Designing assessment tasks based on disciplinary core ideas (DCIs), science and engineering practices (SEPs), and crosscutting concepts (CCCs) as articulated in NGSS performance expectations is challenging. However, the assessments that align with NGSS are valuable because a coherent and consistent approach to K-12 science education depends on having high-quality assessment of students learning.

This purpose of this project is to show the process of developing assessment items that align with NGSS performance expectations using principles of evidence-centered design (ECD) to help students achieve these new science learning goals and to investigate how teachers use the items formatively in their science classroom.

Steps and Examples of Design Process

Unpacking
- Identify performance expectations (PE) that will be targeted for the assessment.
- Elaborate of ideas, terminology, and boundaries, for each disciplinary core idea (DCI), science and engineering practices (SEPs), and crosscutting concept (CCC).
- Explicate of necessary prior knowledge and common challenges.

MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

<table>
<thead>
<tr>
<th>Disciplinary core idea</th>
<th>Science and engineering practices</th>
<th>Crosscutting concepts</th>
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| Organisation for Matter and Energy Flow in Organisms  
- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. | Constructing explanations  
- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students’ own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. | Energy and Matter: Within a natural system, the transfer of energy drives the motion and/or cycling of matter. |

Constructing Learning Performances
- Builds toward understanding of Performance Expectations
- Combine practices and content ideas at a smaller size than the PE
- Identify key aspect(s) from DCI, CCC, and scientific practices to construct a statement of what a student should be able to do

Learning Performance (Draft) Students should be able to construct scientific explanations that shows energy from the Sun initiates the chemical reaction that rearrange molecules and form new substances.

Example of phenomena of photosynthesis
You plant a vegetable garden and then watch it grow over the summer. You notice that there was the same amount of dirt in the vegetable garden at the end of the summer as there was at the beginning. The plants became bigger and bigger, and produced fruits and vegetables, but the amount of dirt did not change. The extra mass did not come from the dirt. That mass comes from the air and water, and photosynthesis is the process that plants use to get it. They absorb carbon dioxide (CO\textsubscript{2}) and water (H\textsubscript{2}O) and, using the energy in sunlight, combine into sugars. They then use these sugars both as food and as structural materials.

Conclusion

Values of our systematic process to facilitate the design of 3-dimensional formative assessments.
- Develop a broadly accessible vision of how to design NGSS assessments
- Document principled design decisions
- Create well-aligned formative tasks that are usable across varied classroom environments
- Generalize to other core ideas, crosscutting concepts, and practices

Investigating the following questions will help us design the support for teachers using the items.
- Do the items support teachers in integrating practices, crosscutting concepts and core ideas in their instruction?
- How does using assessment items in formative ways with 3 dimensions inform instructional decisions?

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