Faciliator's Guide

Grade: 5
Unit: Light Energy
Title: Introduction for Teachers Only

Topic:

Understanding Children's Ideas About Light

Used with the permission of: Physical Science & Everyday Thinking PSET
http://www.petpset.net/student_resources/htm/pset.html

Lesson Summary:

This introduction will provide teachers a chance to practice formative assessment skills while investigating the ideas young children have about light energy. Through these introduction experiences, teachers will uncover misconceptions their students might have about light energy. Through observation, teachers will be able to make decisions regarding the readiness of their students and classroom environment to study light energy.

Arkansas Frameworks: http://www.arkansased.org/teachers/word/science_k-8_011006.doc

PS.7.5.1 Summarize how light can interact with matter through absorption, refraction, and reflection

PS.7.5.2 Investigate how light travels and interacts with an object or material

PS.7.5.3 Conduct investigations demonstrating how an object can be seen

PS.7.5.4 Design and conduct investigations of transparent, translucent, and opaque

NS.1.5.1 Make accurate observations

NS.1.5.2 Identify and define components of experimental design used to produce empirical evidence: hypothesis, replication, ample size, appropriate use of control, use of standardized variables

NS.1.5.4 Interpret scientific data using: data table/charts, bar graphs, circle graphs, line graphs, stem and leaf plots, Venn diagrams

NS.1.5.5 Communicate results and conclusions of the scientific inquiry

Focus Question: What types of ideas do elementary students have about light?

Background Information: Although good teachers use formative assessment often in their classrooms, they may not be aware that is what they are doing. Formative assessment opportunities come from structuring the classroom to allow for student practice of concepts with observations and feedback given by the teacher and/or their peers in a safe learning environment. Formative assessment builds the necessary skills for students to become self-assessors and accountable for their own learning. Students and teachers work together to evaluate the student's individual responses to a task. They evaluate where the student is at that point of the assignment and where they should be. In addition, they create a plan as to how the students will progress toward that outcome. The plan is then implemented through a series of specific steps decided in the created plan. Formative assessment is totally learner-centered and individualized. Rubrics are often used to assess tasks, grades are not given for practice work, and students are involved in the decision-making.

Timeline:
Jigsaw Activity: (10 minutes)
Initial Ideas (15 minutes)
Collecting and Interpreting Evidence (20 minutes)
Summarizing Questions

Materials:
Square table
White paper (1 sheet)
4 people
1 flashlight
Mirror
Copies of the Article "7 Common Ideas & Summary)
Link to the video, "Light.mpg"

	Instruction	Facilitator'sNotes
	1. **Laser lights, Sunlight, Flashlights, or Maglites -** looking directly into the light or pointing the light in the eye can cause serious permanent damage to the retina. Only the teacher should use the laser light during the experiments. 2. **Hairspray -** be sure to aim the can away from face and eyes. Goggles should be used for young children. 3. **Light bulbs -** heat generated by the bulbs can cause serious burns / bulbs made of glass can break and cut the skin or eyes (especially halogens) / salt and oils from bare hands can cause bulbs to shatter when turned on. 4. **Mirrors -** be aware of sharp edges 5. **Lenses and Mirrors -** can magnify the intensity of the light. Teacher should monitor students carefully to avoid reflection into someone's eyes or causing heat which will burn. 6. **Batteries -** should not be installed backwards, put in fire, or mixed with other battery types. This may cause exploding or leaking. 7. **Broken bulbs or old batteries -** should be handled by the teacher and not the student. 8. **Disposal of bulbs or batteries -** wrap glass bulbs before throwing them away / recycle batteries in the proper place (The local post office may have a battery recycling box). 9. **Eating** should be avoided in the science lab area. 10. **Arrange room** and put away unneeded items to avoid tripping and allow for free movement of students during the experiences that require the room to be dark.	
Facilitator Preparation:	Cover windows so the room will be as dark as possible.	
Elicit	Ask the teachers to respond to the following questions: What is light? Name some of the properties of light? What do you know about these properties?	
Engage	***7 Common Ideas Students Have About Light*** <u>Jigsaw activity:</u> (10 minutes) 1. Divide the teachers into 8 groups. 2. Assign each group 1 or the 8 sections of the article, ACTIVITY 5 HW 2 Reading: Children's Ideas about Light, from PSET Learning about Learning (pages 107 – 110) 3. Groups read and discuss their section within their small group. 4.Groups share their section orally with the large group.	
Explore	***Exploring Inital Ideas*** (15 minutes) <u>Procedure 1:</u> 1. Place white paper and mirror in the center of the table. 2. Four students stand around the table - one student on each side 3. One student holds the flashlight (off position) 4. Students predict what each person standing around the table will see when the lights are turn off and a flashlight (turned on) is directed at the center of the table. 5. Teachers discuss what their student's answers might be.	Before doing the experiment with teachers, pass out the sheet with the picture of students lined up around a table ready to shine the flashlight at the mirror. Ask teachers to write their predictions of what each student will see on their paper.

	Procedure 2: 1. Place the mirror in the center of the table. 2. Four students stand around the table - one student on each side 3. One student holds the flashlight (off position) 4. Students predict which of the four students standing around the table would see the light when the lights are turn off and a flashlight (turned on) is directed at the center of the table. 5. Teachers discuss what their student's answers might be. 6. Teachers justify thier answers using one or more of the common ideas described in the article read during the jigsaw activity. 7. Conduct the experiment to test your predictions.	
Explain	1. Ask teachers to discuss at their tables how their experience with the flashlight and mirror supports the article, "7 Common Ideas Children Have About Light." 2. Have groups orally share their responses as a whole group discussion. 3. Ask teachers to discuss at their tables the misconceptions that their students might have about light.	
Elaborate	***Collecting and Interpreting Evidence*** (20 minutes) 1. Show video, Light.mpg (8 minutes) 2. Within the small group, teachers discuss and complete the questions from the evaluate section of this lesson. 3. Have groups orally share their responses as a whole group discussion.	video link: Who Will See the Light
Evaluate Formative Assessment	***Who Will See the Light?*** 1. What idea did the student have about who would see the light when the person with the flashlight shines the light into the mirror? 2. What do you think the student based his prediction on? 3. What evidence do you have to support this?(use quotes from transcript) 4. During the activity what idea or ideas did the 4th grade students construct about the behavior of light? 5. What evidence do you have to support this? (use quotes from transcript) At 6:47:17 Josh stated "Well we discovered, we thought, we found out that the-we started thinking at the end that the mirror could only reflect the light one way." 6. Do you think that the students came up with this idea or do you think that the interviewer played a large role in telling this idea to the students. 7. What evidence can you give to support your answer?	

Extend Formative Assessment	Teachers will extend this lesson by setting the experiment up in their classrooms. While the students conduct the experiment, the teacher will apply the questioning and listening strategies she practiced today. This will provide the teacher information as to what her/his students know about light and any misconceptions the students may have.	
Technology	Video	
Resources:	Used with the permission of: Physical Science & Everyday Thinking PSET http://www.petpset.net/student_resources/htm/pset.html	
Document Links:		