Pseudoscience

Introduction

What is a divining rod? Does "water witching" really work? Are the results based on true scientific experimentation? Try this experiment and see if water witching fits the criteria for a scientific experiment or if it is pseudoscience.

Concepts

- Pseudoscience
- Scientific method

Background

Scientists have to make complex decisions regarding what problems to pursue, when and how to conduct experiments, and how to interpret the results. When the resulting body of knowledge, methodology, or practice is erroneously regarded as scientific, it is called *pseudoscience*. So, what is pseudoscience? Practices that are often regarded as pseudoscience include astrology, homeopathic medicine, feng shui, palm reading, perpetual motion machines, and ESP (extrasensory perception). Pseudoscience fails to meet the criteria met by true science. It often involves choosing the simplest explanation when multiple explanations are possible, making claims without experimental evidence, failing to provide experimentally reproducible results, making claims that violate established experimental results, and by making claims that lack empirical evidence, thereby failing to comply with the scientific method.

Water witching, dowsing, and water divining are all terms used to describe the practice of using a forked stick or metal rod to search for sources of underground water. Use the scientific method to determine if the practice of finding water using a divining rod is truly scientific or if it violates the rules of science.

Materials

Coffee cans or opaque containers with opaque lids, 10	Ink pen barrels, 2
Coat hanger	Wire cutters

Safety Precautions

Although the materials in this experiment are considered nonhazardous, please use all normal laboratory safety precautions. The ends of the divining rods may be sharp. Goggles or safety glasses should be worn to prevent eye injury. Wash hands thoroughly with soap and water after performing laboratory experiments.

Preparation

Cans

1. Half-fill two of the cans or containers with water.
2. Cap all of the cans or containers so that it will not be obvious which two cans contain water.
3. Number each can 1–10.
4. Place the cans in a straight line across the room.

Divining Rod

"Y"-type

1. Using wire cutters, cut a coat hanger as shown in Figure 1.
2. Bend the hook and sides to resemble a "wishbone" shape as shown in Figure 2.
3. Bend down the ends to make handles so the rod is easier to hold.

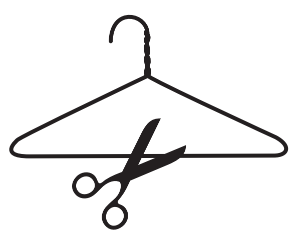

Figure 1.

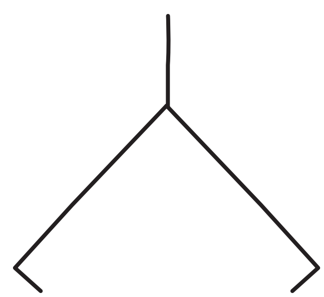

Figure 2.

Crossing-type

1. Using wire cutters, cut a coat hanger as shown in Figure 3.
2. Obtain an ink pen barrel. *Note:* This will require the disassembly of an ink pen.
3. Bend the wire into an "L" shape where the wire on one side of

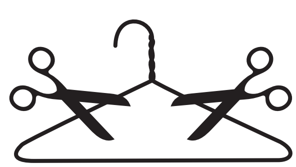

Figure 3.

Figure 4.

the bend is only slightly longer than the ink pen barrel.

4. Slide the short end of the "L" of the divining rod into the ink pen barrel. The ink pen barrel acts as a handle for the rod.
5. Repeat steps 1–4 to create the second part of the crossing-type divining rod.

Procedure

For "Y"-type Divining Rod

1. Students should hold the rod by the handles, so that the open part of the "Y" is facing them and the point is facing away from them.
2. As the students walk around the room, they should hold the pointed end of the diving rod over each can without touching the can.
3. To identify the cans with water, the student should note whether the divining rod starts to bend or pull down slightly.
4. Bending, twisting, pulling down, or slight vibrations are positive indicators for water and should be noted on a data table.
5. Compare all students' results before allowing them to see which cans actually contain water.

For Crossing-type Diving Rod

1. Students should hold the rods by the handles, so that the rods are parallel to each other and tilted slightly downward. Hands should be close together and close to the student's body.
2. As the students walk around the room, they should hold the divining rods over each can (see Figure 5).
3. To identify the cans with water, the student should note whether the divining rods start to bend or twist toward each other and cross (see Figure 6).
4. Crossing is a positive indicator for water and should be noted on a data table. *Note:* The divining rods should go back to the parallel position when the student walks away from the cans that contain water.
5. Compare all students' results before allowing them to see which cans actually contain water.

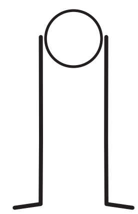

Figure 5.

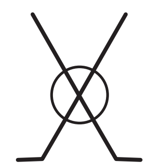

Figure 6.

Disposal

Save materials for future use.

Tips

- This activity makes a great introduction to the scientific method by having students use the scientific method to deter mine the validity of results acquired through the process of using a divining rod to find water.
- Change the location of the cans with water for each class period so other students will not give away the actual location of the water.
- The cans can also be placed in orientations other than a straight line.
- Choose whether to tell the students that they are looking for two cans which contain water or just allow them to discover how many, if any, of the cans actually contain water.
- A forked stick from a tree may be used as an alternative to the coat hanger.
- A dot of hot glue on the sharp ends of the cut coat hangers may prevent them from poking or cutting the students.
- A drinking straw, cut in half, may be used as a substitute for the ink pen barrel when making handles.

Discussion

Were students able to find water using the divining rod? Was the water found by chance, if at all? Use percentages to compare the effectiveness of using divining rods versus random guessing. Were the results reproducible by other students?

Divining for water is classified as pseudoscience. If water is found by any students, it should be the same percentage as just by chance and this is not statistically valid.

Extensions

Have at least three students stand side-by-side, an arms-length apart, in a line facing the same direction. The students should have their eyes closed. Have another student stand 2 m behind them facing the same direction. The single student should pick one person at whom to stare for 1 minute. At the end of 1 minute ask which of the other students perceived that someone was staring at the back of their head. Try this with more students on the line or go through many trials using different students to do the staring. How accurate is this "eyes-in-the-back-of-the-head" feeling?

Cut horoscopes out of the newspaper, removing the astrological reference, then number each article, keeping a list of the astrological sign they represent. Hand the horoscopes out to students and ask them how closely they think the horoscope fits their personality. Have them determine their astrological sign from the list below, then give them the sign associated with the horoscope on the newsprint. How many students thought the horoscope fit them, that it was their horoscope, even though it may not have been for their birth date range? Could each horoscope describe people from any category?

Aries	March 21–April 19
Taurus	April 20–May 20
Gemini	May 21–June 20
Cancer	June 21vJuly 22
Leo	July 23–August 22
Virgo	August 23–September 22
Libra	September 23–October 22
Scorpio	October 23–November 21
Sagittarius	November 22–December 21
Capricorn	December 22–January 19
Aquarius	January 20–February 18
Pisces	February 19–March 20

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Process: Grades K–12
- Evidence, models, and exploration
- Constancy, change, and measurement
- Form and function

Content Standards: Grades 5–8
- Content Standard A: Science as Inquiry
- Content Standard E: Science and Technology
- Content Standard F: Science in Personal and Social Perspectives; personal health; populations, resources, and environments; science and technology in society.
- Content Standard G: History and Nature of Science

Content Standards: Grades 9–12
- Content Standard A: Science as Inquiry
- Content Standard E: Science and Technology
- Content Standard F: Science in Personal and Social Perspectives; personal and community health, natural resources.
- Content Standard G: History and Nature of Science