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| **Grade 5** | **Lesson:** **Magnets Part 2** | Reference to English Interconnections LessonMagnets and Compass Investigation pg. 177  |
| **Science Standard(s): Standard 3 Objective 1** |
| **Content Objective(s):** | **Language Objective(s):** |
| Students will be able to create a temporary magnet and an electromagnet by working with a small group of students.***I can create a temporary magnet and an electromagnet by working with a group of friends.***通过在小组中和其他同学合作，学生将学会制作临时磁铁和电磁铁。通过在小组中和其他同学合作，我能制作临时磁铁和电磁铁。 | Students will be able to explain the difference between a permanent and temporary magnet, and define a natural magnet and electromagnet by using sentence frames with a partner.***I can explain how permanent and temporary magnets are different, and define a natural magnet and electromagnet by using my discussion card with my partner*.**学生将能够和一个同伴使用句型来解释分辨永磁铁和临时磁铁，也能定义什么是天然磁铁什么是电磁铁。 |
| **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, permanent, temporary, natural, electromagnet, , core, electrical current, magnetite, hematite, pyrrhotite磁铁、磁性、有磁性的、磁场、吸引、排斥、北极、南极、永久的、临时的、天然的、电磁铁、核心、电流、磁铁矿、赤铁矿、磁黄铁矿**Speak:** magnet, magnetic field, attract, repel, north pole, south pole, permanent, temporary, natural, electromagnet, core, electrical current, magnetite, hematite, pyrrhotite磁铁、磁场、吸引、排斥、北极、南极、永久的、临时的、天然的、电磁铁、核心、电流、磁铁矿、赤铁矿、磁黄铁矿**Read:** magnet, temporary, permanent, electromagnet, natural磁铁、临时的、永久的、电磁铁、天然的、**Write:** magnet, magnetic field, attract, temporary, permanent, electromagnet, natural, core, electrical current, magnetite, hematite, pyrrhotite磁铁、磁场、吸引、排斥、永久的、电磁铁、天然的、核心、电流、磁铁矿**Sentence Frames:**How can we make a temporary magnet?We can make a temporary magnet by \_\_\_\_\_\_\_\_\_\_What is a temporary magnet and how is it different from a permanent magnet?A temporary magnet is \_\_\_\_\_\_\_\_\_\_\_\_\_ . It is different from a permanent magnet because \_\_\_\_\_\_\_\_\_.How did we make an electromagnet?We made an electromagnet by \_\_\_\_\_\_\_\_\_\_.How is an electromagnet a temporary magnet?An electromagnet is a temporary magnet because \_\_\_\_\_\_\_\_\_\_\_\_\_.What is a natural magnet?A natural magnet is \_\_\_\_\_ .What is an example of a natural magnet?An example of a natural magnet is \_\_\_\_\_\_\_\_\_\_\_ .如何制作临时磁铁？我们可以通过\_\_\_\_\_\_\_来制作临时磁铁。临时磁铁与永磁铁有什么不同？临时磁铁是\_\_\_\_\_\_\_\_\_\_\_。它和永磁铁不同，因为\_\_\_\_\_\_\_\_\_\_\_。如何制作电磁铁？我们可以通过\_\_\_\_\_\_\_\_\_\_来制作电磁铁。电磁铁为什么是一种临时磁铁？电磁铁是临时磁铁，因为\_\_\_\_\_\_\_\_\_\_\_\_\_。什么是天然磁铁？天然磁铁是\_\_\_\_\_\_\_\_\_\_\_\_。天然磁铁的例子有哪些？天然磁铁的例子有\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_。 |
| **Materials:*** 2 pairs of scissors
* Vocabulary cards
* Example of minerals: magnetite, hematite, and pyrrhotite
* Picture of minerals
* Bags of magnets from previous lesson
* Paper clips for each group of students
* Battery (1 for each group of students)
* Copper Wire (2 ft strip for each group of students, with ends stripped of insulation)
* Staples for each group of students
* Masking tape (2 1 in. pieces for each group of students)
* Exit Ticket (1 for every pair of students)
 | **Additional Lesson Vocabulary:**Paperclips, stapler, battery, nail, copper wire, mineral, earth曲别针、订书机、电池、钉子、铜线、矿物、地球 |
| **Lesson:**  | **Instructional Time: 50 Minutes** |
| **Opening:** **(5 minutes)**Hook: You will need two pairs of scissors. Before students arrive, turn one pair of scissors into a temporary magnet by rubbing it on a magnet about 50 times. Show students the pair of scissors that has not been magnetized.Question: “Are scissors a magnet? Can they magnetically attract a set of paper clips? Why or why not? Turn to your partners and discuss.”剪刀是磁铁吗？剪刀可以用磁力吸引曲别针吗？为什么行、为什么不行？和同伴讨论一下。* Give the students time to discuss. Have some students share their responses with the class. Use the pair of scissors that has been magnetized to attract a group of paper clips. Students will be amazed.

Question: “Wow, how do you think this happened? Talk with your partners and discuss.”哇，你们觉得发生了什么？和同伴讨论一下。* Give the students time to discuss. Have some students share their responses with the class from each group

Explain: “I noticed many of you were surprised. You were right. Scissors are typically not magnets. But, I fooled you and turned this other pair of scissors into a temporary magnet. Today we are going to learn about temporary and permanent magnets and you will have the opportunity to create a temporary magnet.”我注意到大家都很吃惊。你们是对的。剪刀一般不是磁铁。但是，我骗了你们，刚才我把这把剪刀变成了临时磁铁。今天，我们要学习临时磁铁和永磁铁，你们今天会有机会制作一个临时磁铁。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.**Introduction to New Material (Direct Instruction): (10 minutes)**Explain: “We have learned that magnets generate force fields called magnetic fields. Through these invisible fields of magnetic force they are able to attract certain metals to them like iron, nickel, and steel. Some magnets are permanent, and always generate magnetic fields. Other magnets are temporary, and only generate magnetic fields for a limited time.”我们学了磁铁可以产生一个力场，叫做磁场。通过这些看不见的磁场，磁铁可以吸引特定的物体，比如说铁、镍和钢。有些磁铁是永久的，永远都会产生磁场。有的磁铁是临时的，它们只会暂时的制造磁场。* Post the new vocabulary cards.

Question: “Think of the different types of magnets we used in the previous lesson. Do you think these were permanent magnets that always generate magnetic fields, or temporary magnets that generate a magnetic field for a limited time? Turn to your partners and discuss.”想一想我们上节课用过的磁铁。你们觉得哪些是永远有磁场的永磁铁，哪些是暂时有磁场的临时磁铁呢？和同伴讨论一下。* Have some students share with the class what they discussed with their partners.
* Hold up the magnets from the previous lesson, and place them under the document camera.

Explain: “You are right. These are permanent magnets. They will always be magnets. Some permanent magnets are made by man and machines. Others are natural. There are some minerals that are found in the earth that are naturally magnetic. Some of these minerals are magnetite, hematite, and pyrrhotite.” 你们说对了。那些都是永磁铁。它们永远都会有磁场。有一些用磁铁是人造的或者是机器造的。有一些是天然的。地球上的一些矿物是天然磁铁。这些矿石包括磁铁矿、赤铁矿、磁黄铁矿。* Show actual minerals or the pictures. Post the new vocabulary card for natural magnet.

Question: “There is one natural magnet that is as big as the earth. Can anyone think of what it is? Talk with your partners.”有一种天然磁铁和地球一样大。你们知道是什么吗？和同伴讨论一下。* Have students share with the class what they discussed with their partners.

Explain: “It is the earth itself! The earth acts as a magnet, but its magnetic field is 100 times weaker than a fridge magnet. We mentioned in the previous lesson that the earth has a north and south pole with magnet fields traveling between the two.”就是地球本身！地球就是一块磁铁，但是它的磁场要比冰箱贴弱100倍。我们上节课提到过地球的北极和南极之间有磁场通过。* Hold up some paperclips and place them under the document camera. Break apart a few staples and place them under the document camera as well.

Question: “Did you know that paperclips could be magnetized? In their current state, they are not. But we can make them temporary magents. Does anyone have any ideas how we might do it? Talk with your partners.”你们知不知道曲别针可以被磁化？他们现在的状态，并没有磁性。但是我们可以让它们变成临时磁铁。有没有人知道我们要怎么做？和同伴讨论一下。* Have students share with the class what they hypothesized with their partners.

Explain: “We can use some metal objects to make temporary magnets by rubbing them on a permanent magnet. We have to rub it in the same direction over and over, up to 50 times. We can then use the object to pick up smaller metal objects, like staples.” 我们可以用一些金属物来做临时磁铁，用金属物和永磁铁互相摩擦就可以了。我们要一直向同一方向反复的摩擦，至少50次以上。然后我们就可以用它来吸起小的金属物体了，比如说订书针。* Rub the paperclip on the magnet going the same direction, downward, repetitively until the paperclip is able to pick up the staples.

Explain: “Temporary magnets are used in our daily lives. Telephones and small motors, for example, have temporary magnets to make them work. Permanent and temporary magnets behave the same way. The difference is that permanent magnets will always be magnets, and temporary magnets will only be magnets for a certain amount of time. There is another way we can make a temporary magnet. This type of temporary magnet is called an electromagnet.”临时磁铁在日常生活中比较常见。比如说电话和小型发动机都有临时磁铁来帮助它们工作。永磁铁和临时磁铁功能是一样的。不同是永磁铁永远都有磁力，临时磁铁只会临时拥有磁力。还有一种制作临时磁铁的方法。这种临时磁铁叫做电磁铁。* Show students the electromagnet already hooked up.

Question: “What do you think will happen with this electromagnet I have created? Predict what you think will happen with your partners.”你们觉得我做的电磁铁会怎么样？和同伴预测一下会发生什么？* Have students share with the class what they predicted with their partners.
* Use the electromagnet to pick up some staples and paperclips under the document camera.

Explain: “We can build an electromagnet using copper wire, a nail, and a battery. Electromagnets are used in computers, televisions and telephones. While connected, this nail becomes magnetized. When disconnected, it is no longer a magnet. The nail is an iron core and the coil of wire carries an electric current. The electricity in the current produces a magnetic field. The strength of the magnet depends on the strength of the current and number of coils of wire. If I only wrapped the wire around the nail a few times, the magnetic current would be weaker. When the current flows, the core behaves like a magnet. Once the current stops, the core is demagnetized.” 我们可以使用铜线、钉子和电池来制作电磁铁。电磁铁应用于电脑、电视和电话中。当连接的时候，这根钉子就会被磁化。断开连接时，就没有磁力了。钉子是它的铁核心，线圈带着电流。这股电流制造了一个磁场。磁力的强弱取决于电流的强度以及线圈的数量。如果我只绕着钉子缠几圈，磁力就会变弱。当有电流的时候，这个核心就想一个磁铁一样。一旦切断电流，磁力也就消失了。* Post the new vocabulary card for electromagnet.

**Guided Practice: (23 minutes)**Explain: “We will be making our own temporary magnets, including an electromagnet with groups of our friends.”在我们的小组里，我们将会制作我们自己的临时磁铁，包括一个电磁铁。* Divide students into groups of 4 students. For each group of students, pass out the bag of magnets from the previous lesson, paperclips, and staples.

*Use the Modeling Cycle:**Teacher Does:* Demonstrate how students should share materials in groups and work together. Take a paperclip and rub it in one direction, downward, up to 50 times. Use the paperclip to pick up staples. *Teacher Does with Group of Students:*Select a group of students to work with you. Demonstrate how students should share materials in groups and work together. Have students share magnets, take a paperclip and rub it in one direction, downward, up to 50 times. Have students use the paperclip to pick up staples. *Group of Students Do:*Have group of students demonstrate without your help.*All Students Practice:*Have all students follow the same procedure with their materials.* Post the sentence frames and pass out the discussion cards to each partnership. Use the modeling cycle to model how to use the language to discuss in partnerships within the group what they learned from the experiment:
	+ Partner 1- “How can we make a temporary magnet?”

如何制作临时磁铁？* + Partner 2- “We can make a temporary magnet by \_\_\_\_\_\_\_\_\_\_(rubbing a metal object on a magnet many times in the same direction).”

我们可以通过\_\_\_\_\_\_\_\_\_\_\_\_\_来制作临时磁铁。* + Partner 2- “What is a temporary magnet and how is it different from a permanent magnet?”

临时磁铁和永磁铁有什么不同？* + Partner 1- “A temporary magnet is \_\_\_\_\_\_\_\_\_\_\_\_\_ (a magnet that is only magnetic for a period of time). It is different from a permanent magnet because \_\_\_\_\_\_\_\_\_(a permanent magnet will always be magnetic).”

临时磁铁是\_\_\_\_\_\_\_\_\_\_\_。它和永磁铁不同，因为\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_。* + Students switch roles asking and answering questions.
* Have some students share their oral responses with the class that they had previously discussed in their partners.
* For each group of students, pass out a battery, wire stripped on the ends to remove any insulation, a nail, some masking tape and some staples and paperclips.

*Use the Modeling Cycle:**Teacher Does:* Demonstrate how students should share materials in groups and work together. It is important in this experiment to take turns for each of the step. One student should take one end of the wire move about 6 inches down and start to wrap it around the nail. Another student can continue to wrap it around the nail as many times as possible, as tightly as possible. Make sure the wire is going downward in the same direction. Another student can tape each end of the wire to the ends of the battery. The last student can begin testing it to make sure it is magnetic. Take turns picking up staples and paperclips with the magnet.向同学展示，小组一起制作时应该共享资源一起合作。制作时按步骤操作至关重要。*Teacher Does with Group of Students:*Select a group of students to work with you. Demonstrate how students should share materials in groups and work together. Have one student should take one end of the wire move about 6 inches down and start to wrap it around the nail. Another student should continue to wrap it around the nail as many times as possible, as tightly as possible. Make sure the wire is going downward in the same direction. Another student should tape each end of the wire to the ends of the battery. The last student can begin testing it to make sure it is magnetic. Take turns picking up staples and paperclips with the magnet.选一组同学和你一起做。向同学展示，小组一起制作时应该共享资源一起合作。*Group of Students Do:*Have group of students demonstrate without your help.*All Students Practice:*Have all students follow the same procedure with their materials.* Post the sentence frames and pass out the discussion cards to each partnership. Use the modeling cycle to model how to use the language to discuss in partnerships within the group what they learned from the experiment:
	+ Partner 1- “How did we make an electromagnet?”

如何制作电磁铁？* + Partner 2- “We made an electromagnet by \_\_\_\_\_\_\_\_\_\_(using the nail as the core and wrapping wire around the nail to carry the electrical current to the nail which magnetizes it).”

我们可以通过\_\_\_\_\_\_\_\_\_\_\_\_来制作电磁铁。* + Partner 2- “How is an electromagnet a temporary magnet?”

电磁铁为什么是临时磁铁？* + Partner 1- “An electromagnet is a temporary magnet because \_\_\_\_\_\_\_\_\_\_\_\_\_ (it is only a magnet for a period of time, until the nail is disconnected from the current and the core).”

电磁铁是临时磁铁，因为\_\_\_\_\_\_\_\_\_\_\_。* + Students switch roles asking and answering questions.
* Have some students share their oral responses with the class that they had previously discussed in their partners.
* If possible, obtain different natural magnets and allow each group to use and experiment with one. Pass them around the different groups. Have students use the natural magnets to push and pull objects without actually touching them.
* Post the sentence frames and pass out the discussion cards to each partnership. Use the modeling cycle to model how to use the language to discuss in partnerships within the group what they learned from the experiment:
	+ Partner 1- “What is a natural magnet?”

什么是天然磁铁？* + Partner 2- “A natural magnet is \_\_\_\_\_ (a magnet that is found in the earth and is naturally magnetic).”

天然磁铁是\_\_\_\_\_\_\_\_\_\_。* + Partner 2- “What is an example of a natural magnet?”

天然磁铁的例子有哪些？* + Partner 1- “An example of a natural magnet is \_\_\_\_\_\_\_\_\_\_\_ (magnetite, hematite, pyrrhotite or the earth).”

天然磁铁的例子有\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_。* + Students switch roles asking and answering questions.

**Independent Practice: (10 minutes)*** Pass out the exit ticket to each partnership.
* Encourage students to use the sentence frames in their discussions with their partners and in filling out their exit tickets.
* Collect the students’ exit tickets and assess them for mastery of the language and content objectives.
* Review the questions on the exit ticket. Have students discuss them orally in partnerships, then as a class.

**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.让2号同学读出学习目标，1号同学解释今天学了什么。让2号来说明怎么知道学会了。Real World Application: Encourage students to use magnets at home on the fridge, etc. to make some temporary magnets at home. Use them to test objects to see which are metals and can be attracted by magnets. Encourage them to look for natural magnets in the world around them. 鼓励学生用家中的磁铁（冰箱贴等）来制作临时磁铁。用它来测试一下那些物体是金属的可以被吸引的。鼓励他们找找身边生活中的天然磁铁。 |
| **Assessment:** |
| Observe students’ conversations during the guided practice to assess their mastery of the language objective. Observe students’ working together during experiments 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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**PERMANENT MAGNET** magnets that always generate magnetic fields

**永磁铁**

永磁铁永远有磁场



**TEMPORARY MAGNET** magnets that only generate magnetic fields for a limited time

**临时磁铁**

临时磁铁只暂时拥有磁场



**NATURAL MAGNET** naturally magnetic materials, such as minerals found in the earth

**天然磁铁**

天然磁铁是有磁性的矿物，

比如说地球中的矿物资源



**ELECTROMAGNET** a temporary magnet made by coiling wire around an iron core so that when the current flows in the coil the iron becomes a magnet

**电磁铁**

电磁铁是用线圈缠绕铁质核心制成的，当电流连通时线圈和核心就变成了一块磁铁



**Natural Magnets**

**magnetite 磁铁矿**

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**hematite 赤铁矿**

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**pyrrhotite 磁黄铁矿**

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Discussion Cards 讨论卡

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| --- | --- |
| Discussion 1 for Partner 1:How can we make a temporary magnet?如何制作临时磁铁？We can make a temporary magnet by \_\_\_\_\_\_\_\_\_\_.我们可以通过\_\_\_\_\_\_\_\_来制作临时磁铁。What is a temporary magnet and how is it different from a permanent magnet?临时磁铁和永磁铁有什么不同？A temporary magnet is \_\_\_\_\_\_\_\_\_\_\_\_\_. It is different from a permanent magnet because \_\_\_\_\_\_\_\_\_.临时磁铁是\_\_\_\_\_\_\_\_\_\_。它和用磁铁不同，因为\_\_\_\_\_\_\_\_\_\_\_\_\_。 | Discussion 1 for Partner 2:How can we make a temporary magnet?如何制作临时磁铁？We can make a temporary magnet by \_\_\_\_\_\_\_\_\_\_.我们可以通过\_\_\_\_\_\_\_\_来制作临时磁铁。What is a temporary magnet and how is it different from a permanent magnet?临时磁铁和永磁铁有什么不同？A temporary magnet is \_\_\_\_\_\_\_\_\_\_\_\_\_. It is different from a permanent magnet because \_\_\_\_\_\_\_\_\_.临时磁铁是\_\_\_\_\_\_\_\_\_\_。它和用磁铁不同，因为\_\_\_\_\_\_\_\_\_\_\_\_\_。 |
| Discussion 2 for Partner 1:How did we make an electromagnet?如何制作电磁铁？We made an electromagnet by \_\_\_\_\_\_\_\_\_\_.我们可以通过\_\_\_\_\_\_\_\_\_\_来制作电磁铁。How is an electromagnet a temporary magnet?电磁铁为什么是临时磁铁？An electromagnet is a temporary magnet because \_\_\_\_\_\_\_\_\_\_\_\_\_.电磁铁是临时磁铁因为\_\_\_\_\_\_\_\_\_\_\_\_\_。 | Discussion 2 for Partner 2:How did we make an electromagnet?如何制作电磁铁？We made an electromagnet by \_\_\_\_\_\_\_\_\_\_.我们可以通过\_\_\_\_\_\_\_\_\_\_来制作电磁铁。How is an electromagnet a temporary magnet?电磁铁为什么是临时磁铁？An electromagnet is a temporary magnet because \_\_\_\_\_\_\_\_\_\_\_\_\_.电磁铁是临时磁铁因为\_\_\_\_\_\_\_\_\_\_\_\_\_。 |
| Discussion 3 for Partner 1:What is a natural magnet?什么是天然磁铁？A natural magnet is \_\_\_\_\_ .天然磁铁是\_\_\_\_\_\_\_\_\_\_\_\_\_。What is an example of a natural magnet?天然磁铁的例子有哪些？An example of a natural magnet is \_\_\_\_\_\_\_\_\_\_\_ .天然磁铁的例子有\_\_\_\_\_\_\_\_\_\_\_\_\_。 | Discussion 3 for Partner 2:What is a natural magnet?什么是天然磁铁？A natural magnet is \_\_\_\_\_ .天然磁铁是\_\_\_\_\_\_\_\_\_\_\_\_\_。What is an example of a natural magnet?天然磁铁的例子有哪些？An example of a natural magnet is \_\_\_\_\_\_\_\_\_\_\_ .天然磁铁的例子有\_\_\_\_\_\_\_\_\_\_\_\_\_。 |

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

1. 解释怎么制作一个临时磁铁。你可以画图表示。

2. 永久磁铁和临时磁铁有什么不同？

3. 解释怎么制作一个电磁铁。你可以画图表示。

4. 电磁铁为什么是临时磁铁？

5. 什么是天然磁铁？

6. 天然磁铁的例子有哪些？