# Lesson 2: Magnetism

## Objective:

Students will understand that the Earth has a magnetic field.

Students will make a magnetic compass to learn about the Earth’s magnetic field. A needle is rubbed on a magnet to help align the atoms in the needle to form a magnet. When placed on water, the needle will always point north. The Earth has a magnetic field due to the iron and nickel in its core and a north and south pole just like the magnet.

## NGSS:

3PS2.B. Electrical and magnetic forces between a pair of objects do not require that the objects be in contact.

## Essential Questions:

1. How does a compass work?
2. How are magnets used in everyday life?
3. How does the Earth’s magnetic field interact with magnets?

## Supplies:

* Magnet, bar or U-shaped
* Water
* Wax paper
* Metal sewing needle with the eye of the needle tactually noted and colored with a red Sharpie. The sharp end should be filed down.
* Scissors
* Medium glass mixing bowl
* Compass

## Lesson Plan Sequence:

1. Fill the bowl with water but not to the rim. Use a compass to make a tactile marking on the rim of the bowl to indicate north and a different tactile marking to indicate south. This is dependent upon how the bowl is to be placed and where it is placed in the classroom.
2. Rub the filed-down end of the needle on the south end of the magnet about 50 times in one direction.
3. Rub the other end of the needle with the tactile marking and red Sharpie coloring about 50 times on the north end of the magnet, also in one direction.
4. Cut a small circle about 1 inch in diameter using the wax paper. Thread the needle into your wax paper close to the middle. You should make this movement about three times so that the blunt end of the needle is hanging out of the paper while the red/tactile end is also hanging out of the paper the same distance.
5. Be sure to align the bowl with the tactile markings for north and south in a north/south plane in the classroom.
6. Float the wax paper-needle combo on the water with the needle on top and the wax paper touching the water. What happened? Notice where the needle moves. Push the paper and jiggle the paper. What end does the blunt end point to? [The needle will always point north no matter how many times you move the paper and needle combo.] Feel the tactile marker or notice that the needle aligns with north.
7. Ask students why this happened. [What is the purpose of rubbing the needles with the two ends of the magnet? Why would the wax paper-needle combo on the water move?]
8. Ask students about how this experiment is like a compass. [The needle points directions and in this case is pointing north.]
9. Ask students how this is beneficial in life. [Travelers can use the magnetic field and a compass to find their way when there are no signs to guide them on their path.]
10. Ask students how this experiment is reliant upon the Earth’s magnetic field. [The Earth’s magnetic field pulls on its ends and makes it point north.]

*Note*. Adapted from “Science Fun with Physics,” Ohio State University Extension, 2015.