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| **Grade 5** | **Lesson:** **Magnets Part 3** | Reference to English Interconnections LessonMagnets and Compass Investigation pg. 177  |
| **Science Standard(s): Standard 3 Objective 2** |
| **Content Objective(s):** | **Language Objective(s):** |
| Students will be able to create their own compasses and use them to demonstrate the effects of earth’s magnetic field on a compass needle by participating in a experiment with a small group.***I can create my own compass and use it to show how the earth’s magnetic field moves a compass needle by participating in an experiment with a group of friends.******能够做成指南针的模型，并用它做实验和组员一起来说明地球磁场是怎样使指南针的指针移动的。*** | Students will be able to explain how compasses work by discussing the compass experiment with a partner.***I can explain how a compass works by talking about the compass experiment with a partner*.****能够通过实验和组员一起说明指南针工作的原理。** |
| **Essential Questions:***How do magnets attract and repel each other? What evidence do we have that Earth has a magnetic field?***磁铁是如何相互吸引和彼此排斥的?我们如何知道地球有磁场？** | **Required Academic Vocabulary for Word Wall:****Listen:** magnet, magnetic field, attract, north pole, south pole, compass, needle**听：磁铁，磁场，吸引，北极，南极，指南针，指针****Speak:** magnet, magnetic field, attract, north pole, south pole, compass, needle**说：磁铁，磁场，吸引，北极，南极，指南针，指针****Read:** magnet, magnetic field, compass, permanent, temporary, disc, scientific evidence, experiment**读：磁铁，磁场，指南针，永久的，暂时的，磁盘，科学依据，实验****Write:** magnet, magnetic field, attract, repel, bar, horseshoe, disc, ring, similar, different, permanent, temporary, compass, needle**写：磁铁，磁场，吸引，排斥，磁条，马蹄铁，磁盘，环，相似的，不同的，永久的，暂时的，指南针，指针****Sentence Frames:**What is a compass?**指南针是什么？**A compass is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**指南针是\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**How does a compass work?**指南针的工作原理是什么？**A compass works by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**指南针的工作原理是\_\_\_\_\_\_\_\_\_\_\_\_\_\_**How did we build our own compass?**我们如何制作自己的指南针？**We built our own compass by \_\_\_\_\_\_\_\_\_\_\_.**通过\_\_\_\_\_\_\_\_\_\_\_\_\_\_来做。** |
| **Materials:*** Compass
* Styrofoam or paper bowls (1 for each group of students)
* Plastic drinking straws (1 7cm piece for each group of students)
* Paper clips (1 straightened 6.5 cm piece for each group of students)
* Wire cutters
* Scissors
* Bar magnets (1 for each group of students)
* Water
* Small stickers (1 for each group of students)
* Vocabulary cards
* Magnet Quiz (1 for every student)
 | **Additional Lesson Vocabulary:**Bowl, straw, paper clips, stickers, north, south, east, west**碗，吸管，回形针，贴纸，北，南，东，西** |
| **Lesson:**  | **Instructional Time: 40 Minutes** |
| **Opening:** **(3 minutes)**Hook: In front of the class and/or the document camera, place an unstraightened paper clip, a straw, and some water in a bowlQuestion: “I am going to take these things with me the next time I go camping. These objects, in combination with the magnetic fields in the earth are going to help me in case I get lost. How could you use these things in the mountains to help you? Turn to your partners and discuss.”**老师：“下次我去野营时就带上这些东西。因为这些东西和指南针能够帮助我当我迷路的时候。大家想一下在山里这些东西能组员帮助我们，和你们的组员谈论一下。”*** Give the students time to discuss. Have some students share their responses with the class.

Explain: “You all had some excellent ideas. Today we are going to learn how to use these materials, along with the magnetic field of the earth, to help us the next time we are lost in the park or the mountains.”**老师：“大家的想法都很好。今天我们就要学习如何利用地球磁场来利用这些东西帮助我们当我们在山里或是公园里迷路时候。”**Introduce the Objectives: \*\*This time, introduce the objectives a little later in the lesson to preserve the surprise. **Introduction to New Material (Direct Instruction): (7 minutes)**Question: “We have learned that the earth itself has a magnetic field. If it does, why do you think our metal objects don’t stick to it? Talk with a partner.”**老师：“我们知道地球有自己的磁场，如果真是这样，大家想一下为什么我们的金属都没有被磁场吸走？和组员讨论一下。”*** Have some students share with the class what they discussed with their partners.

Explain: “The earth acts as a magnet, but its magnetic field is 100 times weaker than a fridge magnet. But the magnetism of the earth is very helpful to us as humans. It enables us to find our way when we are lost.”**老师：“地球就像一个磁铁，但是它的磁场比一般的冰箱贴要弱100倍。这个磁场对我们人类的帮助确是很大的，当我们迷路时，它能帮助我们找到路。”**Question: “Who can think of a device we use to help us find our way when we are lost? Talk with your partners.” **老师：有谁知道我们迷路时我们能用什么工具帮助我们，和你们的组员讨论。*** Have students share with the class what they predicted with their partners. Write their responses on the board.

Question: “Looking at the list of things on the board that can help us when we are lost, which do you think uses the magnetism of the earth to work? Talk with your partners.”**老师：大家看一下白板上能够帮助我们的工具，和组员讨论一下哪一个是利用了地球的磁场？*** Have students share with the class what they predicted with their partners.

Explain: “You are right! A compass uses the magnetism of the earth to help us know which direction is north, which can help us when we are lost.”**老师：很好。指南针利用地球的磁场告诉我们北的方向这样我们就不会迷路了。*** Post the new vocabulary card.

Introduce the Objectives: Number students as Partner 1 and Partner 2. Have Partner 1 read the objective and have Partner 2 explain one thing we are going to learn today. Have Partner 1 identify how we will know that we learned it.* Place a compass underneath the document camera.
* Show students that the needle is pointing North. Place a magnet right next to the compass and redirect the needle away from north. Demonstrate that the needle follows the magnet. Place the magnet far away from the compass and demonstrate that when the magnet is far away, the compass will resort to following the earth’s natural magnet.

Explain: “The needle on a compass always points North. It does not matter where I am or which direction I am facing, the needle will always face north. When we place a permanent magnet right next to a compass, we can redirect the compass needle. It will follow the magnet, but only at a close distance. Once I move the magnet far away, the needle will follow the earth’s magnetic field. A magnet will override the effect the earth’s magnetic field has on the compass needle at a close distance.” **老师：指南针的指针永远都指向北方。无论我在哪里或是我面朝哪个方向，指针都永远指向北方。但如果我们在指南针旁放一个永磁体就能移动指南针的指针。永磁体的距离近指针就能够跟着磁铁移动，永磁体的距离远指针就跟着地球的磁场移动。所以只有是近距离时，磁铁才能够消除地球磁场对指针的影响。****Guided Practice: (15 minutes)**Explain: “We are going make our own compass, working together in small groups.”**老师：我们分成各个小组来做我们自己的指南针。*** In preparation for this experiment, you will need to fill a small bowl half-filled with water, cut a 7 cm piece of a drinking straw, and straighten out a paperclip and cut it with wire cutters to 6.5 cm long.
* Divide class of students into groups of 3-4 students.
* Pass out a small bowl half-filled with water, a bar magnet, a 7 cm piece of drinking straw, a 6.5 cm straightened paper clip, and a small sticker to each small group.
* Direct each group of students to magnetize the straightened paperclip by rubbing it on the bar magnet to make it a temporary magnet and the compass needle. Give students time to do this step.
* Direct each group of students to slide the magnetized needle inside the piece of straw. Give students time to do this step.
* Direct each group of students to lay the straw with the needle inside onto the surface of the water in the bowl. It should not break the surface of the water. If it does sink, dry the straw and needle before placing it back on the surface of the water. Give students time to do this step.
* Direct each group of students to use a bar magnet to determine the north and south poles of your “needle”. To do this, place the south pole of your bar magnet near the “needle” of the compass. The end that is attracted to the bar magnet is the North Pole of the “needle” (opposites attract). The other end of the “needle” is the South Pole. Give students time to do this step.
* Direct each group of students to place a sticker on the straw on the North Pole to distinguish it from the South Pole. Give students time to do this step.
* Take the class outside to use their compasses.
* When students return, post the sentence frames and give them the following questions to discuss in partnerships. As the teacher, ask the questions and have each partner take a turn responding in their partnerships. Then have a partnership share their responses with the class.

What is a compass?**指南针是什么？**A compass is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**指南针是\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**How does a compass work?**指南针的工作原理是什么？**A compass works by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**指南针的工作原理是\_\_\_\_\_\_\_\_\_\_\_\_\_\_**How did we build our own compass?**我们如何制作自己的指南针？**We built our own compass by \_\_\_\_\_\_\_\_\_\_\_.**通过\_\_\_\_\_\_\_\_\_\_\_\_\_\_来做。****Independent Practice: (13 minutes)*** Pass out the magnet quizzes to each student. Three of the questions assess this specific objective while the rest can be used as a summative assessment for the magnet unit.
* Encourage students to use the sentence frames in filling out their exit tickets.
* Collect the students’ exit tickets and assess them for mastery of the language and content objectives of this lesson, as well as using them as a summative assessment for the unit.

**Closing: (2 minutes)**Revisit the Objectives: Have Partner 2 reread the objective and have Partner 1 explain one thing we learned today. Have Partner 2 identify how we know that we learned it.Real World Application: Encourage students to bring a compass or make a compass to take the next time their families go to the park or mountains. Have them explain to their families how the compass works with the earth’s magnetic field. |
| **Assessment:** |
| Observe students’ conversations during the guided practice to assess their mastery of the language objective. Observe students’ working together to build a compass to assess their mastery of the content objective.Collect their quizzes as a summative assessment of the unit’s language and content objectives.  |
| **Extra Ideas:** |
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**COMPASS** an instrument with a magnetized needle that shows the direction of magnetic north

指南针：磁针永远指向北方的方位仪。



姓名\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 班级：\_\_\_\_\_\_\_\_\_\_\_\_ 日期\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. 指南针是什么？
2. 指南针的原理是什么？
3. 我们如何制作自己的指南针？
4. 圆盘磁铁是磁铁中的一种，再说出其它两种。
5. 请说明临时磁铁和永久磁铁的区别。
6. 请说出地球的磁场和永久磁铁的磁场的相同处。（可以画图说明）
7. 请写出两、三个经过你自己实验证明的磁铁的特性。

1. What is a compass and what is it used for?

2. How does a compass work?

3. How did we build our own compass?

4. A disc magnet is one type of magnet. Name two others.

5. Explain the difference between a permanent and a temporary magnet.

6. How is the Earth’s magnetic field like the magnetic field of a magnet?

7. Write down 2-3 facts about magnets that are backed up by scientific evidence (our experiments).