Smithsonian | SCIENCE *for the classroom*

2 Must-Haves for Three-Dimensional Learning and Three-Dimensional Assessment

Use these criteria to evaluate if students are making sense of phenomena and/or designing solutions to problems through tasks that integrate the three dimensions of the NGSS. (See page 2 for an example.)

1 Students do one of the following:

- Figure out the cause of a phenomenon
- Make a prediction about a phenomenon
- Solve a problem

Phenomenon or Problem	How Are Students Engaging with the Problem or Phenomenon?

2 Students use at least one science and engineering practice, disciplinary core idea, and crosscutting concept at the same time.

	Specific Element Used	How Are Students Assessed?
Science and Engineering Practice(s)		
Disciplinary Core Idea(s)		
Crosscutting Concept(s)		

Science and Engineering Practices

Behaviors that scientists and engineers regularly engage in

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational skills
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

Key discipline-specific facts and concepts

Life

- LS1: From Molecules to Organisms: Structures and Processes
- LS2: Ecosystems: Interactions, Energy and Dynamics
- LS3: Heredity: Inheritance and Variation of Traits
- LS4: Biological Evolution: Unity and Diversity

Earth and Space

- ESS1: Earth's Place in the Universe
- ESS2: Earth's Systems
- ESS3: Earth and Human Activity

Physical

- PS1: Matter and Its Interactions
- PS2: Motion and Stability: Forces and Interactions
- PS3: Energy
- PS4: Waves and Their Applications in Technologies for Information Transfer

Engineering Design

- ETS1: Engineering Design

Crosscutting Concepts

Concepts that bridge traditional disciplinary boundaries as common themes

- Patterns
- Cause and effect
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter
- Structure and function
- Stability and change

continued

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Three-Dimensional Learning Example

The following is an example of three-dimensional learning from the **Smithsonian Science for the Classroom Earth and Space Science** module "How Can We Use the Sky to Navigate?" for grade 5.

Students observe the phenomenon that shadows move and change length over the course of a day. Students use two different models to figure out what causes the shadow pattern they observed. First, they use a model to figure out how the Sun's daily pattern of motion in the sky causes the changes in shadows over the course of a day. Second, they use a model to figure out how Earth's rotation causes both the Sun's apparent daily motion as well as the shadow patterns they observed.

Phenomenon or Problem	How Are Students Engaging with the Problem or Phenomenon? *(How are students figuring out the cause of a phenomenon, making a prediction about a phenomenon, or solving a problem?)*
Shadows move and change length over the course of a day.	Example: Students use two different models to explain why shadows move and change length over the course of a day.

Throughout these tasks, students use the **science and engineering practices** of using models and constructing explanations.

They use the **crosscutting concepts** of patterns and cause and effect.

They ultimately explain the **disciplinary core idea** that, ". . . the rotation of Earth about an axis . . . cause(s) observable patterns . . . (such as) daily changes in the length and direction of shadows; and different positions of the Sun . . . at different times of the day . . ."

	Specific Element Used	How Are Students Assessed?
Science and Engineering Practice(s)	• constructing explanations	Example: Students are assessed on their use of evidence to explain that the daily motion of the Sun in the sky is caused by the rotation of Earth on an axis.
Disciplinary Core Idea(s)	. . . the rotation of Earth about an axis . . . cause(s) observable patterns . . . (such as) daily changes in the length and direction of shadows; and different positions of the Sun . . . at different times of the day . . .	Example: Students are assessed on their ability to explain that the rotation of Earth around an axis causes day and night and the Sun's daily pattern of motion.
Crosscutting Concept(s)	• patterns	Example: Students are assessed on their ability to describe that the shadow pattern they observed outside is similar/matches the shadow pattern they observe on the Earth model.

Smithsonian Science for the Classroom

Smithsonian Science for the Classroom integrates hands-on science and engineering content with literacy, drawing on the Smithsonian's research, scientists, and world-class collections featured in the Smithsonian Science Stories series.

Learn more about the curriculum's phenomena- and problem-based modules for grades 1–5 at www.carolina.com/ssftc.

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