

Example of a Planning My Science Talk (Light Energy)

Requirement	Scoring Guidelines	Your Work	Score
<p><b>NGSS Standard</b></p> <p>(2 points)</p>	<p>State NGSS performance objective or disciplinary core idea which links to this topic</p>	<p><b><u>Disciplinary Core Ideas</u></b>  <b>PS4.B: Electromagnetic Radiation (4<sup>th</sup> grade)</b></p> <ul style="list-style-type: none"> <li>An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2)</li> </ul> <p><b><u>Performance Expectations</u></b>  <b>4.PS4.2</b> Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.</p>	
<p><b>Learning Objective</b></p> <p>(2 points)</p>	<p>What do you hope students will learn?</p>	<p>Students will understand that light makes sight possible. In order to see objects light must be reflected off of the object, travel in a straight line to the eye, and be transmitted into the eye. If there is no light, objects cannot be seen.</p>	
<p><b>Prompt/ Essential Question</b></p> <p>(2 points)</p>	<p>Identify the prompt you have been assigned</p>	<p>“Apple in the Dark,” by Page Keeley</p> <p>Access prompt online:  <a href="http://www.wsfcs.k12.nc.us/cms/lib/NC01001395/Centricity/Domain/3333/Probe_Apple%20In%20the%20Dark.pdf">http://www.wsfcs.k12.nc.us/cms/lib/NC01001395/Centricity/Domain/3333/Probe_Apple%20In%20the%20Dark.pdf</a></p>	
<p><b>Answer to Essential Question/ Prompt Response</b></p> <p>(10 points)</p>	<p>Provide a response to the prompt that is <b>thorough and accurate.</b></p>	<p>The prompt states that, “There are no windows in the room or cracks around the door. No light can enter the room.” This means that the room is in complete darkness. In the absence of light, complete darkness, our eyes would have no information to receive and therefore we would not be able to see anything, including color. Our eyes would not adjust, because there would be no light for eyes to receive, which is what the term “adjusting” means. When looking at the responses, the only answer that says that we will not see anything is response A. Response A is the correct answer to the prompt based on my research.</p>	

<p><b>Research</b> <b>(15 points)</b></p>	<p><b>Science content is explained thoroughly and in student's own words.</b> There is evidence of research and sources are cited. Be sure to include research on common misconceptions regarding this concept. Explanation is a minimum of <b>500 words.</b></p>	<p><u>Research:</u></p> <p>In order to see anything in our world, light must reflect off of it and enter our eye. The sense of “sight” is the act of light entering the eye. Light is reflected off all objects until it reaches our eyes and we are able to transmit the light in our eye in order to see it and the color it appears as. We see color when light bounces off an object and reaches our eye. The different properties of the object depend on which wavelengths of light are absorbed and which are reflected. The wavelengths of light that are reflected and that our eyes receive are the “colors” of the object.</p> <p>Within our eye, the retina is the main source of the reception of light. Light comes into the eye and is received in the retina where there are cones. The cones take the light; all cones take in a different color of light, some red, some yellow, and some green. Most of the cones receive red light. Once the cones get the information from the light in the retina, they transmit it to the cerebral cortex of the brain that tells us its color.</p> <p>Darkness is essentially the absence of light. In our world it is extremely rare (almost impossible) to be in complete darkness. In most cases there is minimal light and our eyes can adjust to the light and we will eventually see shapes or shadows. We rarely can see color in darkness because there is not enough light bouncing off the object for the cones in our eyes to see the color. Complete darkness means that there is absolutely no light. This means that there would be nothing for our retina and cones to receive and therefore we would not be able to see anything, especially color.</p> <p>Some misconceptions that students would have on the topic of light, color, and</p>	
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		<p>darkness are that light does reflect of things and that it is just illuminated and doesn't actually enter our eyes. The probe discusses that some studies have shown that students of all ages have trouble understanding that our eyes must receive information in order for us to see an object. This continues on to say that most students do not understand the reflection of light, which translates into their misconceptions about the fact that light must enter the eye in order to see something. Another misconception could be that color is just color and that light does not affect it at all, our eyes just see it as the color it is.</p> <p><u>Sources:</u></p> <ul style="list-style-type: none"> <li>• American Association for the Advancement of Science (AAAS). 2001</li> <li>• <a href="http://www.livescience.com/32559-why-do-we-see-in-color.html">http://www.livescience.com/32559-why-do-we-see-in-color.html</a></li> <li>• National Science Teachers Association: Physical Science Assessment Probe: Related Research</li> <li>•</li> </ul>	
<p><b>Cross-cutting Concepts</b> <b>(2 points)</b></p>	<p>Identify and explain how at least one <b>cross-cutting concept</b> relates and can be incorporated into this talk. <i>Check Resources for link to NGSS Cross-cutting Concepts.</i></p>	<p><b>Cause and Effect</b> – This Crosscutting Concept relates to this topic, because light causes objects to be seen. In the absence of light, there is no energy/stimulus for our eyes to perceive and respond to. The cause is light striking the retina and the effect is that object which reflected the light can be seen. If no light is present the effect (sight) cannot be produced.</p>	
<p><b>Talk Moves</b> <b>(2 points)</b></p>	<p>Identify 2 <b>Talk Moves</b> and explain how you plan to use them</p>	<p><b>Restating</b> - I am going to have a student who is not as eager to speak out in class restate another student's reasoning for question #6 below (about being able to see the apple in the dark) in his or</p>	

		<p>her own words.</p> <p><b>Prompting</b> - I am going also going to involve a different student in the discussion by asking if he disagrees or agrees with a fellow student and ask him to explain why.</p>	
<p><b>Discussion Map and Guiding Questions</b></p> <p><b>(15 points)</b></p>	<p>Provide a plan for the direction of your talk. Within this plan, include a discrepant event/task student will use to gather data and a sequence of a minimum of <b>10 questions and answers</b> to guide your discussion. Label questions as Lower Cognitive Demand (LCD) or Higher Cognitive Demand (HCD).</p>	<p><u>Discussion Map:</u></p> <ol style="list-style-type: none"> <li>1. Access prior knowledge using questions 1-5 below. Do not yet address or correct misconceptions. Record responses on the whiteboard.</li> <li>2. Distribute a copy of the prompt to each participant. Ask them to read and think about how elementary students might respond to the prompt. Give them a couple minutes to complete this task without talking.</li> <li>3. Call on individuals to share responses as if they were elementary-aged students.</li> <li>4. Continue to ask questions, 6-10.</li> <li>5. Have a flashlight and an object. Shine the light on the object and have students draw a model of how the light travels in this example. Ask them to think about how this would be different if there was no light from the flashlight or any source. Have them share the models and discuss the importance of light.</li> <li>6. Address misconceptions and settle on correct answer to the prompt.</li> <li>7. Ask them to think about the main idea/concept behind this science talk prompt. Have them share what they consider the main idea with the group.</li> </ol> <p><u>Guiding Questions:</u></p> <ol style="list-style-type: none"> <li>1. How do we see objects? HCD <i>our eyes perceive light that is reflected off of</i></li> </ol>	

*objects*

2. Do we have to have light to see objects?

LCD yes

a. Where does light come from?

LCD Light is a form of energy.

*When matter heats up and atoms get excited, they give off light.*

b. Can there be an absence of light?

LCD Yes

i. What is this called? LCD

*darkness*

3. How do our eyes perceive light and function to help us see? HCD

a. What are some of the parts of our eyes? LCD *lens, iris, pupil, retina, etc...*

b. *How are these parts of our eyes* are important for sight? LCD

*Light enters through the cornea*

*and is focused by the lens onto the retina at the back of the eye.*

*The pupil expands and contracts to control the amount of light that enters the eye.*

c. Explain how light affects how we see objects? HCD *In order to see anything in our world, light must reflect off of it and enter our eye.*

*The sense of "sight" involves light entering the eye. Light that is reflected off objects travels in a straight line. When it reaches our eyes, it is focused on the retina and the information is processed through the optic nerve to the brain.*

4. What is color? What makes us see color?

a. What is color? LCD. *The*

*wavelengths of light an object*

*reflects and does not absorb are*

*the “colors” of the object.*

- b. Explain how we see color? HCD  
*We perceive color when light bounces off an object and reaches our eye. The different properties of the object depend on which wavelengths of light are absorbed and which are reflected. Some wavelengths of light are absorbed by the object, and the remainder of the light is reflected. The wavelengths of light that are reflected stimulate red, blue and green cone cells in our retina and this is how we perceive color.*

5. What do your eyes normally do in the dark from your experience?
- a. Do you think the room was in complete darkness in your previous experience? LCD
  - b. What is complete darkness? LCD  
*no*
  - c. Is it likely for us to experience this in our world? LCD *no*
  - d. If it was completely dark, would it be possible for us to see anything? Why or why not? HCD  
*no...*
  - e. How do you think our eyes would respond to complete darkness? Why? HCD *We would not be able to see because no light would enter the eye.*
6. Would you be able to see the red apple if it was complete darkness and there was an absence of light?
7. Would you see the apple but in a different color? Why or why not? HCD  
*Without light, you could not see the apple at all.*

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|  |  | <ol style="list-style-type: none"><li>8. What would make you not see the apple, why would the complete darkness affect this? HCD <i>The absence of light would make it impossible to see the apple.</i></li><li>9. What misconceptions might your students have about this topic? HCD <i>Students will be used to having their "eyes adjust," but this is due to there still being light present. Students might be confused by this.</i></li><li>10. How could you address their misconceptions about how we see color and complete darkness? HCD <i>List ideas here so that you can spur students' thinking in case no one volunteers ideas.</i></li></ol> |  |
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