Hansel and Gretel Create a Compass

Activity Description:
In the story of Hansel and Gretel, the first time Hansel and Gretel’s father and stepmother lead them into the forest, Hansel and Gretel use pebbles to help them find their way home. Their step-mother prevents them from collecting more pebbles and so the next time the brother and sister are led into the woods they use bread crumbs to mark the path but the birds eat the bread crumbs and the children are unable to find their way home. Hansel and Gretel could have found their way home if they had a compass, but their step-mother would probably take the compass away. But, what if Hansel and Gretel could create a compass from the items in their pockets? In order to out-smart their step-mother, what would they need to have in their pockets to be able to create a compass that would help them find their way home? In this activity, you will explore how magnets are used to create a compass and help Hansel and Gretel figure out what to put in their pockets before setting out into the forest.

Grade Level: 1  Quarter: 4
Bloom’s Taxonomy Level: Analysis, Synthesis, Evaluation
Related Strands: Magnets

Related GPS Standards and Elements:
S3P2 Magnets
Students will investigate magnets and how they affect other magnets and common objects.
S3P2a Magnetic Attraction of Objects
Investigate to find common objects that are attracted to magnets.
S3P2b Magnets Attract and Repel Each Other
Investigate how magnets attract and repel each other.

Checklist for Providing Guidance:
1. Create a compass using a pie plate, water, paper clip, cork and magnet and the directions. (See Teacher Guidance: Compass)
2. Experiment with different materials for the different parts of a compass and complete the Create a Compass Investigation sheet.

Critical Objectives to assess:
What is magnetism? What causes some items including the Earth to be magnets?
Assessment type:
☑ Constructed response ☐ Informal assessment
☐ Performance task ☐ Selected response

Brief Description of Assessment:
Students will complete the Create a Compass Investigation Questions.
Teacher Key is included.

ALP Thinking Log:
Convergent: Decide what materials Hansel and Gretel need to have in their pocket to create their compass.
Divergent: Brainstorm possibilities for materials for the different parts of Hansel and Gretel’s compass.
Evaluative: Judging which materials did the best job of magnetizing the paper clip; judging how well the compass that the students built worked and what went wrong.

Relationships/Connections: The Earth has a magnetic field and that is why a compass needle always aligns in a north/south direction. Being able to determine north and south allows us to travel from place to place without getting lost.
Create a Compass: Directions

Now to make your own compass you need:

- water in a wide container like a pie plate or bowl.
- a paper clip
- a cork or a piece of light, floating material.

1. Fill your container with water. This is the **housing** for the compass.

2. Cut a piece of the cork and put it on the water. Make sure it floats. This is the **pivot point**.

3. Take a paper clip and make it magnetic. This will be the **compass needle**. There are 2 fast ways to do this.
   - rub it over your clothes
   - rub it over a magnet in straight lines, repeating the same line in the same direction about 50 times.

4. Now that the paper clip is magnetic, put it carefully on the cork or other floating material you used. After 30 sec you will notice it is aligned in a north/south line.

To make sure take the cork and paper clip out of the water.

Lay the paper clip in a different direction on the cork and put it back in the water.

If it then starts pointing again to the same direction you know where the north is.

If it’s not working then it’s possible your paper clip is not magnetic enough.

Make sure you use a metal paper clip or some material that can become magnetic.

Be sure to rub it at least 50 times and always rub it in the same direction.

Dropping the paper clip causes it to lose its magnetism so you will need to start over with step 3.
Teacher Guidance: Compass

**Vocabulary:**
Magnet: object that gives off an external magnetic field

Compass: instrument that uses the Earth’s magnetic field to help people find the direction they are traveling

Compass needle: the magnetized material that points in a north/south direction aligning with the Earth’s magnetic field

Compass pivot point: what the compass needle rests on that allows it to float in the compass housing

Compass housing: the case containing the fluid where the compass pivot point and needle can float.

Ferromagnetic: any material that can be magnetized; materials attracted to a magnet; iron, cobalt, nickel

**Questions for discussion as students are building their compasses.**

1. Why does a compass work?
   A compass works because the inner core of the Earth is made of ferromagnetic material and has its own magnetic field.

2. What other materials could you use for the compass needle?
   Any ferromagnetic material could be used that is small enough to float in the housing. Example: a needle

3. What could you use for the pivot point?
   Any material that will hold the compass needle and float in the compass housing could be used. Example: Styrofoam peanut; leaf

4. Why does rubbing a ferromagnetic material with a magnet magnetize the material?
   It aligns the electrons in the ferromagnetic material in such a way that it creates a magnetic field. That’s why you need to rub the magnetizing material on the ferromagnetic material in the same direction each time. (A good visual way to demonstrate what a magnetic field looks like is to place a bar magnet on a table and put a white piece of paper over it. Then sprinkle the paper with iron filings. The iron filings will create a visual image of a magnetic field.)
5. Could other materials be used to magnetize the compass needle? Have the students try rubbing the ferromagnetic item that they are using for the compass needle with cotton, silk or wool. Good items to use to magnetize the compass needle would be a 100% cotton t-shirt, wool socks or hat, and a silk scarf, tie, or handkerchief. Be sure they design their experiment so that it is consistent. They need to attempt to rub the cotton, silk or wool material the same number of times on the ferromagnetic item and in the same direction. They also need to make sure their ferromagnetic item is demagnetized between experiments so that they can start over with a compass needle that is no longer magnetic to determine which material works best for magnetizing the compass needle. You can demagnetize your compass needle by dropping it on the table or floor. Then test to make sure it is no longer a magnet. If it still is attracting metal objects then drop it on the floor or table again.
Create a Compass Investigation

1. Think about different materials for magnetizing the paper clip. In the Material column use the numbers 1 to 4 to rate how easy it was to magnetize the paper clip using this material. So, the material that magnetized the paper clip the easiest would be 1 and the one that was the most difficult would be 4. Then think about how likely you would be to have this material with you if you were lost in the forest. (hint: think about what clothing is made out of these materials) Use the number 1 for the material you would be most likely to have and 4 for the material you would be least likely to have.

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2. Did your compass work the first time? Why or why not?

3. What are things Hansel and Gretel could use instead of a paper clip as a compass needle? Think of other things that could be magnetized.

4. What are things that Hansel and Gretel could use to magnetize the above item?
5. What could Hansel and Gretel use instead of a cork to float the compass needle?

6. What could Hansel and Gretel use to put water in to float the compass needle? What kind of container could Hansel and Gretel use?

7. What are the things the children should be sure they have before setting out into the forest with their father and step-mother? Remember they can't make their step-mother suspicious!
Create a Compass Investigation (Key)

1. Think about different materials for magnetizing the paper clip. In the Material column use the numbers 1 to 4 to rate how easy it was to magnetize the paper clip using this material. So, the material that magnetized the paper clip the easiest would be 1 and the one that was the most difficult would be 4. Then think about how likely you would be to have this material with you if you were lost in the forest. (hint: think about what clothing is made out of these materials) Use the number 1 for the material you would be most likely to have and 4 for the material you would be least likely to have.

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*In the student’s results the effectiveness of the wool and silk could be switched depending on how consistently the students do the experiment (i.e. rubbing the ferromagnetic material exactly the same number of times on the magnet, cotton, wool, or silk)*

2. Did your compass work the first time? Why or why not?

*If the compass didn’t work the first time, it will probably be because they didn’t rub the paper clip enough times or hard enough to magnetize it. They must also rub the paper clip in the same direction. Also, if they drop the paper clip after magnetizing it, it will lose its magnetic properties.*

3. What are things Hansel and Gretel could use instead of a paper clip as a compass needle? Think of other things that could be magnetized.

*Any material that could be magnetized could be used as long as it will float on the pivot point. Examples: any kind of metal needle or pin, a small piece of iron, etc.*

4. What are things that Hansel and Gretel could use to magnetize the above item?

*They would not have a magnet, so they might have a wool hat, sweater, or socks, or a cotton t-shirt. They might put a silk tie, scarf or*
handkerchief in their pocket but they would be less likely to have these materials in the forest.

5. What could Hansel and Gretel use instead of a cork to float the compass needle?

    A small piece of wood, or a leaf are the most likely things to find in the forest. They might also put something in their pocket that would be small and float the compass needle.

6. What could Hansel and Gretel use to put water in to float the compass needle? What kind of container could Hansel and Gretel use?

    Anything that they might find in the forest that would hold water even if only for a short time could be used. This is the one thing that will be most difficult to put in their pocket because it needs to be big enough to float the pivot point and compass needle. For example, a wool cap would work because they could fill it with water and it would hold the water long enough to float the needle and pivot point.

7. What are the things the children should be sure they have before setting out into the forest with their father and step-mother? Remember they can’t make their step-mother suspicious!

    The students need to identify a material for each part of the compass and put in their pocket anything that they could not find in the forest.