Thunder Color Theory

Thunder games are a buffet for the senses, with sights, sounds, and smells abounding. In this activity, explore the science behind colors and how they impact the game of basketball!

HERE'S WHAT YOU'LL NEED:

- **A prism (a clear glass of water can be substituted)**
- **3 flashlights**
- **White poster board**
- **Colored cellophane (green, red, and blue)**
- **Rubber bands**
- **An internet enabled device**
- **Notebook or paper**
- **Pencil or pen**
- **Colored pencils or markers (optional)**

This activity can be done individually or with a partner, as well as in a classroom or at home.

WARM-UPS

Watching a Thunder game is a bright, bold, colorful experience, whether you're in the arena or watching it on TV. The colorful uniforms, designs and logos on the court, bright arena lights, and the orange of the basketball itself creates a visually exciting time.

One of the most colorful parts of the game is Thunder player's uniforms! Have you ever wondered why the OKC team colors are blue, orange, and yellow? They each have specific meaning to the team! The light blue matches Oklahoma's state flag, and represents the team's inclusion of all Oklahomans. Yellow refers to the warm sunshine of the Great Plains, and the reddish-orange represents the big, beautiful sunsets for which Oklahoma is known.

How can you see and process all this bright, exciting action of the game? Your eyes and brain work together pretty remarkably! Light is a special kind of energy that travels in waves and is made up of all the colors of the rainbow, even if you can't see them right away! The light we can see is called the **visible spectrum**. Different colors travel in waves of different sizes, known as wavelengths. Wavelengths are either absorbed by an object or reflected back to your eyes. For instance, when white light hits a basketball, it reflects orange wavelengths to your eyes and all the other color wavelengths are absorbed.

Grab a prism if you have access to one.

Pro tip: If you don't have a prism, you can also use a clear glass of water, or even a zip top bag of water!

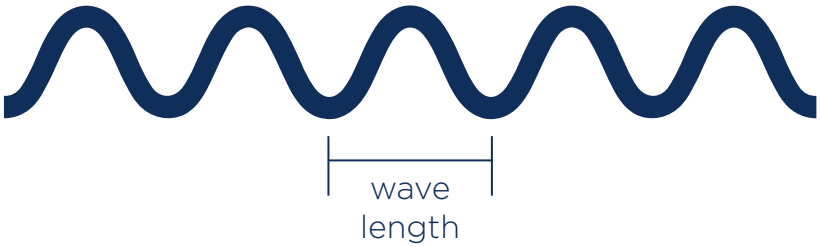
Using a flashlight or a sunbeam through a window, see if you can angle the prism to catch a ray of light. What happened? You're probably familiar with rainbows, even seeing one in the sky after a storm. What do you notice about the rainbow created by the prism? There are seven colors in the color spectrum—red, orange, yellow, green, blue, indigo, and violet. Can you identify all of them in the prism rainbow?

At the back of your eye is a special part called the **retina**, where tiny **rod** and **cone** cells are located. These tiny cells help you see and they react differently to colors depending on the light's wavelength. Wavelengths that make up the colors in the visible spectrum are different depending on the color. Red, for instance, is the longest wavelength and has the lowest amount of energy. Violet, on the other hand, is the shortest wavelength and has the highest amount of energy.

Red Light



Violet Light



GAME TIME

When choosing colors, sports teams put in a lot of thought, analysis, and consideration. The colors selected are often meaningful to the home city, state, culture, fans, and sport. There is also consideration for how the colors will look on TV, in advertisements, on fan gear, and how it will be used in variations of the uniform for away games.

Did you know that until the 2017-2018 season, the home team of every NBA game would wear the white version of their jersey while the traveling team would wear the color version? (The only exception to this was the Los Angeles Lakers, who's home uniform is yellow.) After this season, a new rule was made: the home team got to choose whether they wanted to wear white or colored uniforms, and the traveling team had to wear something that looked different (a contrasting color).

Let's further investigate how we see colors! Grab your three flashlights, white poster board, and colored cellophane. Cut out five squares of each color of cellophane. These squares should fit over the end of your flashlight with extra hanging over the edges. When you have five squares

of one color ready, stack them together and secure them on the front of the flashlight with a rubber band. Repeat this step with the other two flashlights, using a different color of cellophane for each one. When you're finished, you should have three flashlights with stacks of cellophane secured to them—one green, one blue, and one red.

Prop up your poster board against a stack of books or against the wall. This will make your investigation easier. Make the room as dark as possible by turning off all the lights and covering the windows. Begin with the red flashlight. Turn it on and point the light at the white poster board. What color do you see? Record this in your notebook. Repeat this step with the blue and green flashlight, recording your observations as you go.

Next, try combining the different colored lights to see what happens. Choose one of the flashlights, turn it on and point it at the poster board. Set it on a book or another object so that it is still shining on the board but you don't have to hold it. Then, choose one of the other flashlights, turn it on, and point it where the first flashlight is shining. What do you notice?

Pro tip: If you need to, increase or decrease the distance between the poster board and the flashlights to focus the beams of light into clear circles.

Record what color you made when mixing the beams of the two flashlights and any other observations you noticed. Repeat this step with the other flashlights until you have three new color combinations recorded in your book—red and blue, red and green, and green and blue.

Now, try combining all three flashlights' beams onto the poster board. Grab a friend or grown up for an extra set of hands to help you. What happens if you aim all three beams on top of each other on the poster board? What happens if you try to arrange them in a triangle shape? How many different color combinations could you make out of the three original colors? Record these findings in your notebook.





Were you surprised by what happened when you mixed the different colored lights? How do you think things would change if you used a colored poster board instead of white one?

Earlier we mentioned how there are tiny cells in the back of your eye called cones. There are actually three types of cones, and each one is good at sensing a specific color of light—red, green, and blue. Your eyes pick up the wavelengths of these three colors and send signals to your brain, which figures out how they mix to create all the colors you can see (like the rainbow you saw with the prism in the **Warm Ups**). That's why you used red, green, and blue in your investigation. People with color vision deficiency have cones in their eyes that don't work the same way as others. Since red and green wavelengths are so similar, it can be hard for their eyes to tell them apart.



OVERTIME
Let's take it further.

Different colors have different amounts of energy due to the length of their wavelength. Did you know that colors can have different emotional energies as well? Color choice plays an important part in sports psychology. Think about red, for instance. How does that color make you feel? It might make some people feel energized or active, while it might make others think of power or strength. Some might even associate it with anger. What about blue? What does blue make you feel or think of? Maybe it feels calm or relaxing to you, or even confident or focused.

Using your internet enabled device, search which colors are used the most often as team colors in the NBA. What feelings or emotions do you associate with the most used colors? Ask your friends, siblings, guardians, teachers, or others how certain colors make them feel and see if it's similar to you!

OKC Thunder obviously have the best color combinations in the league, but if you were tasked with creating a new NBA team, what colors would you choose for them and why? Grab some paper and colored pencils or markers and give it a try!

COACH'S CORNER
Additional information and explanations for parents and educators

Students experimented with colored light, the visible spectrum, and mixing colors to gain a better, hands-on understanding of how their eyes and brain perceive colors all around them. Color theory is so important to sports science and psychology. When creating team colors, obvious things like marketing, public perception, and brand recognition need to be taken into consideration, but so do things like visibility, differentiation among other teams in a league, and even how the colors will translate to streaming and television broadcasts.

As mentioned in **Game Time**, up until 2018, NBA games required the home team to wear their white uniform while the traveling team would wear a colored uniform. Though not the only reason for this choice, this rule helped differentiate teams on early NBA television broadcasts in the 1950s. Anyone who's seen black and white media knows it's hard to identify specific colors if you don't already have that knowledge. So, in early sports broadcasts, the contrast between any color and white made it easier to tell the teams apart.

Colors are an important part of most sports, whether team sports or solo ventures. One of the most notable examples of this is in soccer. Goalies usually wear bright, neon uniforms (or kits) that bear no relation to their team's colors. This is to create high visibility for both their teammates to easily identify where they are on the field as well as for referees to quickly identify them, since goalies are the only players who can hold the soccer ball with their hands.

Students explored color mixing using flashlights and colored cellophane to learn about additive mixing. Additive mixing is a way of combining colored lights, where the colors we see are based on how our eyes and brain perceive them, not on any physical change to the light itself. In contrast, subtractive mixing is when pigments and dyes are combined, they absorb certain wavelengths of light, changing the colors that are reflected and seen by our eyes.

STANDARDS ALIGNMENT

This activity can be used to support students with developing the skills and/or content associated with the areas listed below.

Subject Areas and Skills/Content	3rd Grade	4th Grade	5th Grade	6th Grade
Wave Properties Waves of the same type can differ in amplitude (height of wave) and wavelength (space between wave peaks).		●		
Electromagnetic Radiation An object can be seen when light reflected from its surface enters the eyes.		●		
Electromagnetic Radiation When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of light.				●
Cause and Effect Cause and effect relationships are routinely identified.	●	●	●	
Patterns Similarities and differences in patterns can be used to sort and classify designed products.	●	●	●	