

3D-Hand

OVERVIEW

This science and art activity creates a fun optical illusion.

WHAT ARE WE LEARNING?

Our eyes and brain work together to allow us to see! By tricking our brain to make it think it's seeing something it's not, we can learn more about how the brain works.

Materials

- White Paper
- Pencil
- Markers
- Your own hand!
- (optional) 3D-Hand Worksheet
- (optional) Ruler
- (optional) Camera/phone to take pictures



Image 1: Supplies (not all optional supplies are included)

INSTRUCTIONS

1. Trace your hand on a white piece of paper, slightly past the wrist. We recommend using a pencil to trace but markers are also acceptable.
2. Decide if you prefer to make lines over the whole paper, as in image 2, or only within the hand, as in image 3. Consider that making lines across the entire page takes longer, but can make the illusion better. (Google "3D hand" to find more examples of hands made with lines across the paper).
3. **Do this step 3 ONLY if you are making lines OUTSIDE the hand.** Use the ruler to make lines across the page OUTSIDE of the hand as in image 4. You can use a pencil or marker, different colors or one color. Putting the lines closer together tends to make a better illusion. There are a lot of different techniques to do this, you might consider researching some online.
4. Make curved lines INSIDE the hands, as in image 3. Start at the bottom of the wrist. If you made lines outside the hand, you will want to match up the "inside" and "outside" colors/lines. You can use a pencil, or marker, different colors or one color. Putting the lines closer together tends to make a better illusion.

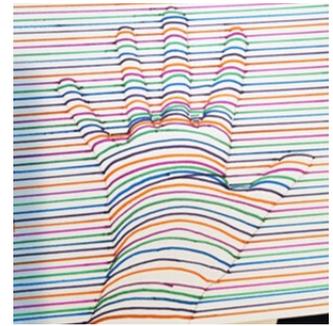


Image 2: Hand created with lines across the entire paper



Image 3: 3D-hand

INSTRUCTIONS (CONT)

5. If you feel inclined, make multiple 3D-hands with different techniques and keep track of the materials you used (e.g. markers, pencils, or crayons?), how thick the lines were, the colors of the lines, how close together the lines were, if you made lines outside the hand and more! Then judge how "3D" your different hands look. Can you figure out which attributes make your hand look the most 3D?

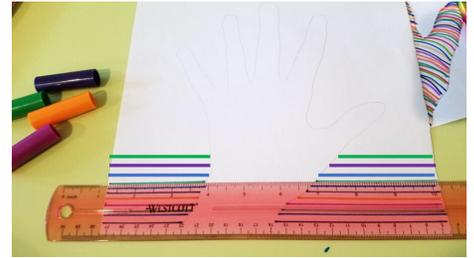


Image 4. Use a ruler to create lines OUTSIDE of the hand (optional)

Use our "3D-Hand Worksheet" to keep track of your data!

You can see some additional 3D hands we did below! Which of these looks the most 3D? What about compared to images 2 or 3? How might you explain the differences?



Image 5: Various 3D-hands. Do they all look 3D? What is different between them? What is similar?

THE SCIENCE

Our brain and eyes work together to perceive images. One way our brain knows if an item is three dimensional (and its location in space) is due to something called "stereopsis." Stereopsis help you see in 3D by comparing the two similar, but slightly different, images from your two eyes. However, the brain also uses other visual cues to determine if things are 3D (and where things are in space), which is why you are still mostly able to navigate around a room with one eye closed. One easy-to-explain example of this is that items appear bigger when they are closer to you. (Have you ever "blocked" someone's head with your thumb?)

In the 3D-hand activity, the curved lines inside the hand give your brain visual cues that signal the hand is three dimensional, even though in actuality, the hand is 2D. This is called an optical illusion. If you draw many hands with a variety of methods, you can start to hone in on the features that "trick" your brain. Artists often have a deep understanding of the features of visual perception and use that knowledge to create the appearance of depth in two dimensional images.

ADVICE FOR DOING SCIENCE WITH YOUR KIDS

- Encourage exploration and curiosity - science is about more than facts and content (although these things are important too!)
- Consider writing down your child's questions and ideas during the activity. You may be able to turn these into a future research project or activity!
- Consider getting a dedicated science journal for your child where they can keep all their thoughts, ideas, and notes on their experiments.
- Do not worry about not knowing the answer to questions! 1. Many "simple" kids science activities have very complicated, or even unknown(!) science behind them. 2. Even scientists will often not know the answers to questions outside their field. No one knows everything! Be honest about not knowing the answer and suggest trying to figure it out together.
- Deviations from exact instructions can often be fruitful - especially if the child has been inspired and wants to try out another line of investigation.
- In many states, the science standards are called the "Next Generation Science Standards," or "NGSS." They can be complicated to parse through but in essence they want student to learn not only content (called "disciplinary core ideas" or "DCI") but also the practices scientists and engineers use ("scientific and engineering practices" or "SEP") and also concepts that cut across all fields ("crosscutting concepts" or "CCC").

