iHub

A Research-Practice Partnership to Design New NGSS Curriculum

This work was supported by a grant from the National Science Foundation (Award #1147590). The opinions expressed herein are those of the authors and do not necessarily reflect those of the NSF.

Agenda for Today

TIME ALLOTTED	ACTIVITY
20 min	Introduction to iHub
1 hour 20 min	Co-design Activity using Challenge Cycle
20 min	Tools for Curriculum Design
1 hour 30 min	LUNCH
30 min	Posing Questions, Planning Investigations
30 min	Academically Productive Talk
30 min	Know Who, Know How

Goals for Today

At the conclusion of this session, participants will be prepared to:

- **Identify expertise** in their local area needed to design or adapt curricula that is aligned to NGSS
- **Organize a design process** that includes teachers and that results in a coherent sequence of instructional experiences for students
- **Lead activities** that simultaneously develop teachers' understanding of NGSS and new instructional materials

iHub

Overview of iHub Biology

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What is iHub?

A project funded by the National Science Foundation

- To design and study digital curriculum materials that can help teachers implement new standards

What is iHub?

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

DENVER PUBLIC SCHOOLS
Discover a World of Opportunity™

UCAR
UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

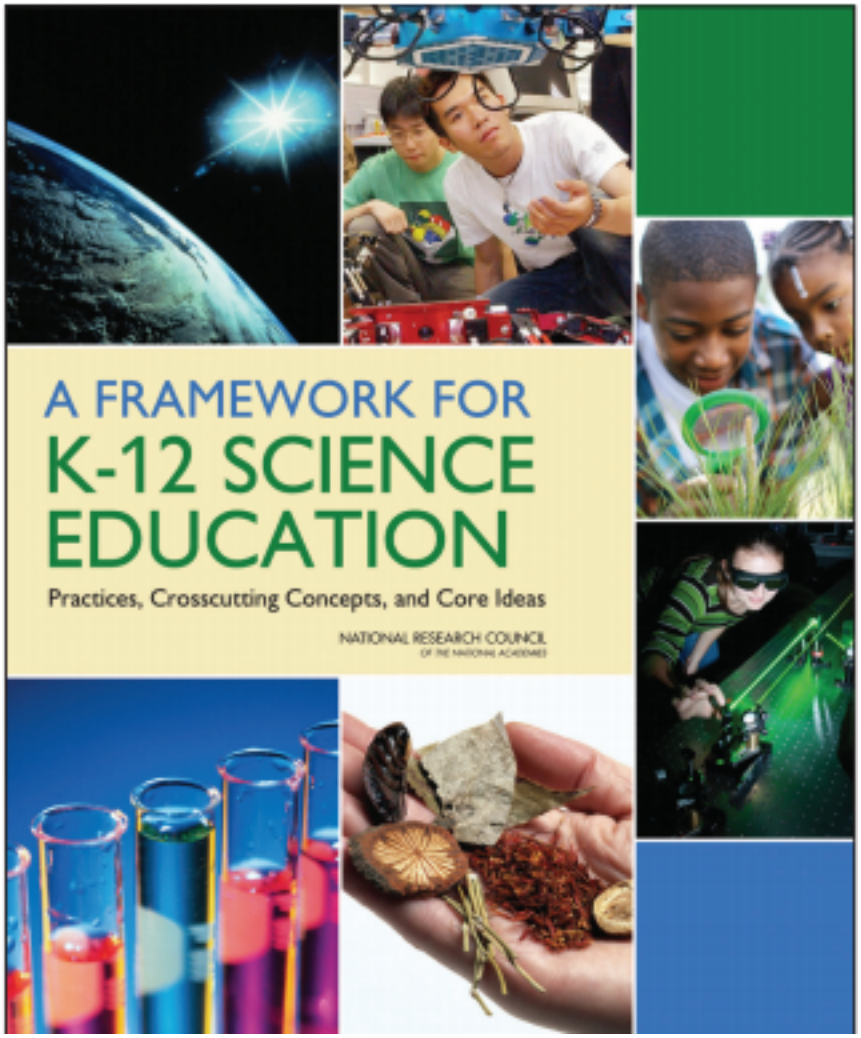
BSCS

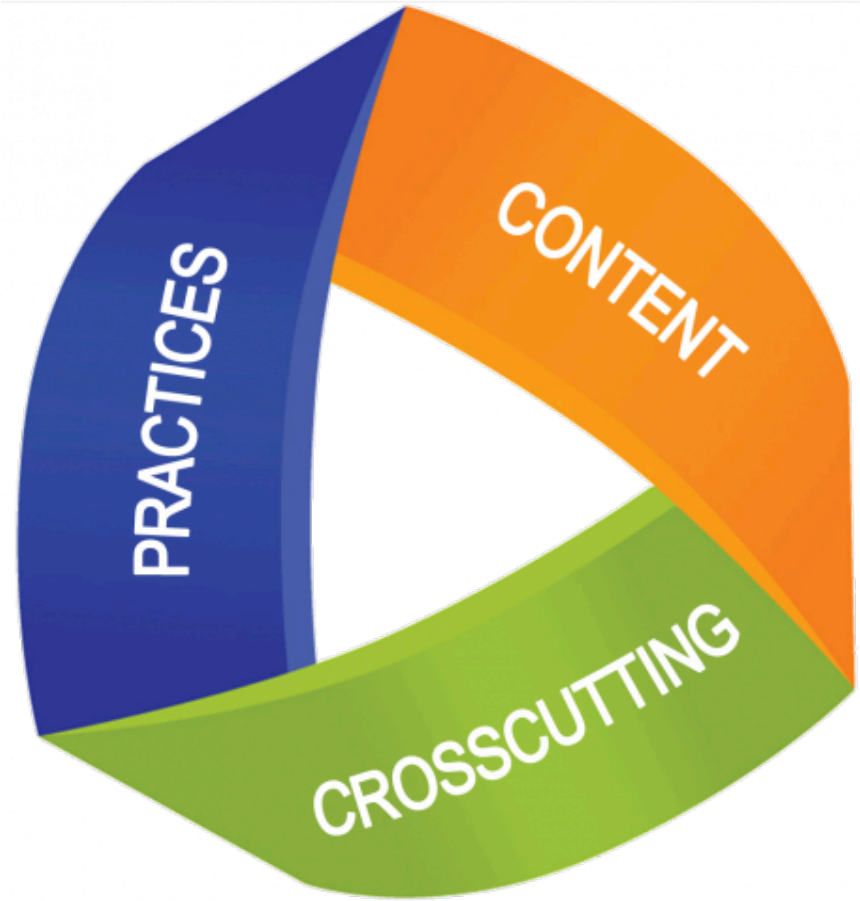
How the Partnership Supports DPS

DPS wishes to replace its aging high school biology curriculum with a new curriculum that:

- Embodies the vision of the *Framework for K-12 Science Education*
- Meets the goals of the Next Generation Science Standards and Colorado Academic Standards
- Is deeply digital for both students and teachers
- Builds on the strengths of a multi-year research-practice partnership

Primary Guide: The *Framework*

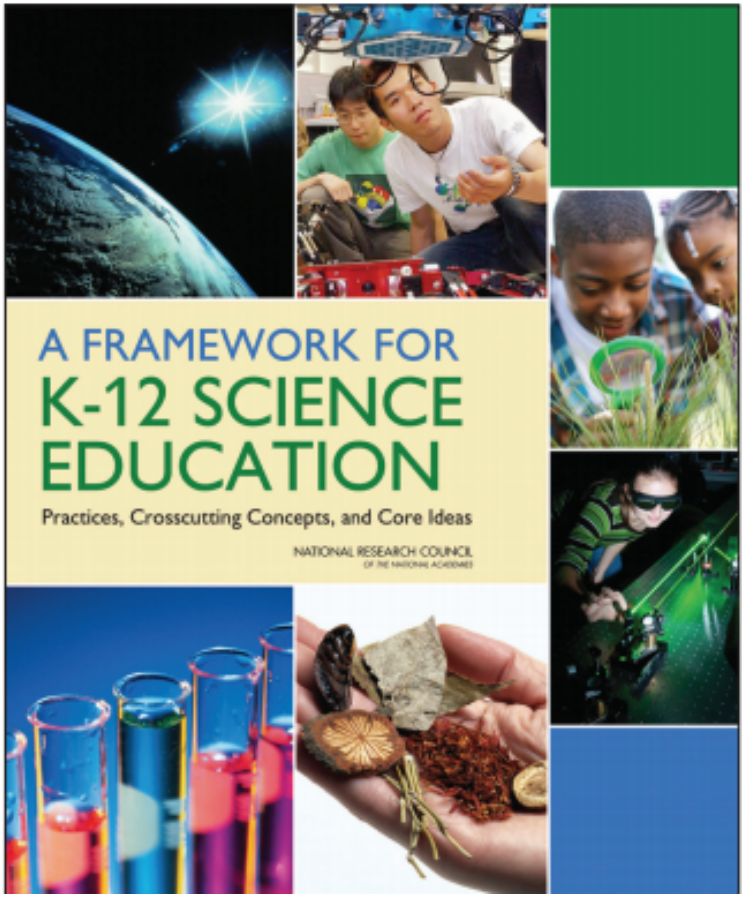




Key Principles

- Integrated science learning, not separate activities focused on teaching content or science processes
- Knowledge builds through science and engineering practices: Ask, “Is [verb in the objectives statement] a practice?”
- “Engage me” versus “trust me” instruction; guided inquiry toward learning goals
- Anchored in phenomena to be modeled and explained

Framing the Challenge



"Alignment of teacher preparation and professional development with the vision of science education advanced in this framework is essential for eventual widespread implementation of the type of instruction that will be needed for students to achieve the standards based on it." (NRC, 2012, p. 256)

Our Initial Strategy: Co-Designing Curriculum with Teachers

What Is It?	Teachers collaboratively design coherent sequences of curriculum with scientists, curriculum experts, and learning scientists
How It Supports Shifts in *Framework*	Focusing on a few disciplinary core ideas and crosscutting concepts Engaging students in scientific and engineering practices
Challenge/Condition Addressed	Lack of curriculum materials aligned to the *Framework* Building common understanding of the key shifts in the *Framework*

Re-Designing the Biology Curriculum

- We are collaboratively re-designing the biology curriculum, one unit at a time, beginning with ecosystems
- Each unit is anchored in phenomenon around NGSS life sciences disciplinary core ideas
  - HS-LS1 From Molecules to Organisms
  - HS-LS2 Ecosystems
  - HS-LS3 Heredity
  - HS-LS4 Biological Evolution

Units and Timeline for Development

Ecosystems: Interactions, Energy, and Dynamics	Biological Evolution: Unity and Diversity	Heredity: Variation of Traits	From Molecules to Organisms: Structures and Processes

2014-15 2015-16 2016-17 2017-18

develop pilot redesign pilot publish

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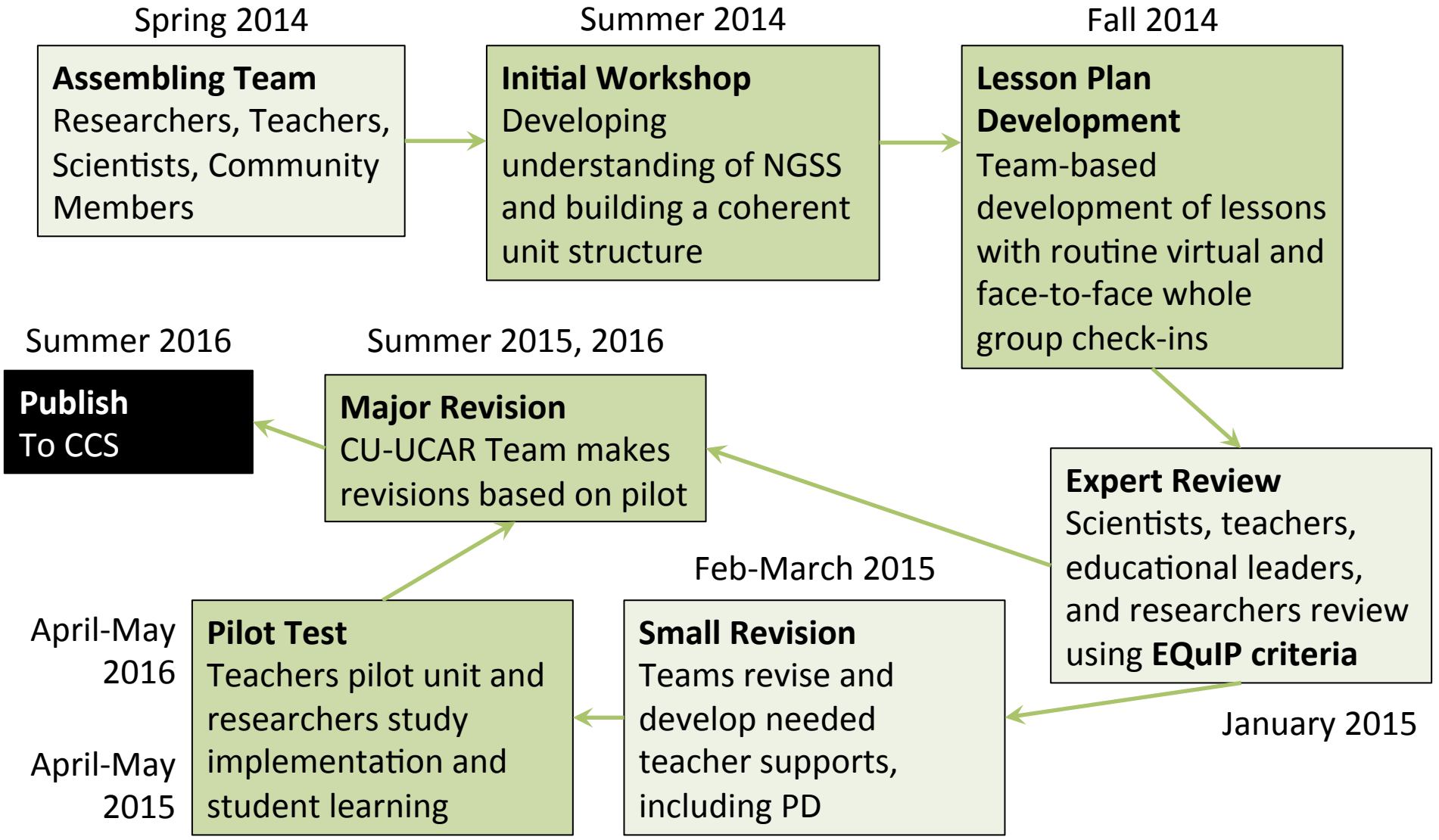
Iterative Design Process



How We Are Organized

- Four teams, each responsible for two weeks of lessons
- Teams are linked by something called a “Storyline” diagram (explained later)
- We need new external partners and teachers in each team to
  - Contribute ideas to how to make a clear storyline that builds toward our goal for students
  - Contribute ideas and insights from science about ecosystem dynamics and other ecosystems we might study

Later: Tools Guiding Our Work

- Challenge Cycle for Unit Development
  - What phenomena intersect with students' interest and NGSS PEs?
- Storyline Diagram
  - How will we build a coherent unit around the phenomena?
- Student Cascade of Practices
  - How can we optimally sequence practices in exploring the phenomenon?

Let's find out who's here

- Each square on the Bingo Card has a skill or experience of someone in the room
- Find people with the skills and life experience represented on your card and put their name in those squares
- When you have completed a row, column, or diagonal, yell Bingo!
- When you win, you'll be asked to introduce the people on your completed row, column, or diagonal
- We'll keep playing until everyone's been introduced at least once