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## Measuring Educators' Perceived Benefits of Participation in Educational Improvement Networks

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### ABSTRACT


Networked improvement communities (NICs) aim to build capacity for school-based educators to work collaboratively as active agents of problem solving and change. Yet, the benefits accrued to educators from participating in improvement networks have been sparsely researched. Using survey responses from the members of 34 improvement networks, we conceptualize and construct a measure of participatory benefits for school-based educators in improvement networks. This measure provides an indicator of participants' commitment and motivation to engage in collaborative local problem solving and to sustain network membership. We hypothesize that such commitment and motivation are necessary conditions for precipitating changes in schooling practices that will ultimately lead to progress toward network improvement aims (e.g., improved student outcomes). Our analyses provide evidence that our measure of members' participatory benefits can reliably distinguish among individuals both within and between networks. We identify distinct individual and network characteristics that are associated with variations in member reports of their participatory benefits.

Networked improvement communities (NICs) support educators in working to improve educational practices and expand learning opportunities for students.<sup>1</sup> NICs are intentionally structured communities in which school-based educators have opportunities to learn and improve their practice through rigorous, focused, and collaborative continuous improvement processes with diverse colleagues and experts, both within their schools, in other schools, and in other organizations (Bryk et al., 2015; Yurkofsky et al., 2020). Ideally, we expect that participation in NICs enables network members to learn problem-solving processes and to work collaboratively to enact the routines and practices of a scientific-professional learning community to improve educational outcomes (Russell et al., 2019, 2025, this issue).

NICs aim to transform typical school improvement processes by putting educators at the center of efforts to find new ways to optimize educational processes and meet the needs of students. NICs create collaborative routines and structures within and across schools that offer opportunities for shared learning about pressing problems of practice. In contrast to externally developed and/or mandated interventions, NICs aim to develop educators' capacities and commitments to be active agents of change by engaging in collaborative problem solving (Russell et al., 2025).

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<sup>1</sup>Throughout this article, in referring to NIC participants or members as “educators,” we include teachers, instructional aides, administrators, principals, guidance counselors, instructional coaches, and others in schools. We do not include the leaders and staff members in the hub organizations that serve as the operational center of NICs.

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This study investigates both how school-based educators benefit from their participation in improvement networks and the factors mediating their perceived participatory benefits. Understanding members' perceptions of participation benefits in NICs is important because we theorize that benefits influence member commitment and engagement, which in turn contributes to the positive changes in their educational practice needed to achieve improvement aims (Gore et al., 2017; Hargreaves & O'Connor, 2017; Horn & Little, 2010; Richter et al., 2021).

A largely unexamined dimension of NICs lies in understanding what motivates school-based educators to engage in challenging work for which they often have little preparation and requires considerable time and effort above their conventional responsibilities (Rohanna, 2022). This is especially important given that participation in NICs is often in varying degrees voluntary. One conjecture is that the motivations are external, for example, accountability pressures or opportunities to secure funding. Another conjecture is that the motivations are internal, for example, a sense of moral responsibility for students or a strong sense of personal agency. In this article, we explore one potential source of internal motivation: the benefits individual educators derive from participating in collaborative problem-solving efforts with colleagues.

Our study details the conceptualization and measurement of member participatory benefits in a sample of improvement networks launched through the Networks for School Improvement (NSI) initiative funded by the Bill & Melinda Gates Foundation. In this article, we make a distinction between the organizational concept of NICs (as described in depth elsewhere in this special issue) and improvement networks in practice (as guided by the NIC concept but actualized to varying degrees in individual networks). We collected data in an annual survey of network members that enables us to explore responses from educators participating in 34 different NSIs. We applied Rasch modeling to construct a measure for members' participatory benefits and used hierarchical linear modeling to analyze variation in the member-perceived benefits associated with select member and network characteristics.

We conceptualize educators' participatory benefits as a key indicator of the early success of networks. Thus, we pose the following two research questions: (1) In what ways (and to what extent) did school-based educators benefit from participation in educational improvement networks? (2) How is variation in members' participatory benefits associated with member and network characteristics?

## Literature review

NICs engage educators in collaborative learning to improve educational practices and outcomes (Bryk et al., 2015). As NICs are a novel organizational form, researchers have yet to develop either a clear conceptualization of what educators value as part of their participation or a means of evaluating member experiences in NICs. Given the nascent state of research on NICs, we looked to research on educators' engagement in collaborative professional development and professional learning communities (PLCs) to theorize how NICs produce participation benefits. This research is relevant because networked learning communities and professional learning communities are grounded in similar theories about how educators learn in collaboration with others (Stoll et al., 2006; Russell et al., 2025, this issue). Additionally, we draw on PLC research to theorize about the individual and network characteristics that may contribute to variable perceptions of participation benefits in the context of the NSI initiative.

## *Conceptualizing and measuring the value of participating in collaborative learning*

We theorize that educators are motivated to engage in NICs, in part, due to the perceived benefits they derive from collaborative problem solving with other educational professionals. Research consistently underscores the potential benefits of the type of educator collaboration intended in NICs, noting its positive impacts on teachers' instruction and student outcomes (Akiba & Liang, 2016; Hargreaves & O'Connor, 2017; Lecat et al., 2019; Ronfeldt et al., 2015; Vangrieken et al., 2015; Vescio et al., 2008). In

PLCs, for example, effective teacher collaboration creates value for the individual through opportunities for professional learning (Prenger et al., 2017).

De Jong et al. (2022) illustrate how the robustness of school-based collaboration is affected by multiple interconnected factors. Educators bring their individual attitudes, beliefs, and knowledge to bear in their engagement in learning communities. Shared history, collegial norms, and diversity of individual interests and skills interact to form a group identity that shapes educators' engagement in collaborative practice (DuFour et al., 2020; Owen, 2016). The ways individuals work together contribute to the development of shared goals and a critical focus on implementing practices. For example, conversational routines that focus on analyzing student work have the potential to support critical reflection on instructional practices and identify areas for improvement (Horn & Kane, 2015; Horn & Little, 2010).

Even though many professional learning initiatives are externally imposed, educators' intrinsic motivations to engage deeply are associated with their perceptions that engagement will contribute to their capacity to have a positive impact on students (Avidov-Ungar, 2016; Guskey, 2010; Haberman, 1995). On the understanding that motivation to engage in collaborative professional learning relates to perceptions of impact, we identified three potential indicators of participatory benefits associated with the NIC model:

- Members' perceptions that their participation is generally worthwhile and valuable
- Perceived benefits related to the collective pursuit of a specific improvement aim
- Perceived benefits from building an individual's capabilities for problem solving

### ***Perceptions that participation is valuable and worthwhile***

At a foundational level, we posit that members must generally perceive that their participation in NICs is worthwhile and valuable in order to maintain engagement and motivation. When studying the effectiveness of professional development interventions, Guskey (2014) measured educators' perceived holistic value associated with professional learning events, arguing that these perceptions are a necessary prerequisite to higher-level evaluations of the impact of participation. Perceptions that participation is worthwhile and valuable are critical indicators of participatory benefits in NICs because time is a scarce school resource (Campbell et al., 2017; Honig & Rainey, 2023; Poortman et al., 2022; Woulfin & Spitzer, 2023). Given that network membership is often to some degree voluntary, members must perceive value to sustain their continued membership and active participation (Russell et al., 2019).

### ***Perceptions related to collective efficacy in pursuit of a specific improvement aim***

NICs are social learning systems that enable educators to collaboratively address complex problems together—akin to the collective efficacy fostered in effective PLCs (Gomez et al., 2016). Effective PLCs build a sense of collective efficacy by establishing individual member engagement in activities and promoting belief in the group's capacity and capability to execute planned actions to accomplish a shared goal to support students' educational needs (Goddard et al., 2015; Voelkel & Chrispeels, 2017).

PLCs achieve a sense of collective efficacy by creating social learning structures anchored in a shared purpose and strong belief that all students can learn. Such PLCs inspire feelings of belonging and agency, and advance practice improvements through fostering both individual and group learning (Datnow & Park, 2018; Gallagher et al., 2016; Hairon et al., 2017; Hargreaves & O'Connor, 2017; Stoll & Louis, 2007). However, many PLCs struggle to actualize these elements fully, particularly in large, siloed secondary schools with diverse stakeholder engagement (Hubers, 2020; Voelkel & Chrispeels, 2017). Moreover, many PLCs become "sharing communities" without a substantive focus on joint work toward shared goals (de Jong et al., 2022; Gomez et al., 2016).

As such, we measure the individual's perception of the network's collective efficacy in pursuit of a specific improvement aim as a crucial aspect of their participation in NICs.

### ***Perceptions related to developing individual capabilities for problem solving***

NICs promote the use of continuous improvement methodologies in the context of a networked social learning infrastructure to build educator capacity for collaborative problem solving (Bryk et al., 2015; Russell et al., 2019). Guided by a central hub, NIC members engage in a rigorous process: understanding the root causes of the focal problem of practice; developing a theory of improvement; and utilizing continuous improvement cycles to design, test, and iteratively refine solutions to their focal problem of practice (Bryk et al., 2015; Hinnant-Crawford, 2020; Russell, Bryk, et al., 2017). To enable this practitioner-based improvement research, network structures are specifically designed to develop and deepen educators' capacity to draw on relevant research and systematically experiment with practice changes. Potential benefits accruing from this individual learning resonant with findings on productive professional learning communities that document how intentionally designed structures and routines can create opportunities to build individual teachers' knowledge and capabilities (Coburn et al., 2012; Horn & Kane, 2015; Little et al., 2003). NICs structure purposeful forms of collaboration that create opportunities for educators to seek help and promote reciprocal help-based and trusting relationships among members (Kallio & Halverson, 2020). Educators' engagement in network structures facilitates learning from colleagues with diverse expertise and forming a shared vision for what they can collectively accomplish (Neumerski & Yurkofsky, 2024; Russell et al., 2019).

In sum, we have identified three distinct elements as a basis for measuring participatory benefits. Taken together with a holistic evaluation of the benefits of participation and their perception of collective efficacy in targeting a valued improvement aim, participatory benefits include educators' perceptions that they are building their own individual capabilities to utilize continuous improvement methods and engage in collaborative learning.

### ***Individual-level factors distinguishing members' benefits***

Next, we consider two individual-level characteristics that we hypothesize may be associated with variation among educators' perceptions of participatory benefits: deep and frequent engagement in network activities and individual demographic characteristics.

#### ***Deep and frequent engagement***

First, we posit that members' deep and frequent engagement in network activities is associated with greater perceived benefits. Professional learning is a dynamic, continuous process. Sustained opportunities to work collaboratively can afford benefits to individual educators, especially in schools with a supportive professional climate (Patrick, 2022). Facilitating this, NICs create opportunities for educators at both the school and network levels to take on leadership roles, which can strengthen their social connections and deepen their sense of ownership of their work. In general, we would expect that teachers who participate in NICs with greater intensity would hold more positive views of their engagement.

#### ***Individual demographic characteristics***

Second, we posit that individual demographic characteristics may influence members' perceptions of participatory benefits. Extant research suggests that individuals' identities shape their experiences in learning communities. For example, demographically diverse teacher groups provide a broader pool of perspectives, which can foster greater innovation; yet this diversity can also challenge group cohesion and reduce social interaction among teachers with different views (Bridwell-Mitchell, 2015). Other research reports that teachers who negotiated the meaning of their own identity in teacher workgroups and addressed preconceptions about students'

sociocultural context were able to expand collective efficacy in addressing racial inequity in schools serving predominately students of color (Ishimaru & Takahashi, 2017). Grooms et al. (2021) found that teachers of color who faced a racialized school climate were less satisfied overall with their teaching careers and expressed more negative views about membership in their school.

### ***Network-level factors shaping member benefits***

The organizational structures and practices of networks are also expected to influence educators' participatory benefits. A supportive organizational context, including structural elements such as time and space for collaboration and leadership support, is critical to professional learning communities (Hargreaves & O'Connor, 2017; Patrick, 2022; Stoll & Kools, 2017; Woulfin & Spitzer, 2023). While research on PLCs mostly addresses school-level context (de Jong et al., 2022; Weddle, 2022), improvement networks are complex organizations operating within and in interaction with other complex organizations (e.g., schools, districts, and education agencies). All of these organizations can affect member experiences in varied ways.

We posit that three structural features of the NSI initiative are likely to influence member experiences: district contexts, hub organization capacity and expertise, and network goals.

#### ***District contexts***

Networks in the NSI initiative operated either as networks of schools within a single large urban school district or networks working in a collection of schools from multiple districts. We would expect this variability in context to influence the capacity of network hubs to manage relationships with district leaders, which could in turn influence members' participatory benefits. Given that hub leaders do not have formal authority over network members, they need to build social relationships and attempt to coordinate efforts with district leaders to enable educators' participation in network activities (Peurach et al., 2025, this issue).

We would expect networks working in more than one district to have more challenges ensuring supportive conditions for network member engagement. For example, Neumerski and Yurkofsky (2024) found that participants in two NICs faced multiple challenges related to conflicting norms and goals across teams, schools, and organizations. We also expect the characteristics of partnering districts to influence the effectiveness of collaboration among educators. For example, Patrick (2022) found that educators in Tennessee's largest districts (those with more than 50 schools) had more opportunities for educator collaboration but perceived collaborative learning opportunities as less valuable than other educators. This finding suggests that achieving participatory benefits may be more challenging for NSIs operating within large urban districts.

#### ***Hub organizations' capacity and expertise***

The improvement networks in our sample were led by different types of hub organizations. Beyond the NSI initiative, research suggests that different hub organizations offer distinct expertise and skills and can bring varied orientations about how to work collaboratively and achieve their intended improvement outcomes (Coburn et al., 2021; Farrell et al., 2022; Ishimaru et al., 2022; Penuel et al., 2020).

For example, certain hub organizations and hub leaders may have a greater capacity to enact a learning organization in ways that have implications for the participatory benefits members experience (Russell et al., 2019). Research on teacher collaboration in schools has frequently pointed to the important role school leaders play in creating the conditions to support productive collaboration. Specifically, Charner-Laird et al. (2017) found that principals fostered conditions to support teacher collaboration by framing the purpose of team time, maintaining a focus on individual and organizational improvement goals, and creating a safe space for experimentation

with practice changes. A reasonable conjecture is that hub leaders may play a similar role in improvement networks.

### **Network improvement goals**

At their core, NICs aim to understand and address practical problems and the educational systems that created them (Dolle et al., 2013). Some improvement goals may be more complex to address through continuous improvement approaches or NICs than others. A problem of practice with easily identified practical indicators of progress toward improvement aims is likely to facilitate educator engagement in continuous improvement processes (e.g., rapid cycle testing of practice changes). Practice domains where there is a strong research base informing a specific theory of improvement and that can guide the identification of interventions and practice changes may facilitate network formation because it is easier to gain consensus on the aspects of a system to target for improvement. In Bocala and Yurkofsky's (2024) study of the enactment of continuous improvement approaches, they found differences in educators' enactment of continuous improvement processes based on the level of uncertainty they experienced in their work. For example, a school that aimed to address Black students' experiences struggled to engage in continuous improvement because there was greater uncertainty about how to define the problem and gather data to examine it.

The improvement networks in the NSI initiative aimed to address core domains of work in secondary schools with different research bases and different affordances for addressing improvement efforts. *Instructional networks* draw on research-based instructional practices and work to build teachers' instructional capacity; however, it can be challenging to enact practical measures that support continuous instructional improvement (Russell, Sherer, et al., 2017). In contrast, *early warning and response networks* are also anchored in a strong body of applied research that guides the introduction of new routines but also benefits from the existence of ready indicators for monitoring student progress (Bryk et al., 2023; Ecker-Lyster & Niileksela, 2016; Wentworth & Nagaoka, 2020). Likewise, *post-secondary transition networks* leverage established insights into the critical events in the college application and matriculation process that predict student success, such as applying for financial aid, and typically have ready access to useable data (Bastedo et al., 2023; Binning et al., 2021). Yet these networks must build relationships with non-school system actors such as families and colleges to be most successful, which may complicate their network formation.

In sum, we expect educators to perceive the benefits of their participation differently depending on the educational context where the network operates, the intermediary organization operating the network, and their target for improvement.

### **Methodology**

Our conceptualization of the individual network member's participatory benefits rests on the understanding that educators develop: (1) a willingness to invest time engaging in valued network activities, (2) a sense of collective efficacy in pursuit of a specific improvement aim, and (3) a valuing of the capabilities they are developing to utilize continuous improvement methods and engage in collaborative local problem solving. We developed a measure, based on this conceptualization, to investigate the extent of members' perceived benefits and how variation in these perceptions was associated with member and network characteristics.

### **Data selection**

The data consist of reports from 2,073 school-based improvement team leaders and members from 34 networks who participated in the 2022–23 Improvement Network Health and Development (INHD) Survey (For more details about the survey and its administration, see Bryk et al., 2025 in this issue). We draw on data related to participant demographics, network roles, participation intensity, structural

**Table 1.** Descriptive statistics of participant-level variables.

Variable	N	%	Mean	SD	Min.	Max.
<b>Membership</b>						
Member tenure in network	2073	100%	2.17	1.39	0	5
Team lead	644	31.1%				
Team member	1429	68.9%				
Intensity of participation	2073	100%	0.88	0.55	0	1.5
<b>Gender</b>						
Woman	1278	61.6%				
Man	562	27.1%				
Additional gender identity	18	0.9%				
Didn't disclose gender	215	10.4%				
<b>Race/ethnicity</b>						
White	694	33.5%				
Asian	109	5.3%				
Black	336	16.2%				
Latinx	502	24.2%				
Mixed race	124	6%				
Additional race identity	33	1.6%				
Didn't disclose race	275	13.3%				
Member participatory benefits	2073	100%	2.72	2.66	-7.1	6.98

features of the networks, and a set of items that measure participatory benefits. Descriptive statistics can be found in [Table 1](#).

We created dummy variables for race/ethnicity for the categories of “White,” “Asian,” “Black,” “Latinx,” “mixed race,” and “additional race identity,” and for individuals who did not respond to the question, “didn’t disclose race.” We created dummy variables for gender categories of “man,” “woman,” “additional gender identity,” and “didn’t disclose gender.” We also created a dummy variable for “team lead” to identify individuals who held a formal role for leading the inquiry work to distinguish them from “team members” in local improvement teams.

*Member tenure* is the number of years the individual has participated in the network. We constructed a measure of *intensity of participation* from two survey items. One addressed the frequency of improvement team meetings and, the other, the consistency of the individual’s reported participation. We multiplied these two items to indicate the number of team meetings attended per month. A value of 0 indicates no participation in improvement meetings, a value of 1 indicates regular participation once a month, and a value of 1.5 indicates regular participation more than once a month.

At the network-level, we selected variables that captured select organizational features aligned with our literature review (see [Table 2](#)). *Archetype* refers to the three core targets for improvement represented among the NSI: instructional, early warning and response, and post-secondary acceptance to a well-matched institution (PSM). *Duration since launch* refers to the number of years the intermediary organization operated as an improvement network funded by the Bill & Melinda Gates Foundation, as of spring 2023. Networks’ *duration since launch* ranges from 1.5 to 5 years

**Table 2.** Descriptive statistics of network-level variables.

Variable	N	%	Mean	SD	Min.	Max.
Single district	15	44.12%				
<b>Archetype</b>						
Instructional	19	55.88%				
Early warning and response	10	21.41%				
Post-secondary match	5	14.71%				
Duration since launch	34	100%	3.6	1.15	1.5	5
<b>Intermediary hub type</b>						
Technical assistance org.	19	55.88%				
Institution of higher education	7	20.59%				
District	4	11.76%				
Other	4	11.76%				

with a mean of 3.6 years. *Network context* refers to the local education agencies overseeing the schools that participate in the network. A dummy variable distinguished between networks operating within single, large urban districts and networks operating across multiple districts. In addition, we created dummy variables for each *type of intermediary hub organization* (e.g., technical assistance providers, higher education institutions, alliances of multiple organizations, district central offices, or charter management organizations). Alliances and charter management organizations were consolidated into a single dummy variable of “other” due to small sample size. These different intermediary hub organizations engage in different structures and practices to initiate, organize, and operate their networks (Russell et al., 2025 in this issue).

Finally, we selected a subset of 11 items in the INHD Survey for the construction of an outcome variable of member participatory benefits. Unlike the bulk of the survey items where individuals are asked to comment on the norms and practices at work in their respective NSIs, these selected items ask network members about their personal experiences and beliefs associated with participation in the improvement network. Each of these items addresses different aspects of the perceived benefit of participating in a NIC.

### Outcome variable construction

We employed Rasch rating scale analysis to construct a participatory benefits measure (Andrich, 1978; Bond et al., 2020; Masters & Wright, 1984). A Rasch analysis calibrates the relative difficulty of endorsing each item and affords tests as to whether an item set functions as a unidimensional, hierarchically organized scale. The analysis generates a fit statistic for each candidate item for assessing the consistency of that item within the developmental dimension being measured and constitutes a test of the scale’s internal construct validity (for a more detailed explanation, see Bryk et al., 2025, in this issue). Initial analyses identified two misfitting items, which were subsequently deleted resulting in a final nine-item measure. Table 3 details these items, grouped by the three domains of benefits described earlier.

Figure 1 presents the structure of the final measure on the Rasch logit scale. The top histogram is the distribution of individual respondents, and the bottom Wright map shows the nine items ordered by their difficulty to endorse. While more than 500 individuals provided the highest responses across all items, the remaining responses were distributed across the entire range of the measure. The item

**Table 3.** The nine items used in measure construction by conceptual construct.

Rasch Scale	Construct	Item
<b>Holistic valuation: Willingness/commitment to invest time</b>		
1 (easiest to endorse)	Values network participation	I value the opportunity to be part of [NETWORK NAME]
7	Network is worthwhile	[NETWORK NAME] is worth the time it takes
9 (hardest to endorse)	Would give network priority	I am willing to give up other professional commitments to stay engaged in this network
<b>Benefit: Collective pursuit of a valued improvement aim</b>		
4	Makes a difference for students	I believe our work is making a difference for the students we serve
2	Will improve my school	The work we do in this network has the potential to improve [NETWORK PROBLEM] at our school(s)
3	Values belonging to community	Feeling a part of a larger community aiming to accomplish something important together
<b>Benefit: Strengthening individual capabilities in support of collaborative problem solving</b>		
5	Inquiry helps us improve	I believe engaging in [INQUIRY ROUTINES] will help us improve [NETWORK PROBLEM]
8	Learns improvement tools	Learning how to use improvement tools and methods (e.g., [INQUIRY ROUTINES], analyzing data)
6	Values access to new ideas	Getting access to new ideas from colleagues at other schools or from researchers associated with the network

### Persons and Items for Participatory Benefits measure

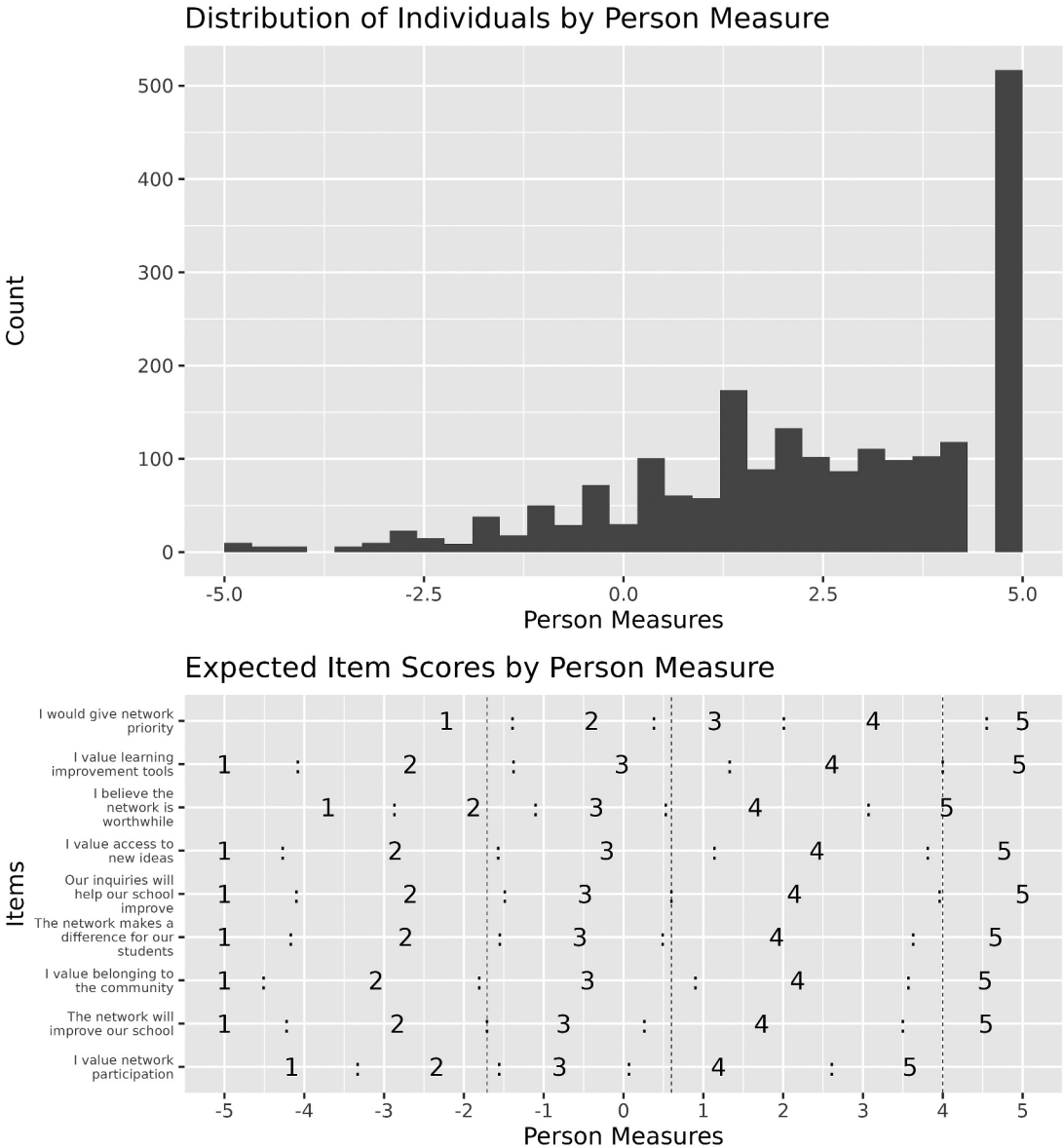


Figure 1. Wright map of participatory benefits measure for individuals and items by person measures.

that anchors the bottom of the scale (i.e., easiest to endorse) offers a general assessment of the value of being part of the network. The hardest-to-endorse item, at the top of the scale, queries whether the respondent would be willing to give up other commitments to stay engaged in the network. The middle seven items capture two different classes of specific benefits: (1) their perceived collective benefits to the school and its students, and (2) the added value to them individually in learning continuous improvement methods and being able to participate in the network’s social learning structure. The colons indicate where on the measurement scale respondents are most likely to shift among the categories in their chosen responses to each given item. The dotted lines represent the thresholds we established for the purposes of developing a probability density display for the

participatory benefits measure. (See Bryk et al., 2025, in this issue for further details about these displays.)

The Rasch analysis generated an individual respondent reliability of 0.92. This is the measure's reliability in distinguishing among individuals in the entirety of the NSI. A subsequent three-level unconditional hierarchical linear model (HLM) analysis indicated that the measure also had excellent reliability in distinguishing among individuals within networks (0.84) and between networks (0.92).

## Findings

### *Descriptive exploration of variation among networks*

Some 27% of the variation in this measure is between networks. To visualize the significance of this variability, we created a caterpillar plot of the rescaled network-level Empirical Bayes (EB) estimates and their corresponding two standard error bars in Figure 2. The network-level estimates run across almost the entire 0–10 point range for the measure, indicating large differences among networks in members' perceived benefits.

The probability density display for participatory benefits provides further descriptive details of the variation among networks. Figure 3 compares the distribution of response categories within the measure from the five lowest versus the five highest networks. The modal response for the top five networks falls in the highest category. Almost 60% of the members in these networks express a great deal of value in learning improvement methods, gaining access to new ideas, and being socially connected in the community. They strongly agree that their collective efforts will make a difference for the school and its students. They may agree or strongly agree that they are even

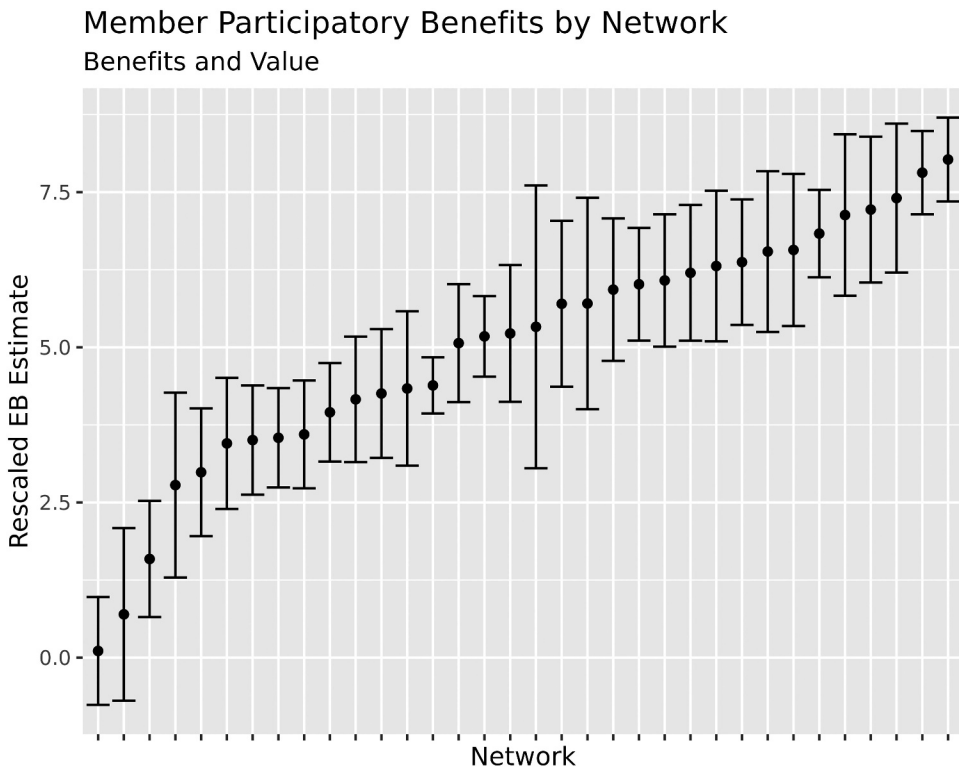
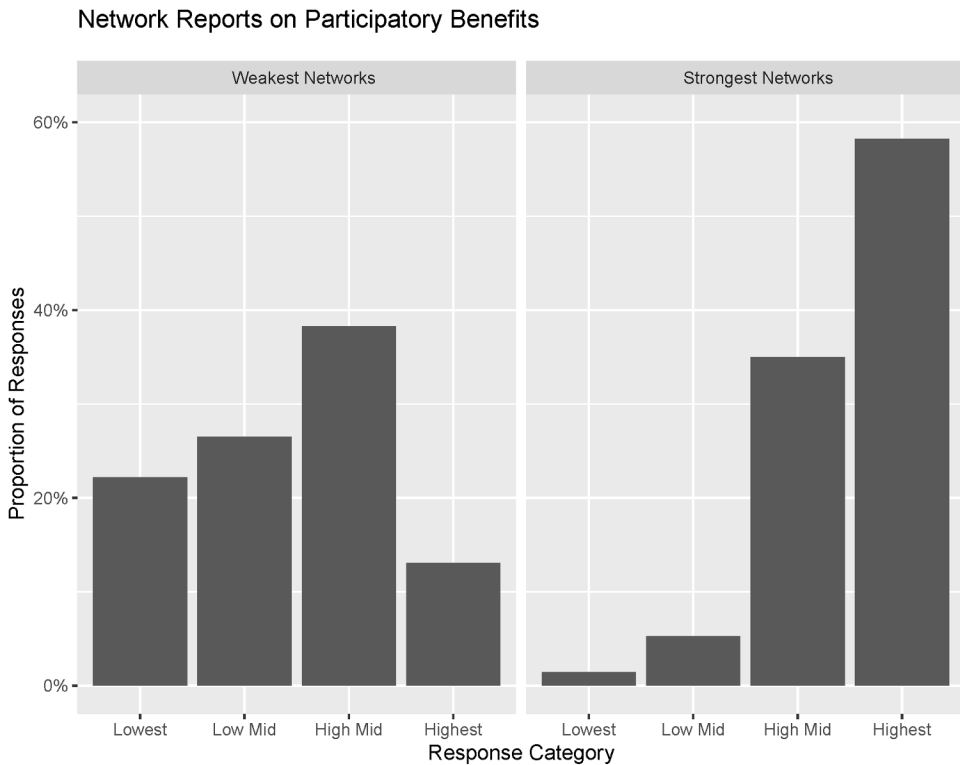


Figure 2. Caterpillar plot of rescaled network-level EB estimates for participatory benefits.



**Figure 3.** Four-bar distribution of participatory benefits in the most and least developed networks.

willing to give up other professional commitments to stay engaged in the networks. Responses from less than 5% of members in these networks fell into the bottom category. In contrast, in the five lowest-scoring networks, more than 20% of the respondents fell into this lowest category. These individuals experienced few or no personal benefits in learning improvement methods and being socially connected to the community, and do not endorse that the improvement network is making a difference for students and their school. These individuals may not agree that the network was worth their time nor value the opportunity to be part of it, and they are unwilling to give up other opportunities to remain involved. Another 20-plus percent of respondents in this group of networks fell into the “low-middle” category. They may perceive a moderate amount of personal benefits and moderately agree that collective benefits will accrue to their students and school. Additionally, they moderately value the opportunity to be part of the network but only slightly agree that they would be willing to give up other professional commitments to stay engaged. The overall distribution of responses in the top five networks is highly skewed toward the top two categories (over 90%). In contrast, members responses in the low-scoring networks are more varied, with some 50% in the lowest two categories. Responses in low-scoring networks represent at best a tepid endorsement of the benefits of participation.

### ***Hierarchical linear modeling***

We investigated the relationships of the predictor variables for participatory benefits using a three-level hierarchical linear model (HLM 8.2.3) (Kamata et al., 2008; Raudenbush & Bryk, 2002; Raudenbush et al., 2019). Our three-level HLM involved a measurement model at level 1 that allowed us to adjust for the different standard errors associated with each individual’s survey-based measure; at level 2, it allowed us to include predictors of variation among

**Table 4.** Measure of participatory benefits – final estimation of fixed effects.

Variable	Unconditional Model	Level-2 predictors	Level-3 predictors	Final Model	Hedge's g (ES)
Intercept $\beta_{000}$	3.16 (0.19)***	3.12 (0.19)***	3.07 (0.15)***	3.03 (0.15)***	
Team lead		0.46 (0.1)***		0.47 (0.1)***	0.25
Member tenure		0.09 (0.04)*		0.09 (0.04)*	0.24 <sup>a</sup>
Intensity		0.48 (0.12)***		0.5 (0.12)***	0.4 <sup>a</sup>
Asian		0.13 (0.22)		0.13 (0.22)	
Black		0.33 (0.14)**		0.33 (0.14)*	0.18
Latinx		0.34 (0.12)***		0.34 (0.14)**	0.18
Mixed race		0.52 (0.21)*		0.51 (0.15)***	0.27
Additional race		0.88 (0.3)**		0.83 (0.3)**	0.45
Didn't disclose race		-0.28 (0.25)		-0.46 (0.19)*	-0.25
Man		-0.03 (0.08)			
Additional gender		-0.45 (0.58)			
Didn't disclose gender		-0.28 (0.23)			
Single district			-1.38 (0.37)***	-1.36 (0.36)***	-1.18
Duration since launch			0.35 (0.12)**	0.35 (0.11)**	1.07 <sup>a</sup>
EWR archetype			0.56 (0.24)*	0.57 (0.24)*	0.5
PSM archetype			-0.12 (0.41)	-0.1 (0.4)	
IHE			0.72 (0.3)*	0.7 (0.29)*	0.61
District			0.72 (0.68)	0.7 (0.66)	
Other			-0.04 (0.35)	-0.02 (0.39)	
Random effects (Variance)					
$e_0$	3.362***	3.113***	3.363***	3.119***	
$r_{00}$	1.242***	1.198***	0.596***	0.559***	

<sup>a</sup>We calculated the effect size for these variables as the difference between the minimum and maximum values found in the data.  
\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

participants within networks, and at level 3, predictors of variation between networks. This is the same model described by Bryk et al. (2025, this issue). All level-2 predictors were group-mean centered to estimate the predictor effects operating within networks, and all level-3 predictors were grand mean centered. We conducted a fully unconditional model to examine the variation between and within networks. Then, we ran separate models for all participant-level predictors and all network-level predictors and then a final full model (see Supplemental Appendix A available online for more details).

Table 4 presents the findings. The table includes the estimated coefficients for each predictor, its standard error, and a denotation for statistical significance. In addition, we calculated the Hedge's g effect size for each significant effect in the final model. In calculating the Hedge's g effect size for the three continuous variables, we based this on the predicted difference between the minimum and maximum values on each respective variable.

### ***Extent of individual member engagement is associated with participatory benefits***

First, members who are more engaged with their network report greater benefits. These associations are manifest in three different ways. School-based improvement team leads who have added responsibilities tend to offer more positive accounts than their team members (ES of 0.25). While controlling for these role differences, individuals who participate more regularly in school-based improvement team meetings also report greater benefits (ES of 0.4). This effect size of 0.4 is the difference between educators who did not participate in local improvement team meetings (value of 0) and educators who participated consistently more than once a month (value of 1.5). Likewise, stronger reports were offered by network members with a greater length of tenure in their network. This results in an overall Hedge's effect estimate of 0.24 for network members with 5 years of tenure. While on its face an estimated coefficient of 0.09 may seem small, it is important to recognize that this is the coefficient per year of membership. Over a five-year period, this produces a cumulative standardized effect size of 0.24.

### ***Network members' racial identity relates to their participatory experience***

Second, members from minoritized racial groups—Black, Latinx, mixed race, and additional race identities—expressed greater added value from their participation in the network with effect sizes of 0.18, 0.18, 0.27, and 0.45, respectively, as compared to their White colleagues. In contrast, network members who did not disclose their race identity expressed more negative participatory benefits with an effect size of  $-0.25$ . These results suggest that the NSI in general created supportive environments for their minoritized members. In contrast, members who did not disclose their racial identity expressed fewer benefits from their participation.

### ***In longer operating networks, educators reported greater benefits***

Participants also reported different levels of benefits based on the duration of their networks. Within our sample, networks' *duration since launch* ranges from 1.5 years to 5 years. Across this range, the effective difference in reported benefits is equivalent to a standardized effect size of 1.07. While numerous factors might explain these effects, the results are consistent with a hypothesis that as improvement networks mature over time, they can evolve stronger structures, practices, and norms to engage participants more meaningfully (Russell, Bryk, et al., 2017).

### ***Members in single-district networks offered more negative responses***

Nearly half ( $n = 15$ ) of the improvement networks in our sample operate in the context of a single, large urban school district. Members in these networks offered weaker reports about their benefits when compared to members of other networks. The single district effect was significant with a large effect size of  $-1.18$ . We assert that these networks operate in contexts where multiple new initiatives may be simultaneously competing for educators' time and attention. Establishing a productive relationship between the district's central office and the network hub can be more challenging, district leadership churn more frequently, and competing organizational priorities may impact members' engagement in the work. Team members may also interpret their participation as the "next new thing they are required to do," which would create a more challenging starting point to begin an NSI and sustain its collaborative work.

### ***Benefit reports varied across different types of intermediary organizations' operating hubs***

Members in hubs organized and operated by institutions of higher education (IHE) offered more positive reports of their participatory benefits (ES of 0.61); *district* and *other* hub types were not significantly different from the reference category of technical assistance providers. This finding is consistent with claims in the growing literature on research-practice-partnerships (Farrell et al., 2022; Ishimaru et al., 2022; Penuel et al., 2020) that the engagement of academic faculty can bring distinctive benefits in building a learning organization, developing an evidence-based culture, and adapting promising practices to their local context (Russell et al., 2019).

Additionally, at the network level, we observed that members in networks who focused on an improvement goal of *early warning and response* had more positive experiences when compared to *instructional networks* or ones that focused on *post-secondary well match*. These networks were characterized by stronger endorsements of participatory benefits with an effect size of 0.5. We note that the early warning and response networks built off a well-established applied research base, including demonstrated successful interventions and useable improvement measures, offering these networks a stronger starting base (Balfanz et al., 2007; Borman et al., 2018; Bos et al., 2022; Ecker-Lyster & Niileksela, 2016; Krone Phillips, 2019).

Lastly, we also investigated possible interaction effects of network archetype and hub type on individual membership variables of improvement team role, member tenure in network, and intensity of participation. All interactions were insignificant.

## Conclusion

This article reports on the development of a measure of member participatory benefits in improvement networks. We found that the measure can reliably distinguish among individuals and networks. We have presented descriptive evidence that links a range of individual and network characteristics to educators' reports of perceived benefits. We anticipate that other researchers, network leaders, and educational reformers will be able to use this measure in the future to assess their progress toward resolving persistent problems of practice facing school-based educators.

In general, our findings support the contention that a vital improvement network makes significant, sustained demands on educators' time. This is consistent with the reported positive findings for member length of participation, intensity of participation, and duration of network operations. It takes time for a network to establish and refine the necessary capabilities, structures, and culture to support local teams to address their problem of practice. Likewise, a vital NSI places a premium on protected opportunities for school-based improvement teams to engage in their inquiry work, meet with hub members, and participate with the broader network. Our findings on this account align with broader, mostly qualitative, research on PLCs and professional collaboration and learning which have highlighted the importance of time in educational change efforts (Datnow & Park, 2018; Honig & Rainey, 2023; Richter et al., 2021).

A central principle of improvement science and NICs is a recognition of the diversity of expertise needed to deeply understand the focal problem of practice and possible solutions. This calls for blending the professional know-how of practitioners, theoretical knowledge and empirical skills of researchers and scholars, and specialized skills and analytical tools of improvement specialists (Bryk et al., 2015). Supportive evidence on this account can also be seen in our results. Hubs operated by institutions of higher education were associated with more positive member participatory benefits. These institutions bring relevant research expertise into an improvement network and appear to offer important support for professional improvement-oriented collaboration. Likewise, networks focused on early warning and response and supported by hubs with prior experiences in this domain were able to leverage established research-based initiatives and analytical tools as a guide for initiating their work (Bryk et al., 2023; Ecker-Lyster & Niileksela, 2016).

Finally, and perhaps most significantly, improvement networks in the NSI initiative were designed to confront systemic challenges for historically minoritized students. Salient in this regard is our finding of more positive benefit reports from educators of minoritized racial backgrounds. These results suggest that many NSIs have been effective in creating an inclusive and supportive environment for engaging diverse practitioners in addressing racially inequitable educational practices.

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## References

- Akiba, M., & Liang, G. (2016). Effects of teacher professional learning activities on student achievement growth. *Journal of Educational Research*, 109(1), 99–110. <https://doi.org/10.1080/00220671.2014.924470>
- Andrich, D. (1978). A rating formulation for ordered response categories. *Psychometrika*, 43(4), 561–573. <https://doi.org/10.1007/BF02293814>
- Avidov-Ungar, O. (2016). A model of professional development: Teachers' perceptions of their professional development. *Teachers & Teaching*, 22(6), 653–669. <https://doi.org/10.1080/13540602.2016.1158955>
- Balfanz, R., Herzog, L., & MacIver, D. J. (2007). Preventing student disengagement and keeping students on the graduation path in urban middle-grades schools: Early identification and effective interventions. *Educational Psychologist*, 42(4), 223–235. <https://doi.org/10.1080/00461520701621079>
- Bastedo, M. N., Umbricht, M., Bausch, E., Byun, B.-K., & Bai, Y. (2023). How well do contextualized admissions measures predict success for low-income students, women, and underrepresented students of color? *Journal of Diversity in Higher Education*, Advance online publication. <https://doi.org/10.1037/dhe0000499>
- Binning, K. R., Blatt, L. R., Chen, S., & Votruba-Drzal, E. (2021). Going to college with a posse: How having high school peers on campus supports college achievement. *AERA Open*, 7. <https://doi.org/10.1177/23328584211049223>
- Bocala, C., & Yurkofsky, M. (2024). Continuous improvement and the 'wicked' problem of racial inequity. *Journal of Educational Change*. <https://doi.org/10.1007/s10833-024-09520-1>
- Bond, T. G., Yan, Z., & Heene, M. (2020). *Applying the Rasch model: Fundamental measurement in the human sciences* (4th ed). Routledge.
- Borman, T. H., Bos, J. M., O'Brien, B. C., Park, S. J., & Liu, F. (2018). *I3 BARR Validation Study Impact Findings: Cohorts 1 and 2*. American Institutes for Research.
- Bos, J. M., Graczewski, C., Dhillon, S., Auchstetter, A., Casasanto-Ferro, J., & Kitmitto, S. (2022). *Building assets and reducing risks (BARR) I3 scale-up evaluation. Final report*.
- Bridwell-Mitchell, E. N. (2015). Theorizing teacher agency and reform: How institutionalized instructional practices change and persist. *Sociology of Education*, 88(2), 140–159. <https://doi.org/10.1177/0038040715575559>
- 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.
- Bryk, A. S., Greenberg, S., Bertani, A., Sebring, P., Tozer, S. E., & Knowles, T. (2023). *How a city learned to improve its schools*. Harvard Education Press.
- Bryk, A. S., Y. L. A., Luppescu, S., & Bui, M. A. (2025). Examining the validity of practical measures of network health and development. *Peabody Journal of Education*, 100(1), 28–47. <https://doi.org/10.1080/0161956X.2025.2444840>
- Campbell, C., Osmond-Johnson, P., Faubert, B., Zeichner, K., Hobbs-Johnson, A., Brown, S., DaCosta, P., Hales, A., Kuehn, L., Sohn, J., & Steffensen, K. (2017). *The state of educators' professional learning in Canada: Final research report*. Learning Forward with.
- Charner-Laird, M., Ng, M., Johnson, S. M., Kraft, M. A., Papay, J. P., & Reinhorn, S. K. (2017). Gauging goodness of fit: Teachers' responses to their instructional teams in high-poverty schools. *American Journal of Education*, 123(4), 553–584. <https://doi.org/10.1086/692663>
- Coburn, C. E., Penuel, W. R., & Farrell, C. C. (2021). Fostering educational improvement with research-practice partnerships. *Phi Delta Kappan*, 102(7), 14–19. <https://doi.org/10.1177/00317217211007332>

- Coburn, C. E., Russell, J. L., Kaufman, J. H., & Stein, M. K. (2012). Supporting sustainability: Teachers' advice networks and ambitious instructional reform. *American Journal of Education*, 119(1), 137–182. <https://doi.org/10.1086/667699>
- Datnow, A., & Park, V. (2018). *Professional collaboration with purpose: Teacher learning towards equitable and excellent schools*. Routledge.
- de Jong, L., Meirink, J., & Admiraal, W. (2022). School-based collaboration as a learning context for teachers: A systematic review. *International Journal of Educational Research*, 112, 101927. <https://doi.org/10.1016/j.ijer.2022.101927>
- Dolle, J. R., Gomez, L. M., Russell, J. L., & Bryk, A. S. (2013). More than a network: Building professional communities for educational improvement. *Teachers College Record: The Voice of Scholarship in Education*, 115(14), 443–463. <https://doi.org/10.1177/016146811311501413>
- DuFour, R., DuFour, R., Eaker, R., Many, T. W., Mattos, M., & Muhammad, A. (2020). *Learning by doing: A handbook for professional learning communities at work* (4th ed). Solution Tree.
- Ecker-Lyster, M., & Niileksela, C. (2016). Keeping students on track to graduate: A synthesis of school dropout trends, prevention, and intervention initiatives. *The Journal of At-Risk Issues*, 19(2), 24–31.
- Farrell, C. C., Penuel, W. R., Allen, A., Anderson, E. R., Bohannon, A., Coburn, C., & Brown, S. L. (2022). Learning at the boundaries of research and practice: A framework for understanding research–practice partnerships. *Educational Researcher*, 51(3), 197–208. <https://doi.org/10.3102/0013189X211069073>
- Gallagher, M. J., Malloy, J., & Ryerson, R. (2016). Achieving excellence: Bringing effective literacy pedagogy to scale in Ontario's publicly-funded education system. *Journal of Educational Change*, 17(4), 477–504. <https://doi.org/10.1007/s10833-016-9284-6>
- Goddard, R., Goddard, Y., Sook Kim, E., & Miller, R. (2015). A theoretical and empirical analysis of the roles of instructional leadership, Teacher collaboration, and collective efficacy beliefs in support of Student learning. *American Journal of Education*, 121(4), 501–530. <https://doi.org/10.1086/681925>
- Gomez, L. M., Russell, J. L., Bryk, A. S., LeMahieu, P. G., & Mejia, E. M. (2016). The right network for the right problem. *Phi Delta Kappan*, 98(3), 8–15. <https://doi.org/10.1177/0031721716677256>
- Gore, J., Lloyd, A., Smith, M., Bowe, J., Ellis, H., & Lubans, D. (2017). Effects of professional development on the quality of teaching: Results from a randomised controlled trial of quality teaching rounds. *Teaching & Teacher Education*, 68, 99–113. <https://doi.org/10.1016/j.tate.2017.08.007>
- Grooms, A. A., Mahatmya, D., & Johnson, E. T. (2021). The retention of educators of color amidst institutionalized racism. *Educational Policy*, 35(2), 180–212. <https://doi.org/10.1177/0895904820986765>
- Guskey, T. R. (2010). Lessons of mastery learning. *Educational Leadership*, 68(2), 52–57.
- Guskey, T. R. (2014). Measuring the effectiveness of educators' professional development. In L. E. Martin, S. Kragler, D. J. Quatroche, & K. L. Bauserman (Eds.), *Handbook of professional development in education: Successful models and practices, prek-12* (pp. 447–465). Guilford Publications.
- Haberman, M. (1995). The dimensions of excellence in programs preparing teachers for urban poverty schools. *Peabody Journal of Education*, 70(2), 24–43. <https://doi.org/10.1080/01619569509538821>
- Hairon, S., Goh, J. W. P., Chua, C. S. K., & Wang, L. (2017). A research agenda for professional learning communities: Moving forward. *Professional Development in Education*, 43(1), 72–86. <https://doi.org/10.1080/19415257.2015.1055861>
- Hargreaves, A., & O'Connor, M. T. (2017). Cultures of professional collaboration: Their origins and opponents. *Journal of Professional Capital & Community*, 2(2), 74–85. <https://doi.org/10.1108/JPCCC-02-2017-0004>
- Hinnant-Crawford, B. N. (2020). *Improvement science: A primer*. Myers Education Press.
- Honig, M. I., & Rainey, L. R. (2023). *From tinkering to transformation: How school district central offices drive equitable teaching and learning*. Harvard Education Press.
- Horn, I. S., & Kane, B. D. (2015). Opportunities for professional learning in mathematics teacher workgroup conversations: Relationships to instructional expertise. *Journal of the Learning Sciences*, 24(3), 373–418. <https://doi.org/10.1080/10508406.2015.1034865>
- Horn, I. S., & Little, J. W. (2010). Attending to problems of practice: Routines and resources for professional learning in teachers' workplace interactions. *American Educational Research Journal*, 47(1), 181–217. <https://doi.org/10.3102/0002831209345158>
- Hubers, M. D. (2020). Paving the way for sustainable educational change: Reconceptualizing what it means to make educational changes that last. *Teaching & Teacher Education*, 93, 103083. <https://doi.org/10.1016/j.tate.2020.103083>
- Ishimaru, A. M., Barajas-Lopez, F., Sun, M., Scarlett, K., & Anderson, E. (2022). Transforming the role of RPPs in remaking educational systems. *Educational Researcher*, 51(7), 465–473. <https://doi.org/10.3102/0013189X221098077>
- Ishimaru, A. M., & Takahashi, S. (2017). Disrupting racialized institutional scripts: Toward parent–Teacher transformative agency for educational justice. *Peabody Journal of Education*, 92(3), 343–362. <https://doi.org/10.1080/0161956X.2017.1324660>
- Kallio, J. M., & Halverson, R. R. (2020). Designing for trust-building interactions in the initiation of a networked improvement community. *Frontiers in Education*, 4, 154. <https://doi.org/10.3389/feduc.2019.00154>
- Kamata, A., Bauer, J. D., & Miyazaki, Y. (2008). Multilevel measurement modeling. In A. A. O'Connell & D. B. McCoach (Eds.), *Multilevel modeling of educational data* (pp. 345–388). Information Age Publishing, Incorporated.

- Krone Phillips, E. (2019). *The make-or-break year: Solving the dropout crisis one ninth Grader at a time*. The new press.
- Lecat, A., Raemdonck, I., Beusaert, S., & März, V. (2019). The what and why of primary and secondary school teachers' informal learning activities. *International Journal of Educational Research*, 96, 100–110. <https://doi.org/10.1016/j.ijer.2019.06.003>
- Little, J. W., Gearhart, M., Curry, M., & Kafka, J. (2003). Looking at student work for teacher learning, teacher community, and school reform. *Phi Delta Kappan*, 85(3), 184–192. <https://doi.org/10.1177/003172170308500305>
- Masters, G. N., & Wright, B. D. (1984). The essential process in a family of measurement models. *Psychometrika*, 49(4), 529–544. <https://doi.org/10.1007/BF02302590>
- Neumerski, C. M., & Yurkofsky, M. M. (2024). Dilemmas in district–university partnerships: Examining network improvement communities as levers for systems change. *Journal of Educational Administration*, 62(6), 702–715. <https://doi.org/10.1108/JEA-10-2023-0261>
- Owen, S. (2016). Professional learning communities: Building skills, reinvigorating the passion, and nurturing teacher wellbeing and “flourishing” within significantly innovative schooling contexts. *Educational Review*, 68(4), 403–419. <https://doi.org/10.1080/00131911.2015.1119101>
- Patrick, S. K. (2022). Organizing schools for collaborative learning: School leadership and teachers' engagement in collaboration. *Educational Administration Quarterly*, 58(4), 638–673. <https://doi.org/10.1177/0013161X221107628>
- Penuel, W. R., Riedy, R., Barber, M. S., Peurach, D. J., LeBouef, W. A., & Clark, T. (2020). Principles of collaborative education research with stakeholders: Toward requirements for a new research and development infrastructure. *Review of Educational Research*, 90(5), 627–674. <https://doi.org/10.3102/0034654320938126>
- Peurach, D. J., Jones, E. S., Duff, M., Sherer, J. Z., & Matthis, C. S. (2025). The practice and contexts of hub and district leadership: New directions in research on educational improvement networks. *Peabody Journal of Education*, 100(1), 117–132. <https://doi.org/10.1080/0161956X.2025.2444846>
- Poortman, C. L., Brown, C., & Schildkamp, K. (2022). Professional learning networks: A conceptual model and research opportunities. *Educational Research*, 64(1), 95–112. <https://doi.org/10.1080/00131881.2021.1985398>
- Prenger, R., Poortman, C. L., & Handalzalts, A. (2017). Factors influencing teachers' professional development in networked professional learning communities. *Teaching & Teacher Education*, 68, 77–90. <https://doi.org/10.1016/j.tate.2017.08.014>
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Vol. 1). Sage Publications.
- Raudenbush, S. W., Bryk, A. S., Cheong, A. S., Fai, Y. F., Congdon, R. T., & du Toit, M. (2019). *HLM 8: Hierarchical linear and nonlinear modeling*. Scientific Software International.
- Richter, E., Kunter, M., Marx, A., & Richter, D. (2021). Who participates in content-focused teacher professional development? Evidence from a large scale study. *Frontiers in Education*, 6, 6. <https://doi.org/10.3389/educ.2021.722169>
- Rohanna, K. (2022). Extending evaluation capacity building theory to improvement science networks. *American Journal of Evaluation*, 43(1), 46–65. <https://doi.org/10.1177/1098214020963189>
- Ronfeldt, M., Farmer, S. O., McQueen, K., & Grissom, J. A. (2015). Teacher collaboration in instructional teams and student achievement. *American Educational Research Journal*, 52(3), 475–514. <https://doi.org/10.3102/0002831215585562>
- Russell, J. L., Bryk, A., Dolle, J., Gomez, L. M., Lemahieu, P., & Grunow, A. (2017). A framework for the initiation of networked improvement communities. *Teachers College Record*, 119(5), 1–36. <https://doi.org/10.1177/016146811711900501>
- Russell, J. L., Bryk, A. S., Peurach, D. J., Sherer, J. Z., Duff, M., Sherer, D., & Matthis, C. S. (2025). Catalyzing scientific-professional learning communities: A framework for conceptualizing the health and development of educational improvement networks. *Peabody Journal of Education*, 100(1), 7–27. <https://doi.org/10.1080/0161956X.2025.2444839>
- Russell, J. L., Bryk, A. S., Peurach, D., Sherer, D., Khachatryan, E., LeMahieu, P. G., Sherer, J. Z., & Hannan, M. (2019). The social structure of networked improvement communities: Cultivating the emergence of a scientific-professional learning community. *American Educational Research Association Annual Meeting*, Toronto, ON (pp. 41).
- Russell, J. L., Sherer, J. Z., Iriti, J., & Long, C. (2017). *The better math teaching network year one: Developmental evaluation report*. Prepared for The Nellie Mae Education Foundation.
- Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of Educational Change*, 7(4), 221–258. <https://doi.org/10.1007/s10833-006-0001-8>
- Stoll, L., & Kools, M. (2017). The school as a learning organisation: A review revisiting and extending a timely concept. *Journal of Professional Capital & Community*, 2(1), 2–17. <https://doi.org/10.1108/JPC-09-2016-0022>
- Stoll, L., & Louis, K. S. (2007). *Professional learning communities*. McGraw-Hill Education.
- Vangrieken, K., Dochy, F., Raes, E., & Kyndt, E. (2015). Teacher collaboration: A systematic review. *Educational Research Review*, 15, 17–40. <https://doi.org/10.1016/j.edurev.2015.04.002>
- Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. *Teaching & Teacher Education*, 24(1), 80–91. <https://doi.org/10.1016/j.tate.2007.01.004>

- Voelkel, R. H., & Chrispeels, J. H. (2017). Understanding the link between professional learning communities and teacher collective efficacy. *School Effectiveness and School Improvement, 28*(4), 505–526. <https://doi.org/10.1080/09243453.2017.1299015>
- Weddle, H. (2022). Approaches to studying teacher collaboration for instructional improvement: A review of literature. *Educational Research Review, 35*, 100415. <https://doi.org/10.1016/j.edurev.2021.100415>
- Wentworth, L., & Nagaoka, J. (2020). Early warning indicators in education: Innovations, uses, and optimal conditions for effectiveness. *Teachers College Record, 122*(14), 1–22. <https://doi.org/10.1177/016146812012201401>
- Woulfin, S. L., & Spitzer, N. (2023). Time is ticking: The dynamics of education reform in the covid-era. *Journal of Educational Administration, 61*(3), 256–271. <https://doi.org/10.1108/JEA-09-2022-0147>
- Yurkofsky, M. M., Peterson, A. J., Mehta, J. D., Horwitz-Willis, R., & Frumin, K. M. (2020). Research on continuous improvement: Exploring the complexities of managing educational change. *Review of Research in Education, 44*(1), 403–433. <https://doi.org/10.3102/0091732X20907363>