Title Slide
BILL:
First I want to thank SIG for Research in Mathematics Education for inviting me to be here with you at NCTM's research conference.

I am pleased to be here with you today, along with my close colleague and collaborative partner, Cathy Martin of Denver Public Schools and a board member of NCTM, to talk with you about design-based implementation research as a strategy for expanding opportunity to learn in school districts.

Cathy and I have been working together closely for the past three years on a project in Denver that we'll use today as a way to discuss the principles of design-based implementation research, or DBIR, as we are applying them to help Denver Public Schools build capacity for teachers to implement the Common Core State Standards in Mathematics.

Of Hedgehogs and Foxes
:02
BILL:
Two years ago, Jo Boaler addressed this meeting and enjoined mathematics education researchers to work harder and more intentionally to translate and communicate research to teachers and the public. She observed that in her earlier surveys of teachers, she had found few US teachers could point to studies that had made a big impact on their practice.

Taking up Isaiah Berlin's metaphor in his famous political essay, *The Hedgehog and the Fox,* she argued that we needed hedgehogs—people who work deeply on a single big idea—and foxes—who draw on a variety of ideas and perspectives—and hybrid hedgefoxes to make mathematics classrooms where all students thrive.

In a subsequent essay, Boaler and her colleagues Sarah Kate Selling and Kathy Sun suggest that among these, foxes can play a special role in mathematics education in "that of making the results of research available to a wider audience, including policymakers and practitioners"

Today I want to suggest another role for foxes in educational research, "developing knowledge together with educational leaders, teachers, families, communities, and students about how to expand opportunities to learn for all students in complex educational systems and communities"

Translating Research into Practice
:04

BILL:
When we talk about translating research on mathematics education to expand students' opportunities to learn, we're often talking about how we can take what we've learned from efforts to design and support equitable learning in mathematics classrooms in particular places and bring those ideas to life in new places. These are places like Railside School, but also myriad classrooms where scholars have studied and document expert practice as Cathy O'Connor and Sarah Michaels have done for many years, and where creative educational researchers like Jim Kaput employed design research to democratize students' access to powerful mathematical ideas.

Jointly Organizing Access to Opportunity
:05

BILL:
But the opportunities to learn documented in the literature require ongoing work to sustain. The arrangements that allow researchers to work closely with a few classroom teachers for any length of time are fragile, easily disturbed. School professional cultures shift, as teachers and principals come and go. Local district policies and instructional guidance are often in flux, and they profoundly shape what can and does happen in classrooms. The school system's policies and its relationships with the community influence the level of support and conflict that exists among parent, business, and community groups for goals of mathematics education.

I would argue that even if we think we know what research says should be happening in classrooms, most of us would acknowledge we share a collective problem—with educational leaders, teachers, parents, and

community members, and students—about how to make powerful mathematics teaching accessible to all students. To do so, as my colleagues Vicki Hand, Kris Gutierrez and I argued, we need to keep in the foreground both the kinds of mathematical ideas students can gain access *within classrooms* and students *access to those classrooms.* This is the new role for foxes in mathematics education research Cathy and I will propose to you today we need to do in partnership with practice.

It's better, too, to think of this not as work of translating research into practice, but of jointly organizing access to opportunities to learn that are informed by a vision of the kinds of people we want students to become and the kinds of institutions and settings for learning we want schools and classrooms to be.

Work for Foxes
:08
BILL:
The work we outline is, we think, work primarily for foxes, the sheer variety of problems that face us require that we draw widely on the ideas of others. It requires us to be nimble and responsive to change, rather than stuck like hedgehogs digging ever deeper holes.

This is not to disparage hedgehogs. There is clear value in going deep, and we know that the pace of social science is necessarily slow, requiring a depth of analysis and re-analysis that cannot be rushed.

But it's challenging to all of us to think of how we can also work more quickly in certain ways. In addition, the work is hard because scholars in the academy are rewarded much more for the *new* ideas we develop, rather than the ideas we adapt and synthesize. I hope you will hear in the stories we tell today about our partnership in Denver that we clearly privilege adaptation and synthesis in our work, and that the novelty lies not in the theoretical approaches or strategies for professional development we are employing, but in the ways we we have organized our work.

The Translational Model
:10
BILL:
Before I talk about the approach we are using, I want to review what for many of us is a familiar model for how to think about improving teaching and learning at scale, which I will call the "translational model" because the movement is from research into practice. It's reflected in this diagram that depicts the Institute for Education Sciences and NSF's Joint Guidelines for Research and Development.

In this model, we get to broad scale change by identifying programs that work and scaling them up. We develop and refine interventions first at small scales, then we test them at larger and larger scales, with replication studies and effectiveness studies that test whether interventions can survive in the wild of the routine conditions of schools and districts.

In this model, the sliders at the bottom represent the expected shifts in roles of researchers and practitioners as an intervention moves toward scale up. Researchers are heavily involved at the beginning, but their involvement fades as educators take over the work of supporting implementation and external evaluators study effects. If proven cost-effective in a wide variety of settings and students, the basic assumption is that educators will adopt the program based on the strength of evidence behind the intervention.

Evaluating the Translational Model (Slide A)
:12
BILL:
On the one hand, the translational model has proven to be a reliable approach for improvement when interventions are focused and brief, when they are easy for teachers to implement, and when they fit within the existing organizational structure of schools.

Good examples are interventions developed to reduce the impact of stereotype threat, which are often brief and easily taught to teachers. A good example is recent work by David Yeager and colleagues at the University of Texas reported last year in the New York Times on fostering persistence through having students read or listen to simple

messages about how others like them may feel as they don't belong, and about the fact that people change, is an example. [See also Weger and colleagues (2012).]

Evaluating the Translational Model (Slide B)
:14
BILL:
But a lot of interventions in mathematics – such as new curricula – are intended to be implemented across multiple years. In addition, their coherence is supported by what Cohen and Ball call the "development" of the intervention, that is, the degree to which materials developed for students are coupled with professional development, educative materials for teachers, and the like.

Another challenge is that most interventions require coordination at the district and school levels to ensure access within and to classrooms where students are engaged in significant mathematics learning. It's not enough to provide professional development to teachers, and expect that implementation will run smoothly. The other elements that make up what Hopkins and Spillane call the "instructional guidance infrastructure" have to be coordinated with any new program or curriculum – pacing guides, interim tests, observational systems, and the like. New structures may need to be invented, too, for supporting teacher leadership at the district level.

Transformative interventions typically demand significant teacher learning - that is, they require big departures from current practice, along with changes to beliefs about mathematics teaching and student capabilities.

DBIR: An Alternate Approach
:17

BILL:
DBIR is a different approach to answering the question: How can research and practice relate?

In DBIR, researchers and educators remain in partnership throughout the design, development, and testing of interventions. As such, it works best when educators and researchers commit to working with one another in a long-term fashion, and in a way that is inclusive of a broad range of stakeholders and mutualistic.

In DBIR, we consider what we need to design to implement a new program or practice well, and that more often than not leads us into designing across different levels of the educational system and sometimes designing across different settings of learning. Today, most reforms include designs for professional development to support teacher implementation of new materials for students. Some also include designs for teacher leaders or instructional coaches to work with teachers in their school-based professional communities. But in DBIR, we think about these elements from the start and also how they need to be articulated with other elements of instructional guidance in play in districts that we didn't initially design. We might work with a district partnership to make adjustments to the existing scope and sequence documents, for example, or to identify opportunities to bring district-level assessment practices into alignment with work we are doing.

Guiding this work is a new layer of theory –about organizational change and improvement – that we need for the work, to inform improvements to design.

Finally, in DBIR, we engage in systematic study of our work all along the way; we gather different forms of evidence to inform our work as we go, some that we try and analyze right away to inform design, and others that we save for careful and in-depth analysis later.

Partnership for Science and Engineering Practices
:21
BILL:
As part of an effort funded by the National Science Foundation, the Research+Practice Collaboratory, I am connected to two efforts that illustrate the first point about DBIR I'd like to highlight, and that illustrate how people are purposefully designing across levels and using implementation theory and research to guide their efforts.

These examples are intended to provide you with a sense of *some* of the variety of DBIR projects that are currently underway, and the different arrangements that are possible.

One is a partnership among the Seattle Public Schools, Renton School District, and the University of Washington's Institute for Science & Math Education. The partnership has been developing over the past three years, but its leaders have worked together in the past in different roles and capacities. At the table are district science coordinators, science coaches in the districts, upper elementary-level teachers, university faculty, and graduate students who take on both leadership and apprenticeship roles in the work.

Though the university researchers' involvement is funded primarily through the Collaboratory, the project activities are mostly funded by an MSP grant awarded by the state to the district. This is significant, since it means that funding goes to both parties, and decision making power rests ultimately with the school districts. However, they have evolved a regular practice of meetings and structures for decision making to share leadership.

A big focus of the work is on adaptation of district-adopted science units to better align to the Next Generation Science Standards. As such, collaborative design teams comprised of teachers, leaders, and researchers are a key context for where the joint work of the partnership happens. Network meetings where everyone involved in the work gathers are a time for sharing and professional development and developing stronger ties among participants, with the aim of building the partnership's capacity for implementing the new standards.

The researchers are drawing on social network theories to study the growth of the network, as a way to track progress in capacity building.

Maine Partnership in Early Mathematics
:24
BILL:
Another partnership that is newer but already engaged in work that will be presented here at both NCSM and NCTM is one formed around early mathematics in Maine. I present this example partly to show that DBIR can take place outside a major urban district – in fact, this is not the only example from Maine.

The challenges of course are different. People in smaller districts play multiple roles in a district. Districts are isolated from one another. Here, too, community members play key roles in the district: schools are centers within their communities. The partnership has to make extensive use of technology to meet.

Their partnership is organized as a collaboration across districts (but this means teachers get lots of different messages about importance of partnership), and the partnership includes community members in governance.

Illustrating the way that DBIR partnerships build on and adapt other researchers' work, the partnership is focused on strategies for Developing students' understanding of number, using a learning trajectories approach (K-2), supported by interactive, touch screen devices available in most Maine schools.

Inquiry Hub
:26

BILL:
The Inquiry Hub or iHub is a long-term research-practice partnership that is focused on addressing significant problems of practice by engaging in design-based research at the district level to develop, test, and refine solutions to those problems. At present, partners include Denver Public Schools, the University Corporation for Atmospheric Research, the University of Colorado Boulder, and BSCS, a major high-quality developer of science curricula in the US. Our work is currently funded by the NSF through its Cyberlearning Program. We are focused on designing and studying digital curriculum materials that can help teachers implement new standards, including the Common Core State Standards in Mathematics and the *Next Generation Science Standards.*

We call ourselves a "multi-tiered partnership" in that we have a leadership team comprised of a core of researchers and district leaders that include our graduate students and 3-4 regular participants from the district central office's curriculum and instruction department and program for English Language Acquisition or ELA. We also have teacher design teams, which include all of us plus teachers and partners such as curriculum developers, and in our science work, community organizations like the Denver Parks and Recreation Department are involved.

We have multiple strands of work going on: We've been doing work to adapt existing district-adopted curriculum materials in mathematics, we are currently piloting an eight-week project-based ecosystem unit aligned to the Next Generation Science Standards that we designed together. And we've worked through our design teams and professional development activities in math and science to develop a district-level, informal cadre of teacher leaders who can help lead district-level professional development and spread our work.

Emerging Bilinguals in Denver
:29
BILL:
We want to tell you about one strand of work in mathematics, tracing its evolution over two years from 2012-2014, and we want to focus in particular on an aspect of equity that is of central importance within Denver.

More than a third of students in DPS are emerging bilinguals, a term for characterizing students classified as “English language learners” that recognizes the strengths young people bring in their native languages as potential resources in learning.

Programs for English Language Learners in the District
:31
BILL:
The district's programs for English language learners are focused on two strategies mainly, transitional native language instruction (which applies only to our Spanish speakers) and sheltered content instruction in English.

There is an agreement with the US Department of Justice for the district to provide resources, both instruction (in Spanish) in some cases, materials in Spanish (where available and of same quality as provided to our native English speakers), and instructional strategies and language scaffolds for all English language learners.

There are English Language Acquisition coordinators at the district level for different subjects, including mathematics and science, and the coordinator for mathematics and science is a key member of our team.

Four Principles of DBIR
:33

BILL:
We'll now talk about our work in mathematics, highlighting ways that we are attempting to address the needs of emerging bilingual students through those lines of work, using the four principles of DBIR.

I will name them briefly now, but I want to elaborate on them in the context of describing our work.
The four principles are:

1. Teams form around a focus on persistent problems of practice from multiple stakeholders' perspectives.
2. To improve practice, teams commit to iterative, collaborative design.
3. To promote quality in the research and development process, teams develop theory related to both classroom learning and implementation through systematic inquiry.
4. Design-based implementation research is concerned with developing capacity for sustaining change in systems.

Now, I will turn it over to Cathy to share more about how we make decisions in our work.

How We Decide the Focus of Joint Work (Slide A)
:34

CATHY:
As an urban district, we often have researchers reaching out to us to partner on a grant. However, oftentimes those researchers have already planned and often written their proposals based on their research interests, thus looking to us to accommodate those agendas rather than reaching out to use a true partner in a grant proposal. From my perspective as the K-12 director of mathematics and science, what we want is to bring together the needs and expertise we have as a district and the expertise and interest that a university partner has and together co-design a project and the accompanying research that benefits both institutions.

The strength of our work with CU Boulder from the very beginning and over the past eight years has been the mutual respect on the part of both partners. In other words, we've always felt value and supported in the relationship—we've always felt heard in our interactions and always believed that our partners were helping us to strategize about how to leverage their resources to work on the challenges we faced, to be a true thought partner, and oftentimes a cheerleader in the especially hard work we do on a daily basis in urban districts. Together we've generated ideas and options for meeting the challenges (and meeting the changing landscape of a district—and I'll talk more about that later) and then once we have determined next steps we've determined how we collaborate on the work.

Persistent Problems of Practice
:36
CATHY:
Early in our current project, we surfaced a number of issues that we thought important to address related to teaching emerging bilingual students, or English language learners.

We've called out here some of the different perspectives on what these problems of practice are, from participants in the collaborative design process, at our earliest stages of work.

From the district's perspective in organizing instruction, a big design challenge is that English learners are not all Spanish-speakers (have new immigrants). Also, how do you prepare teachers to helping students to access high levels of mathematics, so you are not lowering the demands? (Attending to both language and mathematics content)

Teachers: Concerns that certain mathematical tasks aligned to Common Core had too much language that students wouldn't know. They were concerned that none had scaffolds to help students get started on them.

Researchers: Learning mathematics requires engagement in sophisticated discourses; How do you help learners be able to participate in and comprehend rich discussions in mathematics

How We Decide the Focus of Joint Work (Slide B)
:38

CATHY:
How did we figure out that these were the different perspectives on problems of practice, so that we could decide what to focus on in our work?

We didn't have a single process for doing this. But rather, we are very intentional about building relationships and getting input from people in lots of different settings.

The leadership team meets every week on Friday afternoon. In the beginning we met via a conference call, but currently we meet over Zoom (no travel time); we moved from conference call because being able to see each others' faces is so much more valuable and helps to build the relationship we have. By meeting every week, we can make adjustments in real time to the collaborative work that we're doing. We get input from teachers, too. That input comes from our design activities, which we'll describe in a bit, as well as from periodic interviews and brief surveys we gather from teachers and discuss in our Friday meetings.

In addition, we schedule longer semi-annual face–to-face meetings to determine how our work is progressing, to look at where we've been

and how has that worked, and, most importantly what are next steps in our collaborative work. In these meetings as in all of our work, we bring to the table teachers' perspectives, district perspectives, researchers perspectives on the work, what's worked well and what hasn't. We spend time bringing each other up to date--what's happening in the district, sharing perspectives on what's happening in the state and nationally in our fields, and what might funding opportunities for future work together be.

And, not surprisingly, sometimes we have to do significant regrouping in our work together. New initiatives (e.g., student learning objectives) come along and present opportunities to expand our work. We've always approached these from an asset-based perspective and considered how we might use them as ways to further our work, rather than seeing them as roadblocks to our partnership.

Organizing Collaborative Design (SLIDE A)
:40

CATHY:
So, it's interesting and helpful to our story to talk about the history of the partnership. We've working together over the past eight years and actually began the partnership focused on Earth science through developing a digital platform for the district-adopted middle and high school Earth science curriculum. Also, in parallel the Contingent Pedagogies Project was exploring how to enhance classroom assessment activities within the middle school Earth science curriculum. Both projects were funded by the National Science Foundation.

Organizing Collaborative Design (SLIDE B)
:41

CATHY:
Based on the success of this work which had expanded to include middle school physical science, we sought additional funding from NSF, to expand into algebra 1 and biology. We chose to expand into algebra 1 because there was a need in DPS to provide teachers with further support for algebra 1 students and to expand our earlier work with science to biology as a way to enhance district resources that were, at that point, about 8 years old.

Organizing Collaborative Design (SLIDE C)
:42

CATHY:
We revisited the grant when the money came, asked ourselves whether these were still our key needs, and specifically what work was most needed. Fortunately, for both partners, these were still important needs. But new standards meant we needed to develop a focus we hadn't fully anticipated when we wrote the grant. Between the time we applied for the funding and when the award was made, DPS was turning toward supporting implementation of the Common Core State Standards in Mathematics. We wanted to be responsive to that, and to the district's desire in science to ready teachers for the Next Generation Science Standards as well.

Starting with Tasks
:43

CATHY:
We came to the idea of identifying and analyzing mathematical tasks in Algebra as a first strand of work. This work built on earlier work in the district and in the field on the importance of cognitively demanding tasks by Peg Smith, Mary Kay Stein, Marjorie Henningsen, and Ed Silver. This line of work served multiple purposes: for the teachers who were part of our group, it would be a way to deepen their understanding of Common Core, but also to build a cadre of leaders, people who could work with other capacities in the district (now part of assessment development work, because they have a good sense of tasks) to support implementation of CCSS-M.

Note here that this is one of the places where we're asking our research partners to be "foxes" to use the term Bill used earlier, not starting from scratch with a single big idea, but we built on what other people had done.

Teacher Involvement in Design
:45

CATHY:
One thing that is different, though, about how we approached the work is that we tailored Stein and colleagues approach to professional development – in which teachers rate the cognitive demand of mathematical tasks, to our local context.
We knew we had both content and rigor gaps in our existing curriculum that needed to be addressed to meet Common Core. So, we set up a Teacher Advisory Board (TAB) to help identify where they saw gaps in the curriculum where new tasks were needed, to rate tasks, and iterate on a set of rubrics for analyzing those tasks with us.

We started with an analysis of the district's existing curriculum resources and identified content for which resources were most needed. We also surveyed teachers about these. We began our work with the TAB in December of 2012 and structured identification of tasks to be just ahead of where teachers were supposed to be in the curriculum.

(Since we started at the end of the first semester, so we began with focusing on second semester content.)

The process was intended to enhance all students' opportunities to learn within classrooms, and also across classrooms. We wanted to make sure in classrooms across the city that students were engaged with rigorous academic tasks, aligned to the standards, engaging them in mathematical practices, with multiple opportunities for expression for English learners. Teachers had a significant voice in shaping the language rubrics, to align with frameworks they were expected to use, and to make tasks easier to rate reliably.

Language Rubrics
:48

CATHY:
We did have to do some invention, specifically to develop and test some rubrics related to the language of tasks. Early on in the design process, we decided as a leadership team to build some rubrics around language, so we could attend specifically to the learning needs of emerging bilinguals.

Our initial attempts weren't greeted well by teachers – they wanted us to make sure we were coordinating with frameworks their schools were using. So, we looked at those, but the researchers on the team also went to their colleagues at CU – Willy Solano-Flores, for example, to get some help on developing the rubrics. They consulted other scholars' work, such as that of Judit Moschkovich, on how to support emerging bilinguals' participation in rich mathematical discourse. They revised the rubrics to try to blend the frameworks teachers were using with research-based models.

Language: Options for Expression
:50

CATHY:
Then, we took them back to teachers, had them rate tasks, discuss them, and we revised the rubrics with teachers again, until we had become calibrated as a group. This was a really important accomplishment, and

key to developing our cadre of teacher leaders, because we were seeing the same things and agreeing on criteria that were important to us.

Our process was always to rate tasks ahead of our TAB meetings with teachers, present the initial results like you see here, and then have a discussion about the task guided by these two questions you see here. Over time, we shared leadership with teachers for leading these discussions, especially as our team got more and more calibrated.

Developing Evidence to Inform Design (Slide A)
:51

BILL:
In our project, we engage in a variety of research activities intended to support the design process, as well as to build theory and knowledge that we hope will contribute to the research community.

The research we have presented so far at academic conferences has focused on the design process itself and on the task analysis process. In particular, we've been analyzing our discussions in design meetings for evidence that teachers' ratings of task are becoming calibrated with one another. We've also been analyzing how and when teachers' ideas are—and aren't taken up—in the context of our design work. Attending to equity in the design process is important to us, because a key goal is for us to promote teacher agency and leadership through the collaborative design process, as Cathy will explain in a moment.

Our research in mathematics builds directly from the approach taken by Stein and colleagues in their study of task implementation. In fact, one of the tools we are using to examine teaching practice is one developed at the University of Pittsburgh for the study of implementation of mathematical tasks, the Instructional Quality Assessment. We've used this assessment not just to rate the quality of tasks rated by our design team as implemented by them, but also to identify what aspects of implementation might need to be better supported by our design activities with them. Again, acting as foxes, rather than hedgehogs, in our work by looking for work others have done that aligned with our purposes.

Developing Evidence to Inform Design (Slide B)
:54

BILL:
Two things are notable here, as well. We decided to present some data in aggregate form back to the whole design team. That team included the teachers whom we'd observed. They asked us lots of questions, wanting to know more about the measures used than we'd initially provided them. The findings themselves raised important questions about how we might better support implementation of tasks and how we might enlist teachers on our design team in developing these supports with us.

Playlists and Launch Work
:55

BILL:
For emerging bilinguals, teachers became particularly concerned that some of the richest tasks we had built included terms that would be unfamiliar to them, especially to newcomer (immigrant) students. Terms like "bucket brigade," for example that are introduced early on to tasks were ones we thought would be obstacles to students engaging with the *mathematics* of the task.

We started then to develop a set of "task implementation supports,' building from colleagues' work (e.g., Jackson et al., 2012; Michaels, O'Connor, & Resnick, 2008).

We built on an approach developed by Kara Jackson and the team at Vanderbilt from the Middle School Mathematics and Institutional Setting of Teaching (MIST) team on how to launch tasks in ways that allow students with different prior experiences to engage the mathematics embedded in tasks. And we engaged teachers in devising prompts for classroom and small group discussion, building on the work by O'Connor, Michaels, and Chapin on academically productive talk in mathematics.

In addition, we identified some "launch videos" for some tasks, both to engage students and provide a common context to refer back to in the tasks.

Building Capacity
:57

BILL:
One very concrete example of how we are building capacity in the iHub is providing some structures that we (district didn't have before) – curriculum customization service serves as model of how we can create a warehouse to support standards implementation.

Our model of how we work with a teacher advisory board, and how to build things in collaboration with teachers has supported our district capacity to make and sustain change. While it might be easier and quicker to do the work "in house," that doesn't always allow us to hear directly from the field what our teachers' needs are. This work in collaboration with teachers has been really instrumental in helping us to develop leadership in mathematics. And this continual need to build leadership is a reality in an urban district where teacher turnover is a challenge. Further, we know that the real work takes place in schools, so we need to engage these folks, to match up to the need they have and build upon what they can do.

Building Capacity
:59

BILL:
On the research side of the partnership, we are also about capacity building.

For one, faculty on the project are trying to prepare new kinds of researchers, researchers who are flexible in the ways they respond to changes in the district and who see the value of spending time to learn about those changes. When it appeared our work in mathematics would shift to support a new major district initiative, the SLO process, one of our graduate students on the project, Raymond Johnson, spent three days attending professional development for teacher leaders on the

process. We encouraged and supported his participation as leaders of the project, because spending this kind of time getting to know the ins and outs of district policies and practices is an essential part of research-practice partnerships.

I would like to say we have a long-range plan, detailed with studies we might undertake in the coming years focused on our joint work. But that's not realistic, if we want to be good partners to district leaders who must respond to changing policies and circumstances.

An Ongoing Challenge
CATHY or BILL)

In the district, we keep a constant focus on how to expand access to opportunity to young people, especially our English Language Learners, to powerful opportunities to learn.

We are now in the midst of district changes to strengthen access that all schools have to instructional leaders with strong content backgrounds, and as a partnership, we are exploring ways that we can integrate our work more fully into the work of professional learning communities that these leaders will support.

What Keeps Us Going
CATHY
From the district perspective, a real benefit is having a thought partner to help direct the work and to bring other perspectives and expertise to bear on the challenges. Another benefit is bringing funding (Flexible) that allows us to do things we might not otherwise be able to do with expertise that we don't necessarily have—our people resources are limited. We've appreciate having someone to learn from, who has a different view of things than we do (we get caught up in the here and now; can't get a 30K perspective on what the work could be).

BILL:
For us as researchers, we benefit from this partnership as well. Our team members have a substantive interest in the subject of how best to develop teacher capacity, specifically to help all students achieve ambitious goals for mathematics learning. The partnership also

provides a meaningful context for us to apprentice new scholars into the DBIR approach. Through both our successes and setbacks in apprenticeship, we're able to learn more about what it will take for people to learn how to employ DBIR as an approach to organizing research and development.

Perhaps most importantly, I think for all of us, working in partnership in this way helps us feel as though what we do really matters, not just in some distant future where "policy implications" of our papers play out in practice, but now, in a district that we can work with to collaborate to address its most pressing problems.

Expanding DBIR

BILL:

In my view, it is terribly important that we view work in partnerships with district teachers and leaders, curriculum developers, and researchers as only a beginning. There are many more stakeholders in education, and learning doesn't just take place in schools. So, for DBIR to really meet the challenge of changing how research and practice relate, we'll models that show what DBIR looks like when we include parents, community members, even youth.

I view especially promising in this regard work by scholars like Megan Bang, who has articulated a model of community-based design research with Indigenous students as an example of this work, work she has done in partnership with the American Indian Center of Chicago. Aspects of the work of the John W. Gardner Center for Youth and their Communities, featured in the February edition of *Educational Researcher,* is another example.

I want to leave you with the idea that DBIR is a model that is a "work in progress" both for our team and for the field, and that at its core it is about fundamentally reorganizing the relation of research and practice in a way that foregrounds questions of who participates in the efforts to transform our educational systems to be more equitable and effective, how we organize our work as researchers, and how we prepare people to work in partnership with one another, whether they are educational leaders or researchers.

Upcoming Sessions

BILL:

Also, in closing, I want to invite folks to two upcoming sessions, also, that elaborate on work presented here, not just by us, but by the Maine partnership, happening both at NCTM and NCSM. These sessions are both tomorrow, and will provide opportunities to dig deeper into the work of DBIR and what it looks like.

Thank You

BILL:

Thank you very much for having us here. We are available via email, and resources related to DBIR are online at the LearnDBIR and Research+Practice Collaboratory web sites. I'm on Twitter, though I am not as active as one of our team members, Raymond Johnson. And in print, you can read about DBIR here.