

Constructing Explanations and Designing Solutions 6th–12th Grade—Student Guide

Before You Begin

Goal: In this activity, you will explore exhibits and make observations. Then, you will use your evidence to create a scientific explanation for what is happening and design a solution for a problem.

Background Info: The skills used in this exercise are important parts of the scientific process. Scientists’ observations and inferences help them to understand the world around them and create solutions to problems. For example, a civil engineer might notice an inefficiency in our freeway system in Detroit, then collect data analyze it, and use their evidence to come up with a solution to the problem. Today, you will engage in this process with your classmates and the exhibits!

Led By: Students and Chaperone

Explored By: Students Grades 6-12

Activity Length: 30 Minutes

Materials: This worksheet and a writing utensil **OR** This document on a mobile device and pen and paper



With your group, pick one of the following exhibit sets to focus on for your group’s experiment and observations. Your group will need to make observations at each exhibit in the set. If your first choice exhibit is busy, pick another one or come back to it later.

Pulleys
Gear Ratio
Giant Lever

Found in the Simple Machines Gallery on the Lower Level. (Next to the Science Stage)

Explores Forces and Interactions

Gas Laws
Thermocouple
Magnetic Motor

Found in the Electromagnetism Gallery on the Lower Level (outside of Centennial Lab)

Explores Energy, Waves and Electromagnetic Radiation

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Experimenting

Play with the Exhibit...

With your partner, pick an exhibit. Try things out and see what happens. Be sure to **observe** the exhibit before and after you push buttons, test pulleys, or move any of the exhibit's parts. If you can, look inside the exhibit and see what's happening.

Do Some Careful Noticing...

As you are trying things out, talk about what you **observe**. Remember that an **observation** is a something that you notice with your five senses. It is a fact, rather than an opinion.

Here are some questions to discuss with your partner: *What do you observe? What does your partner observe? Are you noticing the same thing? How do you think this exhibit works?*

With your partner, decide on two things that you observed that are important in understanding this exhibit. Discuss your ideas.

Think about the science behind this exhibit...

What do you and your partner think is going on here? You are going to make an inference, or what you believe is happening, based on your observations. This is not about getting the "right answer." It's about talking through your ideas based on your observations. Try to come up with two different explanations for how this exhibit works and the science behind it.

Record your observations and explanations with a smartphone.

Decide who will video and who will talk. In your video, include these four things:

- 1) Introduce the exhibit. Share what you tried and what you observed.
- 2) Share your inference or explanation of what's happening.
- 3) Show one observation you made that can be used as evidence.
- 4) Share one question that you still have about this exhibit.
- 5) Share one problem you think the science concept you explored could solve.

OR

Record your observations and explanations by writing.

On a blank piece of paper, record the following:

- 1) Answer these questions: What did you try? What did you observe?
- 2) Write your inference or explanation for what's happening.
- 3) Write down one observation you made that can be used as evidence.
- 4) Write down one question that you still have about this exhibit.
- 5) Write down one problem you think the science concept you explored could solve.



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