Design-Based Implementation Research as a Strategy for Expanding Opportunity to Learn in School Districts

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Of Hedgehogs and Foxes

Jo Boaler at NCTM 2013 (Denver)

"Where are the foxes in mathematics education?"

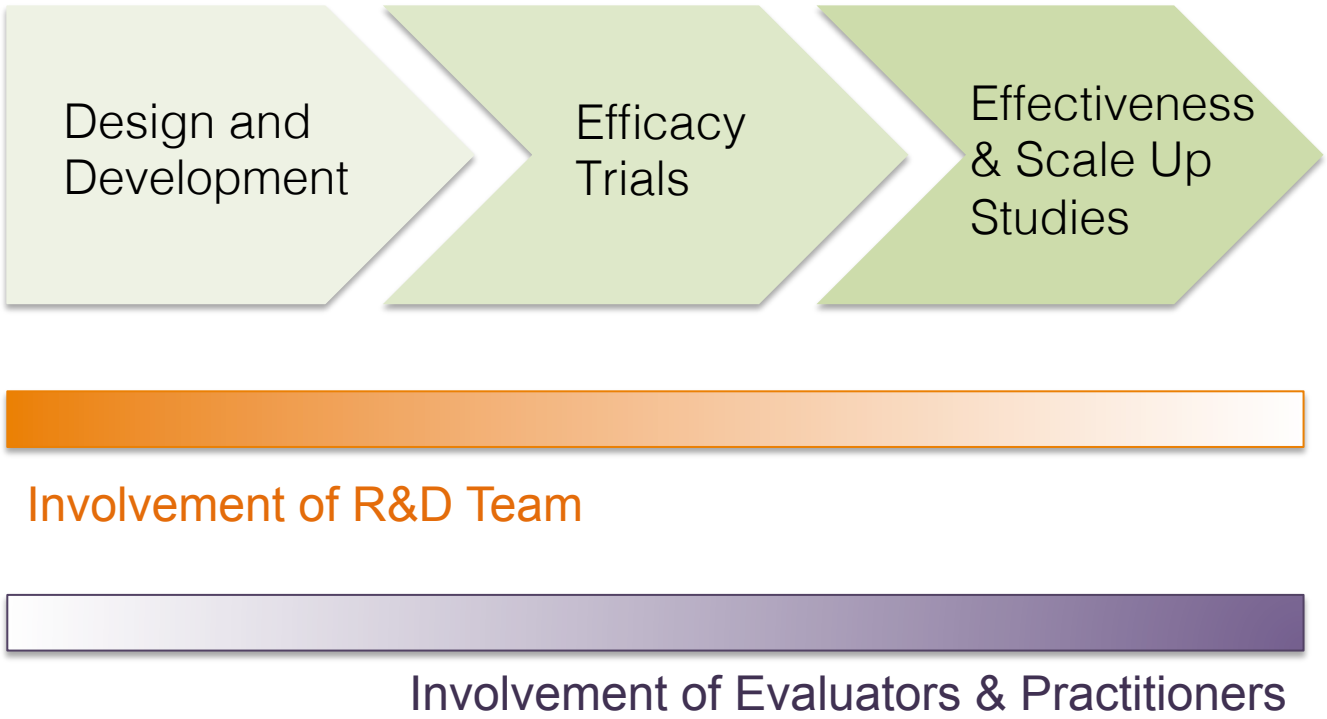
Translating Research into Practice

Jointly Organizing Access to Opportunity

Work for Foxes…

- Need to be able to carry out multiple lines of work simultaneously, at different timescales
- Privileges adaptation and synthesis of ideas from mathematics education research

The Translational Model



Evaluating the Translational Model

Usefulness	Limitations
When interventions are focused and brief (e.g., some interventions focused on fostering productive persistence in college) When interventions demand little teacher learning or departure from current practice When interventions require no organizational changes	

Evaluating the Translational Model

Usefulness	Limitations
When interventions are focused and brief (e.g., some interventions focused on fostering productive persistence in college)	Many interventions are extended in time, and coherence is supported by their being "well developed" (Cohen & Ball, 1999).
When interventions demand little teacher learning or departure from current practice	Transformative interventions typically demand significant teacher learning.
When interventions require no organizational changes	Most interventions require coordination and change at district and school levels.

DBIR: An Alternate Approach

- Works within ongoing *research-practice partnerships*
- Engages teams in *design across levels and settings*
- Uses *implementation theory and research* to inform improvements to design
- Engages in *systematic study* of interventions along the way

Partnership for Science and Engineering Practices

Who Is at the Table	How They Work Together	Focus of Joint Work
District science coordinators Science coaches Elementary teachers University faculty Graduate students	Organized through state-funded MSP grant, awarded to district Regular meetings of leadership team (district leaders and coaches, faculty) Collaborative design teams Network meetings/PD	Capacity building focused on preparing teachers to implement *Next Generation Science Standards:* Adaptation of kit-based science units Equity focus: How to build on students' diverse interests and experiences

RESEARCH + PRACTICE COLLABORATORY

Maine Partnership in Early Mathematics

Who Is at the Table	How They Work Together	Focus of Joint Work
Community members Teachers Principals Math specialists School board chair Technology coordinators Special educators ELL specialists	Two face to face meetings per year Meet monthly (Adobe Connect) – chat, screenshare, simultaneous, every district (large) has videoconference	Developing students' understanding of number, using a learning trajectories approach (K-2) Equity focus: Expanding access through interactive, touch screen devices


RESEARCH BRIEF

The following brief provides a summary of the research study cited below, with the goal of highlighting findings and
test interest and applicability to educators in the field. It is part of a collection of briefs on
development, generated by the Research+Practice Collaboratory, a project funded by the
ation to build stronger bridges between the worlds of educational research and practice.

of video clubs on teachers'
ractice.
ucation, 13(2), 155-176.

of professional development called "video clubs" in
uss excerpts of videos from their classrooms. The
rticipation in a video club influences teachers' thinking
e related contexts: (a) teachers' comments during video-
f-reports of the effects of the video club, and (c)
e year. Data analysis revealed changes in all three
etings, teachers paid increased attention to student
e course of the year. In interviews, teachers reported

EDC Learning transforms lives.

RESEARCH + PRACTICE COLLABORATORY

NSF

Inquiry Hub (iHub)

Who Is at the Table	How We Work Together	Focus of Joint Work
District leaders Teachers Researchers Curriculum developers Scientists	Multi-tiered partnership (more later)	Curriculum adaptation (focus of today's talk) Curriculum design Teacher leadership development

English Language Learners in Denver

- About half of students in DPS are classified as English language learners
- Of these 84% are Spanish speakers
- Top languages spoken by students: Spanish, Vietnamese, Arabic, Somali, Amharic, Nepali, and Russian

Programs for English Language Learners in the District

- Principally focused on two strategies (sometimes in combination)
  - Transitional Native Language Instruction (n = 25)
  - English as a Second Language (*n* = 20 Spanish, *n* = 7 Other)
  - TNLI + ESL (*n* = 23)
- An ELA (English Language Acquisition) coordinator for mathematics and science is a key member of our leadership team.

Source: 2013 Report from Denver Public Schools

Four Principles of DBIR

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, knowledge, and practice 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.

How We Decide Focus of Joint Work

Teams form around a focus on persistent problems of practice from multiple stakeholders' perspectives.

- Foundation: Mutual respect
- Focus is always on how to leverage resources and expertise of university researchers to address challenges district faces.

Persistent Problems of Practice

- District perspective
  - A challenge for us is to design instruction for English learners who speak multiple languages and who may also be new immigrants
  - Need to help students access high levels of mathematics, without lowering cognitive demand
- Teacher perspectives
  - The demands of mathematical tasks that meet CCSS-M standards rely too much on language that students do not know
- Researcher perspectives
  - Helping learners participate in and comprehend academically productive discussions in mathematics

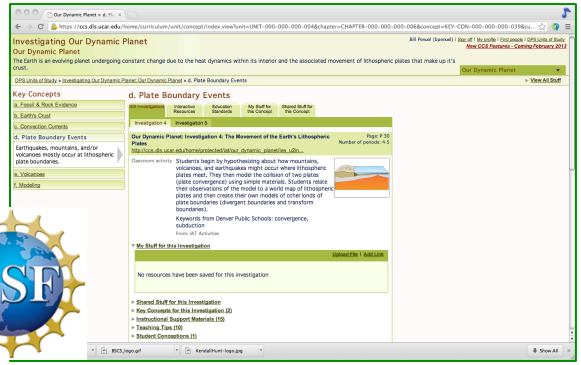
How We Decide Focus of Joint Work

Teams form around a focus on persistent problems of practice from multiple stakeholders' perspectives.

- We regularly review the focus of joint work through:
  - Weekly meetings
  - Getting input from teachers at specified points in time
  - Semi-annual half-day retreats between university researchers and district leaders
  - We are often led to make significant changes to our work.

Organizing Collaborative Design

To improve practice, teams commit to iterative, collaborative design.



Curriculum Customization Service

Contingent Pedagogies

Organizing Collaborative Design

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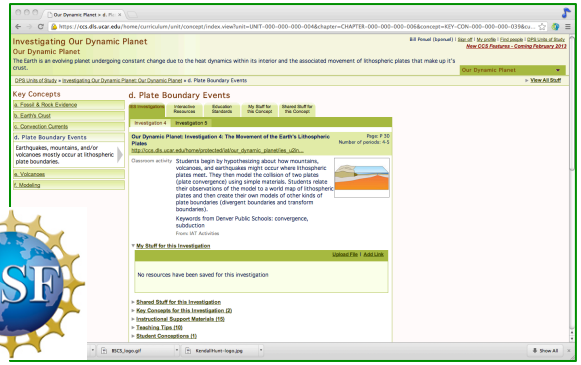

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PROPOSAL
Expansion to:
Algebra I
Biology

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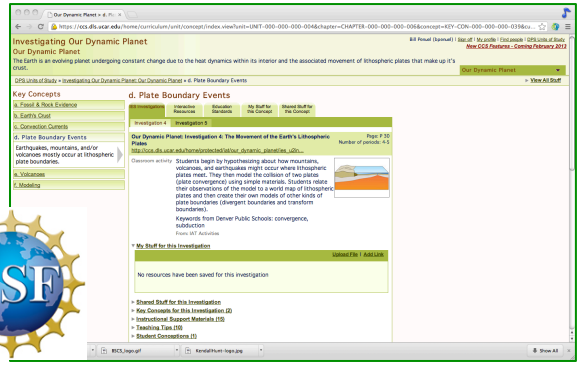

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iHub iHub

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COMMON CORE
STATE STANDARDS INITIATIVE
PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER

Contingent Pedagogies

Starting with Tasks

- *Identifying* tasks that addressed gaps in the existing scope and sequence for the district
  - Significant gaps due to content shifts in CCSS-M
- Rating task qualities as a group
  - Built from approach to professional development developed by Stein, Smith, Henningsen, & Silver (2009)
  - Intended to support shifts in rigor called for in CCSS-M

Teacher Involvement in Design

- Rating the qualities of tasks as a group (adapted from the Stein and colleagues approach)
- Identifying topics for which there were not adequate opportunities to learn presented in the district-adopted textbook (new: fitting to district context)
- Developed and iterated on two rubrics that included dimensions specifically related to equity of opportunity for English Language Learners (new)

Language Rubrics

- Created to address learning needs of emerging bilinguals
- Focus on both the need to engage in rich mathematical discourse and gain access to tasks
- Two rubrics:
  - Language options for expression (opportunities to engage in mathematical discourse)
  - Task language

Language: Options for Expression

Level	Number of Raters
Explicit and Highly Varied	1
Explicit and Somewhat Varied	1
Implicit and Limited	2

What evidence from the task supports your rating?
What language from the rubric for options for expression supports your rating?

Developing Evidence to Inform Design

Teams develop theory, knowledge, and practice related to both classroom learning and implementation through systematic inquiry.

Research Question	Sources of Evidence
How do teachers in the collaborative design process engage with the task analysis and task rating process?	Field notes of collaborative design process Informal interviews Surveys of teachers' experience of the design process and recommendations for improvement
How well-aligned are teachers' ratings of tasks?	Analyses of reliability of ratings, discussion of ratings
How do teachers' adapt the tasks as they implement them?	Classroom observations (IQA) Interviews)

Developing Evidence to Inform Design

Teams develop theory, knowledge, and practice related to both classroom learning and implementation through systematic inquiry.

- Early findings raised questions underscored the need better to support classroom discussion and engage all students in demanding tasks, particularly for emerging bilingual students

Playlists and "Launch" Work

- Emerging problem: Contexts for tasks that teachers judged likely to be unfamiliar to students
- Supporting launch – fox approach of drawing on recent PD work and rubrics developed by Kara Jackson / MIST team on launching tasks for equity

Building Capacity

Design-based implementation research is concerned with developing capacity for sustaining change in systems.

- Building a digital platform for curriculum in the district ("one-stop shop" for teachers)
- Refining model for building district capacity to make and sustain change
- Teacher leaders were engaged in a mix of informal and formal leadership (school and district roles).
  - As TAB members, more informal but recognized by district.

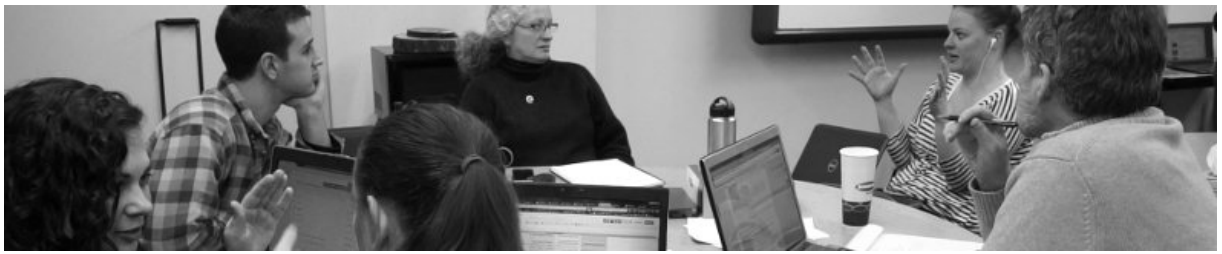
Building Capacity

Design-based implementation research is concerned with developing capacity for sustaining change in systems.

- Supporting graduate students in developing skills needed to be good partners to districts
- Learning how to "ride waves" and adjust to changing policies, organizational structures, and circumstances.

An Ongoing Challenge...

What Keeps Us Going



Expanding DBIR

Megan Bang

JGC

FEATURE ARTICLES

Reinventing the Role of the University Researcher

Ingrid A. Nelson[1], Rebecca A. London[2], and Karen R. Strobel[3]

This study examines the structuring of university–community research partnerships that facilitate theoretically grounded research while also generating findings that community partners find actionable. We analyze one partnership that positions university-based researchers as members of a team working to create, maintain, and use a longitudinal multiagency data source. Through our focus on the evolution of this university–community collaboration, we show how researchers established their commitment to a mutually beneficial exchange and how data-driven action emerged when community agencies assumed ownership and prioritized action throughout the research process.

Keywords: case studies; collaboration; decision making; educational reform; higher education; leadership; observational research; research utilization

Upcoming Sessions

April 14, 2015, 8:30-9:45, Grand Ballroom B (Research)

Early Mathematics with Mobile Technology: A Research-Practice Collaboration

Josephine Louie, Pam Buffington, Catherine McCullough, Discussants: Jere Confrey, Michael Muir

April 14, 11:15a-12:15p,Room 156B (NCSM)

Improving Early Mathematics Learning & Teaching in iPad-Infused Classrooms: A Research and Practice Collaboration

Amber Eliason, Pamela Buffington, Laura Shaw

April 14, 2015, 2:15-3:15p, Room 105 (NCSM)

Supporting Algebra 1 Teachers' Implementation of the CCSS: A Research + Practice Partnership

Raymond Johnson, Cathy Martin, Becky Sauer

Thank You

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In print:

Fishman, B. J., Penuel, W. R., Allen, A.-R., & Cheng, B. H. (Eds.). (2013). *Design-based implementation research: Theories, methods, and exemplars. National Society for the Study of Education Yearbook.* New York, NY: Teachers College Press.

Penuel, W. R., Fishman, B. J., Cheng, B., & Sabelli, N. (2011). Organizing research and development at the intersection of learning, implementation, and design. *Educational Researcher, 40*(7), 331-337.

Options for Expression Rubric

Level	Definition
Explicit and Highly Varied	The options for expressing understanding are EXPLICIT AND HIGHLY VARIED if the task instructions provide options for students to show their understanding in a variety of ways, such as mathematical notation, written language, graphs, diagrams, and interactive ways such as small group discussion, gestures, demonstrations, oral justifications, etc.
Explicit and Somewhat Varied	The options for expressing understanding are EXPLICIT AND SOMEWHAT VARIED if the task instructions provide options for students to show their understanding in more than one way, but usually limited to written, non-interactive ways such as mathematical notation, written language, graphs, and diagrams.
Implicit and Limited	The options for expressing understanding are IMPLICIT AND LIMITED if the task instructions require students to show their understanding in only one way and leaves other options for expressing understanding up to the teacher.

Task Language Rubric

Level	Definition
High	The opportunity to engage in mathematical language is HIGH if the task uses vocabulary, grammar and sentence structures expected of speakers fluent in the discourse of academic and mathematical communities.
Medium	The opportunity to engage in mathematical language is MEDIUM if the task uses vocabulary, grammar and sentence structures expected of proficient native speakers of age-level "everyday" English.
Low	The opportunity to engage in mathematical language is LOW if the task poses problems and asks questions using only a minimal amount of academic and/or mathematical language. Instead, tasks rely on simple grammar and sentence structures, if the task uses language at all.