



Lasers and Optics Demonstration

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| Lesson Source(s) | <ul style="list-style-type: none"> ▪ Great Explorations in Math and Science(GEMS)- Lawrence Hall of Science <u><i>Color Analyzers</i></u> ▪ <u><i>Hands-On Optics: Making an Impact with Light</i></u> – NSF ▪ <u><i>Scope It Out! An Optics and Resource Notebook</i></u> – NSF ▪ Paul Fleitz, W.O.W! Wizard, WPAFB |
| Grade Level | Suggested grades 3-8 |
| Abstract | During this W.O.W! demonstration students will perform a series of investigations of light and color. By observing phenomena that is normally hidden from view, the wizard will explain what the students see in simple, straightforward terms. Students will use red filter glasses to decode secret messages. By utilizing prisms, students will discover that light bends upon entering the prism at an angle. |
| Objectives | <ul style="list-style-type: none"> ▪ Students will observe properties of light energy. ▪ Students will observe the electromagnetic spectrum. ▪ Students will discuss the ray theory of light. ▪ Students will explore reflection and refraction of light. ▪ Students will compare and contrast convex and concave lenses. |
| Pre-Visit | _____ Complete the <i>W.O.W! Photo Release Form</i> _____ Students will need colored pencil s to complete skillsheet |
| Photo/Video | Kit Photo(s): |
| Post-Visit | _____ Complete the brief post-visit survey http://www.surveymonkey.com/s/WOWDemoSurvey |
| Best Teaching Practices | <ul style="list-style-type: none"> ▪ Learning Cycle ▪ Hands-on/Minds-on Learning ▪ Inquiry Approaches ▪ Real-life Applications ▪ Probing Questions |
| Standard Alignment | As a result of the demonstration, students should develop an understanding of <ul style="list-style-type: none"> ▪ Physical Science (Energy, Matter, Properties of Light and Color) ▪ Scientific Inquiry ▪ Scientific Ways of Knowing ▪ Science and Technology |

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| <p>Content Knowledge</p> | <p>White light is made up of all colors: red, orange, yellow, green, blue, indigo, violet. Light is a wave, and each of these colors corresponds to a different frequency, and therefore wavelength of light. The colors in the electromagnetic spectrum are arranged according to their frequency: violet, indigo, and blue light have a higher frequency than red, orange, and yellow light.</p> <p>Light can also be thought of as a collection of particles called photons. Physicists combine both particle and wave models of light to understand it as fully as possible. Blue light has a shorter wavelength than red light. Green light has an intermediate wavelength, between that of blue and red. Our eyes interpret light of different wavelengths as different colors.</p> <p>Light waves that are longer than red cannot be seen at all, but they can be felt as heat. These are called infrared, or heat waves. One way of saying that objects absorb light and give off heat is to say that they absorb light at short wavelengths, and re-radiate that energy at longer wavelengths.</p> <p>When a prism is held in a beam of light, the prism forms a spectrum. A wave of light travels in a straight direction until it encounters a boundary into some other transparent material. If the light hits the boundary head-on it will continue in a straight line. But if it hits the boundary at an angle, the light will bend (or refract) at the boundary. Light of different colors bends (refracts) different amounts.</p> <p>Prisms are made so that waves of light that enter the prism at an angle are refracted. When they leave the prism they are refracted even farther, thus exaggerating the total refraction. The prism forms a spectrum because light of some colors is bent more than light of other colors.</p> |
| <p>Safety</p> | <p>Only the wizard will use the laser pointer. All precautions will be taken to avoid contact with eyes.</p> |
| <p>Applications</p> | <p>Lighthouses, Fiber Optics, Polarized Sunglasses, Kaleidoscopes, and Rainbows.</p> |
| <p>Assessment</p> | <p>Completion of the <i>Decoding Secret Messages</i> sheet Observe student participation in the activity Observe student participation in discussion</p> |
| <p>Other Considerations</p> | <ul style="list-style-type: none"> ▪ <u><i>Laser Dazzlers</i></u> – www.labtvonline.org ▪ <u><i>Beam Me Up</i></u> – www.labtvonline.org ▪ Bill Nye – <u><i>Light Optics</i></u> – DVD with supplement materials ▪ Bill Nye – <u><i>Light and Color</i></u>-DVD with supplement materials <p>Materials available from the W.O.W! Lending Library upon request</p> <p>Extend the lesson: Challenge students to invent their own secret messages. Keep in mind that blue, green, and violet parts show up and red, yellow, and orange parts are disguised.</p> |
| <p>Skillsheet(s)</p> | <p>Laser and Optics Wizard will provide <i>Decoding Secret Message</i> sheets</p> |