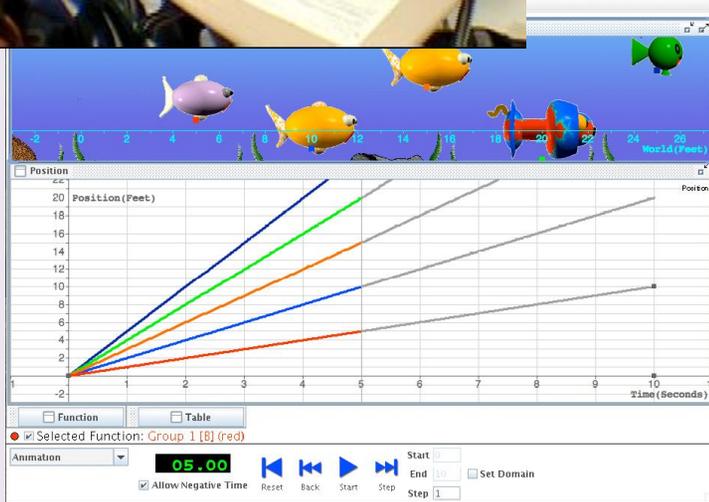


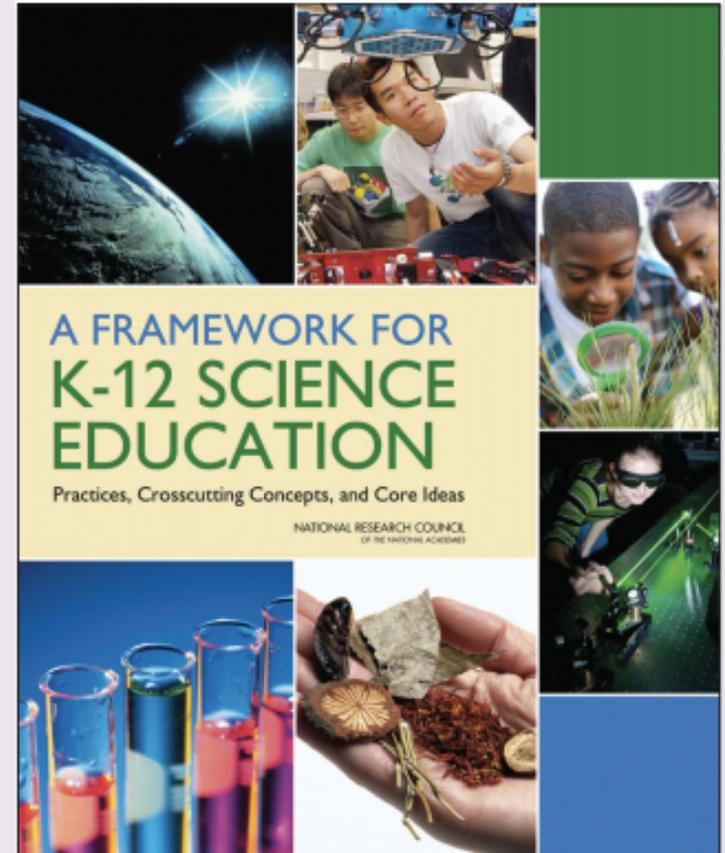
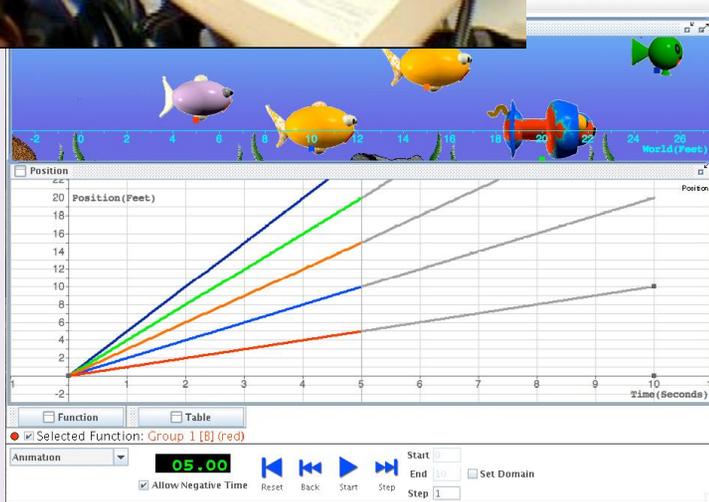
Infrastructuring As a Practice for Promoting Transformation and Equity in Design-Based Implementation Research

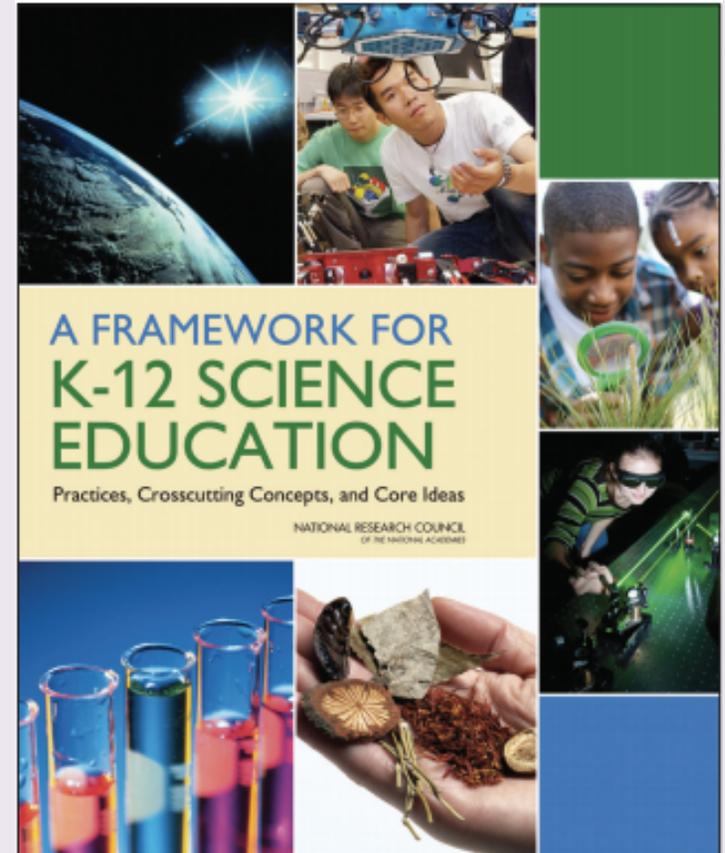
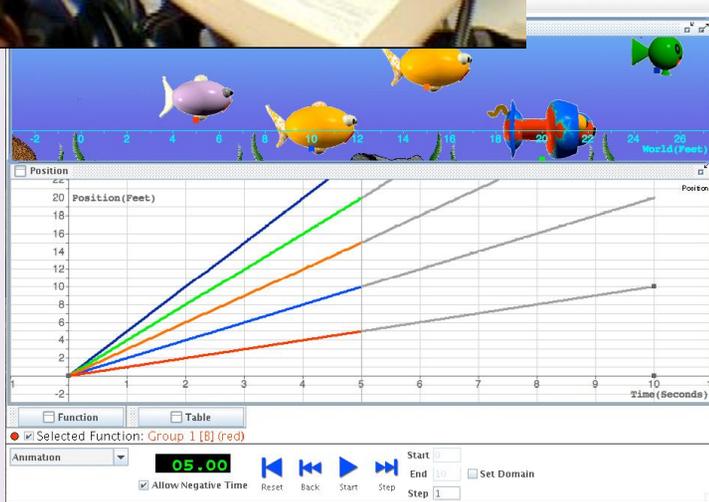
William R. Penuel

University of Colorado Boulder

@bpenuel @learnDBIR @NCRPP







How can we support the equitable transformation of educational systems through design research?

Design-Based Implementation Research (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 related to both classroom learning and implementation through systematic inquiry.
4	DBIR is concerned with developing capacity for sustaining change in systems.

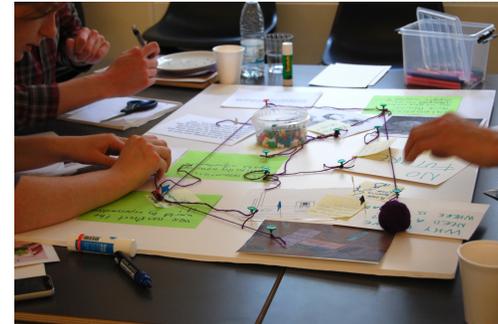
Design-Based Implementation Research (DBIR)

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 related to both classroom learning and implementation through systematic inquiry.
4	DBIR is concerned with developing capacity for sustaining change in systems.

Infrastructuring

Organizing Conditions for Social Innovation

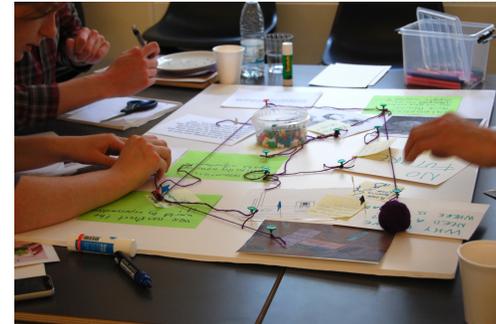
- Focus on cultivating long-term partnerships with diverse individuals and groups
- Matching people and resources to stakeholders and their agendas



Infrastructuring

Organizing Conditions for Social Innovation

- Focus on cultivating long-term partnerships with diverse individuals and groups
- Matching people and resources to stakeholders and their agendas



Ongoing Re-Design of Infrastructures

- Learning from and planning for how organizational structures and processes will influence use of innovations
- Defining design as continuous with implementation: “patchwork” support design



Essential Layers of Theory

Supports for Learning	Supports for Implementation
Vision of high quality teaching and learning Materials Technology tools Participant structures Forms of talk	Teacher and leader learning Organizational routines Policies Technology systems External patterns

Essential Layers of Theory

Supports for Learning	Supports for Implementation
Vision of high quality teaching and learning Materials Technology tools Participant structures Forms of talk	Teacher and leader learning Organizational routines Policies Technology systems External patterns



Developing Theory

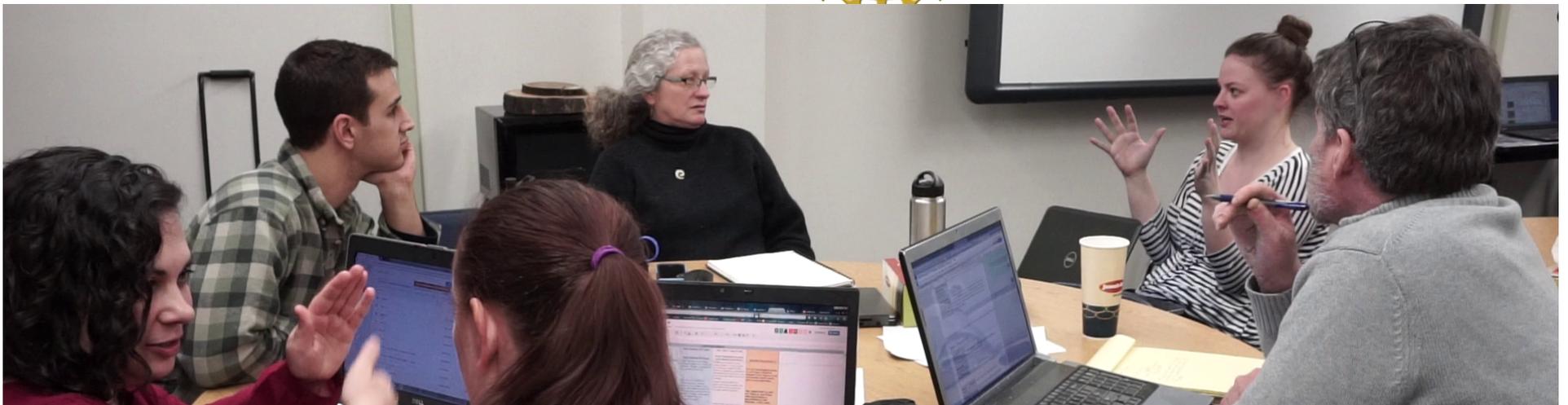
- Instructional Guidance Infrastructure (Hopkins & Spillane, in press)
 - standards, curriculum, and assessments and their relations to one another
 - strongly influence teachers' decisions to implement new materials
- What we hope to learn through design
 - What can design networks do to change IGIs to support equitable implementation of new curriculum materials?
 - What are limits of what networks can do?

What is the Inquiry Hub?

- A set of projects funded by the National Science Foundation & Moore Foundation.
 - To design and study digital curriculum materials that can help teachers implement new standards.



GORDON AND BETTY
MOORE
FOUNDATION



What is the Inquiry Hub?

- A long-term partnership of Denver Public Schools, UCAR, CU Boulder, and BSCS
 - We work on district challenges together, applying what we know from research to develop solutions collaboratively.



Discover a World
of Opportunity™



How We Are Organized

- Multiple design teams, each responsible for a sequence of lessons
- Teams are linked by a coherent “storyline” used to structure project-based units
- External partners provide both feedback and input on units (scientists, Denver Parks and Recreation)

Organizing Conditions for Social Innovation: *Building Capacity*



Discover a World of Opportunity™



Organizing Conditions for Social Innovation: *Safety for Teachers*

- Creating space in agendas for raising concerns related to district requirements
- Adjusting lesson templates to reflect principals' requirements
- Under-designing (Fischer) lessons to authorize modification after design
- Protecting from negative evaluations from observations

What We Have Learned

- What can design networks do to change IGIs to support equitable implementation of new curriculum materials?
 - Support trust building between district leaders and teachers by surfacing *and* addressing concerns
 - Create digital materials that can be easily adapted by teachers for their school context and students
- What are the limits of what networks can do?
 - Many infrastructural components cannot be modified; networks must adjust designs, conform to them, or under-design to enable implementation

Patchwork Efforts

- “Diversions” to modify components of the instructional guidance infrastructure in the district and the design process
- Focus was on expanding agency of participants in classrooms:
 - Helping build a “working infrastructure” for teachers to use curricula
 - Connecting to student interests and experiences

Modifying the Pacing Guide

Colorado 21st Century Skills  <p> Critical Thinking and Reasoning: <i>Thinking Deeply, Thinking Differently</i> Information Literacy: <i>Untangling the Web</i> Collaboration: <i>Working Together, Learning Together</i> Self-Direction: <i>Own Your Learning</i> Invention: <i>Creating Solutions</i> </p>	Science and Engineering Practices <ol style="list-style-type: none"> 1. Ask questions and define problems. 2. Develop and use models. 3. Plan and carry out investigations. 4. Analyze and interpret data (i.e., observations, graphs). 5. Use mathematics and computational thinking. 6. Construct explanations (claims, evidence, reasoning) and design solutions. 7. Engage in arguments (rebuttal) from evidence. 8. Obtain, evaluate, and communicate information. 	
Unit of Study	Length of Unit	Time Frame
1: Ecosystems: Interaction and Interdependence in Living Systems	40 50-minute classes	August–Early October 2015
2: Evolution: Patterns and Products of Change in Living Systems	35 50-minute classes	Mid-October–December 2015
3: Homeostasis: Maintaining a Dynamic Equilibrium in Living Systems	28 50-minute classes	January–Early February 2016
4: Energy, Matter, and Organization in Living Systems	25 50-minute classes	Mid-February–March 2016
5: Reproduction and Inheritance in Living Systems	36 50-minute classes	April–Mid-May 2016
6: Growth, Development, and Differentiation in Living Systems	7 50-minute classes	Mid-May–June 2016



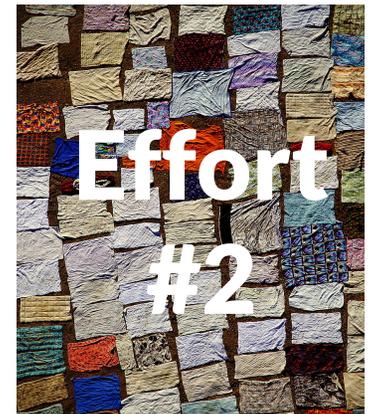
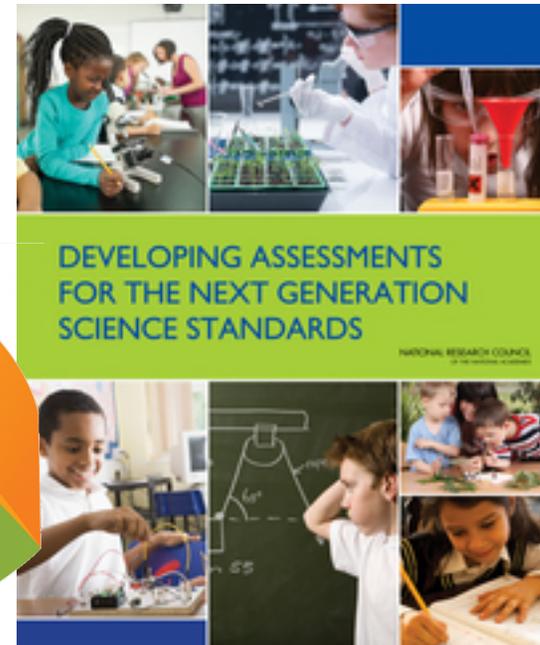
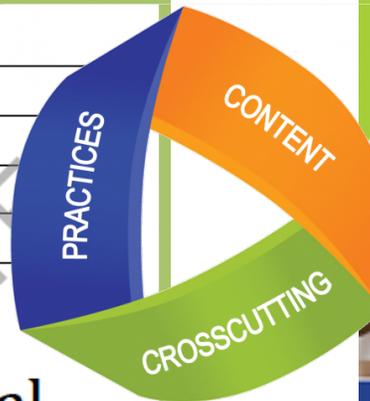
Designing Assessment Tasks

NAME: _____
STUDENT ID: _____
SCHOOL: _____
TEACHER: _____
PERIOD: _____

**Biology Semester Final
Course Assessment**

2014 - 2015

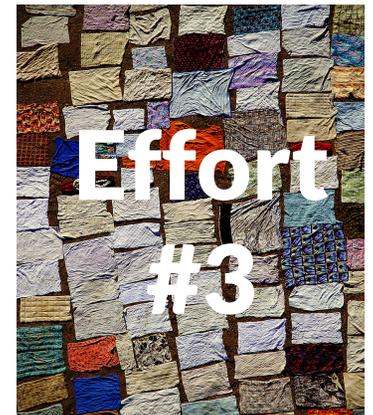
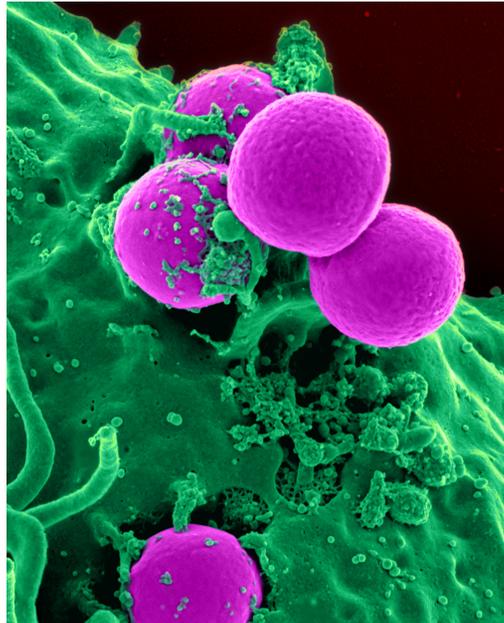
 **DENVER
PUBLIC
SCHOOLS**
Discover a World of Opportunity™



Connecting to Student Interests

- Surveyed current students on potential phenomena to anchor unit on evolution:
 - What would captivate and sustain the attention of their peers?

SUPERBUGS



What We Have Learned

- What can design networks do to change IGIs to support equitable implementation of new curriculum materials?
 - Infrastructure components change rapidly, and design networks must be nimble to influence them
 - Time and expertise needed to align components can come from the outside
 - Incorporating student voice into design can enhance direct connections to student interests
- What are the limits of what networks can do?
 - Some opportunities can easily be missed because of the speed with which changes are required

Potential Contributions to Theory

- On instructional guidance infrastructures' roles in shaping teacher decision making
 - Infrastructural components offer “resistances” that circumscribe agency of design teams to address concerns
 - The resistances are encountered when the design network attempts to change components
- Elaborating the concept of *infrastructuring* in US educational contexts
 - What actors? Which standards? Which systems?

Learning More from DBIR

- Need for greater capacity in research field
 - Deciding on a focus for joint work that (1) addresses a problem of practice and (2) has potential for building knowledge
 - Engaging with implementation theory
- Preparing future school and district leaders for the work
 - Qualifying external research partners
 - “Seeing the system” and acting to change it (Bryk et al., 2015)



RESEARCH + PRACTICE COLLABORATORY

Exploratorium	California Afterschool Tinkering Network
Education Development Center	Interactive STEM Partnership in Auburn (ME)
University of Washington	Partnership for Science and Engineering Practices (WA)
University of Colorado Boulder	Research-Practice Partnership Network

<http://researchandpractice.org>





RESEARCH + PRACTICE COLLABORATORY

Research Practice Partnership Forum

A Series in Google Hangouts on Air

Getting a Partnership Started

October 15, 2015, 3pm-4pm MT