table 2
District Trajectories in Early RPP Stages

District	History	Visioning Process	Vision	Identified Problem and Approach
Washington	Long history with professional developers, no specific perceived area of teaching and learning need	Long and focused	Strongly articulated, robust focus on teaching and learning, operationalized by framework	Improvement of math tasks using vision and systematic data collection supported by framework
Hamilton	Uneven history with professional developers, perceived need to focus on number sense	Short and superficial	Vague and not directly tied to teaching and learning	Improvement of students' number sense without vision or systematic data collection

There are likely several factors that influenced how Washington and Hamilton learned to engage in goal identification and problem identification in their RPPs. Our early analyses highlight the importance of district history. Washington had a long history with professional developers who focused on math teaching and learning in ways reflected by the visioning process. These professional developers served as key boundary spanners who were core members of the university team. In contrast, Hamilton had an uneven history with these professional developers, and their boundary spanning was not as effective at focusing the RPP on learning to develop high-quality goals for math teaching and learning. Moreover, members of the Hamilton DMLT came into the RPP with a belief that number sense was a key area for instructional improvement.

References

Basten, D. & Haamann, T. (2018). Approaches to organizational learning: A literature review. *Business and Management 8*(3), 1-20.

Bryk, A. S., Gomez, L. M., Grunow, A., & LeMahieu, P. G. (2015). *Learning to improve: How America's schools can get better at getting better.* Harvard Education Press.

Cobb, P., Jackson, K., Henrick, E., & Smith, T. (2018). *Systems for Instructional Improvement: Creating Coherence from the Classroom to the District Office*. Harvard Education Press.

Dozios, E., Langulois, M., & Blanchet-Cohen, N. (2010). *A practitioner's guide to developmental evaluation.* Montreal, Quebec, Canada: The J.W. McConnell Family Foundation.

Fishman, B. J., Marx, R. W., Bes, S., & Tal, R. (2003). Linking teacher and student learning to improve professional development in systemic reform. *Teaching and Teacher Education, 19*(6), 643-658.

Fishman, B., Penuel, W., Allen, A., Cheng, B., & Sabelli, N. (2013). Design-based implementation research: An emerging model for transforming the relationship of research and practice. *National Society for the Study of Education, 112*(2), 136-156.

Henrick, E.,Cobb, P., & Jackson, K. (2015). Educational design research to support system-wide instructional improvement. In A. Bikner-Ahsbahs, C. Knipping, & N. Presmeg (Eds.), *Approaches to Qualitative Research in Mathematics* (pp. 497-530). Springer.

Hopkins, M., Weddle, H., Gluckman, M., & Gautsch, L. (2019). Boundary crossing in a professional association: The dynamics of research use among state leaders and researchers in a research-practice partnership. *AERA Open*, *5*(4).

Law, N., & Liang, L. (2019). Sociotechnical co-evolution of an e-Learning innovation network. *British Journal of Educational Technology, 50*(3), 12340-1353.

Penuel, W. R., Fishman, B. J., Cheng, B. H., & Sabelli, N. (2011). Organizing research and development at the intersection of learning, implementation, and design. *Educational Researcher 40*(7), 331-337.

Yin, R. K. (2013). Validity and generalization in future case study evaluations. Evaluation, 19(3), 321-332.

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