ScienceCube

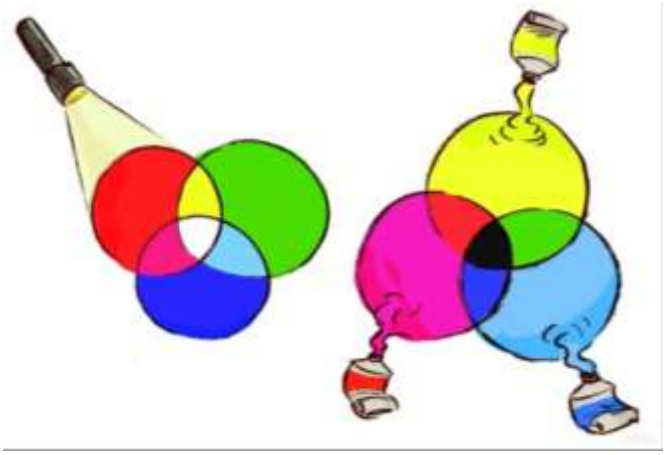
Synthesis of Light

1. **Understand and explain the primary colors of light and the principle of synthesis.**
2. **Measure the ratios of composite colors using an RGB sensor.**

Fundamental Concept

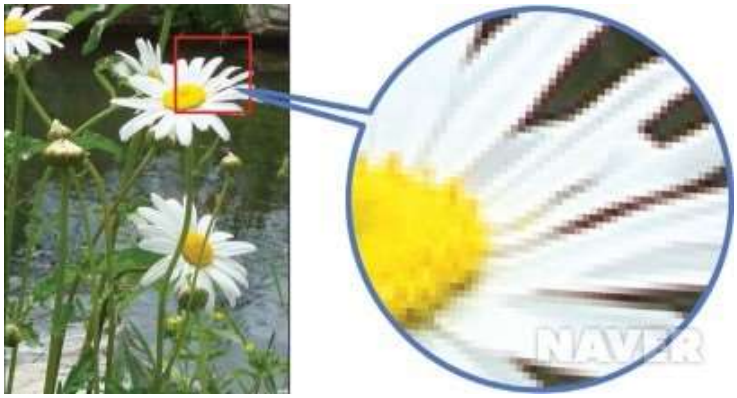
1. Primary Colors of Light

The primary colors of pigments are red, yellow, and blue, but the primary colors of light are red, blue, and green. When primary colors of pigments are mixed, they become darker, which is called subtractive mixing. When primary colors of light are mixed, they become brighter, which is called additive mixing.



2. Synthesis of Light

Computer monitors and digital cameras display smooth, continuous images, but when zoomed in, they are made up of pixels of the three primary colors.



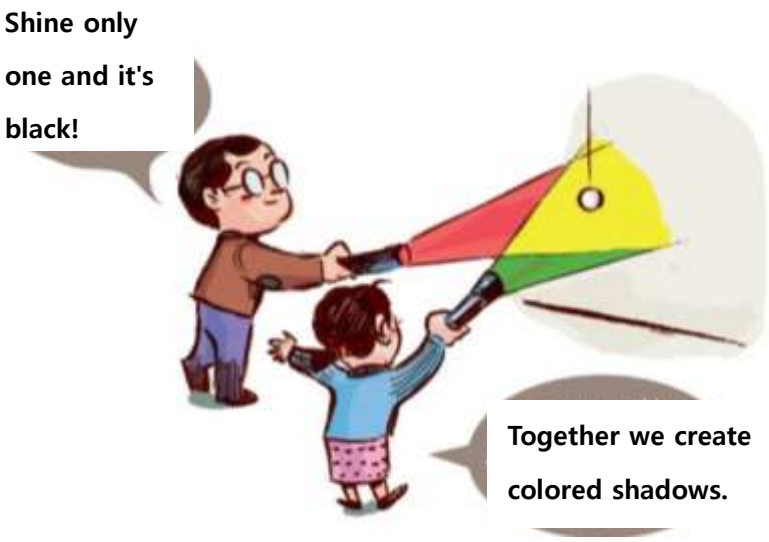
Very colorful computer monitors, TVs, and digital cameras are composed of pixels of these 'primary colors of light'. Various colors are created according to the ratio of the primary colors. Thus, when discussing the performance of digital cameras, the number of pixels is often considered because more pixels mean more detailed colors.

Pointillism is a technique where, instead of painting with purple, red and blue dots are placed close together to appear purple to the human eye..

Seurat's <A Sunday on La Grande Jatte>

3. **Colored Shadows**

Are shadows always black? Can we create colored shadows? If you wrap a flashlight with green cellophane and shine it on a ball, you get one black shadow. If you wrap another flashlight with red cellophane and shine it obliquely, you get two shadows. The shadow that doesn't pass through the red light receives only green light and becomes a green shadow, and the shadow that doesn't pass through the green light receives only red light and becomes a red shadow. The background receiving both red and green light appears yellow.



Experiment

Materials Needed

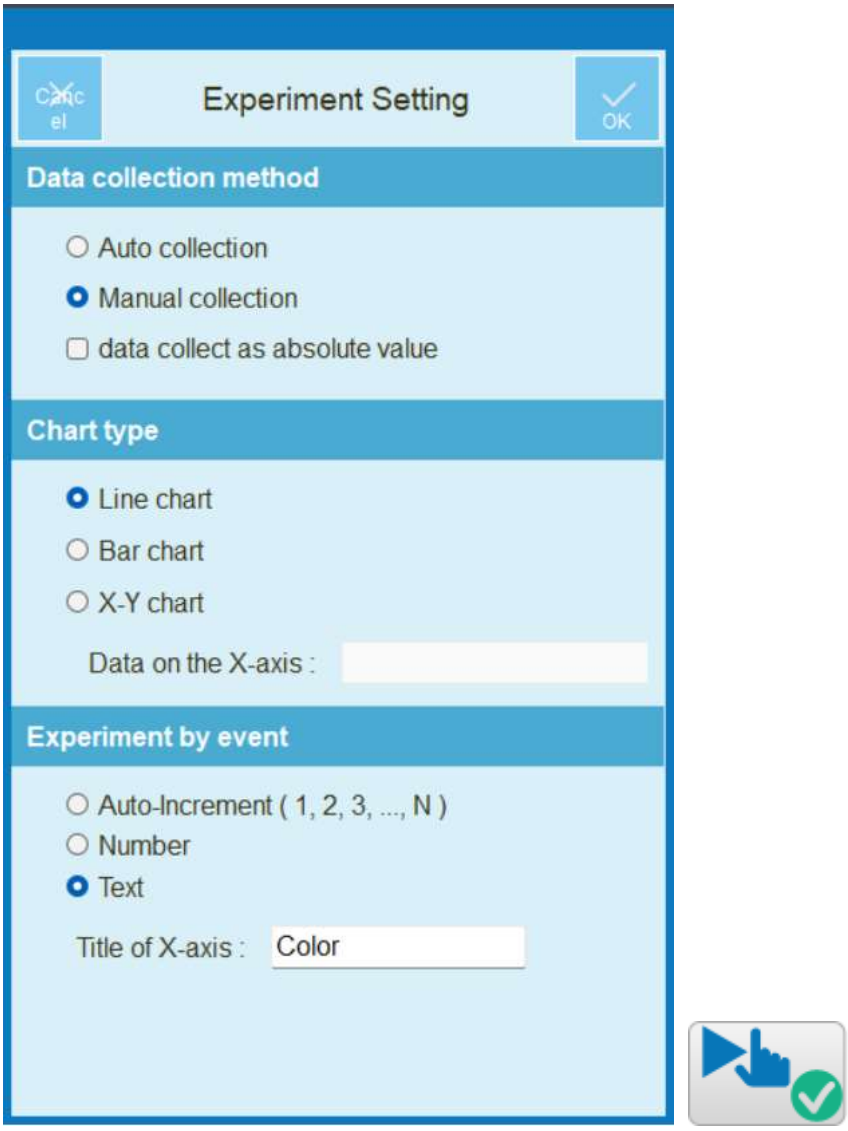
Interface, Science# program, Smart device, Smartphone, RGB sensor

Experiment Preparation

1. Download a smartphone app that displays the desired color on the screen. (Recommendation: 'Color Flashlight Bright LED')
2. Set the screen brightness to the maximum.

Interface Setup

1. Run the Science# program.
2. Connect the RGB sensor to the interface or select 'Colorimeter' from the built-in sensors if using a smart sensor box..
3. Press to set up the experimental environment as shown below or press for automatic setup.



Data Collection

1. Press to set the chart to a bar graph..

2. Press  to start data collection..
3. Display the desired composite color on the screen and shine it on the RGB measurement unit. (Measure red, green, blue, and white light as a must.)

4. Once the values stabilize, press  , and when the text input box appears, enter the name of the color..
5. Measure the RGB values of various colors in the same way.
6. Once the measurements are complete, press  to end data collection

Data Analysis

Recording Data

1. Explain what each of the three values of the RGB sensor represents.

2. Measure and record the RGB values of the three primary colors: red, green, and blue light.

	R	G	B
Red			

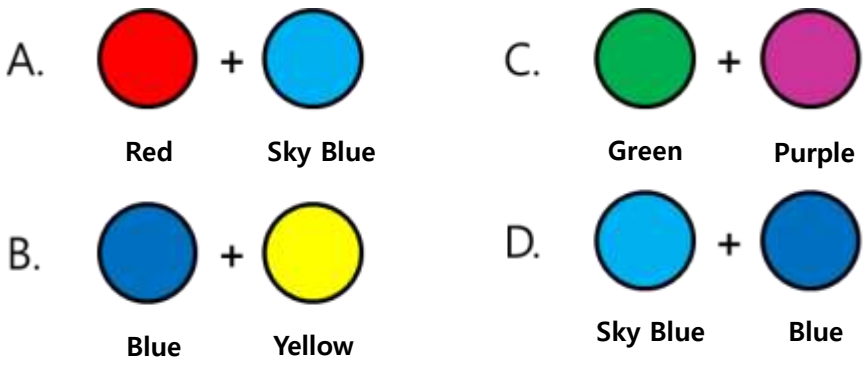
Green			
Blue			

3. Draw a graph of the measured RGB values of various lights.

Data Application

1. Measure the RGB values of white light and explain how white light (white light) is created using the measured data.

2. Identify the cases where it is not possible to create white light by combining various colors of light.



Answer :

3. The following is a photo of strawberries, a representative summer fruit. Explain why the strawberry fruit appears red and the leaves appear green to our eyes.

Extension Activity

1. Explain how color printers, which print various colors, represent colors..


Report
(For Teachers)
Report
(For Students)