

# SCIENCE AT HOME

# THE NATURE OF SCIENCE

GRADE: **9 – 12**

TOPIC: THE NATURE OF SCIENCE

VIDEO: [youtu.be/YaObfsq-Bnc](https://youtu.be/YaObfsq-Bnc)

## INTRODUCTION:

At its core, science is a way of thinking. It's a process you use to try to solve problems and understand the world. Understanding how science works is not only important in the classroom or in the laboratory; it also helps you make decisions about many issues in your daily life. Should you consume less sugar? Should you wear a mask to the grocery store during a pandemic?

In the activities below you will apply some of the skills scientists use every day: observing, inferring and building a model. You make observations using your senses. Your observations come from interpreting the available data. Inferences are the conclusions you reach based on those observations, using both reasoning and your prior knowledge. With those observations and inferences, you build a model of how something works.

Remember that science is tentative. Although the models that scientists construct are based on observations and evidence, those models change as new evidence is discovered. Your models should also change as fresh evidence comes to light.

Also remember that the scientific process is not neutral. It is shaped by the perspectives and experiences of the people doing the science. While doing this work, be sure to consider how scientific knowledge is constructed, how the society you live in affects the science you see in the media and are taught and why it matters who is doing the science.

Asking others in your household to try these activities will help you understand that a person's perspective and world view influence not only the model they construct but also how they go about constructing it.

## ACTIVITY: Building a model around footprint fossils

TIME: 20 minutes

## WHAT YOU NEED:

- Participants (members of your household)
- The three images below



Image #1

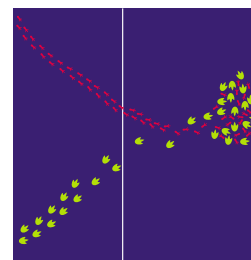


Image #2

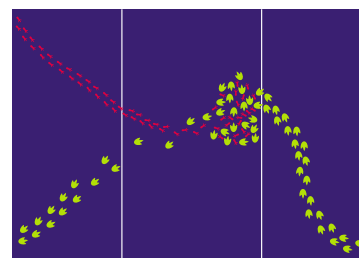


Image #3



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## WHAT YOU DO:

- Conceal all the images until you are ready to show them.
- Show Image #1 to your first participant.
- Say to them: "Here you can see a drawing of a set of fossil footprints found in a rock bed in North America. I'd like you to observe the footprints, make some inferences about those footprints and then develop a model of what you think happened to create those footprints."
- Tell them that in developing their model, they may want to consider:
  - what types of organisms made the footprints
  - how many organisms there were
  - what size the organisms were
  - what speed and direction they were travelling in
- Give the participant a few minutes to think about it. Then, have them either write their model down or tell you what they think happened.
- Show them the second image. Ask them how this new information changes their model. Give them a few minutes to think about it. Then, have them write down their revised model or tell you what they think.
- Show them the third image. Again, ask how this new information changes their model. Give them a few minutes to think about it before they write down or share what they think happened.
- If there are others in your household, repeat this experiment with each person.

- Things to think about:
  - How did each person's model change as more evidence was provided?
  - How do different people's models compare?
  - Whose model do you think is most accurate? Why do you think that? Which model fits best with your own understanding and world view? Reflect on how your world view might affect which one you think is correct.
  - Did you notice that people tend to include their own life experiences when building their model? Perspective matters in science.
  - Is there a correct answer?
  - How does this activity relate to science and the scientific process?

## WHY THIS MATTERS:

We are living through an unusual time, when the whole world is relying on science to help understand and fight a pandemic. Understanding how scientific knowledge is constructed — how we know what we know — can help you understand what you encounter in the news, on social media and when talking with others.



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## WHY THIS MATTERS (continued):

It is important to be critical of the information you read, hear and believe. It's important to ask: whose voice is being heard, whose voice is missing from the conversation and why?

Your first-hand experiences influence your perspectives on the world and it's your responsibility to be aware of how. Some perspectives and knowledge systems are privileged over others, and some have been or continue to be erased or silenced. You can help change that.

Good science comes when many different people with different perspectives all contribute, and when all voices, regardless of race, gender, and class, are valued and heard without prejudice. Good science comes when we constantly reevaluate the limits of what we know, using as many perspectives as we can.

## TAKING IT FURTHER: Mystery box

Build a hidden maze in a shoebox. Then have members of your household use their skills of observation and inference to create a model of what's inside the box. If you have more than one person in your household, encourage them to share their models and watch what happens when they do.

**TIME: 30 minutes**

## SAFETY:

Be careful when cutting cardboard.

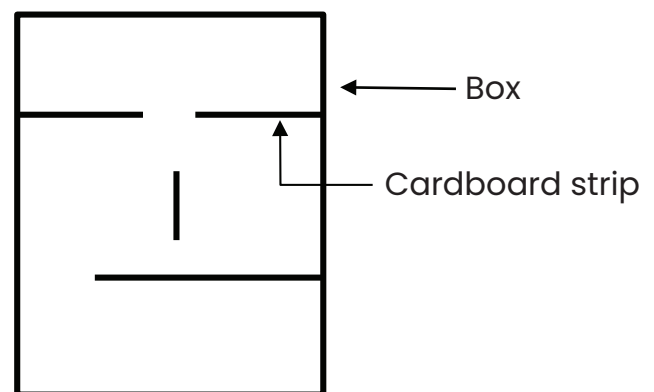
## WHAT YOU NEED:

- Shoebox (or another box with a lid)
- Cardboard
- Tape or glue
- Scissors
- Marble or small ball
- Paper
- Pen or pencil

## WHAT YOU NEED:

### Create a maze in your box

- Draw on a piece of paper the maze that you want to create. Keep it simple! (See the sample drawing below.)



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## WHAT YOU NEED:

- Cut strips of cardboard about two centimetres taller than the height of your box.
- Fold each of your cardboard strips along the long edge to create a two-centimetre base. You will use this base to attach the strip to the bottom of the box.
- Tape or glue each of your strips in place.
- Put your marble or ball into the box.
- Tape or glue the top of the box in place so that your participants won't be able to see the maze inside.

## Challenge others to create a model of what is inside the box.

- Give your mystery box to someone in your household, and allow them to play with it for a few minutes. Ask them to make observations – by listening and feeling the box as the ball rolls – about where the ball is in the box.
- Ask each person to make inferences based on their observations and to draw what they think the inside of the box looks like.
- If you have more than one participant, encourage each person to share their model with others. Allow them to change their models based on feedback they get.

## Never reveal what's inside your box.

- Encourage your participants to construct their own boxes, based on their observations and drawings, and to use that to test their model.

## Consider the following:

How does this illustrate the scientific process?

Did sharing their models with others help your participants get closer to replicating your model? Different perspectives and world views are very important in science. Why do you think this is?

## MORE ONLINE:

Point of View Affects How Science is Done

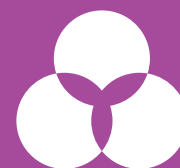
<https://www.scientificamerican.com/article/point-of-view-affects-how-science-is-done/>

Why are Africa's coronavirus successes being overlooked?

<https://www.theguardian.com/commentisfree/2020/may/21/africa-coronavirus-successes-innovation-europe-us>

No COVID-19 Models Are Perfect, But Some Are Useful

<https://time.com/5838335/covid-19-prediction-models/>



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