Preparing Teachers to Design 5D Tasks to Support and Assess Science Learning

5D ASSESSMENT
Making aligned science tasks equitable for rural students

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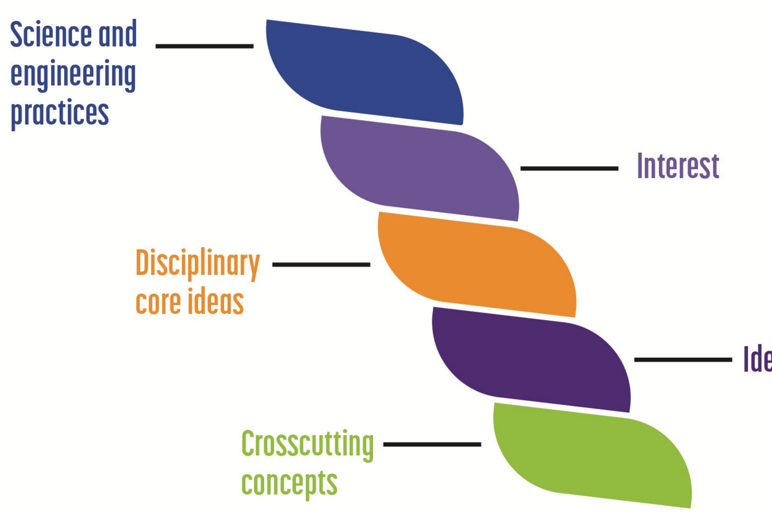
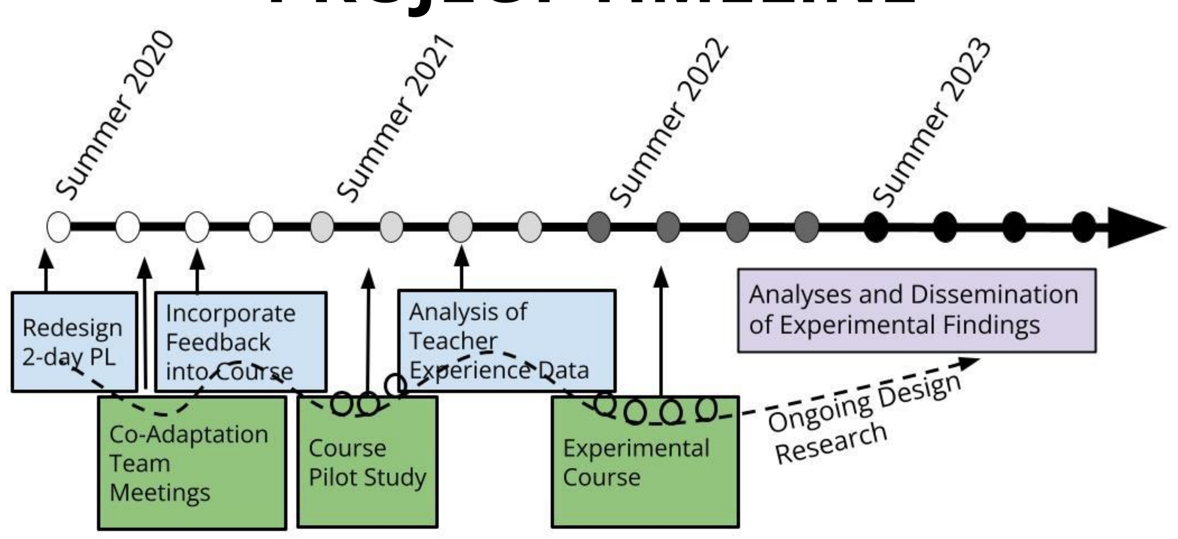
STUDY CONTEXT

One-third of American public schools are rural and one in five students attends a rural school (Williams, 2010). Rural environments provide rich and varied opportunities for engaging students in locally-relevant, community driven science (Avery, 2013; Zimmerman & Weible, 2016). And yet, rural teachers are likely to receive professional development workshops and coaching—particularly in student-centered modes of instruction—than their urban and suburban counterparts (Banilower et al., 2018).

Our project goal involved supporting rural secondary science teachers in adopting a 5-dimensional (5D) vision for meaningful science learning and performance that involves students using disciplinary core ideas, science and engineering practices, and crosscutting concepts to explain phenomena or solve design problems that are important to students and their communities.



PROJECT TIMELINE



Designing for Rural Teachers

We surveyed 87 rural science teachers in Colorado and held focus groups with 18 to learn about their perspectives, prior experiences, concerns, and interests. Overall, rural science teachers in Colorado reported using rich practices for engaging students' interests and identities in the pursuit of high-quality engagement, and they expressed a need for more science-specific professional learning and materials distribution. In particular, teachers desired

1) a deeper, more nuanced understanding of the standards,
2) an introduction to a structure for creating 5D assessments, and
3) opportunities for support and collaboration with others when designing assessments.

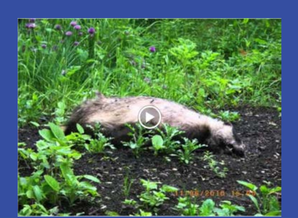
Through our design studies, we recognized the need to:

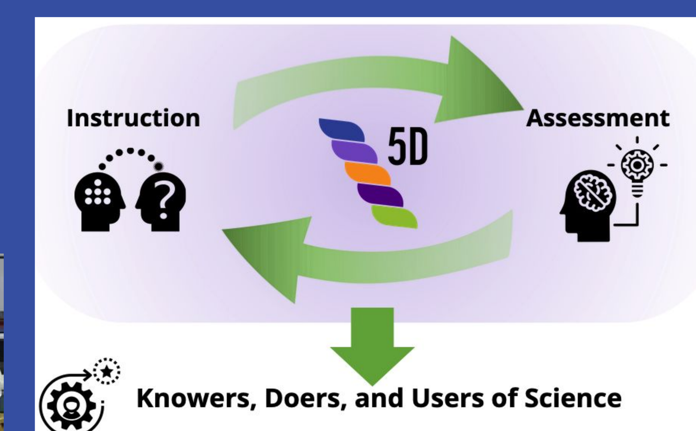
1) More explicitly support teachers' understanding of the 5Ds and what they look like at targeted grade band
2) Explicitly thread student interest, identity, and accessibility hroughout the course
3) Better support teachers' use of phenomena to support student 3D sensemaking
4) Identify accessible, illustrative assessment examples to illustrate design process

5D ASSESSMENT COURSE AND TOOLS

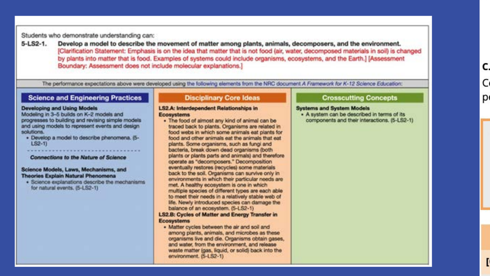
Sessions 1-3: What does 5D teaching look like?

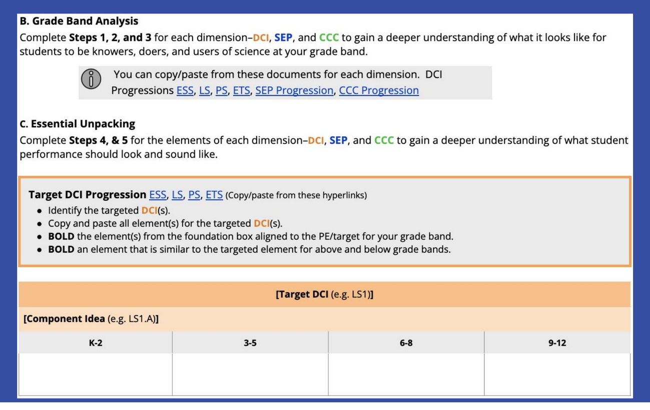
- What is our vision for meaningful science learning and performance, and how do we support it?
- What does 5D science learning and performance look like in the classroom?

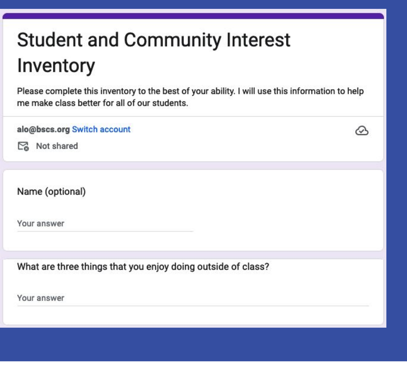




- What guidance do the standards provide for designing *grade band-appropriate* 5D instruction and assessment opportunities?
  - Grade-band analysis of targeted dimensions
  - Essential Unpacking

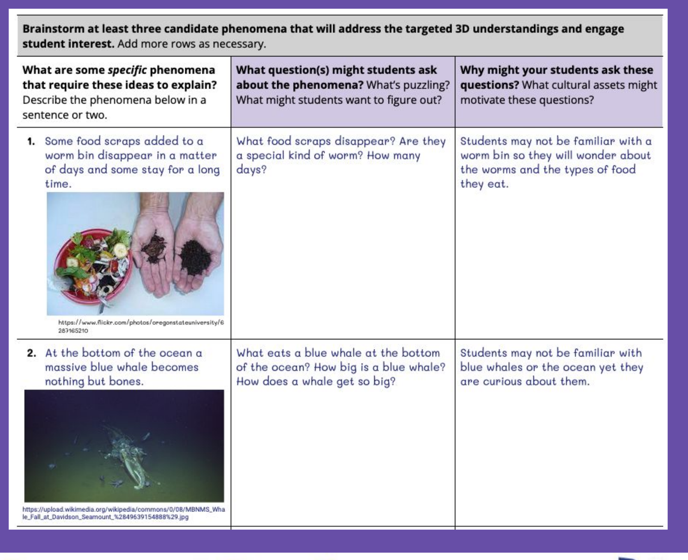


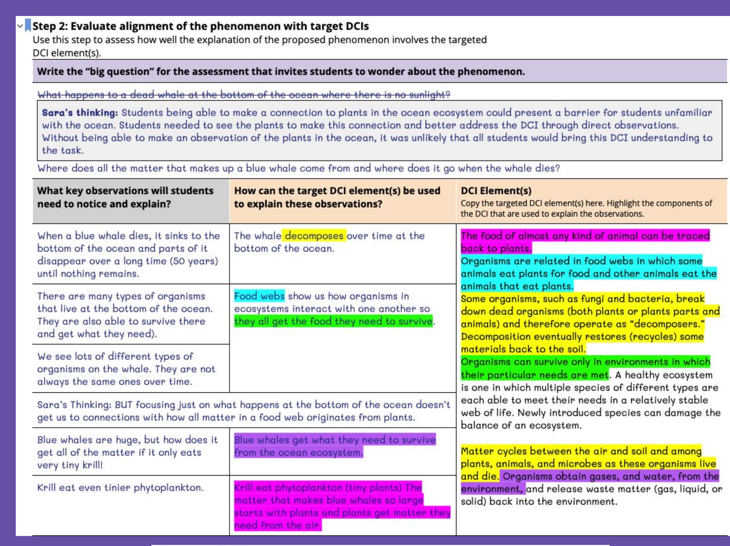




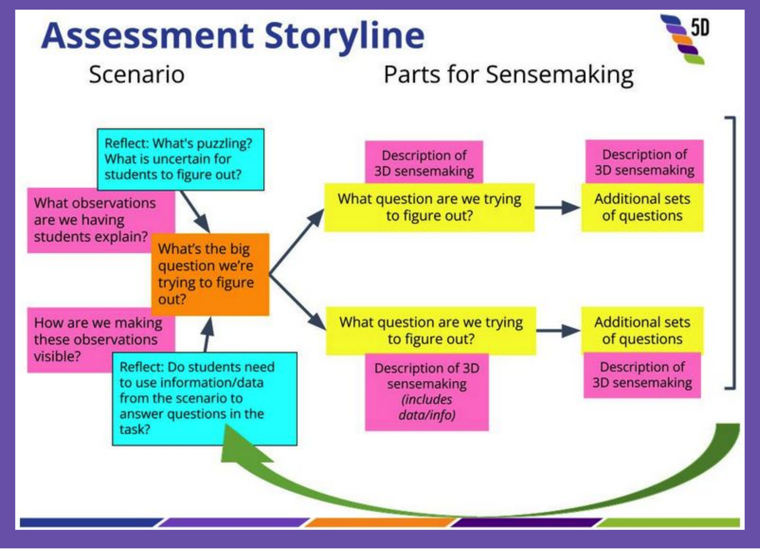
Sessions 4-6: How can we use phenomena to frame instruction and assessment?

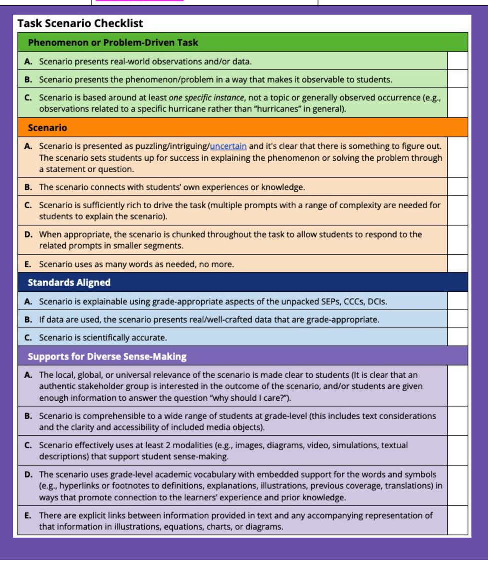
- What criteria can we use when choosing phenomena to develop and assess student understanding?
- How do we choose phenomena for students to develop and demonstrate the targeted DCI (SEP and CCC) elements?
- How do we choose and use data or information to support 3D sensemaking of phenomena?





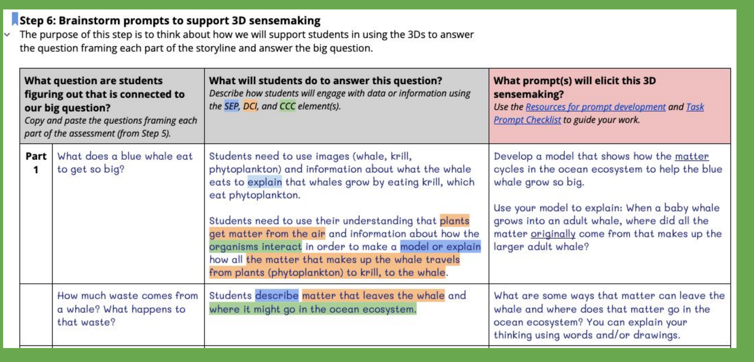
- What's the story of our assessment?
  - Highlight how students will use data or information to make sense of big question.
  - Use Assessment Scenario Checklist to check 5D alignment

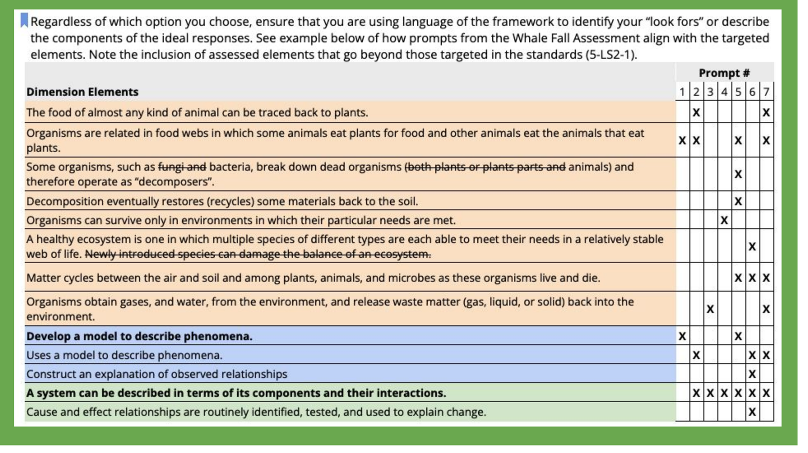




Sessions 7-10: How can we develop and use tasks to assess student understanding?

- How do we write prompts that create opportunities for students to meaningfully use the 3Ds for sensemaking?
- How can we make sense of what students have learned using a 5D assessment?
  - Choose options for providing 3D feedback
- What can we learn from our student work?





RESEARCH QUESTIONS

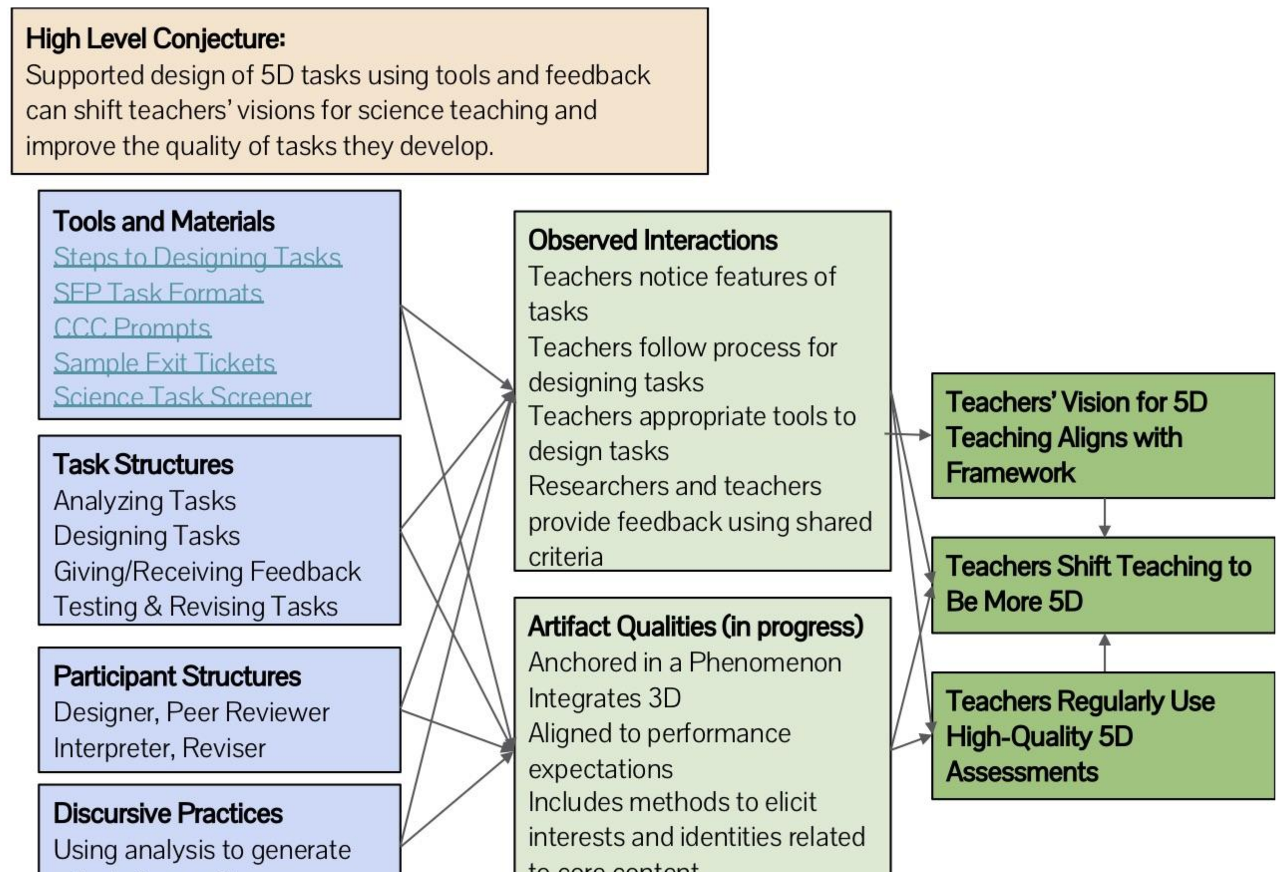
1. How do rural science teachers frame the problems and opportunities of new standards implementation? What material and temporal constraints in teachers' work contexts should be reflected in the design of an online course to support their professional learning?
2. How can teachers' participation in the online course lead to changes in teachers' vision for teaching and instructional practice and student outcomes?
3. What is the impact of the online course on teachers and grades 6-12 students, as compared to the impact of the face-to-face professional learning workshop series?

DATA

Our final sample included 23 treatment and 33 control teachers from 13 states. Teachers engaged in 25 hours of professional learning spread across 3 months. We are relying on a number of data sources to study the impact and teachers' learning processes:

- Interviews
- Artifacts from the course
- Teacher surveys of vision and instructional practice
- Videos of classroom practice
- Rubrics to assess the alignment of educators' tasks with 5D vision

CONJECTURE MAP



MORE INFORMATION

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This project is funded by the National Science Foundation, grant #2010086. Any opinions, findings and conclusions or recommendations expressed in these materials are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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