

Invisibility Shields!



IMPOSSIBLE
SCIENCE

Goal: Students will use their knowledge of how lenticular lenses work to create an illusion and explain it to other students.



Procedure

1. **Prep:** Make the invisibility shield ahead of time, and plan your outfit to match the background of your classroom. For example, if you have a blue wall with a whiteboard on it, wear a white shirt and blue pants. If you are not making the shield, simply have the small lenticular lens sheets cut to size along with a set of colored pencils for each pair of students.
2. **Hook:** Ask: *Have you ever wondered how you could make yourself invisible? I have,*

Materials:

- An invisibility shield made from a large (40x28 inches or so) lenticular lens sheet to share among groups in class and a polycarbonate or plexiglass sheet with two vertical handles *Note: If you don't have access to the materials above, or if they are cost prohibitive, you can show the video and do the modified experiment only with the smaller lens sheets below with equal understanding.
- 3x4 inch lenticular lens sheets to distribute among groups of 2-3
- Colored pencils
- A glass of water
- A pencil
- A magnifying glass
- A vertical cylindrical lens
- Flashlight
- Cardstock

and today I am going to show you how. Hold up the invisibility shield in front of you so that you disappear behind it a few times. Ask students to explain how it might work and share a few responses.

3. Explain: *This shield is actually a lenticular lens, and today we are going to learn about the science behind the lenticular lens, and we will use that knowledge to build our own miniature invisibility shields.*
4. Dip a pencil into a glass of water and have students observe that it appears to bend in the water. Ask students why this illusion occurs and discuss.
5. If needed, remind students that refraction is the bending of light when it passes from one material to another with a different density.
6. Show students [Impossible Science](#) video to 2:09.
7. Ask students what they think will happen to the beam as it passes through the lens and hits the card stock.
8. Have a student move the card stock closer and farther from the light source and lens, observing what happens to the beam and writing down their observations.
9. Hand students small rectangular lenticular lenses and ask them to examine them up close and share what they notice about the lenses.
10. Show [Impossible Science](#) video to 5:03, pausing for students to record.
11. Ask pairs of students why the lenticular lens makes objects seem to disappear.
12. Tell students to line up four colored pencils vertically and to lay two different colored pencils horizontally on top of them. Without using the lenses, ask students to predict what will happen when they hold the lenses over the pencils given that half are vertical and half are horizontal.
13. Have pairs record their predictions and explanations and share a few.
14. Tell students to hold their lenticular lens over the pencils vertically, then turn it horizontally, and observe what they see (as in this [gif](#)).

Vocabulary

1. **Spherical lens**- a lens whose surface matches the surface of a sphere. When light passes through it, it refracts to a focal point.
2. **Cylindrical lens**- its surface matches that of a cylinder. If light passes through a vertical cylindrical lens, it will create a vertical line on the surface beyond the lens. If the surface is moved closer or farther from the lens, the height will not change, but the width will. A vertical cylindrical lens only converges the light that passes through it on the horizontal plane, not the vertical plane.
3. **Lenticular Lens**- a series of cylindrical columns (lenticules) evenly spaced across one surface of a sheet. The number of lenticules per inch is referred to as the LPI.

Assessment

Assign pairs to visit classes of younger students, demonstrating the invisibility shield (if you have one) and/or the pencil illusion and explaining the science behind it. Students should submit a recording of their demonstration and explanation.

Challenge option: Students should create their own illusions to demonstrate how the lenticular lens can make things seem to disappear, and write an advertisement for all of the possibilities for the lenticular lens (military technology, amazing your friends, etc.).

Safety Note:

Adult Supervision Recommended

Watch the companion video here:



Lesson Plan by Whitney Gallagher based on the “Impossible Science” series.

Find more at impossiblescience.com

