

## FOCUSING ON STEM

THE COLOR OF STEM UNIT WILL GUIDE STUDENTS AS THEY EXPLORE THE SCIENCE OF HOW THE HUMAN EYE PERCEIVES THE COLOR TRANSMITTED FROM AN IMAGE. STUDENTS WILL ALSO INVESTIGATE HOW PIXELS ARE CREATED AND COMBINED TO FORM COLORS. STUDENTS WILL EXPERIENCE HOW TO INFLUENCE THE HUMAN EYE COLOR PERCEPTION BY PRACTICING AN ART TECHNIQUE CALLED “POINTILLISM”.

### **Standards:**

#### 1.3 Knowledge Constructor

Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

<https://www.iste.org/standards/iste-standards-for-students>

1.3.a Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.

1.3.c Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.

1.3.d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

### **Background Information:**

A pixel is a tiny dot of light. Multiple dots of light work together to create an image. There are three different colors of light which are red, green and blue that when they combine they are able to form thousands and thousands of other colors. A single pixel

is made out of a value ranging from 0 to 255 (the closest to zero will be very dark and the closest to 255 will be very bright). For example, one single pixel (RGB) of color white will have a value of 255 on red light, 255 on green light and 255 on blue light. The main take away from this activity is to introduce the fact that there are three additive primary colors which are red, green, and blue. This means that by adding various amounts of these three colors almost all the colors can be produced. Additionally, when all three primary colors are added at the same amount the color white is created.

**Lesson Title:** Lighting the Dark Side

**Materials Needed:**

- Student pages
- Color pencils
- Markers
- Internet access (optional)
- Computer, Chromebook, cellphone, or tablet (optional)

**Implementation:**

The first activity is a brainstorm (eye opening) for students to start thinking about primary colors and how they might combine to create thousands of other colors. Students will look at a picture and make observations such as light, colors and patterns. Students will use their observations to explain some possible reasons why colors look differently at specific locations in the picture.

**Discussion Ideas:**

- What do you think will happen if there were two primary colors instead of three?
- Compare the three primary colors we mentioned during the activity and the seven colors found in a rainbow. How are they similar or different?
- What do you think would happen if you replaced one of the primary colors with one that isn't a primary color?

**Extensions:**

Students will recreate the picture shown on the student pages using paper and color pencils to see if the colors behave the same way as color light behaves.

## Student Page

Examine the picture below and share your observations with the rest of the class.



My observations:

**Lesson Title:** One Pixel at a Time

**Materials Needed:**

- Student pages
- Color pencils
- Markers
- Internet access
- Computer, Chromebook, cellphone, or tablet

**Implementation:**

First students will read about pixels and how they are used to create images. Next, students will be provided with a set of triple color combinations (blue, green, and red) in order to create colors. Students will color the template provided for them to display a specific value set as a numerical representation. Then, they will utilize a website to introduce the value set to find out the color represented by that value set.

Lastly, students will find the value set for their favorite colors on the website and share it with other students for them to find out the color they chose.

**Discussion Ideas:**

- Why do you think the maximum amount of basic color value is 255?
- What do you think the difference is between an image coming from a picture versus an image coming from TV?
- How many pixels do you think work together in a black and white image?

**Extensions:**

Students will explore how to represent pixels (value set) in a binary number system using zeros and ones.

## Student Page

**Pixels, are a complicated concept because you can't see them very easily. Actually, if you take a magnifying lens and look at an image on your computer screen you will see that the image is made up out of tiny dots of light and those tiny dots are made out of three colored lights: red, green and blue. By now you are wondering how it is possible. Let's consider the following:**

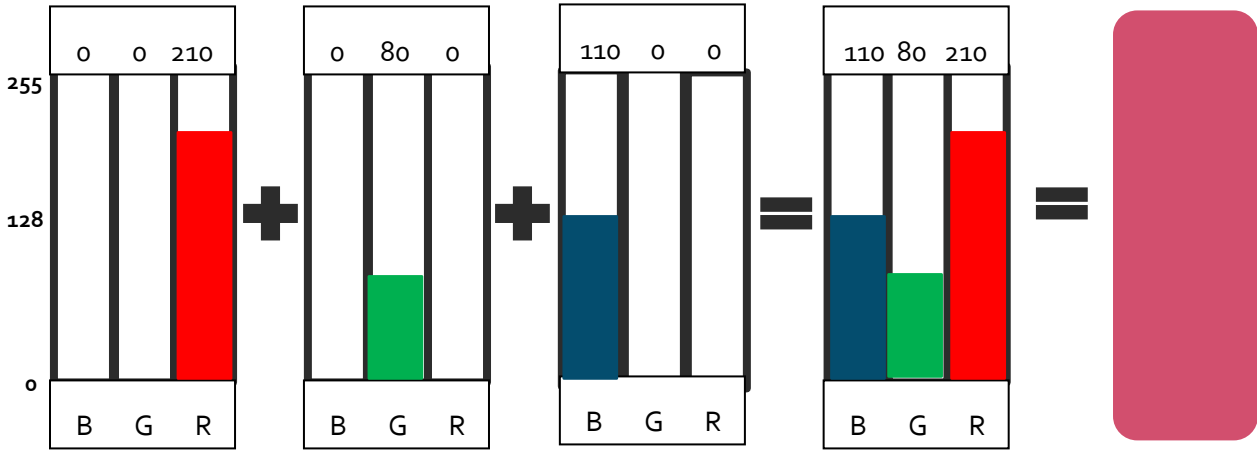
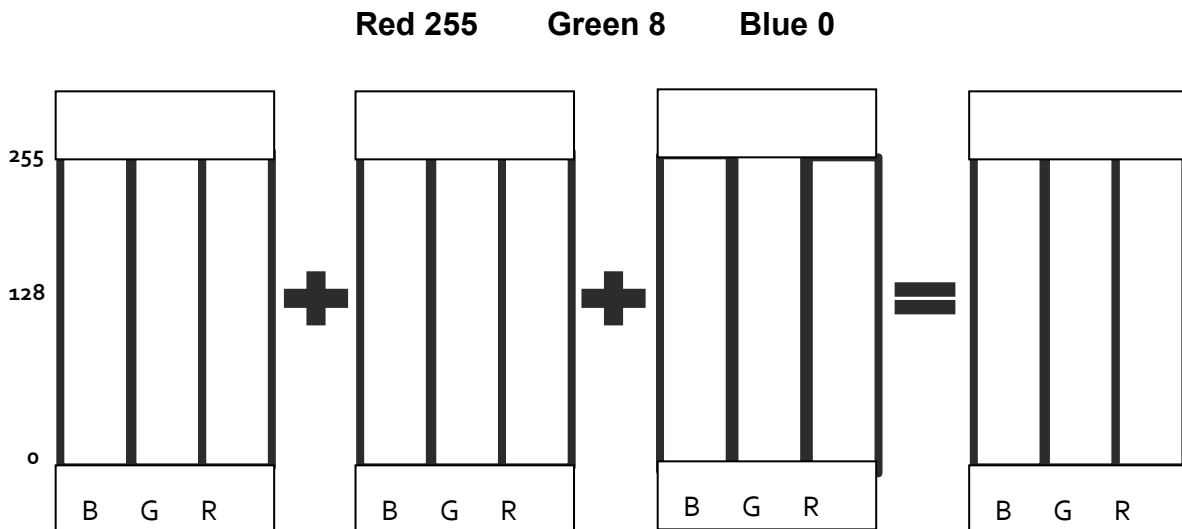


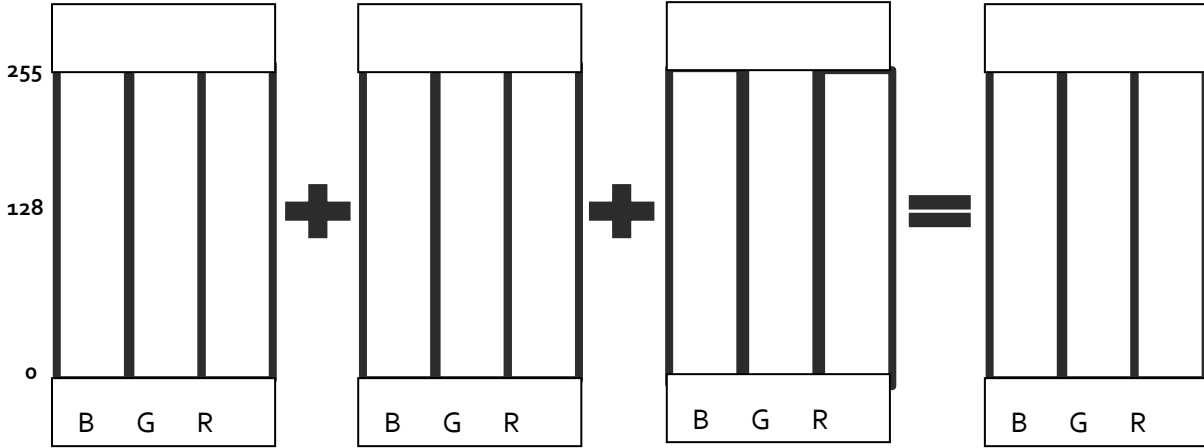
Image by David Hernandez

Now is your turn, display the appropriate amount of color on the tables below based on the information provided.

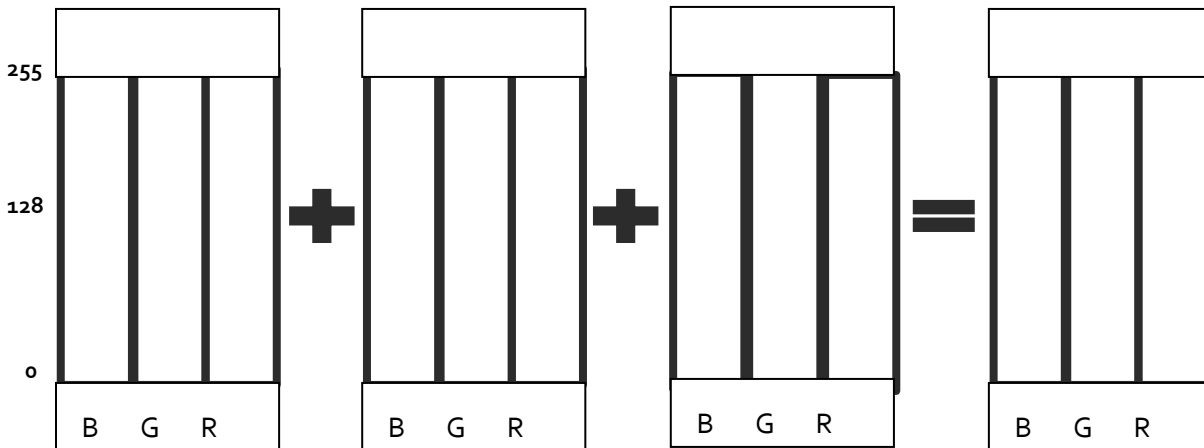


## Student Page

**Red 244    Green 194    Blue 194**



**Red 112    Green 28    Blue 28**

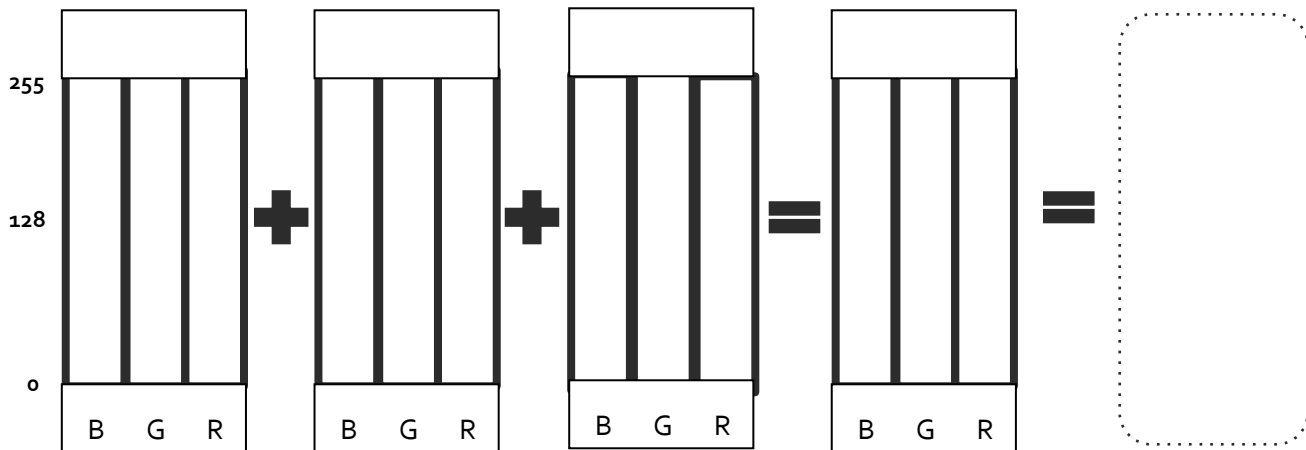
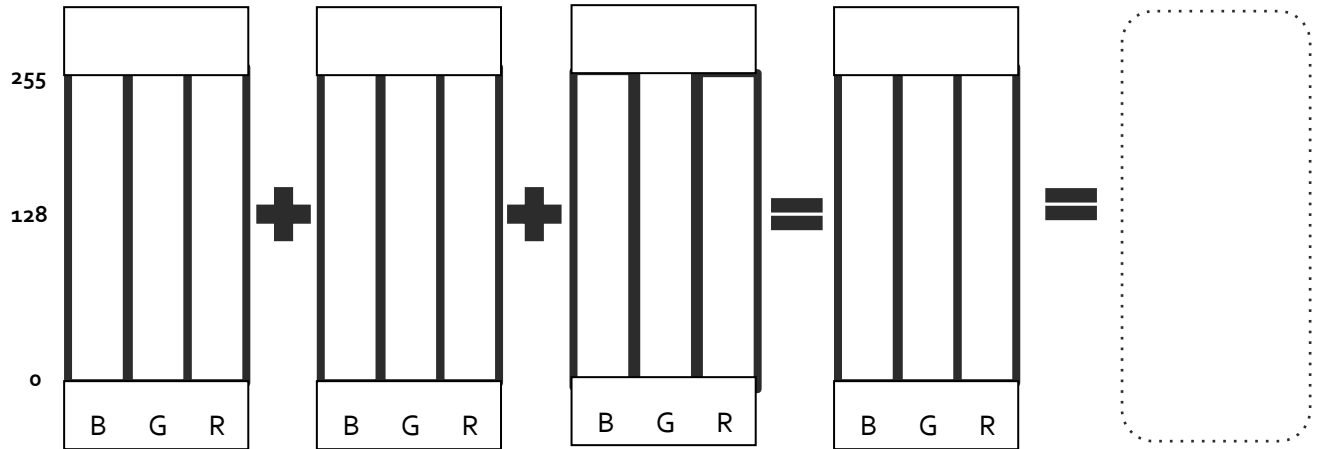


Great job, displaying the amount of color light required for every color **but we still do not know the color every combination of light creates**. Use the following web site to find out what colors you displayed.

<http://www.workwithcolor.com/hsl-color-picker-01.htm?cp=915D03&ch=38-96-29&cb=FFFFFF,FFFFFF,FFFFFF,FFFFFF,FFFFFF,FFFFFF,FFFFFF,FFFFFF,FFFFFF,FFFFFF>

## Student Page

Take your time exploring the web site and find the display of color light of a couple of your favorite colors



Lastly, try finding out what colors your class likes by exchanging color codes with one another.

**Lesson Title:** STEM Behind Art

**Materials Needed:**

- Student pages
- Color pencils
- Markers
- Internet access
- Computer, Chromebook, cell phone, or tablet

**Implementation:**

The first activity will guide the students to explore the magnification of an image. Next, students will learn some information about George Seurat and how this artist and scientist was able to develop a new way to display art by mixing colors and patterns at a distance allowing the human eye to create different images and colors while focusing on specific areas of a paint. Students will see two images (student pages) and they will analyze the images by looking at them at close up and at far away. Finally, students will create their own image utilizing George Seurat's technique.

**Discussion Ideas:**

- Why do you see different colors or patterns by looking at the image from different distances?
- What is the connection between scientists and artists? Why do you think a scientist could be an artist or vice versa?
- Imagine you are a scientist and an artist, what type of artist would you be? What scientific subject would you study?

**Extensions:**

Students will use pieces of different colored paper or sticky notes on a wall and then walk some steps away from the papers and find out how the human eye sees different colors by mixing the colors on the papers at a distance.

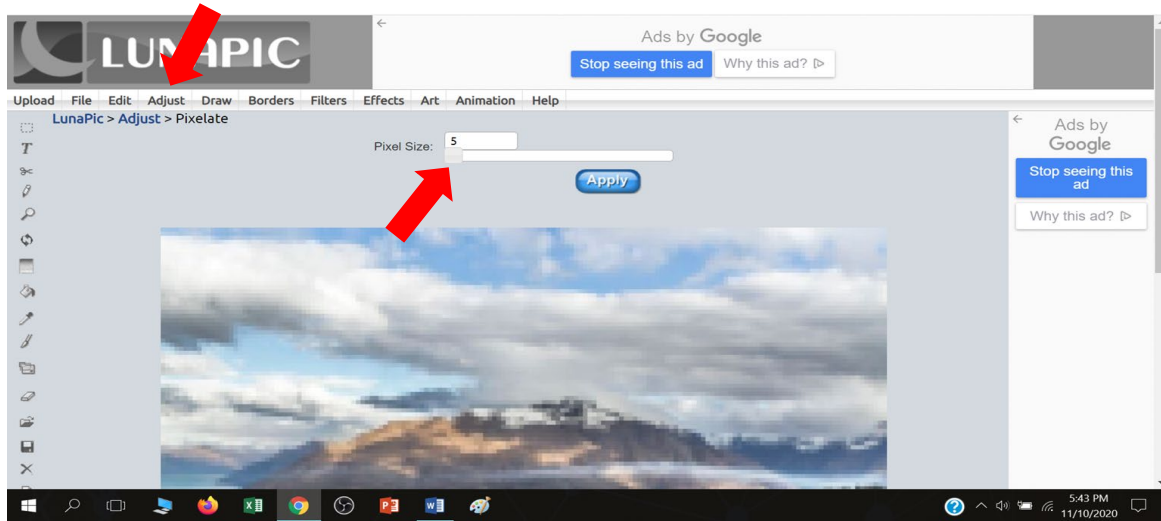




## Student Page

You are about to explore what would happen if you look at an image through a magnifying glass. Open the website below and explore the pixel size feature. It is located at the “Adjust” option, focus on how the pixel size influences the image.

<https://www6.lunapic.com/editor/index.php?action=pixels>



Pixel Size	My Observations	Possible Explanation
5		
10		
15		
20		
25		

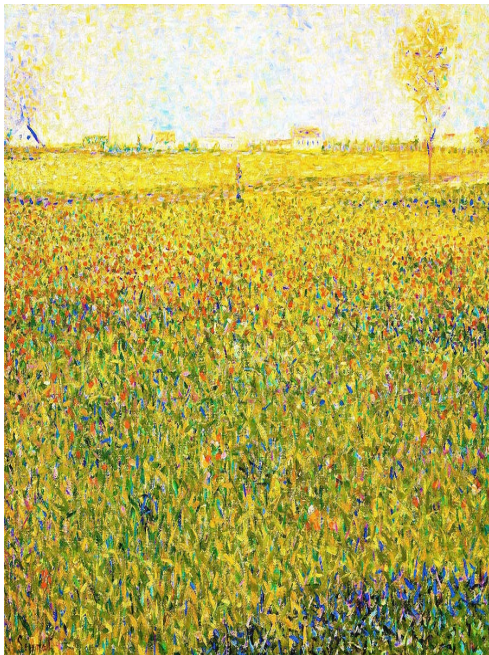
## Student Page

George Seurat had an idea after reading a book from the physicist and artist, Ogden Rood. His idea was to set dots of colors next to each other and then see it from a distance allowing the colors to mix and create something different. Now, it is your turn to try his idea.

What do I see up close?	What do I see from far away?



What do I see up close?	What do I see from far away?



<https://www.bohaglass.co.uk/georges-seurat-art/>

## Student Page

Now that you are inspired by George Seurat it is time to express your artistic skills. Create a picture applying George Seurat's technique of using color combinations to change how the painting looks from a distance. After you finish your masterpiece, share it with the rest of the class and ask your classmates to look at it up close and at a distance.

