

# Reflection-Refraction Action

## 5<sup>th</sup> Grade

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### **Benchmarks:**

ES-5: Explore and summarize observations of the transmission, bending (refraction) and reflection of light.

### **Objectives:**

The students should understand that in general, flat, smooth surfaces (like mirrors) reflect light while objects that have certain shapes (prisms, raindrops, gratings on CDs) refract light and separate it into different colors.

### **Materials**

Flashlights  
Compact discs  
Shoe boxes with small holes cut  
Prisms

### **Initial Observation/Demonstration:**

With the lights turned out, the teacher should shine the flashlight on the board or wall and ask, "What color is this light?" The students will probably reply with "white" or "yellow." Then the teacher shines the light through a prism, making a "rainbow" spectrum on the wall or board. The teacher has the students hypothesize on why the white light turned into a rainbow.

### **Initial Observations:**

Students should see that through refraction, white light can be separated into all color components (ROY G BIV).

### **Initial Model:**

Students hypothesize on how this happens. Some may say, "It's like a rainbow." Or "The light reflects off the prism and makes it look like that." If this is a response, make sure to reinforce that when light reflects, it doesn't change its appearance, so it CANNOT be reflection.

### **Procedure:**

With the lights out again, the teacher should shine the flashlight on a CD and show that it produces a spectrum on the board as well. Then ask, "If the CD looks like a mirror, why does it refract light?"

After discussion of this, break the students into small groups and give each a CD, a flashlight and a prism. Tell them that they are now competing in a contest; the contest is to see which group can make the biggest "rainbow" and the smallest "rainbow." They will need to measure the small one with a ruler (incorporating tools of the trade). The large rainbows will probably be too large to measure, so the teacher will judge these.

### **Discussion/Summary:**

The students should find that the smaller the amount of light they allow to hit the CD or prism (by using the shoebox with the hole as a “point source”), the smaller and more resolved (sharper the colors) the spectrum becomes. They should also find that in order to create a large rainbow, they need to use different angles and much, much more light. You may also want to discuss that this is actually how rainbows appear and ask the students what acts like a prism after it rains (water droplets).

The students should also understand why light separates into a rainbow. The rainbow's appearance is caused by dispersion of sunlight as it is refracted by raindrops. The light is first refracted as it enters the surface of the raindrop, reflected off the back of the drop, and again refracted as it leaves the drop.