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| **Grade 5** | **Lesson:** **Magnets Part 1** | Reference to English Interconnections LessonMagnets and Compass Investigation pg. 177 and Magnet Investigation pg. 185 |
| **Science Standard(s): Standard 3 Objective 1 & 2** |
| **Content Objective(s):** | **Language Objective(s):** |
| Students will be able to explore how magnets react to different magnets and objects by participating in an experiment with a partner.***I can explore how magnets react to different magnets and objects by doing an experiment with a partner.***在和同伴的实验中，学生可以探索磁铁对其他的磁铁和物体有什么反应。在和同伴的实验中，我可以探索磁铁对其他的磁铁和物体有什么反应。 | Students will be able to explain how magnetic fields are similar and different among different types of magnets by participating in an experiment with a small group.***I can explain how magnetic fields are similar and different among different magnets by doing an experiment with a group of friends*.**在小组的实验中，学生可以解释不同磁铁磁场的相似和不同之处。在小组的实验中，我可以解释不同磁铁磁场的相似和不同之处。 |
| **Essential Questions:***How do magnets attract and repel each other? What evidence do we have that Earth has a magnetic field?*磁铁是如何吸引和排斥彼此的？我们如何证明地球有磁场？ | **Required Academic Vocabulary for Word Wall:****Listen:** magnet, magnetism, magnetic, magnetic field, attract, repel, north pole, south pole, bar, horseshoe, disc, ring, iron, steel, 磁铁、磁性、有磁性的、磁场、吸引、排斥、北极、南极、条、马蹄铁、圆盘、环形、铁、钢**Speak:** magnet, magnetic field, attract, repel, north pole, south pole, bar, horseshoe, disc, ring, iron, similar, different磁铁、磁场、吸引、排斥、北极、南极、条、马蹄铁、圆盘、环形、铁、相似、不同**Read:** magnet, compare, contrast, attract磁铁、比较、对比、吸引**Write:** magnet, magnetic field, attract, repel, bar, horseshoe, disc, ring, iron, similar, different磁铁、磁场、吸引、排斥、条、马蹄铁、圆盘、环形、铁、相似、不同**Sentence Frames:**This magnet is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ magnet.这个磁铁是\_\_\_\_\_\_\_\_磁铁。Using the \_\_\_\_\_\_\_\_\_\_\_\_\_ magnet and iron fillings, I observed \_\_\_\_\_\_\_\_\_\_\_.用\_\_\_\_\_\_\_\_\_磁铁和铁屑，我观察到了\_\_\_\_\_\_\_\_\_\_\_。The magnetic field of the \_\_\_\_\_\_\_\_\_ magnet was similar to the \_\_\_\_\_\_\_\_\_\_ because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.\_\_\_\_\_\_\_\_\_磁铁的磁场和\_\_\_\_\_\_\_\_\_磁铁的磁场相似，因为\_\_\_\_\_\_\_\_\_\_\_。The magnetic field of the \_\_\_\_\_\_\_\_\_ magnet was different from the \_\_\_\_\_\_\_\_\_\_ because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.\_\_\_\_\_\_\_\_\_磁铁的磁场和\_\_\_\_\_\_\_\_\_磁铁的磁场不同，因为\_\_\_\_\_\_\_\_\_\_\_。 |
| **Materials:*** Magna-Doodle (or youtube video or picture of Magna-Doodle)
* Vocabulary cards
* Picture of Magnets
* Bar Magnets (1 for each group of students)
* Horseshoe Magnets (1 for each group of students)
* Disc Magnets (1 for each group of students)
* Ring Magnets (1 for each group of students)
* Ziplock bags (2 for each group of students)
* Vegetable Oil
* Iron Fillings
* Foil (1 for each group of students)
* Pennies (1 for each group of students)
* Paperclips (1 for each group of students)
* Metallic Fabric (1 for each group of students)
* Cotton Balls (1 for each group of students)
* Plastic Spoons (1 for each group of students)
* Metal Spoons (1 for each group of students)
* Nails (1 for each group of students)
* Toothpicks (1 for each group of students)
* Metal Washer (1 for each group of students)
* Steel Wool (1 for each group of students)
* Magnetic Field Observation Worksheet (1 for every student)
* Observation Exit Ticket (1 for every pair of students)
 | **Additional Lesson Vocabulary:**foil, penny, paperclips, metallic fabric, cotton ball, plastic spoons metal spoons, nails, toothpicks, metal washer and steel wool箔、1美分、曲别针、金属线织物、棉球、塑料勺、铁勺、钉子、牙签、金属垫圈、钢丝绒 |
| **Lesson:**  | **Instructional Time: 45 Minutes** |
| **Opening:** **(5 minutes)**Hook: Show students a Magna-Doodle. There are many simple no-name versions that are often available at the dollar store. If you cannot find a Magna-Doodle, look up a youtube video of a Magna-Doodle or just a simple picture to show the class.Question: “Have any of you seen or used a Magna-Doodle? Everyone, turn to your groups and see if someone can describe what a Magna-Doodle does.”你们有没有见过或用过磁铁画板？所有人在你们的小组里讨论一下，看看有没有人能说出磁铁画板是什么。* Give the students time to discuss. Have some students share their responses with the class from each group. If you have a Magna-Doodle or a video of one, show them what it does.

Explain: “Yes, it has a pen with a magnet on the bottom that allows you to write on this surface. A regular pen or pencil would not work.” 见过，有一支笔上面有磁铁，可以在画板上画画。普通的笔或者铅笔都不行。Question: “How do you think a Magna-Doodle works? Everyone, turn to your groups and see if you can come up with some ideas about how a Magna-Doodle works.”磁铁画板是什么原理呢？大家在小组中讨论一下，看看能不能想到它的原理。* Give the students time to discuss. Have some students share their responses with the class from each group

Explain: “You all had some excellent ideas. Many of you used some key words: magnet, magnetic, magnetism, and attraction. Today we are going to learn more about magnets and magnetism that might help us understand a Magna-Doodle a little more. Let’s look at our objectives today.”你们的想法非常好。很多人用了一些关键词：磁铁、有磁性的、磁性还有吸引。今天我们就要学习关于磁铁和磁性的知识，将会帮助我们理解磁铁画板的工作原理。让我们看看今天的学习目标。Introduce the Objectives: Number students as Partner 1 and Partner 2. Have Partner 2 read the objective and have Partner 1 explain one thing we are going to learn today. Have Partner 2 identify how we will know that we learned it.**+Introduction to New Material (Direct Instruction): (10 minutes)**Explain: “A magnet is an object that is surrounded by a magnetic field and that has the property of attracting metals such as iron or steel. This property can be natural or induced. Many of us have seen magnets in the world around us. We may even have some in this school or in this very room.”磁铁是周围有磁场的物体，它拥有吸引金属物体的特性，比如铁和钢。* Post the new vocabulary card.

Question: “What are some magnets you may have seen in the world around us, or even in this classroom? Turn to your partners and identify them.”在我们身边，甚至是教室里，你们见过什么样的磁铁？和同伴讨论一下。* Have some students share with the class what they discussed with their partners.
* Hold up a bar magnet, and place it under the document camera.

Explain: “There are different types of magnets. This is a bar magnet.”磁铁分不同的种类。这是一个条形磁铁。Question: “Why do you think it is called a bar magnet? Talk with your partners.” “Yes, it looks like a long bar. Turn to your partners and make some observations about this bar magnet. What do you notice about it?” “Yes, there is an N and an S on it. Sometimes half of a bar magnet is red, and the other is silver. What you do think the N and S stand for? Talk with your partners?” 想想这为什么叫做条形磁铁？和同伴讨论一下。是的，看起来像一个长条。和同伴一起观察一下条形磁铁。你们发现了什么？发现了，有N和S在上面。有时候条形磁铁的一半是红色的，另一半是银色的。你们觉得N和S代表什么呢？和同伴讨论一下吧。Explain: “Many of you had the correct idea. N stands for North, and S stands for S. A magnet has a north pole and a south pole, just like the earth. They are also on opposite sides, just like the earth. We are going to see what happens when I use two bar magnets together.”大部分同学都说对了。N代表北方，S代表南方。每一块磁铁都有北极和南极，就像我们的地球一样。他们分别在两边，就像地球一样。我们要看看我把两块条形磁铁放到一起会发生什么。Question: “I wonder what will happen if I touch the two north ends together? What do you think will happen? Talk with your partners and make a prediction.”我在想如果我把两个北极放到一起会怎么样？你们觉得会怎么样？和同伴讨论一下，猜一猜。* Have students share with the class what they predicted with their partners.
* Put the two north ends together under the document camera to show that they repel, or push away from each other.

Explain: “The two north ends do not want to be together. The two north ends repel, or push away from each other.” 两个北极不想在一起。两个北极在一起会排斥，互相排斥。* Post the new vocabulary card.

Question: “I wonder what will happen if I touch the two south ends together? What do you think will happen? Talk with your partners and make a prediction.”我在想如果我把两个南极放到一起会怎么样？你们觉得会怎么样？和同伴讨论一下，猜一猜。* Have students share with the class what they predicted with their partners.
* Put the two south ends together under the document camera to show that they repel, or push away from each other.

Explain: “The two south ends do not want to be together. The two souths ends repel, or push away from each other, just like the north ends.” 两个南极不想在一起。两个南极在一起也会排斥，互相排斥，就想北极一样。Question: “I wonder what will happen if I touch the north end to the south end? What do you think will happen? Talk with your partners and make a prediction.”我在想如果我把北极和南极放到一起会怎么样？你们觉得会怎么样？和同伴讨论一下，猜一猜。* Have students share with the class what they predicted with their partners.
* Put the north end of one bar magnet next to the south end of one bar magnet under the document camera to show that they attract, or come together.

Explain: “The north end and south end want to be together. The opposite sides attract, or come together.” 北极和南极想在一起。两个相反的方向会互相吸引，会到一起。* Post the new vocabulary card.

Explain: “Here is an interesting fact—if I break a bar magnet in half, each piece will have a north and south pole. Every bar magnet will have one north pole and one south pole.”我这有一条有趣的事实 —如果一个条形磁铁从中间断成两半，每一块都会有一个新的北极和南极。每一块条形磁铁都只有一个北极和一个南极。* Set one bar magnet down, and hold the other. Demonstrate how the magnetic field is strong enough to spin a magnet or turn it around to attract its opposite pole.

Explain: “There are unseen magnetic fields around magnets. North and south polarized ends of magnets are where the strong pulling and repelling occurs. We have looked at one type of magnet, a bar magnet, but there are many others. Bar, ring, disc and horseshoe magnets have different, distinctly-shaped magnetic fields.”磁铁的周围有我们看不到的磁场。磁铁的北极和南极端是排斥或吸引的地方。我们看了一种磁铁，条形磁铁，但是还有很多其他的。跳转、环形、盘状和马蹄铁形，他们都有非常不同形状的磁场。* Hold up the different magnets to demonstrate, and/or use the large magnet picture.

Explain: “Earth has a magnetic field very similar to a bar magnet. There are magnetic fields flowing away from the north pole and returning in an oval pattern to the south pole.”地球的磁场和条形磁铁的非常相似。磁场从北极出来划出一条弧线后回到南极。**Guided Practice: (15 minutes)**Explain: “We are going to learn about these different magnet fields around the different types of magnet. We will be identifying the type of magnet, our observations, and then identifying how a particular magnetic field is similar or different from other magnets.”我们现在来学习一下不同磁铁的不同磁场。我们要识别不同的磁铁，先观察，然后看看一种磁场和其他磁场是相似还是不同。* Pass out the Magnetic Field Observation worksheets to each student. Divide students into groups of 3-4 students. For each group of students, pour vegetable oil into a strong Ziplock bag and mix in iron filings. Zip the bag closed and put it inside a second Ziplock bag and zip the second bag closes. Pass one bag with the iron fillings to each group with a set of magnets: bar, horseshoe, disc and ring magnets.

*Use the Modeling Cycle:**Teacher Does:* Shake the bag up gently so the iron fillings are equally distributed in the vegetable oil. Place a bar magnet as flat as possible on a smooth, hard surface. Place the shaken bag on top of the bar magnet and observe the lines that occur. Show that you are allowing your whole group to see the lines and magnetic field. Place the Magnetic Field Observation worksheet under the document camera. As the teacher, read the questions out loud about the first magnet. Use stuffed animals, objects, or imaginary students to model that you are working in a group by discussing the question and then writing on your own individual papers. Post the sentence frames. Discuss with your group using the sentence frames, then label the magnet using the sentence frames. Discuss in your group with the sentence frames what special characteristics or patterns you observed. Respond to the question on your paper. Draw it on your paper. Explain that with the first magnet you won’t have another magnet to compare it to, so you will not compare and contrast until you experiment with the next magnet.小组中，用句型讨论，然后用句型来标出不同的磁铁。在小组中用句型讨论你们所观察到的不同磁场的特点。Respond to the question on your paper. Draw it on your paper. 第一块磁铁不用比较，所以知道后面观察其他磁铁的时候才会用到比较和对比。*Teacher Does with Group of Students:*As the teacher, shake the bag up gently so the iron fillings are equally distributed in the vegetable oil. Place a bar magnet as flat as possible on a smooth, hard surface. Place the shaken bag on top of the bar magnet and observe the lines that occur. Have the group of students do the same with their bag. Read the questions out loud about the first magnet. Point to the sentence frames. Discuss with your group using the sentence frames, then label the magnet using the sentence frames on your paper. Have all students work on their own papers. Discuss in your group with the sentence frames what special characteristics or patterns you observed. Respond to the question on your paper while students work on their papers. Draw it on your paper while they draw on theirs. Explain that with the first magnet you won’t have another magnet to compare it to, so you will not compare and contrast until you experiment with the next magnet.第一块磁铁不用比较，所以知道后面观察其他磁铁的时候才会用到比较和对比。*Group of Students Do:*As the teacher, set up the experiment and read the questions out loud about the first magnet. Have the group of students work together to talk about each question and respond on their own papers. *All Students Practice:*Have all students follow the same procedure with the bar magnet. The teacher will direct the questions, students will work together and respond individually on their own worksheets. Follow the same procedure with the horseshoe, disc and ring magnets. After each magnet, debrief as a class what the groups observed:Question: “What special characteristics or patterns did you observe with the \_\_\_\_\_\_\_\_ magnet? How was this magnet similar to the \_\_\_\_\_\_\_\_\_\_ magnet? How was this magnet different from the \_\_\_\_\_\_\_\_ magnet?”在对\_\_\_\_\_\_\_\_\_磁铁的观察中，你们发现了什么样的特征？这种磁铁和\_\_\_\_\_\_\_\_磁铁有什么相似之处？这种磁铁和\_\_\_\_\_\_\_\_磁铁有什么不同？* Have some students share their written responses with the class that they had previously discussed in their groups. Spend extra time comparing and contrasting different magnets and their magnetic fields.

**Independent Practice: (13 minutes)*** Leave the different magnets with each group to experiment with. Pass out assorted items to check for magnetism: foil, penny, paperclips, metallic fabric, cotton ball, plastic spoons metal spoons, nails, toothpicks, metal washer and steel wool. Have students use the different magnets to check for magnetism and observe the field of magnetism. Have students use the magnets to push and pull objects without actually touching them to objects.

让学生用磁铁排斥或吸引其他物体，但是不要让磁铁真的接触到物体。* Pass out the Observation Exit Ticket to all partnerships. Students will share materials in their groups, but will be working with partners and filling out the exit ticket in partnerships.
* The modeling cycle may need to be used if students need additional modeling, however the language and procedure is very similar to the guided practice. In this independent practice students will have a little more freedom to experiment and explore than in the guided practice.
* Encourage students to use the sentence frames in their discussions with their partners and in filling out their exit tickets.

鼓励学生用句型和他们的同伴讨论，并且填写他们的退出卡。* Collect the students’ exit tickets and assess them for mastery of the language and content objectives.

**Closing: (2 minutes)**Revisit the Objectives: Have Partner 1 reread the objective and have Partner 2 explain one thing we learned today. Have Partner 1 identify how we know that we learned it.1号同学重新读目标，2号同学解释今天学了什么。1号同学来说明怎么知道他们学会了。Real World Application: Encourage students to look for magnets at home and in the world around them. Tell them to classify them based on the type of magnet and magnetic field. Encourage them to look for things that a magnet would attract. In a future class period, give students the opportunity to share what they found at home.鼓励学生找找家里或者身边的磁铁。要通过磁铁的种类和磁场的样子来分类。鼓励学生看看什么样的物体会被磁铁吸引。下一课，给学生分享经历的机会。 |
| **Assessment:** |
| Observe students’ conversations during the guided practice to assess their mastery of the language objective. Observe students’ discussions and recordings on their record sheets to assess their mastery of the content objective. Collect their exit tickets as a formative assessment of the language and content objectives.  |
| **Extra Ideas:** |
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**MAGNET** a device that attracts iron and produces a magnetic field

**磁铁**是可以吸引铁和拥有磁场物品的物体



**MAGNET FIELD** the lines of force surrounding a permanent magnet

**磁场**是永磁铁周围的磁

力线



Types of Magnets



Bar Magnet

条形磁铁

Horseshoe Magnet

马蹄形磁铁

Disc Magnet

盘状磁铁



Ring Magnet

环形磁铁

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

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出两。的有什么不同。\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Exit Ticket

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Bar Magnet Drawing:

Observations: 画图：

条形磁铁：

观察结果：

2. Horseshoe Magnet Drawing:

Observations: 画图：

马蹄形磁铁：

观察结果：

3. Disc Magnet Drawing:

Observations: 画图：

盘状磁铁：

观察结果：

4. Ring Magnet Drawing:

Observations: 画图：

环形磁铁：

观察结果：

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Bar Magnet Drawing:

Observations:

2. Horseshoe Magnet Drawing:

Observations:

3. Disc Magnet Drawing:

Observations:

4. Ring Magnet Drawing:

Observations: