

3: Colorful Colorado

Based on the Colorado quarter reverse



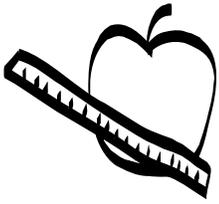
OBJECTIVES

Students will explain the relationship between wavelength and the color of light. Students will identify the colors of the visible spectrum. Students will analyze the effect of a prism on white light and describe why this occurs.



MATERIALS

- 1 overhead projector (optional)
- 1 overhead transparency (or photocopy) of the “Colorado Quarter Reverse” page
- 1 class map of the United States
- Copies of the following worksheets:
 - “Color Wheels”
 - “Why is the Sky Blue?”
 - “Why is the Sky Blue Rubric”
- Copies of a text about the state of Colorado, such as:
 - *America the Beautiful, Colorado* by Deborah Kent
 - *Colorado* by Dennis Brindell Fradin
 - *Colorado* by Sara Bledsoe
 - *Rocky Mountain National Park* by David Petersen
 - *Hello USA, Colorado* by Sara Bledsoe
 - *Celebrate the States: Colorado* by Eleanor H. Ayer
- Prisms
- White paper
- Flashlights
- Markers (red, orange, yellow, green, blue, and violet)
- Tag board
- Scissors
- Glue
- Rulers
- Pencils
- Poster paper



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PREPARATIONS

- Make copies of the following:
 - “Color Wheel” worksheet (1 per student)
 - “Why is the Sky Blue?” worksheet (1 per student)
 - “Why is the Sky Blue Rubric” (1 per student)
- Make an overhead transparency (or photocopy) of the “Colorado Quarter Reverse” page.
- Reserve computer lab for one session for research.
- Locate an appropriate text about Colorado (1 copy per small group) (see examples under “Materials”).
- Bookmark appropriate Web sites on light and color.
- Gather the materials for the experiment.



GROUPING

- Whole group
- Small groups
- Pairs
- Individual work



CLASS TIME

Five 45- to 60-minute sessions



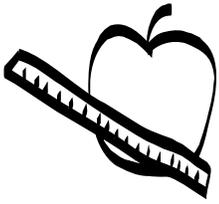
CONNECTIONS

- Science
- Social Studies
- Mathematics
- Art



TERMS AND CONCEPTS

- Obverse (front)
- Reverse (back)
- Light
- Prism



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BACKGROUND KNOWLEDGE

Students should have a basic knowledge of:

- Color
- Equal parts



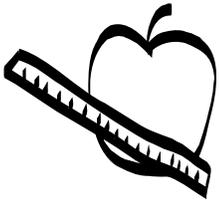
STEPS

Session 1

1. Describe the 50 State Quarters® Program for background information, if necessary, using the example of your own state, if available. Locate Colorado on a classroom map. Note its position in relation to your school's location.
2. Display the transparency or photocopy of the “Colorado Quarter Reverse” page. Examine the design with the students and have them identify the images and the phrase “Colorful Colorado.”
3. Divide the class into small groups. Distribute a copy of a text on Colorado to each group. Introduce the students to the selected texts about Colorado. Explain to the students that they will work in their groups to find some pictures or phrases to explain why the governor of Colorado would have chosen the “Colorful Colorado” image for the quarter. The students will share their findings with the rest of the class.
4. Allow time for the students to search. Allow each group to share with the class.
5. Write the student responses on chart paper.
6. Ask the students where color comes from. Explain that we couldn't see color without light, and that white light contains all the colors of the rainbow.
7. Divide the students into small groups of three or four. Explain to the students that they will be looking at how white light can be broken up into colors. Distribute a prism, a sheet of white paper, and a flashlight to each group. Darken the room if necessary. Have a student in each group hold the prism. Have another student hold the flashlight. A third student should hold up the sheet of paper. Align the flashlight, the prism, and the paper so that a rainbow shows on the white paper. Discuss with the students what is happening.
8. After the students return the materials, have them take out their science journals or a sheet of paper. Have the students draw an illustration of what they observed and write five sentences about their observation.
9. Collect the written observations and drawings.

Session 2

1. Review the observations from the previous session. Explain to the students that the six main colors in the rainbow or spectrum are revealed by the prism. Ask the students to identify the colors. Lead them to mention red, orange, yellow, green, blue, and violet.



Colorful Colorado

Sometimes in books and other reference materials you will see a seventh color: indigo. Indigo is only added to the list to make it easier to remember the colors by combining the first letters of their names. The letters form the name “Roy G. Biv.” Review this with the students if necessary.

2. Now that the students have split white light into colors, ask them how they might combine the different colors to make white. If the students suggest mixing paints, explain to the students or show them that mixing paints would make grey or brown, depending on the ratio of colors.
3. Distribute tag board, pencils, scissors, markers, rulers, and one copy of the “Color Wheel” worksheet to each student. Review the directions and have the students complete the activity.
4. As a class, discuss what happened during the color wheel experiment. Collect the sheet and materials.

Session 3

1. Review the activity from Session 2. Review the concept that white light is made up of all the colors of the spectrum. Explain to the students that wavelength determines color. Red is the shortest wavelength and violet the longest. As you go through the colors of the spectrum, each color has a longer wavelength than the one preceding it.
2. Explain to the students that they will be researching some information to answer a question that is related to light and color.
3. Pair the students. Distribute the “Why Is the Sky Blue?” worksheet and the “Why is the Sky Blue Rubric.”
4. Review the directions and the rubric with the students. Assign each pair one of the three questions. Have the students choose what presentation method they are going to use.
5. Take the students to the computer lab and allow them time to research.

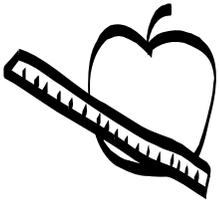
Sessions 4 and 5

1. Allow time for the students to finish their presentations.
2. Have the students present their projects.
3. Collect all project-related student materials for assessment.



ASSESSMENT

- Use the “Why is the Sky Blue Rubric” to assess student achievement of the stated objectives.
- Review and evaluate student journal entries.



Colorful Colorado



ENRICHMENTS/EXTENSIONS

- Have pairs find the answer to more than one question.
- Have students design a picture book on light and color using the information from the demonstrations used in this lesson.
- Have students research more about infrared and ultraviolet light.



DIFFERENTIATED LEARNING OPTIONS

- Have the students use books to find the answers to the questions.
- Allow students to make audio or video recordings of their presentations.



CONNECTION TO WWW.USMINT.GOV/KIDS

- Have students learn more about light with the 2003 Maine quarter lesson plan for grades 2–3 at www.usmint.gov/kids/index.cfm?fileContents=teachers/lessonPlans/lesson_select.cfm&grade=2.
- Have students learn more about light by visiting the 2005 Kansas quarter plan for grades 4 through 6 at www.usmint.gov/kids/index.cfm?fileContents=teachers/lessonPlans/lesson_select.cfm&grade=3.
- Have students learn more about light with the February 2004 Coin of the Month, the Thomas Edison Commemorative Silver Dollar, at www.usmint.gov/kids/index.cfm?FileContents=/kids/coinnews/cotm/2004/02.cfm.

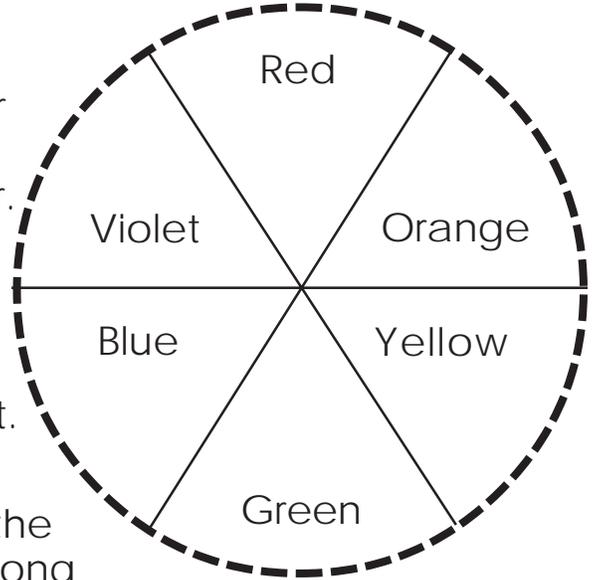


Name _____

Color Wheel

Directions

1. Glue the circle at right to heavy paper and cut it out, or cut your own circle 3 inches in diameter from heavy paper.
2. Using a pencil and a ruler, divide the circle into 6 roughly equal parts.
3. Color the sections in this order: red, orange, yellow, green, blue, and violet.
4. Carefully poke the point of your pencil through the center of your circle from the front of the wheel. Move the wheel along the pencil until the wheel is near the eraser. The colors should face upward when the pencil is resting on its point.
5. Spin the pencil as fast as you can between your hands and observe the color effect.
6. Record your observations below.



Observations

How did the colors look when you spun the pencil?

Why do you think this happened?



Name _____

Why Is the Sky Blue?

DIRECTIONS

1. Working with a partner, find the answer to one of these questions:
 - Why is the sky blue?
 - Why are clouds white?
 - Why is the sunset red?
2. Make a poster, multimedia presentation, enactment, or display that illustrates the answer to your question.
3. Present your project to the class.



WORK SPACE

Notes from research:

Rough sketches of diagrams:



Name _____

Why Is the Sky Blue?

Rubric

REQUIRED ELEMENTS

1. Written explanation of answer, which must contain information about wave lengths.
2. Illustration of answer.

CATEGORY	4	3	2	1	SELF	TEACHER
USE OF CLASS TIME	Excellent. Always focused on the project; never distracted others.	Very good. Usually focused on project without distracting others.	Fair. Sometimes focused on project but distracted others.	Did not use time to focus on the project, or often distracted others.		
GRAPHICS CLARITY	All graphics clear; content easy to see.	Most graphics clear and easy to see.	Some graphics clear and fairly easy to see.	Many graphics unclear or too small.		
GRAPHICS LABELS	All major items are clearly labeled.	Almost all major items are clearly labeled.	Some major items are clearly labeled.	Labels are too small to see or labels are missing.		
REQUIRED ELEMENTS	All are included, plus more information.	All are included.	One is missing or incomplete.	Several are missing or incomplete.		
KNOWLEDGE GAINED	Student can answer all questions about the topic and how the presentation was created.	Student can answer most questions about the topic and how the presentation was created.	Student can answer some questions about the topic and how the presentation was created.	Student appears to have little knowledge about the topic or the presentation's creation.		
CONTENT ACCURACY	All facts are accurate.	Most facts are accurate.	Some facts are accurate.	Few facts are accurate.		
CONTENT GRAMMAR	Grammar is free of mistakes.	There is 1 grammatical mistake.	There are 2 grammatical mistakes.	There are more than 2 grammatical mistakes.		
MECHANICS	Capitalization and punctuation are correct throughout.	There is 1 error in capitalization or punctuation.	There are 2 errors in capitalization or punctuation.	There are more than 2 errors in capitalization or punctuation.		

TOTAL POINTS

TEACHER COMMENTS



Colorado Quarter Reverse

