Color Absorption and Reflection

Major Topic and SOL	Light and Color
Science SOL	8.9 a,b,d

1 - 45 minute class
1 - 45 minute c

Major Understanding

- Visible light is a form of radiant energy that moves in transverse waves.
- Radiant energy travels in straight lines until it strikes an object where it can be reflected, absorbed, or transmitted.
- Light coming from the Sun or from a light bulb is a mixture of the whole spectrum, from red to violet. Mixed all together, these colors look white to our eye. When there's no light, we see black.
- Most real things that we see are not white or black; only part of the spectrum comes to our eye from the surface of colored objects, so they appear to have a color.

Essential Questions

- What do you think creates the color of a material?
- How do you think filters and gases be used to affect perceived color?

Student Objectives

- Students will manipulate a model to change the absorption and reflection of red, blue and /or green light in order to determine the effects on a beam of white light (all three) and the perceived color of the surface it strikes.
- Students will determine what perceived colors result from the various combinations of red, blue and green light.
- Students will investigate the effects of gas particles as a filter that absorbs the various colors of light.

Bloom's Taxonomy Skills	21 st Century Learning Skills
Evaluating	Critical Thinking
Analyzing	Problem Solving
Applying	Communication
Understanding	Collaboration
	Contextual Learning

Assessment Evidence

Performance Tasks

Students will:

- Explain why they think various objects appear to be a certain color.
- Manipulate a model of white light (red, green and blue photons) hitting a surface.
- Predict the reflected color when various combinations of light are absorbed by the surface.
- Describe the absorption settings used to create several different reflected colors.
- Identify the colors that appear from each combination of red, green and blue light.
- Predict how gas filters will affect the color of light that passes through.
- Compare surface absorption to gas filtration of light.
- Analyze the HSB color system and compare it to the RGB one used in the activity.

Other Evidence

Students will write responses to the following (these responses can be accessed through the online portal recorded during this activity):

- If a surface absorbs red and green, what color will it appear to be?
- If light from a red filter is combined with light from a green filter, what will the resulting color be?
- What colors do you think are used in the chlorophyll reaction, if leaves filled with chlorophyll appear to be green?
- What's the difference between a **surface** that absorbs red and a **filter** that absorbs red?
- Why is the sky blue? Think about the gas absorption model.
- Sometimes pigments (paint colors) are called subtractive, and light from filters are called additive. Why? Use the two diagrams provided to explain this.
- What creates the color of a material?
- If you were a graphic designer designing posters for a concert hall that had dim lighting, what colors would you use to make them most noticeable? Explain why you would choose those colors.
- Would you enjoy working as a graphic designer? Why or why not?
- What other careers can you think of that might depend on an understanding of light absorption and color?

Technology

Computers, Internet Access

Internet Resources

• ITSI-SU activity <u>http://itsisu.portal.concord.org/activities/70</u>

Note: the teacher will need to have an <u>account set up</u>, as well as a class for their students to enroll in with this activity assigned. Once you create a teacher account, you can access the ITSI-SU <u>help guides</u> to get you set up your class with assigned activities.

Supplies/Materials

• copies of various color after image illusions provide tangible follow-up to the discussion to evaluate student understanding of the concepts

Lesson: Light Absorption and Reflection (1-45 minutes period)

Engage:

- Students should log in to the <u>ITSI-SU website</u> and launch the activity, **"Color Absorption and Reflection".**
- Discuss in pairs or as a class why objects appear to be the colors they are and what might affect their perceived color.

Explore:

- The students will manipulate a model of white light hitting a surface by changing the amount and color of photons that are absorbed or reflected by the surface.
- Then, predict and determine how various reflected combinations of light colors result in different perceived surface colors

Explain:

• They will describe the six different extreme combinations of light and the perceived color that results from each (The teacher may choose to record these as a whole class and project it, or write it on a chalk or whiteboard).

Elaborate:

- The students will investigate the effects of gas particles as a filter that absorbs light and how color changes as a result by continuing to manipulate the online model.
- They will record and analyze the similarities and differences between a surface that reflects light and a gas that absorbs light.

Evaluate:

- As a class, discuss how objects appear to be certain colors and how that perception might be changed (this is where you can bring different lights in to demonstrate).
- Students will complete the *Further Investigation* activity to apply the understandings gained and explore a different way of describing and measuring light and color.
- The instructor should review the ITSI-SU reports to read student responses and identify any areas need further study or explanation.