Enlightening Explorations, Part III

Summary

This lesson contains three student activities: Rainbows, Refraction with Prisms, and What Color Is It?

Group Size

Small Groups

Materials

Rainbows
For each student:
- Rainbow worksheet (pdf)
  Book on color and light
  Light or lamp with bare bulb
  Diffraction glasses
  Colored pencils or crayons
  1/2 sheet of art paper
  Paintbrush
  Red, yellow, and blue watercolors
  Water

Refraction with Prisms
- Refraction with Prisms worksheet (pdf)
  Assorted prisms
  Bright light (overhead projector or old filmstrip projector)
  White paper to reflect on

What Color Is it?
Bagged for the group:
  Red apple
  Green leaf
  Orange
  Yellow lemon
  White square of paper
  Blue square of paper

Per student:
  Colored lens card
- What Color Is It? worksheet (pdf)

Additional Resources
Books
  Light and Color , by Gary Gibson; ISBN 1-56294-616-1
  Light Fantastic , by Philip Watson; ISBN 0-688-00975-1
  Color Analyzers: Grades 5-8 , by Cary Sneider, Alan Gould, Cheryll Hawthorne (GEMS: Great Explorations in Math and Science); ISBN 0-924886-66-8.

Video
  Light and Color , by Bill Nye (Disney Educational Productions, 1-800-295-5010, http://dep.disney.go.com/educational/index); Product ID: 68C01VL00

Background for Teachers

Visible light is made up of different wavelengths, with each color having its own unique wavelength.

The seven colors of the visible light spectrum are red, orange, yellow, green, blue, indigo, and violet (ROY G. BIV). (There is ongoing dissention as to whether indigo is really a color or not. This would make a good student research project.) As light hits an object, some light is absorbed and some is reflected back. The color of an object is the color of the light it reflects. Grass looks green because when light hits, it the blades absorb all the colors of light except green, which it reflects back to our eyes. Objects that appear white reflect back all colors of light waves; black objects absorb all colors of light waves and don't reflect any colors back to our eyes.

White light contains all the colors of light. The colors can be separated when a bright white light is shone through a prism at an angle. Short wavelengths, such as blue and violet, are bent more than longer wavelengths, like red, so the colors always separate into the same pattern. In nature, people have noticed the color separation during or after a rainstorm or from a sprinkler. The primary colors of light are red, green and blue (Roy G Biv's initials), which are different than the primary colors of pigment (yellow, magenta, cyan). Light of all colors can be made from these primary light colors, and when all colors of light are added together, white light is produced.

When colored filters are used, only certain wavelengths pass through; others are absorbed. When a red filter is used over a light, only red light passes through, and objects appear either in shades of red or black.

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
4. Communicate Effectively Using Science Language and Reasoning

Instructional Procedures

Invitation to Learn

Continue with light labs. You may want to review information already learned.

Instructional Procedures

Continue with light labs. It is important to discuss what was learned in each center when students are finished and have recorded their findings. Like scientists, students share their discoveries and include observable evidence proving what they learned. Allow time for students to challenge each other if a disagreement arises so that the properties of light are understood. Sometimes it takes the final discussion and summarizing of observations before the concept is learned.

Extensions

Using *Color Analyzers: Grades 5-8*, make hidden pictures where students can only see the picture if looking through a different colored filter. Make secret messages by writing the message they want someone to see with a blue colored pencil. Using a red pencil, they write letters, numbers, etc. over the blue so the blue message is no longer readable. However, when they look through a red filter, only the blue message appears.

Have students trace white circles that have pie-shaped divisions on them. Students may experiment with coloring different colors in different fractional amounts to see if they will reflect white or black when spun around. The circle can be taped to the end of one beater of a hand mixer, then the mixer turned on. Students can compare the colors they saw with their prediction.

Have students use fine-tipped markers (red, yellow, blue, and black) and try pointillist painting, using small dots of these primary colors to create a picture. Students could also use a magnifying glass to look closely at a television screen when it is turned on. They should see lines of very small red, green, and blue dots.

Students who struggle with written language can be encouraged to draw what they have discovered, then label key things you want them to remember.

Family Connections

This Web site is an online kaleidoscope where students can create patterns.
http://www.permadi.com/java/spaint/spaint.html
This is a great Web site with color slides explaining why we see the colors we do.
http://whyfiles.larc.nasa.gov/text/kids/Problem_Board/problems/light/sim1.html
This is a fun interactive Web site where students can mix colors, learn about colors in nature, and have fun exploring with light.
http://www.opticsforkids.org/

Assessment Plan

Have students make a graphic organizer that includes what they know about light and color. Key words to put in the organizer are: energy, electromagnetic spectrum, how light travels, reflection, refraction, and colors of light. Students add what they know about each of these. (This could be a prewriting activity for a reflections paper.)
Students write a reflections paper containing two to three paragraphs about what they have learned. List several key things you expect them to learn, such as energy, reflection, refraction, angle of incidence, and colors of light.
After completing the heat, light, and sound lessons, give each student or group a *Heat, Light, and Sound Venn Diagram* . As they complete it, help them compare the different properties of each, and discover the similarities and differences.

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