

LESSON 5: SECRET ANAGLYPH

SUPPLIES

MAIN BIN

- Red transparent paper (15)
- Blue pencils (15)

FOLDER

- 15 Sheets White Paper
 - (cut in half, 2 per student)
- 15 Sheets of Grid Paper
 - (cut in half, 2 per student)

PENCIL BOX

- Markers
- Pencils


OBJECTIVES

- Explain how we see color
- Explore how colored filters absorb and reflect light waves to change our perception of colors

HOOK 3-5 min

- Distribute a piece of transparent red paper to each student. Have them hold it over their eyes and look around the room. What do they see?
- Is there anything that looks much different using the red filter? How are the other colors changed?

INTRODUCTION

 3-5 min

Welcome back, agents. Today, we will gain new info about our eyesight and learn vision-enhancing techniques from Agent Visor. An effective Secret Agent needs to understand how colors can be changed in order to hide information, and how the brain interprets different colors--specifically, **Red** and **Blue**--when they are in the same place at the same time. Agent Visor will teach us all about Anaglyphs, a special kind of picture that uses different colors to hide messages.

We will create their own secret spy messages, and decode messages from other agents!

MEET TODAY'S SECRET AGENT

VISOR



Specialty: Enhanced vision

Agent Visor possesses extraordinary visual capabilities, including enhanced vision and optics. With exceptional eyesight, Agent Visor can see with remarkable clarity, even in low-light conditions. He has the ability to detect microscopic details, see through disguises, and analyze the tiniest visual clues that others might miss. Let's learn some of his skills!

DISCUSSION

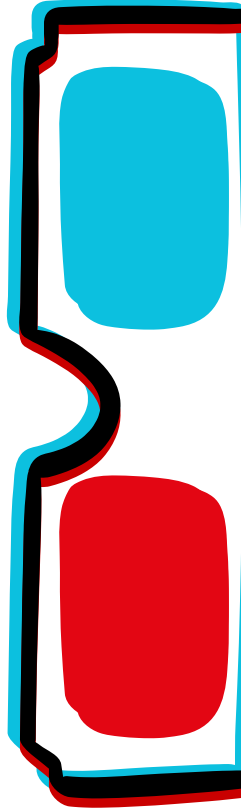
🕒 5 min

Let's explore the fascinating world of color, and how spies can use it to send secret messages! To begin, let's think about how we see colors.

Colors come from light. Light waves are made up of different colors. In fact, when we see white light, it's actually a combination of all the colors of light waves mixed together. When this white light hits an object, something interesting happens. Most of the light waves are absorbed by the object, but some are reflected back to our eyes.

Let's imagine a brown desk. When light hits it, the brown light waves are reflected, and the other light waves are absorbed. Our eyes see these reflected light waves and send the information to our brain, which helps us interpret the colors we see. That's why we see the desk as brown.

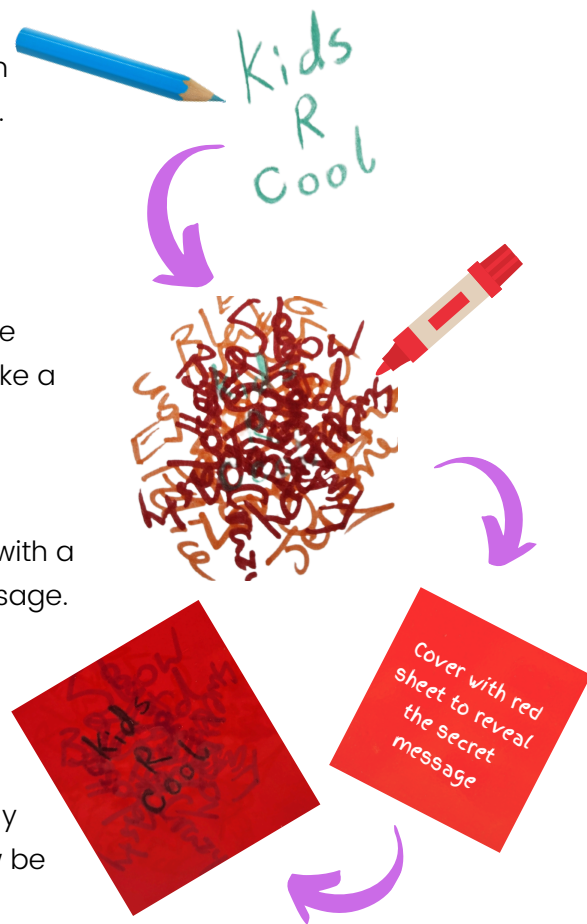
Now, let's imagine how spies can use colors to send secret messages. How do you think colors could be used in secret communication? One technique they use is called **anaglyphs** (a-nuh-glif). Anaglyphs are special images that contain hidden messages. They work by using the way we see color to hide the message within the image. By understanding how light interacts with different colors and using clever techniques like anaglyphs, spies can communicate covertly, or secretly, making sure that their messages remain hidden from prying eyes.



ACTIVITY PART 1

🕒 10-15 min

1. Give each student a white sheet of paper and a **BLUE** pencil. Have them write a secret message in the colored pencil, on the center of the page.
2. Then, have students create a design of doodles on top of the message using the **RED** marker. This is called "decoy information," because it isn't actually important--it just exists to hide the real message.
 - Encourage students to think how they could make this even more secretive by disguising the message in a picture of something, like a red apple, or a red heart outline with doodles on the inside.
 - Write a whole bunch of words with the **Red** marker
3. Once students have completed their pictures, have them swap pages with a partner. Ask the students to try and decipher their partner's secret message.
4. If the partner can not read the message, tell students that they have achieved their spy goal of writing a secret message!
5. Now, give each student a piece of red transparent paper. Have them lay the red paper over top of the drawing. The secret message should now be visible to everyone!



ACTIVITY PART 2

🕒 15-20 min

1. Separate the students into groups of 3-4. Each table will need a set of these marker colors:

- a. Blue or Green or Purple (Blue tinted)
- b. Red or Orange or Yellow or Pink (Red tinted)

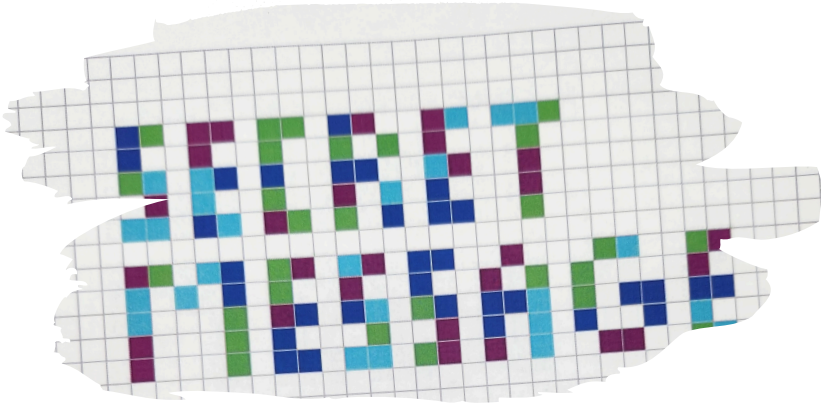
This works best if you have 2 of at least some of these colors, so that students don't fight over colors. Pass out 1-2 sheets of grid paper to each student.

2. Instruct the students to only use the **Blue tinted** markers for this first part. They will color in one box at a time to create a word or picture they wish to be their hidden message. If it needs to be simpler, they can use just one **Blue tinted** color, but this will make the message too noticeable.


3. Now we are going to only use the **Red tinted** markers to fill in the box spaces surrounding the hidden message. Remember, the more colors you use in random patterns, the more hidden the message will be. Refer to example for ideas

4. Once all of the message has been hidden, ask the students to swap their pages with their group mates to see if they can see the hidden message. The students can then use their transparent red sheets over their designs to reveal their messages!

5. They can repeat this process to make new messages or pictures as many times as they like!



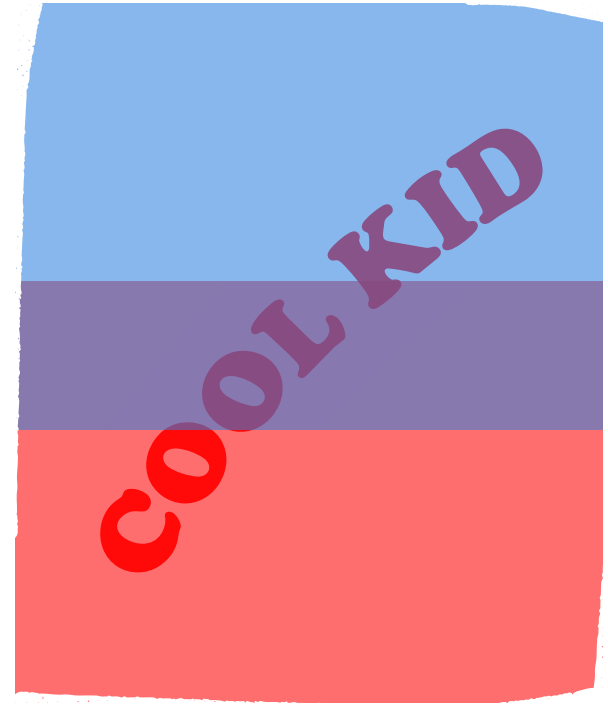
OBSERVE & EXPLAIN

 5 min

Ask students to discuss what happened when the red paper was laid over the top of the drawing. The red paper allowed the blue tinted colors to shine through, and the message became visible.

Explain that the original image, without the red paper, was on white paper in white light. The light reflected the red and absorbed the other colors. When the red transparent paper was laid on top of the picture, it absorbed the red light waves. Therefore, the marks made with a red marker were absorbed, and the light waves only reflected back the blue pencil. This allowed our brains to only see the blue color (which now looked darker) and send the message to our brains to read the message!

The red paper acts like selective windows: it only shows us certain parts of the full-color image. So by writing your message in one color and your decoy information in another, you can control what the viewer sees based on the color filter applied. If this message was passed along to another secret agent who knows how to enhance their vision, the message can be read! If it falls into the wrong hands, however, the message looks like garbled information.



Exit Ticket



Ask each student one of the following questions as they walk out the door.

- Q: How do we see color?
 - A: Light waves are absorbed and reflected on objects. Our eyes see the reflected light waves and our brain interprets this as color
- Q: How does a colored filter work?
 - A: It absorbs specific colors and reflects other colors
- Q: How does an anaglyph hide a secret message?
 - A: The filter helps to only reflect the color of the secret message and absorb the colors in the marker on top