How We Perceive Color Quick Guide

Color perception is the result of the physical properties of light, the specialized cells in our eyes that detect light, and our brains who interpret the signal received from the eye. In this station we will examine each of these processes.

(1) **Look at the picture of the electromagnetic spectrum.** The visible spectrum, from red to purple, is a small part of the electromagnetic spectrum.

(2) The LED lights in this box emit defined wavelengths of light - red, yellow, green (a mix of yellow and blue), and blue. **Hold the filters over the LEDs and see which lights appear dimmer.** The didymium filter blocks yellow light only (589 nm).

(3) We can use these goggles to simulate color blindness. **Hold the goggles over the LEDs and see which colors disappear.** The green goggles block red light (and some yellow light), which simulates protanopia, where the eye cannot detect red light. The pink/magenta goggles block green light (and some blue and yellow light).

(4) **Look at the cards without green goggles and then with the green goggles.** People with normal vision should be able to see the shapes on all the cards. (Very young children can match the shapes.) Put on the green goggles and see what happens when a person is unable to detect red light (A1, A2, A3). **Look at the cards with the blue filter** – is it easier to see the shapes?

(5) **Look at the cards using the pink goggles.** Some colors are enhanced and those shapes seem to pop out.

(6) **Look at the poster that shows three types of color blindness. Note the red and pink tulips.**

(7) Red-green color blindness is due to defects in either green or red cone pigments, leading to an inability to see either green or red light. When light hits an object, some wavelengths are absorbed and others are reflected. The color of the object is determined by the wavelengths of light that are reflected from that object. For example, an object is red because it reflects red and absorbs all other wavelengths of light. Inability to detect red light causes the red object to appear dark.

(8) **Picture cards** also show examples of what a colorblind person would see. Microsoft Word and Photoshop have color vision checkers.

(9) **Optional: scribble cards and filters** can be combined to see how blocking certain wavelengths makes the pattern pop out.

(10) We have looked at how wavelengths of light "create" color and how our eyes detect these wavelengths of light. However, our brains are also really important in perceiving color. **Look at the boards.** Are the colors the same? Lift up the boards and see if you are correct. These boards show that our brain looks at the surroundings in deciding what the color is. What color is the stop sign? Lift up the flap. Our brain assumes the stop sign is red because stop signs are always red and because the bluish background makes us think the sign is red. However, the sign is purple.

Bookmark shows a diagram of eye and photoreceptors and the color spectrum in color blindness. There's a game on the back that gives an example of how eyes and brain work together, or, maybe, not together.