



Learning at the Boundaries of Research and Practice: A Framework for Understanding Research–Practice Partnerships

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Given the rapid growth of research–practice partnerships (RPPs), we need a framework that helps the field understand how RPPs can facilitate organizational learning in service of local educational improvement and transformation. Drawing on sociocultural and organizational learning theories, we argue that learning can happen for the organizations engaged in RPPs at the boundaries of research and practice. Such learning is evident when there are changes in collective knowledge, policies, and routines of participating organizations, with implications for longer-term outcomes of educational improvement and transformation locally and more broadly. The degree to which organizations can make use of the ideas from the RPP is dependent, in part, on the presence and design of boundary infrastructure and the preexisting organizational capacities and conditions. We conclude with implications for those engaging in RPPs and future research.

Keywords: absorptive capacity; boundary object; boundary practice; boundary spanning; collaboration; educational policy; educational reform; organization theory/change; organizational learning; qualitative research; research–practice partnership; research utilization; sociocultural learning

Many worry that the ideas from educational research tend to have a limited impact on the lives of students, families, and educators. However, studies have shown that engagement, interaction, and sensemaking around research ideas are important for the degree to which they are used in practice (K. Johnson et al., 2009), and that partnerships among educators, community members, and researchers can help improve the relevance of research by focusing on questions of concern to local communities (National Research Council, 2012). Research–practice partnerships (RPPs) are one approach to collaborative research that seeks to address inequities in schools and communities through engagement with research (Farrell et al., 2021). In recent years, major investments from federal government and private foundations have helped grow the RPP field (Arce-Trigatti et al., 2018).

Though emergent, the evidence of impact of RPPs is growing. In formal school settings, RPPs have been shown to support the design of interventions that improve student achievement (Booth et al., 2015), support more equitable participation in classroom learning (O'Connor et al., 2015), and enhance the

quality of teaching (Penuel et al., 2017). RPPs with an informal education focus have contributed to expanded youth social networks (Ching et al., 2016), while partnerships with community and family partners transform educational decision making in ways that center the voices of historically marginalized communities (Ishimaru & Bang, 2016). Research developed in an RPP can contribute to shifts in district routines and policies (Farrell et al., 2018) and support implementation of those policies in schools and classrooms (Henrick et al., 2018). Knowledge developed within an RPP can have a broad reach, as when routines, strategies, or interventions developed in one RPP spread to other settings. For example, the idea of an early warning indicator system, initially developed by the University of Chicago Consortium on School Research and Chicago Public Schools, has been

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adapted in multiple locales, including Philadelphia, New York, and Baltimore (Wentworth & Nagaoka, 2020).

Yet RPPs can face significant challenges in their efforts to support educational improvement and transformation. When researchers and practitioners come together, these groups can talk past one another or fail to develop shared understandings (Farrell et al., 2019). They must navigate leadership turnover, different paces of work, and engaging key decision makers with authority to act on findings (Cohen-Vogel et al., 2018). Turbulent educational environments not only challenge communities and schools, they can also cause RPPs to shift their focus and adapt quickly (e.g., Greenberg et al., 2020). As with any collaboration that seeks to improve or transform educational systems, RPPs need to create structures that allow them to innovate in the face of challenges and grow from their experiences (Glazer & Peurach, 2013). We know little about when and under what conditions RPPs can navigate these challenges and make progress on their goals for longer-term outcomes. Existing frameworks for relating research and practice are not sufficient for describing what the actual work of collaboration looks like.¹

Below, we offer an interdisciplinary conceptual framework that draws on sociocultural and organizational theories of learning to shed light on how they work and the mechanisms through which they foster educational improvement and transformation locally and more broadly. RPPs involve partners working together across boundaries of their respective cultural, professional, community, and organizational affiliations (Bang & Vossoughi, 2016; Wegemer & Renick, 2021). We argue that within and across these spaces, ideas from research and practice can be exchanged, mediated, or transformed as participants engage in joint work—which we define as learning within an RPP (Akkerman & Bruining, 2016). The degree to which participants can make use of the ideas from the RPP is dependent, in part, on the presence or design of a “boundary infrastructure” (Bowker & Star, 1999) and the preexisting organizational capacities and conditions. When RPPs are productive, participating organizations can integrate ideas from the RPP into the collective knowledge, routines, and policies—all markers of organizational learning (Levitt & March, 1988). It is through these intermediary, organizational learning outcomes that we anticipate longer-term shifts in educational improvement and transformation locally and more broadly, through the production of knowledge that can spread to other settings. To illustrate the interpretive power of this framework, we use it as a lens to understand the Middle School Mathematics and the Institutional Setting of Teaching (MIST) RPP. We conclude with implications for those engaged in RPP efforts and future research.

Learning at the Boundaries of Research and Practice

RPPs are organized to engage diverse perspectives among researchers, educators, families, and communities. These individuals can sit within a range of different organizations, including universities, research, state agencies, local school districts, schools, or community, families, and youth organizations (Farrell et al., 2021). When engaged together in an RPP, participants encounter multiple boundaries where the linked, partially overlapping worlds of practice, research, and community can meet (Penuel

et al., 2015; see Figure 1). Here, boundaries refer to encounters in which participants who need to negotiate differences in terminology, context, practices, norms, or expectations engage with one another. As Suchman (1994) argued, a boundary entails “encountering difference, entering onto territory in which we are unfamiliar and, to some significant extent therefore, unqualified” (p. 25). The concept of boundaries foregrounds how sociocultural differences can become salient and experienced in action, as people from different cultural, professional, community, and institutional groups interact in new ways (Akkerman & Bakker, 2011; Bronkhorst & Akkerman, 2016; Engeström et al., 1995; Engeström et al., 2003). Given that partnerships are situated in unique cultural, economic, and historical contexts, boundaries can also surface related to race, gender, class, (dis)ability, and language (Bang & Vossoughi, 2016). In addition, they can emerge *within* partnering organizations, when the goals and activities of the RPP come into conflict with policies, incentives, or organizational norms (Penuel et al., 2015).

Whether partnerships stall and disband in the face of difference or move forward depends on what happens when partners encounter boundaries. Boundaries give rise to “discontinuity in action” or halting of a partnership’s work (Akkerman & Bakker, 2011, p. 133). Though discontinuity implies a threat to a partnership, such moments of discontinuity can also serve as opportunities for collective learning (Engeström et al., 1995). An RPP’s ability to respond to differences that emerge is due, in part, to its “boundary infrastructure” (Bowker & Star, 1999), the networks of people, practices, and objects that are “required to keep moving things along” (p. 313). In an RPP, enacted roles (boundary spanners), intentionally designed interaction structures (boundary practices), and artifacts (boundary objects) help partnerships navigate cultural, professional, or organizational differences. Furthermore, this infrastructure can help the boundaries become “more porous,” enabling people, ideas, and resources to flow more easily between spaces (Calabrese Barton & Tan, 2018).

Boundary Spanners

Boundary spanning refers to the enacted transitions and interactions across different sites of practice (Akkerman & Bakker, 2011). In an RPP, this might entail a researcher going to a community center to meet with families or a district leader preparing for a presentation at an academic conference (Wentworth et al., 2021). Individuals who move across boundaries and facilitate connections between groups are called boundary spanners or brokers (Neal et al., 2021; Weber & Yanovitzky, 2021). Within a partnership, certain individuals may emerge or be formally designated for the role (Levina & Vaast, 2005). However, boundary spanning can occur outside of an official capacity as well it is the doing or enactment of boundary spanning practices that matter more than an official designation.

Boundary spanners can take several actions to facilitate sharing of ideas in partnerships (Mull & Adams, 2017). They can foster social networks, improving communication pathways within the partnership. Such pathways facilitate learning because complex ideas about practice and research that are typically the focus of partnerships’ work require intensive communication (Hansen, 1999). Boundary spanners can reframe ideas from one

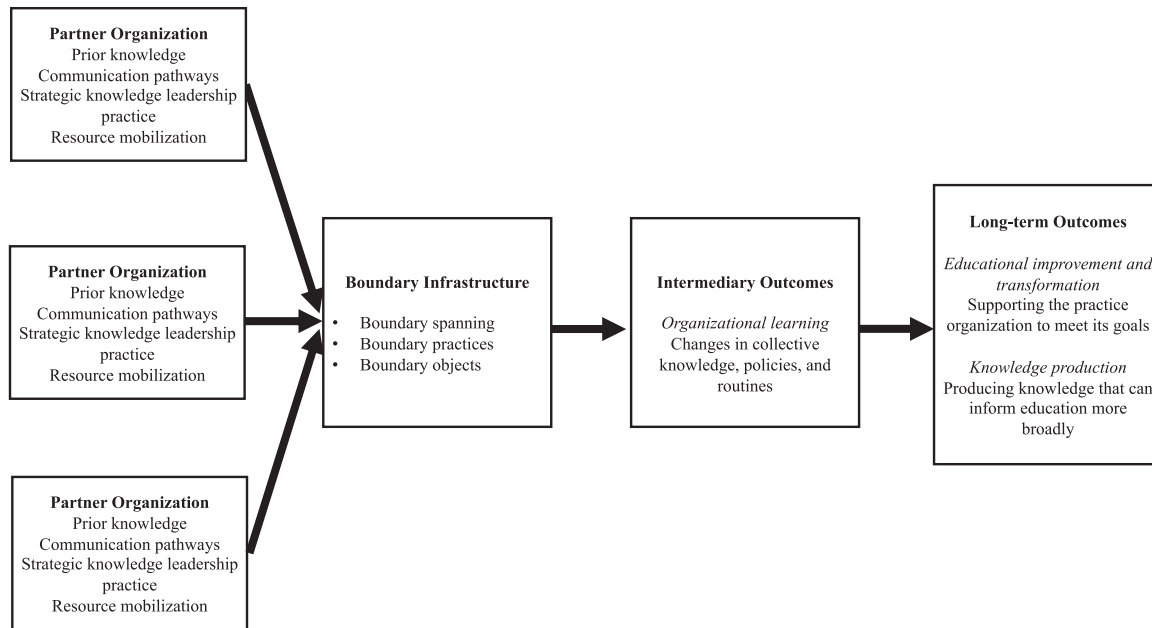


FIGURE 1. *Learning at the boundaries of research and practice.*

Note. Organizational configurations in research–practice partnerships (RPPs) vary widely, with some RPPs involving only two organizations, while others have many more involved. Figure 1 includes three partnering organizations as an example. Also, there are other outcomes outlined in the Henrick et al., 2017 framework for RPP outcomes. We focus on the two most relevant for educational improvement and transformation here.

group into ways others may understand more easily or help others see how different organizational goals might overlap (Davidson & Penuel, 2019). Boundary spanners may also be a resource for managing or repairing partnership relationships, particularly critical when there are missteps or histories of mistrust (Booker et al., 2019).

Boundary Practices

Boundary practices are partnership activities that bring together multiple participants with varying roles, perspectives, experiences, and areas of expertise, and who are situated within organizations with different capacities and conditions. Boundary practices are hybrid spaces that serve as a forum where ideas from research and practice can interact. It is during boundary practices that RPP members have opportunities to make sense of data and evidence, pose questions to one another, and deliberate possible courses of action (Rigby et al., 2018). Examples of boundary practices in an RPP might include codesign meetings (Bell et al., 2016), plan–do–study–act cycles of networked improvement communities (Russell et al., 2017), or joint meetings where RPP participants discuss findings (Moeller et al., 2018).

There are several features of boundary practices that may create conditions that support sharing of ideas in the partnership. First, a boundary practice can be structured in ways that elicit and make use of relevant perspectives and knowledge of participants. Established practices for making expertise visible allow participants to connect what they had brought to the table with the work of the others and come to appreciate the other’s unique contributions (Campano et al., 2016). Doing so with explicit attention to differences in social power is especially important

(Bang et al., 2010). Otherwise, these practices can unwittingly reinforce inequality among participants and diminish the voices and contributions of specific partners (Vakil et al., 2016). Second, boundary practices can establish roles, responsibilities, and expectations that clarify what is expected of participants and how they can contribute to the activity as a whole (Davidson & Penuel, 2019). Such roles can be specified ahead of time, but they can also emerge as people become more comfortable with participation. When people create expectations and fulfill them, trust can develop, which is essential for productive partnering.

Boundary Objects

Boundary objects are material and conceptual tools used in a partnership that are critical for joint activity (Akkerman & Bakker, 2011). Something is a boundary object if it serves a coordination function between groups that work in different organizational or community settings, and if it mediates activity within each setting, albeit differently for each (Star, 2010). Both characteristics—coordination *across* groups and mediation *within* groups—are necessary for something to function as a boundary object that can develop and maintain coherence across intersecting groups (Bowker & Star, 1999; Star & Griesemer, 1989). In this way, boundary objects can make aspects of partners’ practices and expertise visible and can carry some of the meanings of partners’ distinct settings into the partnership space.

An example of how boundary objects function within an RPP comes from R. Johnson et al. (2016). Here, researchers, teachers, and district leaders engaged around a set of mathematics tasks and researcher-designed rubrics. These artifacts served different functions for different groups. For teachers, rubric-facilitated analyses

were resources to support student learning; for district leaders, the rubrics were an artifact that could help teachers understand new standards; and for researchers, the rubrics were a way to engage with educator practice. Initially, though, the rubric ran into problems. The researcher-developed task rubric did not meet teachers' needs, and the researchers had great difficulty in achieving reliability in rubric use. At this point, the rubric ran the risk of being a boundary roadblock (Carlile, 2002). However, the practitioners adapted the rubric, resulting in greater reliability, and the discussions themselves deepened the group's collective understanding of the role of particular aspects of the tasks that made them standards aligned. Other boundary objects might include partnership charters (Bresnen, 2010), driver diagrams (Thompson et al., 2019), fishbone diagrams (Biag et al., 2021), feedback reports (Rosenquist et al., 2015), or resources for professional development, like PowerPoints or instructional materials (Anderson et al., 2018).

Organizational Conditions That Support Learning at the Boundaries

Not all teams are equally positioned to make use of ideas shared via boundary infrastructure. The organizational concept of "absorptive capacity" provides some useful ideas to help us understand the organizational conditions necessary to support these efforts. Cohen and Levinthal (1990) first introduced the idea of absorptive capacity, describing it as an organization's "ability to recognize the value of new information, assimilate it, and apply it" (p. 128). In the RPP context, absorptive capacity refers to an organization's ability to learn productively from its interactions with external partner(s) (Farrell & Coburn, 2017; Farrell et al., 2019). Although the term "absorptive capacity" may suggest a metaphor of passive knowledge "absorption," we conceptualize absorptive capacity in interactive terms, including the capacity to make sense of information and construct new knowledge through activity and social interaction (Lane et al., 2006; Zahra & George, 2002). Partners from different organizations may be better prepared to engage in and learn from their encounters at boundaries when they possess relevant prior knowledge, communicate internally, engage in strategic knowledge leadership (SKL) practice, and mobilize resources.

Engaging Relevant Prior Knowledge

The degree to which engagement in an RPP supports idea sharing depends, in part, on the knowledge, expertise, and perspectives participants bring to the interactions (Cohen & Levinthal, 1990). Prior knowledge relevant to the goal(s) of the partnership is critical, as knowing something about a given issue enables people to better discern the value of knowledge from partners and incorporate it into their own efforts. The potential for learning is greatest when knowledge resources across partners are complementary, similar enough to enable communication and facilitate learning but dissimilar enough so that there is value to the partnership (Cohen & Levinthal, 1990). Too much overlap in expertise—or even the perception of such overlap—and there may be little for groups to learn from one another, or difficulty in discerning potential contributions (Farrell & Coburn, 2017). If there is too wide of a distance between the sources of expertise, however, RPP

members may struggle to establish common ground on which to collaborate effectively. In the cases when knowledge resources are quite divergent, RPPs may require more extensive or elaborate boundary work to support idea sharing and learning.

Internal Communication

The communication pathways *within* participating organizations also matter for the potential for learning from the partnership interactions. First, internal communication pathways can influence the expertise available to the partnership. For example, in a school district with highly siloed departments that do not communicate frequently, an RPP may have limited access to perspectives to inform the problem at hand, particularly an issue when the partnership's focus requires multiple perspectives (Farrell et al., 2019). In contrast, strong within-organization communication may better ensure there are relevant perspectives and sources of expertise involved in the partnership's boundary practice. Internal communication pathways can also support the representation of others' perspectives even if they cannot be direct participants in the boundary practices. Finally, internal communication pathways can spread ideas developed or discussed within boundary practices into the routines of partner organizations (Penuel et al., 2020).

Strong internal communication pathways within organizations can also support successful boundary spanning across partner organizations. What makes someone a good boundary spanner is not only extensive ties to the outside organization but also strong ties to others within the organization, which enables the flow of ideas within the organization (Tushman & Scanlan, 1981). In contrast, RPP participants with weak internal ties may be unaware of the activities of others, leading to missed opportunities for the boundary spanning work within the RPP that could support organizational learning.

Mobilization of Resources

Partnerships require organizational resources—budget, time, staffing, materials—to engage productively at the boundaries of research and practice (Donovan & Snow, 2018). Developing and engaging in boundary practices require a budget that supports the time of key partners. Some RPPs use resources to support dedicated staff that coordinate boundary practices or serve in boundary spanning roles. Resources can also be required to develop or share boundary objects integral to the work. Underestimating the resources needed can undermine the effectiveness of work at the boundaries, particularly if boundary spanning work is seen as additional to RPP members' current responsibilities.

Strategic Knowledge Leadership Practice

RPP leaders provide important oversight both within and beyond the partnership. A specific type of leadership, strategic knowledge leadership (SKL), is key to these efforts. SKL practice involves assessing current internal expertise, identifying gaps or potential opportunities, and scanning the field for available partners; designing boundary practices; creating or supporting communication pathways that make that expertise available to the

partnership; and anticipating how ideas from the partnership can connect to current routines, policies, or practices with the organizational setting (Farrell et al., 2019). SKL practices have close ties with other conditions that support absorptive capacity. For example, SKL involves assessing internal expertise and finding partners with the right overlap, requiring an understanding of current internal expertise and opportunities for knowledge complementarity. SKL can also influence resource mobilization too, when leaders make time, space, or financial resources available to prioritize partnership work.

SKL practice likely matters for RPP members' ability to engage productively at the boundaries of research and practice. SKL is involved in launching partnerships before boundary practices can begin, and subsequently, SKL can play a role in the authorization, design, or refinement of boundary practices. In one recent study, district leaders set an expectation that work with any partner would be in service of department goals and initiatives as part of their SKL efforts. In subsequent work, partner staff played an advisory role, participating in the department's central meetings, where leaders could make sense collectively of research ideas in the context of their ongoing work (Farrell et al., 2019). We also suspect that SKL practice and boundary spanning are interrelated. Because SKL involves attending to the expertise available to the partnership, a leader with SKL may be effective in acting as a boundary spanner by linking different stakeholders together or helping to build connections between participating organizations to expand available sources of knowledge. This practice can involve identifying gaps of available expertise and bringing other perspectives to the partnership when necessary or in replacing people when they leave the partnership.

Organizational Learning Outcomes

When partner organizations' conditions for absorptive capacity are sufficient, boundary infrastructure can facilitate organizational learning. Organizational learning occurs when there are shifts in collective knowledge, routines, and policies (Feldman & March, 1981; Levinthal & March, 1981; Levitt & March, 1988; March, 1991). As with other scholars, we see organizations as more than the sum of the individuals within them (Scott & Davis, 2007). This definition recognizes that shifts in policies and routines are stretched across individuals (Sherer & Spillane, 2011); may or may not involve individual cognitive change (Coburn, 2006); and can carry on past any one individual's tenure (Hedberg, 1981).

One form of organizational learning involves shifts in collective knowledge. Levitt and March (1988) argued that one of the most powerful consequences of engagement with new ideas and experiences is the "transformation of the givens" or the "redefinition of events, alternatives, and concepts" (p. 324). Researchers stand to gain new collective understandings about the issues in education based on the on-the-ground conditions and implementation challenges (Cohen-Vogel et al., 2015). Or, they can acquire new collective understandings around partnering, and what it takes to work with their practice partners (Holmqvist, 2003). Similarly, educators may gain new research-based ideas about the issues in education. For instance, Coburn et al. (2008) described how one partnership shifted district leaders' thinking related to professional development—from one-time trainings

to professional development that was ongoing and situated in day-to-day work.

Organizational learning is also evident in shifts in organizations' policies, when they result from the joint work of RPPs. We define policy broadly, including formal policies as well as implicit rules, plans, and guidelines. In the example above, the organizational learning for the educational organization went beyond new collective understandings about professional development; the district changed its policy regarding teacher professional learning (Coburn et al., 2008). Similarly, a community organization might develop a new initiative in response to RPP efforts (Wilson, 2021), or a research university could adapt evaluation and tenure policies to recognize partnership efforts (Ozer et al., in press).

Partnership efforts can also contribute to shifts in organizational routines, the patterned ways actors in an organization interact with one another (Feldman & Pentland, 2003). For instance, a school might adopt a new walk-through routine to be implemented based on their partnerships' efforts. Research organizations can create new routines for copresenting with their practice partners or create new roles (Kim et al., 2019). Community-based organizations might develop new strategies for mobilization or new ways of getting community voices on the table (Campano et al., 2016).

Long-Term RPP Outcomes

Changes in collective knowledge, policies, and/or routines are not an end unto themselves. Henrick et al. (2017) recently used an iterative, participatory process of soliciting input from multiple RPPs across the country to identify five longer-term goals that RPPs agreed were important. Here, we focus on two of these longer-term outcomes of RPPs that organizational learning in participating organizations helps to accomplish: supporting directly supporting improvement or equitable transformation goals and producing knowledge and tools that can inform educational change efforts more broadly (Henrick et al., 2017). While not all RPPs may choose to pursue both goals equally, both goals advance educational improvement and transformation whether on a local or broad scale.

For example, as part of the Strategic Education Research Partnership, researchers and practitioners worked together to develop and test Word Generation, an intervention that targeted middle school students' academic language. The work together led to adaptations to the roles for partnership members and partnership routines, organizational learning indicators. Partner school districts adapted their literacy policies and routines to incorporate Word Generation, also markers of organizational learning. These intermediary changes then contributed to longer-term outcomes. As a part of subsequent randomized trials, Word Generation has demonstrated a positive impact on a range of longer-term student learning outcomes, and these efforts have also supported research that has spread to new settings, through traditional research reports, research-based tools, and new lines of inquiry (Donovan & Snow, 2018).

Organizational learning is not the only condition for accomplishing these outcomes, but it is likely a necessary one. We recognize that the environments of RPPs, including available

funding or local politics, can influence RPP success, and turnover and other organizational changes can also threaten the viability of RPPs (Wentworth et al., 2017). Yet if RPPs are to accomplish these long-term outcomes, they will need to learn from their joint work at boundaries—that is, develop new knowledge, routines, and ways of working—to directly support local improvement or equitable transformation goals and produce ideas that others can take up beyond the partnership.

Middle School Mathematics and Institutional Setting of Teaching Project (MIST)

To illustrate the interpretive power of this framework, we use it to understand learning at the boundaries of research and practice in the MIST project. Supported by the National Science Foundation, the MIST project was organized as an RPP between university-based researchers and educational leaders in four large school districts that served a total of 360,000 students. The goal of the MIST RPP was to study and support the development of ambitious and equitable mathematics instruction in urban schools (Cobb et al., 2018). To this end, the research team conducted interviews with educators and observed classrooms in the fall of each year. In the winter, the research team analyzed the data and presented it back to district leaders as a short report. At the May feedback meeting, the RPP discussed the findings, and at the June design meeting, the group revised district instructional improvement strategies.

The feedback and design meetings served as a set of boundary practices. First, they were structured to surface different areas of expertise and perspectives relevant for the focal issues. In the feedback sessions, the research team shared research-based ideas related to mathematics education, adult learning, and policy change, while district leaders brought critical expertise related to on-the-ground conditions and implementation challenges. Next, the organizers structured these interactions to support new roles, responsibilities, or ways of engaging. These meetings included representation from a range of departments and roles, from the superintendent to teachers on special assignment (TSA). As those closest to classroom instruction, the perspectives of TSAs were prioritized, and cabinet-level leaders and researchers were asked to reflect on the TSAs' experiences. These were unique opportunities for honest conversations among people with diverse perspectives about the implications for research findings on the district's own improvement strategies.

The annual feedback report functioned as a boundary object. The report was neither an evaluation report (typical of districts) nor a journal article (typical of researchers), but rather a focused summary of research-based findings and recommendations centered on district priorities. It served to coordinate activity in the partnership as a central artifact within the boundary practices. It also served different functions for each team. For researchers, it helped focus activity sharply on synthesizing a large amount of data on district priorities and initiatives with an eye to informing action. For district leaders, the feedback report outlined recommendations, research-based ideas framed in pragmatic terms as potential guides for action.

Within and outside of the boundary practices, boundary spanning work was critical for navigating the inevitable challenges that

occurred in the partnership. For example, like many other partnerships, the RPP had to navigate turnover in district leadership and subsequent changes in district strategy. At these turning points, key individuals within the district who held strong relationships with the research team helped the researchers connect to new leadership initiatives and priorities. They were able to do so by reframing the goals of the partnership in terms of new leaders' direction, thus aligning and advancing the work of the partnership moving forward.

The districts and the research team were well-positioned to engage in learning at boundaries because of prior organizational conditions (Cobb et al., 2013; Cobb et al., 2018). The RPP brought together a range of expertise necessary to inform the issues at hand. The research team involved scholars with mathematics education, learning, and organizational and policy backgrounds who engaged with district leaders with expertise in curriculum, instruction, school leadership, and serving special populations (e.g., English learners), among others. Key individuals in both the research teams and district provided SKL, connecting the efforts directly to the main initiatives in the district. For example, nearly every year, the RPP focused on gathering data, analyzing, and developing recommendations on instructional coaching, a central initiative for the district. Resources funded project staff and opportunities to engage together in-person. While within-team communication was sometimes a challenge, as with many siloed central offices or research teams that represent multiple disciplinary perspectives (Penuel et al., 2015), the work of boundary spanners helped navigate these issues.

Given their extensive use of boundary practices, objects and spanning, and the absorptive capacity of both organizations, it is unsurprising that we see evidence of organizational learning for both the district and research teams. Analysis of district improvement plans shows that some of the key research findings—discussed within the boundary practices, evident in key boundary objects, and discussed by boundary spanners—were directly taken up district policies and routines (Henrick et al., 2018). For instance, on the recommendation of MIST researchers, the district allocated more time for school-level collaboration, evidence of an adjusted routine. The MIST research team also demonstrated organizational learning by integrating routines for feedback into subsequent partnership work and by iterating on its approach to studying implementation of district-level instructional improvement initiatives.

These revised routines and policies were implemented in schools and classrooms, advancing the partnership's goals to support high-quality mathematics instruction (Henrick et al., 2018), thus contributing to the partner organization's goals, a key longer-term RPP outcome. The partnership developed tools and knowledge, intermediary organizational learning, outcomes that have been taken up and referenced beyond the district as well, another longer-term RPP goal. As an example, researchers described the professional development designs for supporting students to engage with cognitively demanding tasks in a publication read widely by mathematics educators and leaders (Jackson et al., 2012). Subsequently, a leader in another RPP directed their RPP leaders to consider how to incorporate ideas

about effectively “launching” such tasks in a local effort focused on task analysis in algebra. The research team has also produced widely cited articles on school leadership (Rigby et al., 2018), teacher learning in teams (Horn et al., 2015), and crafting coherent instructional systems at the district level (Cobb et al., 2018).

We summarize how the MIST example illustrates our framework in Table 1. Table 1 also includes examples from a report focused on three different RPPs (Penuel et al., 2020) to provide additional examples that make concrete what these constructs might look like in RPPs beyond MIST.

Table 1
Key Constructs, Definition, and Illustrations

Construct	Definition	Illustrations	
		MIST RPP	Other RPPs (Penuel et al., 2020) ^a
<i>Learning at the boundaries of research and practice</i>			
Boundary spanning	An individual's enacted transitions and interactions across different sites of practice.	MIST leaders were able to reframe goals to sustain RPP through significant district leadership changes.	In research alliance, boundary spanning involved facilitating interactions within complex district central office and brokering connections between district and research partners.
Boundary practices	Routines, established and sustained over time, that bring together participants from different domains for ongoing engagement.	Feedback sessions and design meetings were “cornerstone” to collaboration.	For research alliance, meetings to discuss research questions and findings were typical. Co-design sessions of professional development were typical for design partnerships. Network meetings as part of Plan-Do-Study-Act cycles were frequent in NIC.
Boundary objects	Material and conceptual tools used in a partnership that support coordination between groups that work in different organizational settings and mediate activity within each organization.	Annual report with feedback on district theory of action and recommendations was key boundary object.	For design partnership, boundary objects included video records of teaching practice and teacher leadership as well as internal research reports.
<i>Organizational conditions for absorptive capacity</i>			
Relevant expertise	Prior knowledge distributed across multiple individuals within a department or team, relevant for the issue at hand.	Practice partners had expertise related to adopted curriculum and the local system, while research team brought perspectives on mathematics, teacher leadership, leadership, organizations.	In design partnership, practice partners brought deep understandings of curriculum, professional learning strategies, local system. Research teams brought expertise in methods of collaborative design, teacher learning, and conducting large-scale observational research.
Communication pathways	Formal and informal structures within or between groups that enable people to access, share, make meaning of, and use knowledge to solve problems.	Within the research team, coordination was needed among sub-teams as well as within and across departments in the district.	In NIC, communication was required across districts in the network and between schools and district offices.
Resources	Financial and human capital resources that support partnering.	Through NSF funds, the research team was able to fund staff for data collection, analysis, and co-design, while the district dedicated time for staff members to be involved.	For the design partnership, grant funding from a national foundation supported staffing for those dedicated to partnership coordination and purchase of relevant materials and technology.
Strategic knowledge leadership practices	Strategies involved in identifying and assessing current sources of knowledge, scanning the broader field for available sources of knowledge, and linking new ideas with current educational initiatives.	MIST connected knowledge of job-embedded professional development to key district initiatives, including coaching, peer networks, and teacher feedback.	In NIC, partners used tools from improvement science to link ideas from research on mathematics tasks and effective professional development to current student outcomes.
<i>Organizational learning outcomes</i>			
Change in collective knowledge	New collective understandings about research findings, issues in education, or ways of thinking about partnering.	District leaders gained an understanding of the value of maintaining cognitive demand in mathematics tasks, while researchers formed a commitment to working in partnership in future research.	In design partnership, district leaders (both involved in the partnership and beyond) understood the important role for facilitators in teacher professional development. Researchers reported deeper understanding of local context and implementation challenges.
Change in policies	When ideas from the partnership inform formal policies as well as rules, plans, and guidelines.	In response to MIST team findings, district created new positions for subject matter coaches.	Educational leaders in all three RPPs reported incorporating research-based practices into professional development.

(continued)

Table 1 (continued)

Construct	Definition	Illustrations	
		MIST RPP	Other RPPs (Penuel et al., 2020) ^a
Change in routines	When ideas from the partnership inform tools are integrated into the content or structure of a participating organization's designed or emergent routines.	In response to MIST team findings, district institutionalized time for teacher collaborative learning. Researchers took on rapid feedback cycles and multiple means of communicating into ongoing practice.	Educators in NIC adopted improvement routines (e.g., use of short surveys to measure changes in practice). Researchers adopted routines for co-developing and co-presenting at conferences.
<i>RPP outcomes</i>			
Supporting practice organization in achieving its goals	The activities of an RPP are in service of larger, concrete aims for educational improvement and equity issues, not just to develop an understanding of problems.	Many of MIST's recommendations were not only taken up in policy but were implemented in schools to advance high-quality mathematics instruction (Cobb et al., 2018).	In research alliance, research studies have helped district refine its implementation plan for mathematics professional development and instruction.
Producing knowledge that can inform education improvement efforts more broadly	RPPs seek to inform the work of others outside of the partnership through publications, networks, and the development and sharing of research-based tools or strategies.	MIST partners published paper on how to launch complex tasks in practitioner journal picked up in other RPPs, and they developed academic papers that have advanced theory and knowledge on leadership, teacher learning, and district coherence.	All three partnerships have developed research publications and tools related to mathematics teaching and learning, professional development, and equitable outcomes for students, teachers, and schools.

Note. MIST = Middle School Mathematics and the Institutional Setting of Teaching; RPP = research–practice partnerships.

^aPenuel et al. (2020) is a comparative case study of three RPPs: one research alliance, one design research partnership, and one networked improvement community.

Conclusions

RPPs are a strategy for bringing together research and practice to improve or transform educational systems, but not all partnerships are able to foster these outcomes. Here, we have brought together sociocultural and organizational accounts of learning to create a conceptual framework for understanding the dynamics and outcomes of RPPs. In an RPP, we envision the interplay of research and practice ideas at the boundaries. Learning can be multidirectional, where productive engagement together can contribute to shifts in collective knowledge, policies, or routines for the organizations involved and subsequent goals of educational improvement and transformation. The degree to which a partnership can make productive use of the differences that inevitably emerge depends in part on the nature of boundary infrastructure and the internal conditions for absorptive capacity for participating organizations.

Our framework contributes to theory on RPPs and the relationship between research and practice in several ways. First, our framework recognizes that professional, professional, cultural, and institutional differences will likely emerge when different groups come together. These differences are not “gaps” to be closed but instead sociocultural differences that, if navigated via boundary infrastructure, have potential to foster organizational learning in service of educational improvement and transformation. Second, our framework recognizes the heterogeneity of the organizations that participate in RPPs. Some organizations or teams may be better positioned to work productively with, and learn from, their partner based on existing organizational conditions. This account brings into relief the role that internal conditions of partner organizations’ ability can play in their capacity to engage in productively in their work together, including existing expertise, communication pathways, SKL practices, and available resources. Third, we argue that it is not simply how


partners navigate sociocultural differences via boundary infrastructure, or the internal conditions of different partner organizations, as suggested by previous work, but the *combination* of these dimensions that enables shifts in collective knowledge, policies, and routines, and by extension, improved long-term RPP outcomes.


This framework has implications for those who engage in RPPs. It suggests that potential partners might begin by conducting an initial assessment of all partnering organizations to evaluate their existing conditions for absorptive capacity. Then, partners could brainstorm and design potential boundary infrastructure that addresses or attends to these organizational conditions. For instance, if participating organizations have highly siloed infrastructures for communication, there may be important roles for boundary spanning for both within and across organizations. If multiple organizations are involved, intentional efforts to create boundary objects that can surface and engage differences or help coordinate activities both within and between participating groups may be beneficial. After launching this partnership infrastructure, partnerships could track the ways in which ideas or processes introduced within the RPP efforts go on to shape organizational learning outcomes of each partnering organization. A check on the longer-term outcomes would then be warranted (i.e., “Did we help support our partners in achieving their educational improvement goals?”). This process might begin again with an assessment of whether absorptive capacity conditions had changed or how the boundary infrastructure might need to adjust.

This framework also provides conceptual direction for future studies of RPPs. For instance, research could investigate in more detail the role that boundary infrastructure plays in creating opportunities for knowledge sharing and learning. What are the affordances and constraints of boundary practices with different designs, for instance? This framework identifies key

organizational conditions that likely matter for a participating organization's ability to engage productively in an RPP, but how do different combinations of conditions between partner organizations that make work together more worthwhile? Future studies should also consider the relationship between the boundary infrastructure and organizational conditions. Are there certain kinds of boundary infrastructure that are more conducive to learning if participating organizations have few organizational supports in place, compared with those with ample relevant knowledge, communication pathways, SKL, and resources? In other words, are the situations where a boundary infrastructure would not be effective in supporting learning because existing organizational conditions are too limited? Finally, future research can elaborate this framework further. There are other characteristics of participant organizations, as well as the external environment, that could potentially influence partners' ability to engage. Applying and testing this conceptual framework empirically can provide clarity to these and other questions and illuminate whether and under what conditions RPPs can foster organizational learning for those involved, with what consequences for longer-term impact.

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NOTES

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¹For instance, one dominant framework emphasizes the need for better translation of research into practice (Greenhalgh & Wieringa, 2011), and some suggest that RPPs may be a vehicle for “translating” research findings into practice (e.g., Palinkas & Soyden, 2012). Another popular model for characterizing the relationship between research and practice is “two-communities” theory (Caplan, 1979). Here, practitioners and researchers are cast as two separate communities, divided by institutional and cultural gaps (Farley-Ripple et al., 2018). When applied to RPPs, this view tends to construct both practitioners and researchers as relatively homogeneous groups with distinct cultures (e.g., Palinkas et al., 2009). However, these frameworks provide an overly simplistic way to characterize the breadth of activities of an RPP (Newman et al., 2015), and they do not provide a lens for understanding the dynamics of collaboration.

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