Next Gen PET

Teaching and Learning

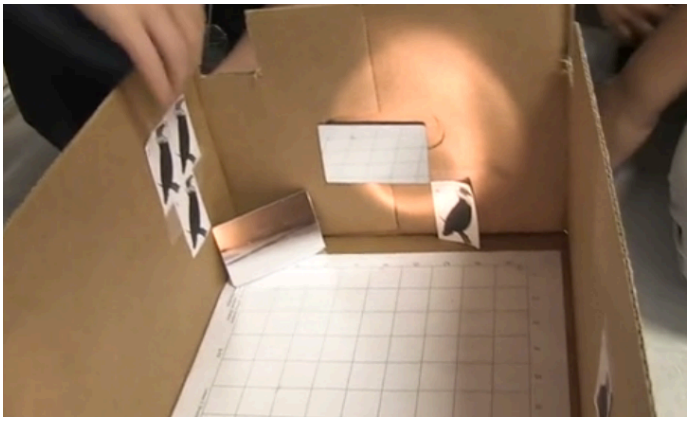
Activity 8: Arguments and Evidence (NGSS Practice 7)

Purpose and Materials Needed

In this activity we will consider Practice 7 of the Next Generation Science Standards (NGSS), *arguments from evidence*. You should have already watched a video of fifth graders designing and presenting a lighting system before coming to class and reviewed the NGSS expectations for elementary school children. The transcripts for the videos can be found at the end of Extension M.

The video for this activity is presented in two parts.
Part 1: http://www.eie.org/eie-curriculum/resources/designing-lighting-system-1-grade-5-fall-river-ma
Part 2: http://www.eie.org/eie-curriculum/resources/designing-lighting-system-2-grade-5-fall-river-ma

These two videos describe the fourth lesson of the EiE curricular unit *Lighten Up*. The design challenge is for children to design a lighting system for an Egyptian tomb (represented with a cardboard box).



Prior to this, they investigated how materials interact with light and learned to use a tool to measure the intensity of light. This tool is a plastic sheet with four different shades of grey. The students look through the sheet and identify the darkest shade of grey that they can look through and still see the eye of the vulture.

What are the teachers' and students' roles in engaging in argument from evidence?

Predictions, Observations and Making Sense

Part 1: Your Ideas about Arguments and Evidence

Consider a time in your Next Gen PET class where students presented two different ideas. This may have been in a discussion among a few students in a small group setting or it may have been two ideas publically discussed in class, for example students supporting two different answers to a question posed in the curriculum.


When there are two conflicting ideas presented, what criteria do you use to decide which idea is the "better" of the two ideas?

In your class, your instructor has likely established and modeled expected ways of discussing conflicting science ideas.

Part 2: Observing Students Compare Solutions

In the fifth grade classroom in the videos, the students present different solutions to the design problem. Comparing solutions can help children move forward in thinking about their own solutions.


How does the teacher facilitate the comparison of the different solutions so that the activity remains a learning experience?

One of the things that the teacher does is create a system for scoring designs along a set of constraints and goals. They are awarded so many points if the cost is kept down and other points for being able to see more hieroglyphs, and seeing them more clearly.


How does creating a set of criteria to score design solutions help students compare solutions?


Give one or two examples of questions or comments that students in the class make about *other students'* designs.


In Extension M, you should have made a chart of the expectations for Practice 7 that you noticed students engaging in. Look at your chart. What are some ways you could you modify this activity to engage students in more of the expectations? (The table of expectations is included for your reference at the end of this activity).

Summarizing Question

S1: In activities where the students will be arguing about science ideas or about the merit of a solution to a design problem, what are some *norms* (ways of acting and talking) and *expectations* that teachers need to establish in their classrooms?

Engaging in Argument from Evidence

The study of science and engineering should produce a sense of the process of argument necessary for advancing and defending a new idea or an explanation of a phenomenon and the norms for conducting such arguments. In that spirit, students should argue for the explanations they construct, defend their interpretations of the associated data, and advocate for the designs they propose. (NRC Framework, 2012, p. 73)

Grades K-2 Expectations	Grades 3-5 Expectations
Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). • Identify arguments that are supported by evidence. • Distinguish between explanations that account for all gathered evidence and those that do not. • Analyze why some evidence is relevant to a scientific question and some is not. • Distinguish between opinions and evidence in one's own explanations. • Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument. • Construct an argument with evidence to support a claim. • Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.	Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Compare and refine arguments • based on an evaluation of the evidence presented. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. • Construct and/or support an argument with evidence, data, □ and/or a model. • Use data to evaluate claims about cause and effect. • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.