

Amuse with Ooze

Objectives

Children will:

- Discuss the ways in which energy plays a role in electricity and magnetism.
- Experiment with ferrofluid and investigate the properties associated with ferrofluid.
- Connect a variety of science and engineering practices to describe how they acted as scientists in this activity.

**Important warning: this activity is very messy and will stain clothes! It should be done only with teacher or adult supervision.*

BACKGROUND KNOWLEDGE

In this activity, children can have fun experimenting with *ferrofluid* which is a liquid that can become strongly magnetized in the presence of a magnetic field. In doing so, the magnetic particles in the ferrofluid line up with the particles in the magnetic field to create an attraction. Ferrofluid is being tested in the automotive industry for the potential use in shock absorbing suspension and brakes.

CROSSCUTTING CONCEPTS

Energy and matter are not only critical elements for the survival of living things on Earth, but they also are critical to Earth as a whole. Have children predict the ways in which energy and matter are critical components to Earth. Remind them that energy can be transferred in different ways and between objects. Discuss the ways in which energy is important to electricity and magnetism to ensure that children are ready for this activity.

MATERIALS

- Wave Wires wooden station with steel base plate
- Wave Wires clear viewing tray
- 1 Red/Blue magnet wire (6mm)
- Vegetable oil
- Cup or bowl (sturdy but disposable)
- Black iron oxide powder
- Iron filings

BUILD IT

- If you have not already assembled the Wave Wires wooden station, follow the assembly instructions on pages 6–7 of your Teacher’s Guide.
- Insert the clear viewing tray in the station/tray support and place the steel base plate in the station’s base.
- Pour ½ teaspoon of vegetable oil into a small cup. Slowly and carefully add small amounts of black iron oxide powder into the oil until the mixture becomes a viscosity that oozes but is not quite slushy. (Add it gradually, stir, and check the viscosity before adding more.) The amount of black iron oxide needed will vary a lot depending on the brand of vegetable oil used.

EXPLORE IT

- Carefully pour the ferrofluid into the center of the tray and gently close the tray.
- Place the red/blue Wave Wires magnet wire just off center on the steel base plate.
- Activate the wire under the ferrofluid. Record your observations.
- Experiment with different speeds and observe the movement of the wire and ferrofluid. Record your observations.

ANALYZE & INTERPRET

1. What happened when you activated the wire under the ferrofluid? Why?
[Answer: the ferrofluid moved in interesting ways, as it is pulled by the magnetic force. This happened because the ferrous material becomes magnetized due to the magnetic field.]
2. Using your knowledge of ferrofluid and evidence from your experiment, explain how and/or why engineers are using ferrofluid in the automotive industry.
[Answer: while answers will vary, the child should infer that some car parts may be magnetic and/or have magnetic properties. When ferrous material comes in contact with these parts, a magnetic force is established, and the part becomes magnetized.]

**Note: if children have difficulty recognizing the important parts of an automobile, take some time to explain parts like brakes and suspension. Then, have them construct a response to Question 2.*

FOCUS ON ENGINEERING & TECHNOLOGY

Set the stage for this extension activity by reminding children that scientists make observations to produce data. This data often serves as the basis for evidence to explain phenomena or test solutions to designs. Have your child write a summary that details how they acted like a scientist in this activity. In this summary, encourage them to use their data (observations) to justify the importance of to explain why magnets (and magnetic fields) are important to our everyday lives. Be sure that they focus on other industries (other than automotive) that may benefit from ferrofluid.