

Terrabagga Activity Using a Magnetometer

Lesson found on http://www.windows.ucar.edu/tour/link=/teacher_resources/magnetism/teach_terrabagga.html

Grade Level: 8th grade

Time allotted to unit: 40 minutes

Lesson Plan

Students will build a simulated planet with a magnetic field. They will use a simple magnetometer to determine the orientation of the "planet's" magnetic field.

Goals and Objectives

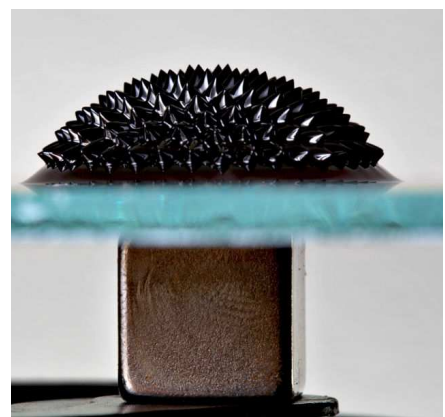
- Students will review ferrofluids and magnetism.
- Students will construct a simulated planet with a magnetic field.
- Students will be able to label the equator and lines of longitude on a globe.
- Students will determine the orientation of a magnetic field using a magnetometer.

Materials

- 1 paper grocery bag made from recycled materials (these bags will break down the best)
- one plastic grocery bag (optional)
- 1 dead D-size battery
- 2 ceramic donut magnets, 1 and 1/8 inch in diameter
- masking tape
- 3 rubber bands (size 64 will work best)
- marker or thick pen
- magnetometer instrument

NJCCCS: 5.7.8 in Science,
4.5.8.C.3, 4.5.8.C.4 in Mathematics

Activities and Procedures:



1. Remained students about my research in liquid crystals and ferrofluids. Mention that ferrofluids are “magnetic liquids”. A **ferrofluid** (from the Latin *ferrum*, meaning iron) is a liquid which becomes strongly polarised in the presence of a magnetic field.
2. Show examples of ferrofluids.
3. Review concept of magnetism with the students.
4. Divide students into groups of 3.
5. Hand out the student’s worksheets.
6. Students will build a simulated planet with a magnetic core.
7. The students will use a magnetometer to determine which octant of the planet the north and south magnet poles are beneath.
8. Let students record this info, then swap planets with other groups so they can repeat the "finding the poles" process on several different "planets".
9. Go over worksheets and conclusions.

Accommodations:

For SLD explain each activity step by step. Arrange heterogeneous group assignments. For ELL give some vocabulary the day before so they can prepare with another student or look up in dictionary, or specifically translate some words for them.

Assessment:

- Check to see whether students correctly labeled the rubber bands representing longitudinal meridians and the equator to assess their understanding of these geographic concepts.
- Check whether students understand that magnets have opposite north and south poles. See if the students correctly labeled the poles on the "planet" they created.
- Check whether students correctly used their magnetometers to find the north and south magnetic poles of the other worlds they explored (the ones created by other student groups).
- Collect worksheets

Name _____

Date _____

Terrabagga Student Worksheet

Name of your group:

Names of people in your group:

Information about the "planet" your group built:

Name of Planet	Segment number where magnetic north pole was found	Segment number where magnetic south pole was found

Information about the "planets" your group explored:

Name of Planet	Segment number where magnetic north pole was found	Segment number where magnetic south pole was found

Instructions for Students: Building "Terrabagga"

Overview: You will build a simulated planet with a magnetic core. The core will consist a large bar magnet. The core will be wrapped in a crumpled paper bag. This is the bulk of the "planet". The bag will be held shut by rubber bands, which will also serve as latitude and longitude lines dividing the "planet" into eight segments. You will use a magnetometer to determine which octant of the planet the north and south magnet poles are beneath.

Step-by-step Instructions:

1. The first step in building a world with a magnetic field in it is to create the dipolar magnet that will go inside the world. Take the two magnets and place them on top of each other so that the magnets are attracted to each other. Now without flipping either magnet over, place the top magnet on the top of the battery. Tape this magnet in place. Place the bottom magnet on the bottom of the battery.



2. Turn the paper bag inside out. Work the bag by crumpling it and folding it.



3. Place your battery inside the paper bag. Create a nice smooth, fairly round "planet".
4. Put the rubber band markers on your world.



5. Pick one of the intersections of your two rubber bands to be the geographic north pole.
6. Label parts of your world:
7. Note that the rubber bands make an "X" when looking down on the North Pole. The four "branches" represent four lines of longitude separated by 90°; the prime meridian at 0°, 90° west longitude, the international dateline at 180°, and 270° west longitude (which is the same as 90 east longitude).

8. Use the marker to write a zero on the rubber band on one side of the North Pole, then write "180" on the same rubber band on the opposite side of the North Pole.
9. Label the part of your (unlabelled) rubber band that lies in the eastern hemisphere 90 E. Label the part of that same rubber band that lies in the western hemisphere 90 W.

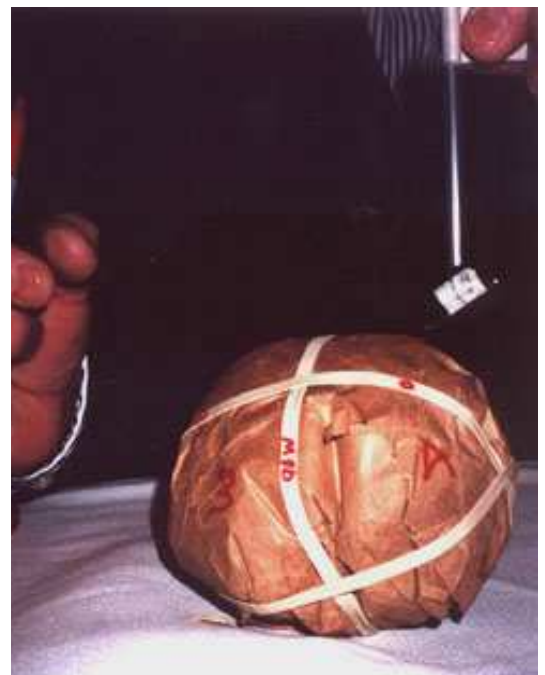


10. Label third rubber band "equator". Everything above equator towards the geographic north pole is the northern hemisphere and everything to the south of the equator is the southern hemisphere.

11. Label the 8 segments. The segments in the northern hemisphere should be labeled 1-4 with segment 1 being between 0 and 90 E. Segment 2 is then between 90 E and 180, segment 3 is between 180 and 90 W and segment 4 should end up being between 90 W and 0. The segments in the southern hemisphere should be labeled 5-8 with segment 5 being below segment 1 and so on so that segment 8 is below segment 4.

12. Make up a name for your "planet".

13. Use your magnetometer to test where the magnetic north pole of your world is. Write the segment number where you find the magnetic north pole of your world onto your student worksheet. Follow a similar process



to locate the magnetic south pole of your "planet".

14. Trade planets with another group. Use your magnetometer to locate the north and south magnetic poles of several planets and record that information on your worksheet.