Science Assessment

In the age of NGSS

Your presenters

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Assessment at the State Level

Assessment System that includes accountability

- Three Tiered System
  - Classroom-embedded Formative Assessment (all Science Classrooms)
  - Through Course Tasks (All science students K-12)
  - State Summative Assessment (4th, 7th, and high school)

Classroom Embedded Formative Assessment

Through Course Tasks

State Summative Assessment

Phenomena
Storylines
Three Dimensions

Dates to Remember

- Now
- November-March
- March 2017

Designing Assessment for the Classroom

Identify “Priority Standards”

Already done by NGSS writers

Write Assessment Items

NGSS Task Format

One Resource

Potential Task Formats: Developing and Using Models (Science)

Format	Task Requirements for Students
1	Present two models to students, *then* Ask them to compare the models to identify both common and unique model components, relationships, and mechanisms.
2	Present students with an illustration or drawing of a scientific process or system, *then* Ask students to label the components, interactions, and mechanisms in the model, *and* Write a description of what is shown in the drawing.
3	Present students with a model of an observable scientific process or system and some evidence about how the system behaves that does not fit the model, *then* Ask students to revise the model to better fit available evidence.
4	Present students with a textual description of an observable scientific phenomenon, *then* Ask students to draw and label the model components, interactions among components, and mechanisms in the model, *and* Ask students to write an explanation for the phenomenon, using the model as supporting evidence.
5	Present students with a textual description of an observable scientific phenomenon, *then* Ask students to draw a model that helps explain how this phenomenon occurs by applying their understanding of a disciplinary core idea, *and* Write a predicti1on about something that might happen in the future that could be explained by the model.

Crosscutting Concepts: Possible Prompts

CAUSE AND EFFECT

When drawing conclusions from a simple investigation, Ask students:

What caused the patterns you observed?

Follow up question: How do you know that _____ caused _____?

Does the fact that that the data showed that _____ always happened [after/whenever] _____ occurred mean that _____ causes _____? Why or why not?

Follow up question: How can you test whether _____ caused _____ to happen?

What do you predict would happen if [extrapolate to new, related situation]?

When seeking to elicit whether students understand the ***underlying mechanism*** involving *something that is not part of the surface situation presented in the scenario, ask students:*

What [properties, entities, or rules] that aren't described explains what you see happening [in the scenario]?

What would you predict in [present new situation involving same mechanism] would happen? How is the situation similar to or different from [the presented scenario]?

When a system or situation presented in the scenario involves ***complex or relational causality*** *(e.g., as in ecosystems and co-evolution), ask students:*

Draw a diagram that shows how changes to one component of the system affects components that are not directly connected to that component.

Phenomena
Storylines
Three Dimensions

Define Success Criteria

Use the Evidence Statements

Nextgenscience.org

NEXT GENERATION SCIENCE STANDARDS
For States, By States

**Unless otherwise specified, "descriptions" referenced in the evidence statements could include but are not limited to written, oral, pictorial, and kinesthetic descriptions.*

MS-LS1-7 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

MS-LS1-7. **Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.** [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [*Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.*]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to describe unobservable mechanisms.

Disciplinary Core Ideas

LS1.C: Organization for Matter and Energy Flow in Organisms

- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy.

PS3.D: Energy in Chemical Processes and Everyday Life

- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.*(secondary)*

Crosscutting Concepts

Energy and Matter

- Matter is conserved because atoms are conserved in physical and chemical processes.

Observable features of the student performance by the end of the course:			
1	Components of the model		
	a	To make sense of a phenomenon, students develop a model in which they identify the relevant components for describing* how food molecules are rearranged as matter moves through an organism, including:	
		i.	Molecules of food, which are complex carbon-containing molecules.
		ii.	Oxygen.
		iii.	Energy that is released or absorbed during chemical reactions between food and oxygen.
		iv.	New types of molecules produced through chemical reactions involving food.
2	Relationships		
	a	In the model, students identify and describe* the relationships between components, including:	
		i.	During cellular respiration, molecules of food undergo chemical reactions with oxygen, releasing stored energy.
		ii.	The atoms in food are rearranged through chemical reactions to form new molecules.
3	Connections		
	a	Students use the model to describe*:	
		i.	The number of each type of atom being the same before and after chemical reactions, indicating that the matter ingested as food is conserved as it moves through an organism to support growth.
		ii.	That all matter (atoms) used by the organism for growth comes from the products of the chemical reactions involving the matter taken in by the organism.
		iii.	Food molecules taken in by the organism are broken down and can then be rearranged to become the molecules that comprise the organism (e.g., the proteins and other molecules in a hamburger can be broken down and used to make a variety of tissues in humans).
		iv.	As food molecules are rearranged, energy is released and can be used to support other processes within the organism.

Resources to include

Task Formats from R&P Collab
http://researchandpractice.org/ngsstaskformats/

CCC Integration
http://learndbir.org/resources/integrating-crosscutting-concepts-into-assessment-tasks

NGSS Evidence Statements
http://www.nextgenscience.org/evidence-statements

Example Phenomena (and ideas for use) http://www.ngssphenomena.com/