CHAPTER 2

The Work of Improvement

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Scholars in disciplinary fields like management and organizational studies, informatics and human-centered design, infrastructure ethnography, and human computer interaction have studied *work* in various ways that provide insights into community-engaged research (CER) approaches. Our aim in this chapter is to highlight some ways that research on workplaces and work routines can help strengthen how one enters into, conducts, and contributes to equitable improvements in our education systems. No matter which CER approach one might gravitate toward as they engage with the community, we can analyze how understanding work helps attune us to unique affordances and strengths of CER. We use the term *CER* to describe a variety of methodologies that seek to connect researchers and community partners, such that the research enterprise better reflects their goals and can maximize our potential to make tangible improvements to issues that matter to community partners.

Specific CER approaches differ in their values, aims, and methodological procedures but share some key features. First, they share a focus on helping researchers understand the work of partnering with the community as part of the research process. Second, for the education field specifically, these methodologies attend to understanding the work of education systems in order to identify targets for improvement. For example, social design experiments implore scholars to focus on systemic targets of change in work, by understanding the historical, social, and political trajectories of our community partners (Gutiérrez & Jurow, 2016). Design-based implementation research (DBIR) and improvement science (IS) approaches pay special attention to the work practices of education professionals, and either focus on codesigning new routines or improving the interlocking system of practices that lead to outcomes of interest (Bryk et al., 2015; Penuel et al., 2011). Participatory design approaches, as another example, provide philosophical stances about how to share power among researchers, designers, and community partners, as they utilize different strategies to reimagine and cocreate their workplaces (DiSalvo et al., 2017). Taken together, a focus on work provides an analytical onramp into a diverse range of research fields.

In this chapter, we summarize key stances and insights from studies of work and workplaces that can inform improvement research in education. First, we make linkages between studies of work and vital features of CER such as the building of trust

and relationship structures in partnership work. We provide illustrative examples of how research that foregrounds work systems and infrastructures inform the ways in which we can approach CER. Second, we highlight how design methods such as human-centered design, participatory design, and related methodological extensions can help CER practitioners more clearly see the key targets for improvement work from the perspective of community members. Finally, we illuminate how critical and equity-focused lenses help us push beyond assumed values, goals, and work processes to understand when CER projects must radically shift in their approach, or when research itself may not be beneficial for a given community's needs. These frameworks are vital to help practitioners develop deeper practices of reflexivity, to bound CER work in situations where values and aims are aligned, and to continuously monitor the potential harms one might enact (often unintentionally) without a critical CER practice.

Understanding Relational and Infrastructural Contexts in Community-Engaged Research

We begin with some foundational notions of improvement and community-engaged research as a starting point to understand the educational communities that often partner with educational researchers. For example, social systems, or the attunement to how people, roles, processes, and materials interact (LeMahieu et al., 2017), can describe teaching and learning environments such as schools. Improvement science builds on these ideas of organizational improvement from Deming (2018) that to understand a work system, the roles of people in the system, their routines, and the variation in behaviors and outcomes that this interconnected system produces must be mapped and studied. Other approaches that integrate theory and methodology, such as design-based implementation research (DBIR) and cultural-historical activity theory (CHAT), share this focus on understanding a social system before embarking on an educational change or improvement effort. We highlight the contributions of different fields in thinking through the people, roles, and (work) processes that make up an educational setting. In addition, we will also highlight how fields of scholarship delve deeper into the notion of "materials," which scholars refer to as infrastructure, and highlight some ways to think through how infrastructure shapes CER work.

ROLES, IDENTITIES, AND RELATIONS

A common element across different CER approaches is a commitment to understanding the people involved in a given educational context, the roles they play, identities they inhabit, and the relations they create between each other. In the field of learning sciences, scholars who utilize *social design experiments* as a methodology emphasize a key insight: that one must understand the historical experiences of partners in a given community project and their unique positionality within the social system that the partnership creates. Jurow et al.'s (2016) research on Impact, a nonprofit organization

that worked with communities to increase food access and justice in an urban neighborhood called South Elm, is a good example of this methodology. Impact supported community members in growing their own backyard vegetable gardens, an initiative that followed from a citywide effort to produce and distribute more local food. Impact hired 10 *promotoras*, using "a traditional Latin American public health and community engagement approach," to broker relationships between the organization and local residents who maintained the gardens (Hall & Jurow, 2015, p. 183).

The *promotoras* paid visits to neighbors' homes and helped them maintain their gardens while also supporting Impact's mission to bring more food to the community. Impact hired the *promotoras* with a purpose in mind, but Jurow et al. (2016), in partnership with the *promotoras*, found that much of the *promotoras*' work was invisible to the organization. The *promotoras* helped neighbors troubleshoot garden issues and provided emotional support to community members. They played a specific role in bridging between community members and the formal nonprofit and research organization. Their deeper understanding of the social system allowed the *promotoras*, the researchers, and Impact to develop a fuller account, both in the research and organizationally, of the practices necessary to fully serve the community and to support the *promotoras* in doing so. Ultimately, by knowing such misalignment existed, Impact, the *promotoras*, and Jurow et al. (2016) came together to develop new technologies to support the *promotoras*.

Paying attention to the roles, identities, and relations that community members have with one another also makes clear how decentering Western, White, and settler-colonial perspectives can introduce expansive new ways of conducting partnership work and vastly different improvement efforts. For example, Bang et al. (2013) illuminate how science education can be improved and reimagined when centering Indigenous ways of knowing, teaching, and learning. They illuminate how partnership work can be built from very different axiological stances, or different values. For example, Western ways of knowing science treat nature as separate objects to possess, observe, study, destroy, or otherwise manipulate for human knowledge. However, Indigenous approaches take a relational view where elements in nature (plants, animals, etc.) are in relationship with each other, and human beings are just one part of the relational ecosystem (Cajete, 2000). In addition, Indigenous norms of relationships can structure community-engaged work in ways that, for example, value the role of elders, cultural stories and wisdom from local traditions, and the lived expertise of community members. Attending to such nuances in roles, identities, and relations helps CER scholars adapt to and perhaps adopt very different roles themselves, unlocking new ways of being in partnership and in creating new interventions.

One community-based product from Bang and colleagues' wider research effort, *Learning in Places*, is an open-access curriculum of field-based, educational experiences for families and elementary school-aged children that forwards new ways of teaching, learning, and knowing science. The curriculum includes both a set of lessons and tools for teachers and families that help orient participants to the frameworks and sensibilities of the curriculum. These resources include a framework for socioecological decision-making that supports teachers in engaging students in using evidence from their investigations in concert with values and a long-term, historical perspective on change, as well as a tool for families to use to track their daily decisions and their

impacts on their families and lives. The tools were developed through a participatory process of codesigning with families, educators, and Indigenous community leaders.

Other CER approaches share some commonalities with social design experiments. For example, DBIR methods place substantial importance on relationship development between practice partners and researchers, up-front in the development of the project. This relationship development includes strategies to identify different stakeholders' roles in their organizations, sharing what expertise and lenses each partner brings, developing a shared set of values together, and creating a joint focus of work that reflects the positions of all partners (Penuel et al., 2013; Ryoo & Kekelis, 2016). Similarly, improvement science methods stress the importance of defining clear roles of different stakeholders in the network; from those in the hub of the network who provide the coordination and structure of the work to the participants of the network who are positioned to cocreate ideas, test new strategies or interventions, and collect data to understand their progress (Russell et al., 2017).

TRUST AS A KEY FACET OF CER AND IMPROVEMENT RESEARCH

A common observation and requirement in CER approaches, which build from attention to roles, identities, and relations, is the need to develop deeper trust among all partners for joint work to develop successfully (Bryk & Schneider, 2002, 2003; Forman et al., 2017). Here, insights from fields such as organizational and management studies offer ways for education CER practitioners to think about trust as a concept and develop it in future research and in partnerships. Mayer, Davis, and Schoorman (1995) offer a definition of trust that provides a jumping off point: "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (p. 712). This definition offers some features that sharpen our notion of trust. First, the definition establishes the need for risk to be present, that one or more parties could be vulnerable to harm in some way, but despite this risk, individuals remain in the vulnerable position. Second, the definition establishes that there has been some sort of shared history between people, such that their expectations for future action is stable.

Bryk and Schneider (2002) employ an organizational lens on trust in their study of schools. In a school environment, there are multiple stakeholders from the school principal and leadership staff to teachers and other related staff (specialists, counselors, custodial staff, etc.). Students are key stakeholders in schools, and their parents and extended families are also key constituents of the organization. In addition, the wide variety of partners, outside consultants, and other entities who work with the school comprise even more relationships. Bryk and Schneider's key finding is that the relational trust—multidirectional and complex between different stakeholders—that is present in a school is related to the school's overall capacity or chances of enacting any new changes or improvement efforts. Thus, conversations from partnership approaches that have foregrounded understanding of partners (people), relations, and trust are very much tied to other approaches that might foreground improvement.

WORK ROUTINES

Work routines are a source of both stability and change within organizations (Feldman & Pentland, 2003). Routines are composed of both structure (elements that can be carried out by different people at different places and times) and agency (the routine as enacted by particular people in a time and place). The planned or designed elements of a work routine guide action, while routines as enacted are sources of improvisation and modification. In education, routines can be supports for teachers enacting specific curriculum (e.g., DeBarger et al., 2010), for teachers reflecting on their practice (e.g., Horn & Little, 2010), for leaders organizing for improvement efforts in schools and districts (Spillane et al., 2011), and for researchers and educators organizing the work of partnerships (Yurkofsky et al., 2020).

The description and modeling of work routines is a powerful means for "making work visible," which is necessary to carry out complex activities such as teaching, as well as for revealing the complexities behind what might appear to be less cognitively demanding work. Ethnographies of craft and repair work, for example, have highlighted how such work demands extraordinary skill, as well as how people apprentice to such work (Barley & Kunda, 2001; Rose, 2004). In CER, the mapping of work routines can help reveal the tensions and contradictions between components in an activity system, as well as contradictions between systems (Yamagata-Lynch & Haudenschild, 2009). Such mapping can also reveal conditions for implementing and sustaining interventions (Cole, 2001). Understanding the work routines of a given partnership can also facilitate the development of a theory of improvement that is grounded in an understanding of what current practice looks like and how it is producing the outcomes it does (Bryk et al., 2015), as well as inform the development of measures of practice that can be integrated into the ongoing flow of existing or redesigned work routines (Yeager et al., 2013). Finally, studying variation in the enactment of routines can be a source for improvement, when researchers look for productive adaptations made that result in gains in valued outcomes (LeMahieu et al., 2017).

INFRASTRUCTURES AND INFRASTRUCTURING

We have highlighted several key aspects of work and work environments that are relevant considerations for CER in education: roles, identities, relations, trust, and work routines. We turn now to considering how these are brought together in sociomaterial *infrastructures* of organizations, which also can become objects of improvement in education. Here, we draw on scholarship from outside education—specifically the fields of informatics and human-computer interaction—to describe infrastructures as relations and infrastructuring as an object of design.

Infrastructure at a basic level is what supports and structures social practices, including those of schooling. Infrastructure is typically invisible in the way it supports tasks and is sunk into and inside of other structures, social arrangements, and technologies (Star & Ruhleder, 1996). Infrastructure includes such things as standards for practice and classification schemes (e.g., of race, diagnostic categories of illness or

disability) that both shape and are shaped by conventions of social practice (Bowker & Star, 1999). Infrastructures are typically not transformed so much as redesigned in a more modular fashion, as often there are layers of infrastructure that exist as vestiges in organizations but that are no longer tied at all to the current goals of the organizations (Bowker & Star, 1999). Making infrastructures visible—like making work processes visible—can help facilitate change, but there can also be costs. People who are "doing the work" without much visibility may come under greater scrutiny once their contributions to infrastructure are more widely known in an organization (Suchman, 1995).

Infrastructure as we use it here is a relational concept, that is to say, an infrastructure is always for a particular practice. In the case of schools within the educational system, there are extensive instructional guidance infrastructures intended to support and monitor the practice of teaching (Hopkins & Spillane, 2015; Hopkins et al., 2013; Hopkins & Woulfin, 2015). These instructional infrastructures vary by subject (Hopkins & Spillane, 2015) and are comparatively coherent or incoherent depending on the system (Peurach et al., 2019). The components of infrastructure include standards, curriculum materials, assessments, and teacher evaluation systems, which are developed and revised through coordinated activities that take place across multiple units and levels of the educational system with the aim of bringing these different components into being and into relation with one another—that is, to make them into a working infrastructure for teaching (Penuel, 2019).

There is another educational infrastructure at the level of a community that, among other things, exists to support the purposes of student learning and development out of school. Community infrastructures include a range of physical places, public and private, such as libraries, clubs, museums, parks, and community-based organizations, as well as virtual spaces where people share media, information, and activities (Falk & Dierking, 2018; Gee & Hayes, 2012). Recent scholarship in the learning sciences and media highlight how educators and learners traverse physical and virtual "pathways" between different places, such as the transportation system that allows young people to move from school to an after-school program in a different neighborhood, and websites where young people can learn about opportunities to pursue interests related to ones they have pursued in the past in new venues and programs (Pinkard, 2019). These community-level infrastructures are not just individual contexts for learning; the infrastructure itself can be viewed as a multifaceted, linked learning environment in which people engage with and make sense of the world (Barab & Kirshner, 2001; Carr & Lynch, 1977). This kind of connected infrastructure can be analyzed in terms of its affordances for supporting a variety of forms of learning (e.g., Pinkard et al., 2016), the spatial accessibility of places for learning (e.g., Quigley et al., 2016), the connectedness of spaces to one another (Falk & Dierking, 2018), and availability of material and social supports for brokering opportunities to learn across different spaces (e.g., Ahn et al., 2018; Ching et al., 2016; DiGiacomo et al., 2018). Sustainable community infrastructures for learning are ones characterized in this sense by high levels of diversity, accessibility, and social and material resources.

The work of *infrastructuring*, the verb, refers to the act of redesigning infrastructures, and as a concept, has developed within the field of human-computer interaction, specifically within participatory design circles. The verb "to infrastructure" was used

by Star and Bowker (2002) to highlight the active work of redesigning infrastructures. Infrastructuring involves not the creation of a single, monolithic infrastructure but an "artful integration" of multiple systems, materials, and social practice: at its center "is the integration of new tools and technologies with existing people, materials and tools" (Karasti & Syrjänen, 2004, p. 21). Infrastructuring benefits from the analytic effort to engage in "infrastructural inversion" that makes visible the material structures, as well as the work routines, that bring together people in different roles and identities around a common practice (Simonsen et al., 2020).

Research on the Chicago City of Learning (CCOL) illustrates an approach to making visible learning opportunities throughout a large city through infrastructure redesign in CER. CCOL was an initiative from the mayor's office initially conceived to reduce summer learning loss by providing a platform whereby young people and their families could find enriching learning opportunities around the city that were offered during the summer months. Nichole Pinkard and a team led by practitioners and scholars at a group called YOUmedia in Chicago created a platform and coordinated an effort that saw more than 170 organizations list more than 3,000 opportunities for youth. The platform served as a new digital infrastructure on top of an evolving infrastructure of programs that had never before been so mapped.

Pinkard (2019) saw the absence of systems for sharing available opportunities and for facilitating deliberation among program leaders and policy makers as to what learning opportunities are offered where and what gaps there are as a significant challenge to be addressed in promoting equity. She and her team sought to create a more robust sociotechnical infrastructure that could provide a "connective tissue" (Pinkard, 2019, p. 43) between components of the ecosystem of school-based and out-of-school learning opportunities in the city, such that youth themselves could see what choices were available to them at any given time, as well as potential pathways for developing knowledge and skills across multiple programs that were related to their interests.

Working with a team of researchers from two different universities, Pinkard and colleagues created a new set of visualizations for program leaders and policy makers to support an analysis of the distribution of organized opportunities for learning across the city. The visualization sought to capitalize on conceptualizing the city's opportunities as an ecosystem with variable levels of program abundance and diversity by neighborhood (Quigley et al., 2016). In addition, the visualizations highlighted the accessibility of programs, integrating geospatial data from Google Maps with program information included on the CCOL platform (Dibie et al., 2017). These visualizations made clear just how spaces for learning were not equitably distributed across the city. It also highlighted how opportunities to pursue particular activities, such as STEM-related activities, were far less accessible to some neighborhoods than others. The visualizations are a novel form of learning analytics (Nacu et al., 2019) that have allowed the team to develop applications for youth and recommend systems based on young people's interests and the accessibility of programs.

Ultimately, we highlight a key set of frameworks and concepts that CER scholars bring together from different fields. At a broad level, researchers seek to understand work systems as an interlocking assembly of people, roles, work routines, and infrastructures. Theories from different fields such as sociology, informatics,

human-computer interaction, learning sciences, and education help us think about both infrastructure that shapes our potential action and the agency of people to act, adopt, adapt, and appropriate our resources to make improvements in educational systems. This observation that work settings provide structure that enables or constrains action, but that also the activities of the stakeholders within settings also redefine work systems, has also been theorized across a wide variety of fields such as structuration (Giddens, 1984; Jones et al., 2004), adaptive structuration (DeSanctis & Poole, 1994; Fulk & DeSanctis, 1999), social informatics (Kling, 2007), and notions of sociomateriality (Leonardi, 2013).

Designing Together, through Tensions, to Transform Work and Systems

A key aspect of CER approaches is some form of joint design to improve the work systems that comprise an educational environment. The process of improving involves imagining and testing new ideas for how to structure work, or do the work, of education. In this area, various insights from design research—ranging from cultural-historical activity theory (CHAT), human-centered design (HCD), participatory design (PD), to iterations of design-based research (DBR, DBIR) in education and the learning sciences—provide foundational philosophies and strategies to imagine, build, and test new innovations. We highlight a few key notions from various design research traditions that can aid in a fuller CER practice for researchers and partners.

By combining an attention to work systems with a repertoire of design methodologies, CER practitioners can more clearly see the key targets for improvement work from the perspective of community members. For example, researchers who utilize CHAT seek to describe a variety of educational phenomena as an interconnecting system of activity (Engeström, 2001). CHAT documents and understands workplaces as mediated activity systems where multiple voices represent an accumulation of knowledge from prior generations, and where the community composed of many different voices coordinates through a division of labor, has rules of engagement, uses tools and technologies, and works to achieve some objective. That objective within workplaces emerges most often from a need for change within the activity system fueled by contradictions or dilemmas. Expansion of the object occurs via confronting contradictions within and between activity systems in the "formation of a new, expanded object and pattern of activity oriented to the object [problem space]" (Engeström & Sannino, 2010, p. 7; see also Engeström, 1996, 2005). In a design process, contradictions are navigated in relationships and in efforts to improve.

The field of human-centered design (and relatedly human-computer interaction) provides a repertoire of methods, strategies, and frameworks to create new infrastructures for the workplace (Abras et al., 2004; Rogers et al., 2011) that range from technology to social systems, policies, and other aspects of infrastructure that we noted earlier. We observe key connections between human-centered design approaches in that designers from this tradition spend substantial focus on understanding the

end-users, their work environments, and workflows to design improvements that are directly relevant and related to their needs (Beyer & Holtzblatt, 1999). Education researchers have also extended human-centered design traditions to apply them to learners, for example, to design new technologies from a deeper understanding of what learners' experience in different environments (Ahn & Clegg, 2018; Quintana et al., 1999; Soloway et al., 1996).

Another point of connection between human-centered design and CER approaches is the notion of revealing tensions for which to design improvements. As we noted earlier, a nuanced attention to interconnecting work systems helps researchers identify the places of contradiction, which could be the target of redesigning potential improvements. Separately, HCD researchers such as Tatar (2007) have also highlighted how, when designing improvements to a system (e.g., a new technology or tool), one must focus the process on identifying the key contradictions of the work system and create tools that balance the inherent trade-offs that these contradictions present. Thus, in designing improvements to work systems or infrastructures, one is not problem solving in a straightforward fashion (e.g., creating a perfect tool to solve a direct problem) but, instead, developing tools that satisfice (Simon, 1956) or value the inherent compromises that work situations present.

Numerous design traditions and methodological extensions have arisen in the scholarly literature that involve "designing with" others for improvement. Each methodological extension has various contributions for CER researchers who are developing a repertoire of methods to design new improvements in education. For example, value-sensitive design focuses on connecting the underlying values that partners assume or hold when they work to create new innovations or improvements (Friedman et al., 2017; Friedman & Hendry, 2012). In education, the notion of design experiments (Cobb et al., 2003), learner-centered design (Quintana et al., 1999), and design-based research (Anderson & Shattuck, 2012; Barab & Squire, 2004; Bell, 2004) attune designer-researchers to create solutions that are relevant to the unique needs of educational environments and learners, or to directly test learning theories in situ with education partners. In general, we briefly mention these various design traditions to underscore a key evolution that appears to occur across different scholarly fields. No matter which disciplinary tradition one comes from, researchers who gravitate toward improvement research in education inevitably touch upon the need to deepen their understanding of design in some way. A most recent example is in the field of learning analytics, where computer science and data science scholars are increasingly interested in applying human-centered design to create more relevant, useful, and impactful improvements from digital data, algorithms, and analytics (Ahn et al., 2019; Buckingham Shum et al., 2019).

A PARTICIPATORY TURN: ENGAGING WITH COMMUNITY MEMBERS TO DEVELOP TARGETS FOR IMPROVEMENT

Design can be done with more or less participation of partners and communities, and thus with varying levels of shared authority. In fact, many of the design approaches

outlined earlier often assume, or leave unspoken, a mental model of a designer, creating solutions from their own research activities or theory. The partners in this model act as participants who test out the design, give feedback, or operate as informants for data collection. In the design field, however, scholars have also experimented with more participatory approaches where community partners can be positioned more equally (ideally and aspirationally, if difficult in practice) as cocreators (Druin, 2002). For CER, where much of improvement work is done in partnership with community stakeholders, participatory design (PD) traditions provide key insights about how to engage with community members and offer ways to better develop the targets for improvement that may be the most salient and impactful for partners. Thus, we focus on participatory design approaches in the following section, attending to how these methodologies position stakeholders as cocreators, and can provide insight into where in the system to focus change efforts (DiSalvo et al., 2017).

Influenced by Scandinavian participatory design processes, participatory design emerged as a means to design transformational workplace technologies and practices alongside the workers themselves (Ehn, 1992; Severance et al., 2016; Simonsen & Robertson, 2013). Participatory design asks researchers and stakeholders to engage in a joint process of creation—from the infrastructure that bounds one's work to the practices of the workplace itself. PD methods also seek to position stakeholders with more agency, co-create solutions alongside designers and researchers, and adopt methods and solutions flexibly throughout the research process. The precedent of work systems as an organizing feature of community-engaged research is also a thread across participatory design approaches in two key ways: (1) that design ought to be done with the participation of partners and communities who share varying levels of authority in joint work and (2) that different design traditions attune us to specific insights and assets that the community has and thus objects for improvement.

Relationally, participatory design techniques structure a wide variety of activities ranging from how partnerships use research to then conjecture about change, design that change through tools or programmatic efforts, and position everyone in the partnership as cocreators. Participatory design methods also support stakeholders to cocreate solutions alongside designers/researchers and adopt methods and solutions flexibly throughout the research process. Methodologically, PD is facilitated in such a way that is team based, where practitioners across a variety of backgrounds "work together in defined roles to design an educational innovation, realize the design in one or more prototypes, and evaluate each prototype's significance for addressing a concrete educational need" (Penuel et al., 2007, p. 51).

In participatory design, it is understood that each member of a partnership holds a vision of what good partnership work looks like, values about what work is needed, and individual ideas and experiences about what would work for their contexts. Careful facilitation to draw upon every partner's expertise, past history, and assets creates situations where more robust solutions can arise that take into account the wisdom of the entire team. In doing so, participatory design underscores an imperative that researchers ought to make the impact and value of their research more expansive by prioritizing relationships with those most affected by the potential intervention (Strand et al., 2003).

Participatory design also works toward consequential improvement efforts. Participatory design can focus a partnership to target change and redesign their environment in such a way that prioritizes coherent education systems (Fishman et al., 2013). As one illustrative example, researchers in the Middle School Mathematics and the Institutional Setting of Teaching project (MIST) engaged district leaders in an interactive design process to create a district-wide system for high-quality mathematics instruction (Cobb et al., 2013, 2020). The researchers wondered what interventions could support teachers' agency to practice equitable instructional practices. The first was to collaborate with districts in providing them with iterative and timely feedback about their mathematical instruction approaches. Second, they drew on theory to develop district-wide instructional improvements in mathematics that could be applied across districts. More recent developments in this project have involved the cocreation of practical measures (Yeager et al., 2013) for math teachers to track student experiences with inquiry in their classrooms. The research-practice partnership (RPP) teams in this extended project have worked with teachers to understand the valid uses of these measures, grounded in work contexts of mathematics teachers (Ing et al., 2021), and rich accounts of how mathematics teachers might utilize these practical measures and link them to their practice (Nieman et al., 2020). Finally, this partnership team has engaged in the participatory design of data dashboards with teachers to explore how visual representations of their data could aid in their sense making and decision-making about classroom pedagogy, modeling how the cocreation process reveals new insights for the role of analytics within K–12 school settings (Ahn et al., 2019, 2021).

Work for Equity in Community-Engaged Research

We end this chapter with a conversation about the implications of studying work for equity in educational contexts. Scholars have contributed critical and equity-focused lenses to push beyond the assumed values, goals, and work processes that may characterize CER and improvement research itself. These vital areas of scholarship help us understand when CER projects might need to radically shift in their approach, or when improvement research (as currently practiced) itself may not even be beneficial for a given community's needs. Critical lenses push us to pay honest attention to who is at the table in partnership work, whose definitions of improvement are foregrounded, who receives the material resources or social positioning to enact change, and whose values are reflected in the entire enterprise. These moves can have broader impacts for how scholars and practitioners can develop deeper practices of reflexivity, to bound the work of CER in situations where values and aims are aligned, and to continuously monitor the potential harms one might enact (often unintentionally) without a critical CER practice.

To illuminate this point, we first reflect on illustrative texts that can push us to think about some core tenets of CER and improvement research. For example, Dumas (2014) artfully describes the everyday, enduring suffering that Black students, parents, and community members experience as part of their formal schooling. The nuances of such analysis directly question and shed light on whether CER and improvement

research methodologies could aid in reducing the continual suffering of racialized and marginalized learners. Scholarship in this tradition reminds us that there are open questions about whether CER and improvement research—which often partner with stakeholders in existing, formal education systems—may also in fact work to perpetuate those systems, and merely iterate on education systems that continue to forward experiences of suffering for different populations.

Second, exciting research from partnership scholars is shedding light on core facets of the work, such as the relationship building that is vital to CER. For example, Vakil et al. (2016) describe their various partnership research experiences, to highlight how relationships between researchers and partners are not neutral but, instead, highly political and power laden. They highlight the term *politicized trust*, to call CER and improvement researchers to pay deeper attention to the intersectional features such as race, ethnicity, gender, socioeconomic status, and histories of specific communities, and how these facets are fundamental to the kinds of relationships that can be developed in partnership work. Aspects of ourselves, histories, identities, positions, and power are not external to creating relationships and constructing CER or improvement research; instead, they fundamentally shape how the projects develop and progress.

Finally, as we noted earlier, CER researchers such as Bang and colleagues (Bang et al., 2013) illuminate how we must also be reflexive in who is brought to the table, and put in positions of power, to drive CER projects themselves. In their work, they center Indigenous partners and ways of knowing to fundamentally shape the agenda of their research. These moves link with Dumas (2014) and other critical stances such as Tuck & Yang (2012) who call for scholars to entirely decolonize their practices (not only talk about them theoretically but also commit to fully relinquishing land and power back to Indigenous peoples) in a radical way. Specifically, CER and improvement researchers might consider partnership projects that work fully outside of formal education systems, with populations that consistently have suffered from existing systems as the primary drivers and envisioning partners, to imagine and create entirely new systems.

We mention these examples of exciting, critical perspectives because they may open up new innovations, and ways of conducting CER and improvement research, to a wider diversity of partnership projects. These projects may range from partnerships that iteratively improve existing systems, that critically work from different vantage points (particularly from traditionally silenced populations), that work to develop more equitable relationships, and that even push researchers to honestly consider whether a given project should be directed by others in the community (beyond ourselves in the academy) who are better positioned to directly address community needs.

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