

Building a Networked Improvement Community to Promote Equitable, Coherent Systems of Science Education: How a State-Level Team Can Support District-Level Change Efforts

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Abstract

This paper describes a Networked Improvement Community comprised of a network of 13 states focused on improving coherence and equity in state systems of science education. Grounded in principles of improvement science adapted from healthcare, we are developing and testing resources for formative assessment in science, with the aim of developing systems where actors at every level of the education system are oriented toward a common vision for science, and where there is a common commitment to equity. The paper describes these strategies and implications of this work for district-level change efforts.

Key Words

science education, networked improvement communities, coherence, equity

The purpose of this paper is to describe a partnership between two universities and a professional association of state education agency leaders in science.

The paper describes the aims of the partnership and its key activities, which involve not only state leaders but also teams comprised of district administrators, teacher leaders, and other organizations that are integral to creating coherent and equitable systems of science and education.

The partnership describes the roles that education leaders can play in providing more coherent guidance to teachers regarding subject matter teaching, a key condition for implementing changes associated with adoption of ambitious new standards. The paper is written from the perspective of leaders in this partnership.

Need for the Partnership

Many educators see their state department of education as an obstacle to improving teaching and learning. Teachers can view the state as a source of incoherent guidance about what they should be doing in their classrooms, even when state leaders make efforts to bring standards, assessments, and curricular frameworks into alignment.

Leaders try to create instructional coherence by buffering teachers from these different influences (Spillane, Parise, & Sherer, 2011). When standards change, teachers and principals brace for more incoherence, rather than embracing the possibility of renewal and reform.

But what if state leaders worked together with other stakeholders to craft more coherent guidance and to build supports for teachers and building leaders to

develop a common understanding of equitable teaching and learning? Can state leaders, working in collaboration with teams from multiple states, do anything to increase the coherence of their state systems and achieve ambitious equity goals?

Those are the questions that a network of state teams are asking as part of a research-practice partnership between the Council of State Science Supervisors and university researchers at the University of Colorado Boulder and the University of Washington.

This partnership, funded currently by the National Science Foundation, is organized as a *networked improvement community*, or “NIC.” In a NIC, a network of educational organizations forms to address a specific, persistent problem of practice, and collaborates to design and test solutions (Bryk, Gomez, Grunow, & LeMahieu, 2015). In a NIC, the roles of researcher and educator are intentionally blurred.

In this particular NIC, the researchers bring relevant expertise in designing improvement strategies while the educators contribute by co-designing strategies and testing them as well as collecting and interpreting the resulting data.

Improving Coherence and Equity as a Persistent Problem in State Systems

To describe a state system of education as providing *coherent* guidance to teachers means at least three things. First, it means that all of the key actors in the system share a common vision of what improvement looks like. When that is true, the system is said to be “vertically coherent,” because at whatever level we look in the system, we see

people espousing similar ideas about how to improve teaching and learning (National Research Council, 2001).

Second, coherence means that the key components that shape what teachers do—standards, assessments, curriculum frameworks, and professional development—all aim toward that common vision. When this is the case, the system is said to be “horizontally coherent” (National Research Council, 2001).

Last, a coherent system is one in which people are engaged in ongoing work to refine, build, and test the guiding vision together. Coherent systems at any level are the result of people working together both to “make sense” and “give sense” to current practice and how it needs to change, in order to achieve a particular vision for practice (Honig & Hatch, 2004).

It is difficult to achieve coherence in state systems, and as a consequence, such systems reproduce inequities of opportunity and outcomes. Actors may have divergent visions for education grounded in different value systems that are difficult to change. They may have one vision for their own children and another for “other people’s children” that limits opportunities depending on students’ standardized test scores, income, or race (Delpit, 1988).

Different actors have authority for the key components of systems, and these are subject to political influence at multiple levels of the system. Schools under accountability pressures may get more guidance about what should be happening in classrooms, often at the expense of students experiencing a rich and varied curriculum.

There are also limited opportunities for actors at different levels of the system to shape visions and discuss them with others—especially teachers, parents, community members, and students. These have the result of replicating historical inequities as to who is at the table for reform.

In our NIC, many of the states have adopted or are considering adopting new standards. Changes to standards present both risk and opportunity when it comes to coherence and equity. On the one hand, the risk is that few resources are invested in helping people understand the new standards or the vision that guided their development.

In addition, curriculum and assessment inevitably lag behind, leaving teachers with uncertainty as to how to realize the vision. At the same time, new standards can provide an impetus for change and hope for new possibilities for teaching and learning, especially when they are ambitious and when there is an expectation that all students will meet them.

Framework for K-12 Science Education: An Impetus for State-level Change

Five years ago, the National Research Council’s (2012) *A Framework for K-12 Science Education* presented a new vision of equitable teaching and learning in science and engineering.

That vision presented some core assumptions about science and science learning—grounded in decades of research—that guided the development of the Next Generation Science Standards:

- Children are born investigators
- Science teaching should focus on a few core ideas and disciplinary practices
- Proficiency in science and engineering requires both knowledge and practice
- Understanding develops over time
- Science teaching should connect to students' interests and experience
- Systems should promote equity by expanding opportunities to learn science and preparing teachers to implement inclusive instructional strategies

Shortly after the *Framework* was released, a professional association of state leaders in science, the Council of State Science Supervisors, organized a project to help states prepare to implement its vision.

The project, Building Capacity for State Science Education (BCSSE), was unprecedented in the degree to which state leaders were proactively planning ways that their states would need to change, to make the vision of the *Framework* a reality.

Teams from nearly all 50 states came together to develop implementation plans, and they brought researchers in to help them think not only about the shifts in science teaching that would be required, but also about the organizational changes needed to create a more coherent, equitable system focused on the vision of the *Framework*.

A marker of success of this group is that standards adopted in nearly every state since the publication of the *Framework* have been based on its vision.

Within these teams, the leaders in each state have been and continue to be linchpins for creating horizontal coherence. In a recent survey of state science leaders in education, they reported most frequent involvement in reviewing or developing state science standards, designing statewide science assessments, designing or conducting science professional development, identifying resources to share with district leaders, and establishing partnerships between business, industry, and non-formal education groups (Hopkins, 2016).

The influence they have over key components of the system and their role as brokers and collaborators make them key leaders in efforts to promote coherence and equity in ways that can impact schools, even though they are far from the classroom.

The Council of State Science Supervisors, moreover, is an important learning community for its members. Through structured activities like conferences, workshops, and webinars, as well as via more informal interactions with other educational leaders and researchers, state science leaders have opportunities to learn about and engage deeply with research and research-based information and expertise to inform their state's implementation of the *Framework*.

Much of this information derives from National Research Council reports that outline research-based strategies for

implementing the *Framework* across different components of the education system (e.g., via assessment, professional development) and at different levels (i.e., elementary, middle, high) (Hopkins, 2016). As such, CSSS members serve as key brokers of research-based ideas about improvement statewide, as they often draw on and share the ideas they learn about in their work with district and school personnel.

Looking to Improve Improvement: Building a Networked Improvement Community of Science Education Leadership Teams

To extend the work of BCSSE, the Council of State Science Supervisors formed a partnership with researchers at two institutions—the University of Colorado and University of Washington.

The aim of this partnership and NSF-funded project, Advancing Coherent and Equitable Systems of Science Education (ACESSE), is to enable a network of teams to “get better at getting better,” that is, to learn from their efforts to implement the vision of the *Framework* in ways that can advance the goals of coherence and equity.

The partnership is organized according to key principles and practices of improvement science: it is sharply focused on persistent problems of practice, organized around a clear set of shared aims, and—in ways that extend the BCSSE initiative—engages an expanded range of “system actors” in systematic testing of change strategies.

To help the network understand problems of coherence and equity, the network is undertaking a systematic

investigation of what is happening in each state. This includes a survey of teachers fielded by the researchers to assess the distance between teachers’ own visions for science teaching and that of the *Framework*.

That survey is also identifying teachers’ own areas where they would like to grow as professionals—to help the network focus its efforts on areas where there is energy and broad educator support for improvement. State teams are also holding focus groups—using a protocol developed collaboratively by the network—to attain better insight into different stakeholders’ views of science education.

Each state team is formed purposefully to include people from different sectors in education—people judged to be “key influencers” of system components and overall direction of science education in their states.

Across states, team members include not only researchers from higher education and leaders from state departments of education, but also leaders from districts, education nonprofits, educator associations and more. The purposeful effort to build teams that include community representatives is an attempt to include new voices in systems reform.

As other networked improvement communities seek to do, the partnership is focused on improving a “high leverage” practice, namely formative assessment. Ever since Black and William’s (1998) famous review, educators everywhere have sought to improve formative assessment, on the premise that it can dramatically improve student learning. But formative assessment is a good leverage point for coherence for

another reason: it sits at the intersection of curriculum, instruction, and standards, and to get better at it, teachers need professional development. In other words, improvement requires horizontal coherence.

To be effective, formative assessment also needs to be guided by a vision for teaching and learning, another reason that it is a good leverage point for the partnership's effort to bring system actors into alignment with the *Framework's* vision for equitable science teaching and learning. Finally, certain kinds of formative assessment (e.g., Tzou & Bell, 2010) can draw attention to ways that science teaching does or does not connect with students' interests and experiences, a key strategy for promoting equity.

This focused attention on deepening formative assessment practice is only part of the process. The partnership is collaboratively designing a set of resources state teams can use to help build a common understanding of the vision of the *Framework*, while the states teams are helping adapt and test these resources based on problems identified from surveys and focus groups.

The research team is developing a system of "practical measures"—measures that can be used to signal improvement goals and assess what strategies are helping states accomplish their aims (Yeager, Bryk, Muhich, Hausman, & Morales, 2013)—for states to implement.

How a State-Level Team Can Support District-Level Change Efforts

State level teams are, of course, far removed from particular classrooms. But state teams

have taken teachers' visions into account in developing needed resources, and district curriculum leaders are part of the effort. Some state teams have adapted ACESSE's processes for analyzing their state system's coherence and applied it to the study of their district and schools. Some are also adopting the partnership's the iterative design process for creating, getting stakeholder feedback on, and testing resources.

Finally, state leaders are working with local educators to implement activities developed by the network and measure their effects on participants.

The methods of improvement science being employed in the partnership may be applied to other subject areas to support district-wide reform. These include the development of specific aim statements, the use of system mapping tools to identify key leverage points for improvement, and the iterative cycles of design and testing of strategies for improvement.

The focus on formative assessment is likewise an appropriate focus for district-wide reform.

What is not typical—but important in our view—is to find districts being guided by subject-matter specific visions for teaching and learning. Research suggests that these subject-matter specific visions are critical guides, if formative assessment is to have an impact on student learning outcomes (Penuel & Shepard, 2016).

Therefore, though common processes may be used for supporting improvement, subject matter expertise and pedagogical content knowledge in the disciplines is a necessary condition for success.

The partnership's specific tools for supporting equitable, three-dimensional classroom assessment may also be used across a district. The resources and activities designed by the partnership can be just as easily implemented by a network of district science coordinators, within a building-wide professional development, or by a peer-led professional learning community.

Finally, they relate directly by linking what teachers do every day to the "why" of what they do—the vision from the *Framework* around which states hope to organize their systems of science education.

Ultimately, leading district-level change requires distributed leadership at the district level—that is, multiple departments, school leaders, and teacher leaders working together toward common

aims in the face of changing environments and with limited resources.

But state leaders can clear the way for those leaders and provide models for getting everyone in the building on the same page with respect to a vision for teaching and learning. Such models are crucial for implementing any new policy.

By modeling participatory, collaborative approaches to reform such as networked improvement communities, state leaders show the way for principals to lead their school in a way that mobilizes support around shared reform goals and that bolsters morale.

Leading for coherence and equity in turbulent environments requires leadership activity at all levels.

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