



SCIENCE:

# GRADE 2—FORCE AND MOTION



# Force and Motion

## Magnets in Everyday Life

### TEKS

- 2 (6) Force, motion, and energy. The student knows that forces cause change and energy exists in many forms.**
- (B) The student is expected to observe and identify how magnets are used in everyday life.

#### Content Objective

*I can identify how magnets are used in everyday life.*

### Science

#### Science Process Skills

- 2 (1) Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures.**
- (A) The student is expected to identify and demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations, including wearing safety goggles, washing hands, and using materials appropriately.
- 2 (2) Scientific investigation and reasoning. The student develops abilities necessary to do scientific inquiry in classroom and outdoor investigations.**
- (A) The student is expected to ask questions about organisms, objects, and events during observations and investigations.
- (B) The student is expected to plan and conduct descriptive investigations such as how organisms grow.
- (D) The student is expected to record and organize data using pictures, numbers, and words.
- 2 (3) Scientific investigation and reasoning. The student knows that information and critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions.**
- (A) The student is expected to identify and explain a problem in his/her own



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words and propose a task and solution for the problem such as a lack of water in a habitat.

**2 (4) Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world.**

(A) The student is expected to collect, record, and compare information using tools, including computers, hand lenses, rulers, primary balances, plastic beakers, magnets, collecting nets, notebooks, and safety goggles; timing devices, including clocks and stopwatches; weather instruments such as thermometers, wind vanes, and rain gauges; and materials to support observations of habitats of organisms such as terrariums and aquariums.

**2 (5) Matter and energy. The student knows that matter has physical properties and those properties determine how it is described, classified, changed, and used.**

(D) The student is expected to combine materials that when put together can do things that they cannot do by themselves such as building a tower or a bridge and justify the selection of those materials based on their physical properties.

## Mathematics

**2 (13) Underlying processes and mathematical tools. The student communicates about Grade 2 mathematics using informal language.**

(A) The student is expected to explain and record observations using objects, words, pictures, numbers, and technology.

**2 (14) Underlying processes and mathematical tools. The student uses logical reasoning. The student is expected to justify his or her thinking using objects, words, pictures, numbers, and technology.**

## English Language Arts and Reading

**2 (28) Listening and speaking/listening. Students use comprehension skills to listen attentively to others in formal and informal settings. Students continue to apply earlier standards with greater complexity.**

(A) Students are expected to listen attentively to speakers and ask relevant questions to clarify information.

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- 2 (29) Listening and speaking/speaking.** Students speak clearly and to the point, using the conventions of language. Students continue to apply earlier standards with greater complexity. Students are expected to share information and ideas that focus on the topic under discussion, speaking clearly at an appropriate pace, using the conventions of language.
- 2 (30) Listening and speaking/teamwork.** Students work productively with others in teams. Students continue to apply earlier standards with greater complexity. Students are expected to follow agreed-upon rules for discussion, including listening to others, speaking when recognized, and making appropriate contributions.

**Figure 19.**

**Reading/comprehension skills.** Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author’s message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers.

(C) The student is expected to monitor and adjust comprehension (e.g., using background knowledge, creating sensory images, re-reading a portion aloud, generating questions).

(D) The student is expected to make inferences about text using textual evidence to support understanding.

(F) The student is expected to make connections to own experiences, to ideas in other texts, and to the larger community and discuss textual evidence.



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## English Language Proficiency Standards

2 (I) Cross-curricular second language acquisition/listening. The student is expected to demonstrate listening comprehension of increasingly complex spoken English by following directions, retelling or summarizing spoken messages, responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs.

3 (D) Cross-curricular second language acquisition/speaking. The student is expected to speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency.

### Language Objective

*I can follow spoken and written instructions to complete a task.*

## Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELA content, thus supporting the active engagement of students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found throughout each lesson in sections titled “Differentiation Strategy.”

Differentiation should

- focus on skills students did not understand and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
  - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
  - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
  - participating in more tangible experiences, such as experiments, investigations, and active exploration;
  - sorting academic vocabulary words into categories by common attributes— process words or science content vocabulary;

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- organizing brainstorming into semantic maps or creating graphic organizers;
- discussing the meaning of a graphic organizer with a partner; and
- creating a visual representation to demonstrate understanding.

*See the handout in the Content Resources section that addresses instructional strategies.*

## College and Career Readiness Standards

I.C1 Collaborative and safe working practices. Collaborate on joint projects.

I.E1 Effective communication of scientific information. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

### Vocabulary Focus

magnets

identify

observe



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## Prerequisite Science Knowledge

K (6)(B) The student is expected to explore interactions between magnets and various materials.

1 (6)(B) The student is expected to predict and describe how a magnet can be used to push and pull an object.

## 5E Lesson Summary

### Engage

Students identify everyday uses of magnets.

### Explore

Students explore how magnets are used in everyday objects.

### Explain

Students explain and explore everyday uses of magnets.

### Elaborate

Students identify a problem that could be solved with a magnet and create a solution.

### Evaluate

Students illustrate how they use magnets every day.

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## Engage

### Materials

#### For teacher

- RM 1, printed in color or projected
- objects with magnets

### Advance Preparation

Gather objects with magnets, such as a purse or a phone case with a magnetic closure, jewelry with a magnetic clasp, refrigerator magnets, a screwdriver with a magnetic tip, and a paper clip holder.

### Differentiation Strategy

ELL: Display the photos from *RM 1: Everyday Magnet Photos* and ask students to use magazines or the Internet to gather additional pictures of everyday objects that use magnets. Students will then create an interactive photo board of magnetic items. Identify each object or photo with a label.

### Teacher Instruction

- Display the pictures from *RM 1* and the gathered objects for all students to observe.
- Ask the following: What do all these items have in common? *Accept all reasonable answers.*
- Ask the following: Which of these objects have magnets and which do not? *Answers will vary based on objects used.*
- Lead students to discover that each object uses magnets in one way or another. At this time, students need to understand only that magnets are used in many ways.
- Ask the following: Did you know that magnets were used in so many ways? Which of these magnet examples surprised you? *Accept all reasonable answers.*



Visit <http://region4.edu.glogster.com/fmgrade2engage>.  
Substitute this Glog for *RM 1*.



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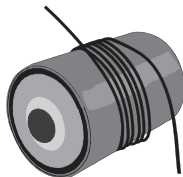
## Explore

### Advance Preparation

World's Simplest Motors™ can be purchased from educational supply companies or some craft stores. Use the instructions below to partially prepare a World's Simplest Motor™ for each student group. Then place the motor pieces into a resealable plastic bag for each student group. Straighten the wire.

1. Measure 5 cm from one end of the wire and make a small bend.
2. Put on your safety goggles to protect your eyes from loose wires.
3. Wrap the rest of the wire after the bend around the battery.
4. Leave about 5 cm of wire sticking straight out to match the other end of wire (Figure 1).

Figure 1



5. Slide the wire off the battery (Figure 2).

Figure 2



#### Materials

##### For teacher

- RM 2
- D-cell battery
- resealable plastic bags
- World's Simplest Motor™
- safety goggles
- metric ruler

##### For student groups

- RM 2
- 5 centimeter cubes
- D-cell battery
- World's Simplest Motor™

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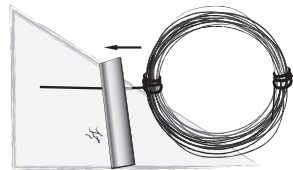
6. Wrap each end of wire tightly around the coil three times to keep the coil together. Make sure the ends stick out at least 3 cm directly opposite each other (Figure 3).

**Figure 3**



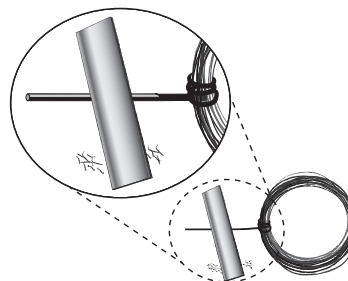
7. Place one end of the wire on the table (Figure 4).

**Figure 4**



8. Use the edge of the metal support to scrape the coating off the top half of the wire from the end of the wire to the coil. Repeat this process for the wire on the other side of the coil (Figure 5).

**Figure 5**



9. Prepare a setup for each group and place it in a resealable plastic bag.
10. Test each setup to make sure it works before using the setups with students. If the coil catches on the plastic holder, flatten the coil a little to help it spin freely.

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## Teacher Note

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Remove the coils from the metal supports to avoid depleting the batteries.

## Content Builder

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How the motor works: The battery sends an electric current through the wires when they touch the metal supports. There is a magnetic field around any wire carrying a current. The coil of wire is magnetized by the current flowing through it. The coil of wire is attracted to and then repelled by the magnet of the motor, causing the coil of wire to spin. The more current that is run through the wire, the faster the motor turns.

## Teacher Instruction

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- Pass a prepared set of materials to each group of four students.
- Instruct students to follow the directions on *RM 2: Make a Simple Motor* to complete a simple motor.
- Model and describe each step on *RM 2* for the class or groups as needed.

## Facilitation Questions

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- What do you observe when you place the wires into the metal supports and hold the coil in place with the shiny sides down? *The coil pushes away from the magnet.*
- What happens if you flip the magnet over? *The speed at which the coil spins changes. The coil will spin faster or slower depending on the side of the magnet facing up.*
- Does the motor work if you remove the magnet? *No, the coil does not spin on its own if the magnet is not in place.*
- Does the motor work if you remove the battery? *No, the coil does not spin if the battery is not in place.*
- Do all the parts in the system need to be in place for the motor to work? *Yes, all the parts must be in place for the system to work.*

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## Explain

### Materials

#### For teacher

- D-cell battery
- mini flathead screwdriver
- small hobby motor
- paper clip
- short sections of wire with end stripped
- *Popular Magnetics: Magnets in Everyday Use* book
- small hobby motor
- headphones
- large paper clip
- resealable plastic bags

#### For each student

- science notebook

#### For student groups

- small hobby motor
- paper clip

### Teacher Note

Small hobby motors can be purchased from electronics or crafts stores. Purchase motors without gears. If the motor does not come with wires attached, you will need to strip short sections of wire for the teacher demonstration. Strip the insulation from the wires by gently and partially closing scissors on the wire and twisting the scissors around the insulation, being careful to not cut through the wire. Once the insulation has been cut, slide it off the wire.

A screwdriver used for eyeglasses repair will work as a mini flathead screwdriver.

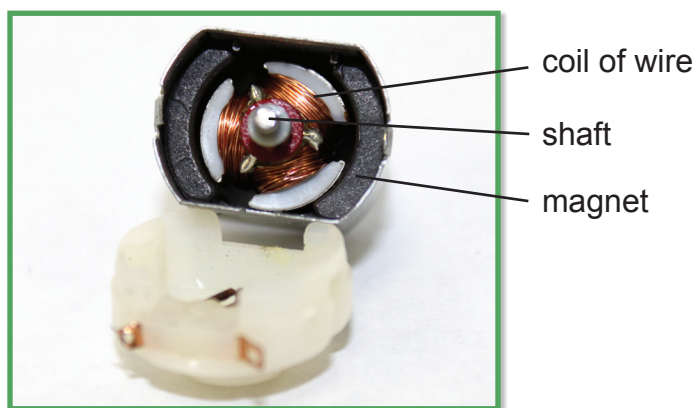
Inexpensive headphones are recommended for this lesson.

### Advance Preparation

#### Small Hobby Motor

Use a mini flathead screwdriver to loosen, or open, the clips on the plastic end of the small hobby motors. This will allow students to easily remove the end covering of the motor. There is a coil of wire and a magnet inside the motor. The coil of wire is attached to the shaft. Pull the shaft of the motor out to investigate the magnet inside.

Place the student materials in a resealable plastic bag for each group.

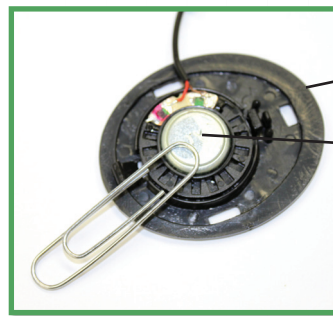


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## Earphone

Remove the covering of the earphone and open it. Remove the plastic covering of the speaker inside. Use a paper clip to detect the magnet inside the earphone.

Be careful not to damage the diaphragm, which usually is made of thin plastic.



earphone

magnet

## Safety Alerts

- Remind students not to use magnets around electrical outlets and other objects such as speakers and computers.
- Do not allow students to disassemble motors, headphones, or other objects without adult supervision.

## Teacher Demonstration

- Hold a wire from the motor on each end of the battery and allow all students to observe the motor working.
- Ask the following: Did you know that a magnet helps make this motor work?
- Place a paper clip on the motor and show that it is attracted to the motor.
- Display a motor with the plastic end removed.
- Use a paper clip to identify the magnet inside the motor.

## Teacher Instruction

- Pass a set of materials to each group of four students.

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- Instruct students to remove the plastic end of the motor and to use the paper clip to identify the magnet.
- Allow adequate time for each student to observe the motor.

## Facilitation Questions

- How is this small motor like the motor you built during Explore? *Both motors have a coil of wire that interacts with a magnet to make it work. Both motors require electricity to work.*
- What other objects can you name that may have magnets in them? Use motors to work? *Answers may include everyday objects like purses with magnetic closures and objects with motors like clothes dryers, televisions, and computers.*

## Teacher Instruction

- Read and discuss *Popular Magnetics: Magnets in Everyday Use*.
- Pause as you read about the headphones, and use the paper clip to show that it is attracted to an earphone.
- Pass the earphone around with the paper clip so students can observe the magnet in the earphone.

## Facilitation Questions

- Did you know that magnets were part of so many things? What uses of magnets surprised you? *Answers will vary.*
- How are magnets used in everyday life? *Answers will vary and may include that magnets are used to hold papers to refrigerators, keep purses closed, and pick things up. Magnets are also found in many things, such as headphones, and in things with motors, such as ceiling fans and electric toothbrushes.*

## Science Notebook Entry

What would your life be like without magnets? Can you think of a problem you could solve using a magnet or a way that magnets could help simplify a part of your daily life?



Use Project Share ePortfolio Blog tool to gather student responses. Refer to the “ePortfolio Blog” video in your Science Academies for Grades K–4 Project Share group.



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## Elaborate



### Teacher Note

Students will be asked to identify a problem that could be solved by using a magnet and to create a solution to the problem. They will not be required to build or test their solutions but may be given materials to help with the planning and the experimenting process. Students should include a description of the role the magnet plays in the solution by answering the following question: Is it a pushing force or a pulling force?

### Teacher Instruction

- Display the pictures of *RM 1* for all students.
- Ask students to identify the use of magnets in the pictures.
- Divide the class into groups of four students.
- Instruct student groups to identify a problem that could be solved by using a magnet. Students may use their science notebook entries from Explain as inspiration.
- Instruct students that the solution or invention should use at least one magnet.
- Instruct students to describe, illustrate, and label the drawings of their scenarios in their science notebooks.

### Facilitation Questions

- What problem could you solve with a magnet? *Answers will vary.*
- Why do you think a magnet could help accomplish this task? *Answers will vary.*

#### Materials

##### For teacher

- RM 1 from Engage

##### For each student

- science notebook
- pencil



Visit <http://edu.glogster.com> to use Glogster EDU for student presentations.



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## Evaluate

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### Teacher Instruction

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#### Materials

*For each student*

- science notebook

- Instruct students to list and illustrate three ways they use magnets every day or three ways magnets are used in everyday life.
- Students should demonstrate an understanding of how magnets interact with other magnets and other materials and how magnets are and can be used in everyday life.



Visit <http://www.voicethread.com> to use VoiceThread for students to demonstrate their understanding of how magnets are used in everyday life.







# Grade 2

## RM 1: Everyday Magnet Photos



refrigerator magnet



can opener



compass



credit card



electric toothbrush



electromagnet



# Grade 2

## RM 1: Everyday Magnet Photos continued



paper clip holder



ceiling fan



toaster



generator



maglev train



doorbell



# Grade 2

## RM 2: Make a Simple Motor

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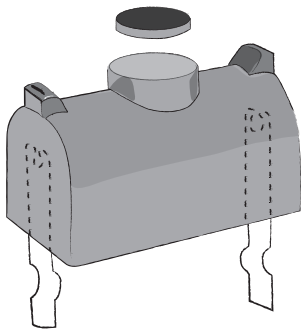
### Materials

- D-cell battery
- World's Simplest Motor™

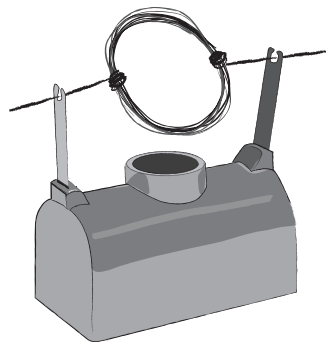
### Steps

1. Push the *U* end of the metal support through the slot on the end of the base. The bumps in the supports need to face each other (Figure 1).
2. Repeat this step with the other metal support.
3. Push the battery into the base, making sure the battery touches the supports.
4. Place the magnet in the round holder on top of the base (Figure 1). Set the straight ends of the wire on the supports (Figure 2).

**Figure 1**



**Figure 2**



5. Push the coil to make it spin. If it does not continue to spin on its own, try turning the coil the other direction.

### Not working?

- Are the shiny sides of the wires both facing up (Figure 1)?
- Is the coil centered (Figure 2)?

### Try this:

- Will the motor work if you remove the magnet?
- What happens if you flip the magnet over?
- Does the motor work if you hold the magnet above the coil?

# NOTES





