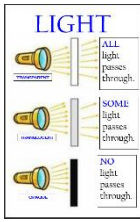


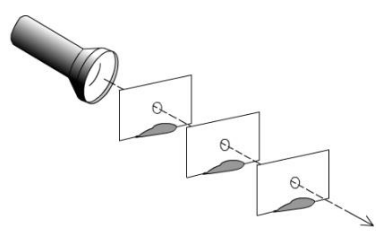
# Wizards of Wright

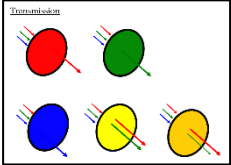
## Lesson: Light Science


Use WOW! Lesson Intro to begin.

<p><b>Background Info for Wizards:</b></p>	<p>Many students begin with the misconception that the light they experience every day is “clear” and that things create color. In reality, everyday light is composed of many colors, and the colors they see are the result of the interaction between light and matter. Light travels in waves, but can be manipulated! You can mix it, bend it, and make it change directions. Today we will run some experiments that will allow you to do all of these things.</p>
<p><b>Materials:</b></p>	<ul style="list-style-type: none"> <li>- 3 paper-plates showing (transparent, translucent, opaque) and accompanying graphic</li> <li>- 3 index cards, modeling clay, flashlight</li> <li>- light transmission graphic and filter glasses</li> <li>- coloring sheets and filter glasses</li> <li>- shadow graphic</li> <li>- student boxes will include 3 Light Blox (red, blue, and green) and 1 Reflect View</li> <li>- Shadows and Transmission worksheet</li> </ul>
<p><b>Lesson Time: 45-60 minutes</b></p>	<p>Introduction: 5-7 minutes          Guided Lesson #1: 5 minutes          Wizard Demonstration: 5-7 minutes          Guided Lesson #2: 5 minutes          Student Activity #1: 10 minutes          Guided Lesson #3: 5 minutes          Student Activity #2: 10-15 minutes          Conclusion:</p>
<p><b>Learning Targets:</b></p>	<p>Students will explore that light is a form of energy that travels.</p> <p>Students will learn that when light interacts with other objects it is reflected, refracted or absorbed.</p> <p>Students will learn that when we see color it is due to the reflection and absorption of light.</p> <p>Students will learn that the amount of light that can pass through a transparent, translucent or opaque material is different.</p>

<p><b>Introduction for Students:</b> 5-7 minutes</p>	<p><b>What is light made of?</b> This is not an easy question. It is not considered matter because it has no mass, or take up a specific space. Light is a form of energy made up of very small particles called photons.</p> <p><b>Why does light go through some things and not others?</b> Light behaves differently, depending on the matter it interacts with. When light passes directly through something (like air or water or glass) it is called transparent. When light is blocked by an object and can't pass through it at all (like an animal or wood, metal, trees and a book), the object is called opaque. A third type of object allows some light to pass through it, but scatters the light enough that you can't clearly see the object (like frosted glass, tissue paper, thin sheets of plastic, and ice). These objects are called translucent.</p> <p>Show paper-plates: transparent, translucent, opaque Can also show graphic of flashlights.</p> 
<p><b>Guided Lesson #1:</b> 5 minutes</p>	<p><b>What is Light?</b> When we're little, we have a simple understanding of light: the world is either light or dark and we can change from one to the other by flicking a switch on the wall. But as we grow up we learn that light is more complex than this.</p> <p>Light is a kind of energy.</p> <ul style="list-style-type: none"> <li>- Light travels. It can travel between two places like from the Sun to the Earth or from a flashlight to the sidewalk in front of you on a dark night.</li> <li>- The energy travels in the form of waves. This is similar to the waves on the sea but about 100 million times smaller. It is a vibrating wave of electricity and magnetism.</li> </ul> <p><b>How does light travel and how fast does it travel??</b> Light follows a perfectly straight path until something bends it.</p> <p>Light moves very quickly, it travels to Earth from the Sun, which is 93 million miles away. Light travels at 186,000 miles per second, so the sunlight you're seeing now was still on the Sun about eight minutes ago. Does this seem SLOW? Well, if you could DRIVE to the sun at 60 mph, it would take you 177 years to get there! In one second, light can go around the earth 7 times!</p>

<p><b>Wizard Demonstration #1:</b> 5-7 minutes</p>	<p><b>How does Light Travel?</b> Use the index cards and little bits of clay.</p> <ol style="list-style-type: none"> <li>1. For each card, use a small piece of clay and place the card into the clay to create a "stand" for the card. Place the cards so that they stand at an equal distance from each other.</li> <li>2. Place the flashlight (or Light Blox) at one end of the row of index cards and turn off the light in the room.</li> <li>3. Arrange the index cards so that light can be seen through all the holes.</li> <li>4. Observe and discuss your observations.</li> </ol>  <p>How can the light be seen through all the index cards? - The holes are in alignment and the light travels in a straight line.</p> <p>What does the experiment prove about the path light travels? - Light travels in a straight line.</p> <p>What would happen if the holes were smaller? - The light would continue to travel in a straight line, in a narrower path.</p> <p>An extension to this activity is included for teachers borrowing the <i>WOW! on Wheels</i> Extension kit after this lesson. If that kit is not being borrowed, a few more things can be presented in this demonstration.</p> <ul style="list-style-type: none"> <li>- What happens when you move the center card? Can the light “get around” the card and pass through the last hole? Why?</li> <li>- What happens if cards are very close together? Or very far apart?</li> <li>- What happens if the Light Blox is closer? Or farther away?</li> </ul>
<p><b>Guided Lesson #2:</b> 5 minutes</p>	<p>When light comes into contact with something it is either reflected, absorbed, or transmitted.</p>

	<p>When light travels it is called TRANSMISSION. (show graphic – 5 color circles)</p>  <p>You see things as a specific color because that is the type of light that is reflected back to your eyes. <b>All of the other colors are absorbed.</b> We can use filters (show glasses) to control what type of light reaches our eye. This will allow us to decode secret messages in the pictures you colored!</p>
<p><b>Student Activity #1:</b> 10 minutes</p>	<p>The teacher was emailed pictures for the students to color. The students need to pull out those sheets. Pass out the filter glasses for students to use.</p> <p>If students have not finished theirs use the finished pictures provided.</p> <p>The “warm” colors (red, yellow, orange) are filtered out while the “cool” colors (blue, green, purple) “pop” out!</p> <p><b>Have the students put their sheets away. Collect the glasses.</b></p>
<p><b>Guided Lesson #3:</b> 5 minutes</p>	<p><b>Let’s Review.</b> Light travels in a straight line.</p> <p>Sometimes light will pass directly through an object. This type of matter is called transparent.</p> <p>Some transparent objects only allow only certain colors of light to pass through them (certain wavelengths). This is called selective transmission. A red filter will allow only red light to pass through it. All other colors (wavelengths) are blocked or absorbed.</p> <p>Another type of object lets some light through, but blocks part of the light as well. These objects are translucent.</p> <p>Other objects completely block light. These objects are called opaque.</p>

	<p>When light travels and meets an obstacle, there are times when the light cannot shine through. When an object blocks the light from passing through, an area of darkness is created - a shadow. Shadows are an absence of light.</p> <p>(show shadow graphic)</p> 
<p><b>Student Activity #2:</b> 10-15 minutes</p>	<p>Have students work with a partner to answer the questions on the Shadows and Transmission worksheet using the student boxes of materials. Discuss the answers as a class.</p> <p>Have students look for/think about:</p> <ul style="list-style-type: none"> <li>- Light travels in a straight line and cannot move around an obstacle in its path.</li> <li>- When light encounters an object, it can either be reflected, absorbed, or transmitted.</li> <li>- If an object is transparent, it may allow the light to be transmitted, or pass through, to the other side.</li> <li>- Opaque objects either reflect or absorb the light, <u>and a shadow is formed.</u></li> <li>- <i>This activity will explore the formation of shadows by selectively transparent objects.</i></li> <li>- <i>These types of materials only allow certain wavelengths of light, or colors, to pass through them.</i></li> </ul>
<p><b>Conclusion:</b></p>	<p>Review what was learned as final materials are collected.</p>