

BRAIN BENDERS

Put your brain into overdrive and explore how light interacts with objects and the concepts behind some of the oldest visual illusions out there!

KEYWORDS:

Perception

How we interpret how something looks

Illusion

When we perceive something different than it is

Visual Cortex

Part of the brain that takes signals from the eyes

ASK YOUR CLASS:

Q: What is the involvement of light in how we see the arrow flip when it passes behind the cup of water? **A:** The arrow is not physically changing. Since there is light hitting the paper and bouncing around in the cup of water before hitting our eyes, it is the light that changes our perception. If it was completely dark, the arrow still would not flip - it's purely due to how the light hits our eyes and how our brains interpret that information. (1-PS4-2)

Q: Why does the penny seem to disappear beneath the cup full of water, but not when the cup is empty? What other containers can you try to see how they change the experiment? **A:** The light passing through water refracts, or bends, differently than light passing just through the cup. Water makes the light bend more and the image of the penny gets obscured. This experiment could be tried with glass rather than plastic, or containers of different shapes to test how what affects our ability to see the penny. (2-PS1-1)

Q: Why do visual illusions work? **A:** Our brains try to interpret the world around us in the simplest way. This can result in illusions that trick us into seeing something that is not there.

Q: How do thaumatropes create one image out of two? **A:** By taking two parts of an image and spinning the thaumatrope quickly, our brain does not have time to finish processing each individual image. Instead, it combines them into one image.

Q: Test the thaumatrope at different speeds. Is there a speed at which it spins slow enough you can see both images completely separately? **A:** The students can try spinning their thaumatropes at different speeds. They may get it fast enough, the image blurs too much, or so slow they see two separate images. (3-PS2-2)

K-3RD NGS STANDARDS COVERED:

- 1-PS4-2:** Make observations to construct an evidence-based account that objects can be seen only when illuminated.
- 2-PS1-1:** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- 3-PS2-2:** Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.