

## Baltimore Curriculum Project Draft Lessons

### Introductory Notes

These lessons generally follow the grade-by-grade topics in the Core Knowledge Sequence, but they have been developed independent of the Core Knowledge Foundation. While the Core Knowledge Foundation encourages the development and sharing of lessons based on the Core Knowledge Sequence, it does not endorse any one set of lesson plans as the best or only way that the knowledge in the Sequence should be taught.

You may feel free to download and distribute these lessons, but please note that they are currently in DRAFT form. At this time the draft lessons on this web site do NOT have accompanying graphics, such as maps or cut-out patterns. Graphics will be added to this site later.

In participating BCP schools, these lessons are used in conjunction with the Direct Instruction skills programs in reading, language, and math. If you use or adapt these lessons, keep in mind that they are meant to address content and the application of skills. You will need to use other materials to ensure that children master skills in reading, language, and math.

## Second Grade - Science - Lesson 9 - Magnetism

### Background Information for Magnetism Unit

Magnets have an invisible force that pulls things toward them or pushes things away. Magnets are identified by their ability to attract objects made of iron, cobalt, and nickel, and to align on a north-south axis like a compass. The like poles of two magnets will repel each other. This property distinguishes magnets from materials which are simply magnetic. (Magnetic materials are attracted, but not repelled, by a magnet.)

The earliest records of magnets come from Magnesia in Asia Minor. It is thought that the word "magnet" probably comes from the name of this city. Lodestones or naturally occurring magnets were found in abundance in this area. These natural magnets attracted pieces of iron. It was soon learned that a suspended lodestone, free to swing, always came to rest with its axis aligned along a line of longitude. Early sailors used this characteristic of lodestone to navigate on long ocean voyages. The modern name for lodestone is magnetite.

### Suggested Books for Magnetism Unit

Ardley, Neil. *Exploring Magnetism*. New York: Franklin Watts, 1983.

\_\_\_\_\_. *The Science Book of Magnets*. New York: Harcourt Brace Jovanovich, 1991.

Branley, Franklyn. *North, South, East, West*. New York: Harper, 1966.

\_\_\_\_\_. *What Makes a Magnet?* New York: Harper, 1996.

Catherall, Ed. *Fun With Magnets*. East Sussex, G.B.: Wayland Ltd., 1985.

\_\_\_\_\_. *Magnets*. New York: Silver Burdett, 1982.

Challand, Helen. *Experiments With Magnets*. Chicago: Children's Press, 1986.

Freeman, Mae. *The Book of Magnets*. New York: Four Winds Press, 1969.

Robson, Pam. *Magnetism*. New York: Gloucester Press, 1993.

Taylor, Barbara. *Electricity and Magnets*. New York: Watts, 1990.

Whyman, Kathryn. *Electricity and Magnetism*. New York: Gloucester Press, 1986.

## **Objectives**

Describe the properties of a magnet.

Define the term magnet.

## **Materials**

1 bar magnet/pair of students

Steel paper clips/pair of students.

## **Procedure**

The children should be in pairs for the first part of the lesson; two pairs will form a group of four after the initial observations are recorded.

Hold up a bar magnet and tell the children that you are going to give every team of two people one of these objects to observe. Do not use the name magnet and tell the children that you do not want them to tell you the name of the object, you simply want them to tell you what they observe about the object.

Pass out magnets and allow students to experiment with them. You might suggest that they touch the magnets to different parts of their desks, chairs, pencils, etc. Move from team to team, listening to be sure children are on task and that they are using good team member skills.

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Go around the room asking teams to share their observations with the entire class. Ask the rest of the class if they agree with each statement. Make a list of these observations on the board.

Ask each team of two to work with another team to make a group of four. Each group will now have two magnets. Ask the students to observe how the magnets react to each other. Tell them to experiment by placing the magnets near each other in different ways. Ask teams to share their observations and add these to your list on the board (unlike poles attract, like poles repel).

Give each team of four a small pile of paper clips. Ask the children to experiment with the magnets and the paper clips. Go around the room asking teams to share their additional observations with the class.

Add these observations to the list on the board.

Ask the children if anyone knows what the objects they have been observing are called. Write the word "Magnet" for the children and have them say it after you. Using the list on the board, have the children develop a simple definition of the word magnet. (A magnet pushes or pulls another magnet. A magnet will pick up a steel paper clip.) This is a good point at which to give the children some of the background information found above. Mention that lodestones are magnets that occur naturally; do not discuss the navigational uses in this lesson. This use will be taken up later.

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## **Second Grade - Science - Lesson 10 - Magnetism**

### **Objectives**

Determine from a group of objects which are magnets.

Test the strength of various magnets.

### **Materials**

Activity 1: for each group of four- A bar magnet, a horseshoe magnet, a disc magnet, a metal screw, a steel paper clip, a plastic comb, a crayon, a "Which are Magnets?" worksheet.

Activity 2: for each group of four - 20 steel paper clips (and the magnets which they used in Activity 1).

### **Procedure**

Show children an assortment of objects and tell them that today they have two tasks. Task 1 is to decide from a group of objects which are magnets and which are not. Once they have completed this task, Task 2 is to determine whether all of the magnets are equal in strength. Have children work in teams of four. Assign the following jobs to team members:

Runner - gets and returns group material

Reader - reads directions and keeps group on task

Recorder - writes down group answers

Reporter - presents group's results to the class

Have the runner pick up group materials for Task 1. Allow teams to investigate objects and to decide upon a strategy for identifying magnets. Circulate between groups to be sure each group is on task. As the children decide which items are and are not magnets, have the recorder make a check in the appropriate column on the "Which are Magnets?" worksheet. Upon completion, have the reporter for each group tell which objects their group identified as magnets.

After all reporters have shared results, hold up each object students investigated and review the results. Identify each magnet by name (horseshoe, bar, disc) and write the names on the board so that the children will become familiar with them. You will need this type of chart for Task 2.

	Horseshoe	Bar	Disc
Group 1			
Group ...			

Have the children explain the various strategies their group used to differentiate magnets and nonmagnets. Have the runners return the nonmagnets to you and exchange them for 20 steel paper clips.

Tell children that in Task 2 they are to determine whether the magnets are equally strong. Have the recorder copy the words: horseshoe, bar, disc (in a horizontal line, just as you have them on the board) across the top of the back of the worksheet. Ask children if they think that all magnets can push or pull with the same strength. Ask individual students why they answered as they did. Demonstrate how children can make a chain of paper clips by placing the first clip in

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contact with the magnet, the second in contact with the tip of the first clip, etc. Be sure the children understand that they are not to hook the paper clips together; explain that the strength of the magnet will hold the clips in a chain. Ask children if they can come up with a method to determine which of the magnets has the greatest pull. If they are having difficulty, ask: Which paper clip chain would be heavier (and consequently, take greater strength to hold), one made up of two paper clips or one made up of three? Why? Have the recorder write the number of paper clips that each type of magnet was able to hold under that magnet's name on the worksheet. Fill in the chart on the board as each reporter gives the results of his/her group. It should be obvious that the magnets are not equally strong.

As a review, ask individual children whether all objects are magnets and whether all magnets are equal in strength.

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### **Second Grade - Science - Lesson 11 - Magnetism**

#### **Objective**

Identify magnetic and nonmagnetic materials.

#### **Materials**

A horseshoe magnet, a collection of small objects of different materials (nail, metal spoon, plastic fork, piece of foil, paper clip, button, eraser, a piece of fabric), and a worksheet/

each group of four

For homework: A steel paper clip for each student

### **Procedure**

Instruct children to get into their four-person work groups. Assign the following jobs to team members:

Runner - gets and returns group materials

Reader - reads directions and keeps group on task

Recorder - writes down group answers

Reporter - presents group's results to the class

Remind children to use good group member skills and to work as a team.

Tell the children that this activity will help them answer the question, "Do magnets pull everything toward them?" Each group will be given a collection of objects. They will test each object individually to see if it can be pulled toward the magnet. If it can, it is called magnetic material. Any object that is not pulled by a magnet is called nonmagnetic.

Have the runner pick up the materials to be tested (not the magnets). Encourage the groups to examine the materials and decide together whether they think the material is magnetic or not. As you circulate through the classroom, give a worksheet to the recorder in each group. Tell the recorder to put an M in the column headed Prediction if the group thinks the material is magnetic and an N if the group thinks it is nonmagnetic. Circulate between groups to be sure that each member of the group is participating in the team activity and also to challenge the children to think.

Ask the reporters from each group to tell which materials their group predicted to be magnetic and which nonmagnetic. Ask why they predicted as they did. Discuss the answers. Ask the runners to get a magnet for their group and instruct the children to test the materials and determine if they are, in fact, magnetic or nonmagnetic. Tell the recorders to put a check in the magnetic column if the material is magnetic and a check in the nonmagnetic column if nonmagnetic.

Ask the reporters from each group to tell which materials their group found to be magnetic and which they found to be nonmagnetic. Ask another member of the group if they did a good job of predicting. Find out from a group member if the magnet had to actually touch the magnetic material in order to pull it. Did the pulling begin before the magnet touched the paper clip? As a class, examine the list of magnetic materials and describe what those materials have in common.

Discuss with the children the fact that magnets are used in electric motors that power everything from trains to hair dryers. Magnets in tape and disc players make it possible for us to listen to music. Computers use magnets to record information. If a magnet gets too close to a *BCP DRAFT SCI 25*

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computer disc, the magnet may cause damage to the information stored on the disc. People who

work with computers are warned not to let magnets get near their discs. Very large magnets are used to lift cars that are to be used for scrap metal.

### Homework Suggestion

There are magnets in use all around your home. For example, the door of your refrigerator has a magnet which helps the door to close. See if you can find this magnet by holding a steel paper clip close to the inside of the refrigerator door. Draw a picture showing where the magnet is located.

Use the clip to find other magnets in your house. Name the other places you found magnets.

**Note:** supply a steel paper clip to each student.

NAME: \_\_\_\_\_

*Which materials are magnetic? Which materials are nonmagnetic?*

*Before you test, make a prediction about the materials. If you think a material is magnetic, write an M in the prediction column. If you think a material is nonmagnetic, write an N in the prediction column.*

*After you have tested the materials, check ( ) in the magnetic or nonmagnetic column for each object.*

Materials	Prediction	Magnetic	Nonmagnetic
NAIL			
METAL SPOON			
PLASTIC FORK			
PIECE OF FOIL			
PAPER CLIP			
BUTTON			
PIECE OF FABRIC			
ERASER			

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### Second Grade - Science - Lesson 12 - Magnetism

#### Objectives

Find the north-seeking and south-seeking poles of a magnet.

Determine which part of a magnet has the greatest strength.

### **Materials**

Bar magnets, horseshoe magnets, thread, red and blue dot stickers, lots of steel paper clips

"Which Part is Stronger?" worksheet/each group of four

"Task Completion" worksheet/child

### **Procedure**

Instruct the children to get into their four-person work groups. Assign the following jobs to the team members:

Runner - gets and returns group materials

Reader - reads directions and keeps group on task

Recorder - writes down group answers

Reporter - presents group's results to the class

Remind children to use good group member skills and to work as a team.

Tell the children that the earth acts like a huge magnet. If a bar magnet is free to move, the earth's magnetism pulls one of its ends and makes that end point toward the North Pole. (The north magnetic pole and the North Pole are near each other but are not the same.) The end of the magnet that does this is called the north-seeking pole, or the north pole for short. The other end of the magnet is called the south-seeking pole, or south pole for short. It is pulled toward the South Pole of the earth. Have a student point out the North and South Poles of the earth on a globe or a map.

Have the runners pick up the materials and a worksheet called "Which Part is Stronger?" Tell the children that today they have two tasks. Explain that Task 1 is to determine which end of their magnet is the north-seeking pole and which is the south-seeking pole. Task 2 is to determine which part of a magnet exerts the stronger push or pull.

Task 1: Before beginning this activity, you will have used a compass to find north in your particular classroom. Stand in the center of the north wall of the room. Have each reader tie thread around the center of the magnet, suspend it, and let it settle. Explain that you are standing against the north wall of the room; consequently, the end of the bar magnet that points toward you is the north-seeking or north pole. The opposite end of the magnet is the south-seeking or south pole. Tell each reader to put a blue dot on the north pole and a red dot on the south pole. Have the remaining children in the group take turns suspending the magnet, thus insuring that each child has the chance to verify that the north pole of the magnet will point north.

Ask the children: From your work with magnets, which part of the magnet do you expect to be stronger? Why? Do you think that all magnets can push or pull with the same strength? Ask individual students why they answered as they did. Ask the children if they can come up with a method to determine which part of the magnet has the greatest pull. If they are having difficulty, remind them that the length of the paper clip chains can help them determine the relative strength of the magnets. Tell the children to

predict how many paper clips they think the each magnet can hold at a pole and how many at the center/middle. (Point out to the children that the poles and

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centers are marked on the worksheet.) The recorder should record the predictions (number of paper clips) on the line in the lower right corner of the appropriate box in the *Prediction* (top) half of the worksheet.

Now have the reader and the reporter take turns hanging paper clip chains from the poles and center of the magnets (as indicated in each box) as the recorder records the results in the *What happened?* (bottom) half of the worksheet. Remind children not to hook the paper clips to each other; the strength of the magnet will hold the chain together. Ask various groups if they predicted well.

Next, make a chart on the board: Bar Magnet Center, Bar Magnet Pole, Horseshoe Magnet Center, Horseshoe Magnet Pole. Ask reporters to tell you how many paper clips the magnets held at these specific points so that you can fill in your chart. It should become obvious that the strength is at the poles.

The runner should return the magnets, paper clips, and group worksheets; he/she should pick up a "Task Completion" worksheet for each member of the group.

Have the children look over their worksheets as you explain that they are going to write sentences telling what they have discovered about magnets today. Ask them to point to Task 1 on the worksheet and call on a child to read the Task 1 questions. Now have the children point to Task 2 and have a child read that question. Remind the children that their answers are to be complete sentences. When they have written the answer to the Task 1 question, and have proofread for punctuation, capitalization, and spelling, they are to make a check in the Task 1 box to indicate completion. Have them repeat these steps for Task 2.

Review with the children why the north pole of a magnet is called the north pole. (It is the north-seeking pole.)

### Task Completion

Name: \_\_\_\_\_

Answer in complete sentences. Be sure to check the box when the work is completed.

Task 1. How many poles does a magnet have? Name one of them.

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Task 2. Where are the magnets the strongest?

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**Second Grade - Science - Lesson 13 - Magnetism**

**Objectives**

Demonstrate that magnetism can act through different materials.

Observe magnetic fields.

Observe that magnetic fields are strongest at the magnet's poles.

**Materials**

Activity 1: A steel paper clip, cotton thread, a piece of tape, a magnet for demonstration

Activity 2: A small glass jar with a screw-on lid, mineral oil, two bar magnets, iron filings for demonstration

Activity 3: A bar magnet, a couple of steel paper clips/each child

**Procedure**

This lesson includes two teacher demonstrations and a hands-on task for children. Ask the children if

they think that the pull of a magnet can act through the air. What makes them think yes or no? Remind them of the pull of the magnet on the paper clip when they were working in a previous lesson. Did the magnet actually have to touch the paper clip before the pulling began? Once it has been established that a magnet can pull through the air, ask the children to predict whether or not a magnet is strong enough to pull through air even if something were in the way, say an index card. Ask one or two of the children to explain why they answered as they did. Ask for raised hands to show how many think the magnet can pull through the card and how many think not. Tally the answers under two columns on the board: "Can Pull" and "Cannot Pull."

Tie a piece of thread to the paper clip and tape the thread to a desktop. Use the magnet to pick up the paper clip. Lift the magnet until the thread is straight. Pull the magnet away from the paper clip and insert the index card between the paper clip and the magnet to show that the magnet's power passes through the air even when there is an index card in front of it. Ask the children if they think the magnet is strong enough to pull through the air no matter what you put between the magnet and the paper clip. Discuss the strength of various magnets.

Ask the children if they can think of another force that cannot be seen or felt that acts through space. A hint could be, "When an apple falls from a tree, what causes it to fall to the ground rather than spin off into space?" Tell the children that the space around a magnet where the force of magnetism acts is called a "magnetic field" or a "force field." This force field can be felt but not seen. Demonstrate what happens when you place a north pole of one bar magnet and the south pole of another together. (The magnets attract.) Now demonstrate what happens when you place a north pole of one magnet and the north pole of another together. (The magnets repel.) Repeat with south pole to south pole. Remind the children that they have probably been able to feel this in their earlier work with magnets.

Tell the children that while they cannot actually see the magnet's force field, they can see a *picture* of the magnet's force field. Put a teaspoonful of iron filings into the jar. Fill the jar with mineral oil and screw on the lid tightly. Shake the jar to mix the filings and the oil. Hold one end of each magnet next to the jar. What happens to the iron filings? Try turning one of the magnets so that the opposite end is next to the jar. Are the iron filings still in the same place?

Explain to the children that the force of the magnets, or their magnetism, has arranged the iron filings into patterns. These patterns are "pictures" of the magnets' force fields. The places *BCP DRAFT SCI 29*

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where the lines are closest together show where the magnetic force field is the strongest.

You may choose to leave the jar and two bar magnets in a place the children can access so they can experiment.

Distribute a bar magnet and a couple of paper clips to each child. Have the children put the paper clips on top of their desks and then hold the magnet inside the desk directly under the paper clips. The magnet will allow the paper clips to be moved around the desktop, and the children will observe that the magnetic force can pull through solid materials.

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### **Second Grade - Science - Lesson 14 - Magnetism**

## Objectives

Discover that a compass uses a magnet which will always point north.

Locate north, south, east, and west in the classroom.

Learn how a compass can be used to determine directions.

## Materials

A compass for each student

An overhead transparency of a compass

## Procedure

Discuss with the class how early explorers used the stars to find their way. Ask: When might this be a problem? (daytime, cloudy night) Ask the children if they remember the name of the naturally occurring magnets found in Asia Minor (lodestones, see **Background Information** at Lesson 9). Tell them that lodestones were used by early sailors to navigate on long ocean voyages. A lodestone could be used to navigate because, when it is suspended on a string, a lodestone points in a particular direction. Around the year 1000 an object was invented that makes finding your way much easier and more accurate. This object has a part that always points in one direction. Ask: Does anyone know what this invention is called? (a compass) As you hand out the compasses, explain that this is the invention that makes finding your way much easier than suspending a lodestone on a string.

Show the class the overhead transparency of the compass and point out N, E, S, W on the overhead. Now have the children locate N, E, S, W on their compasses. Ask: What do these letters stand for? If you have a map in your room, you might discuss where north, east, south, and west are on the map. Point out the free swinging needle and explain that the needle is a little bar magnet. Ask: When you suspended your bar magnet on a string, what happened? In which direction did it point? (north)

Tell the class that the north-seeking end of their compass is painted. Explain that the proper way to hold a compass is in the palm of your hand at waist height. Instruct the children how to hold the compass properly as they slowly turn on their heels, making several revolutions. Ask: What was your compass needle doing as you were turning? (It was jiggling, bobbing up and down, but stayed pointing north.)

Having established that the painted end of the needle is pointing north, have the children determine whether the painted end of the needle is also pointing to the letter N on the compass. (If it is, it is only by chance. Turn the cases of any compasses that have the painted end of the needle and the letter N aligned so that this is no longer the case.) Ask: What does the letter N stand for? (north) Ask: If the letter N stands for north, and the needle is pointing north, doesn't it seem that the needle and the letter N should be pointing in the same direction? (yes) Ask: What makes the painted end of the needle point north? (The needle is a bar magnet; the north-seeking pole of the magnet is painted. The earth's magnetism pulls that end of the magnet toward the earth's north magnetic pole.) Ask: Is the letter N on the compass a bar magnet? (no) Ask: Since the letter N is not a magnet, do you think the earth's magnetic force will pull the letter N to point to the north? (no) Ask: If the letter N does not point to the North, can we be sure that the letter S is pointing south, or E, east, or W, west? (no) Ask: What can be done to get the letter N aligned *BCP DRAFT SCI 31*

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with the painted end of the compass needle? (Someone might know that the compass casing can be turned so that the letter N is in line with the north-seeking end of the needle.) Encourage the children to turn the compass casing and try to align the letter N on the compass face with the painted end of the needle. Explain that when the painted end of the needle is pointing to the letter N on the compass face, the letter E on the compass face is facing east, the letter W is facing west, and the letter S is facing south. Now the compass can be used to determine direction. Reiterate that this is true *only* if the letter N and the painted end of the needle are in line.

Tell the children they are now ready for orienteering (using a compass to find a direction). Their job will be to position themselves so that they are facing an easterly direction, able to walk towards the Atlantic Ocean. Tell the children to hold the compass in one hand and use the other hand to rotate the casing until the E is across the center of the compass from them. Make sure the children understand that they must leave the compass in that position in their hands. If they want to face east, the E must stay directly across from them. Ask: Is the painted end of the needle pointing to the N? (no). Ask: Where must the painted needle of the compass point in order to use the compass to indicate direction? (Toward the N - north). Previously, the children turned the compass casing to align the needle and the N, but to face east **and** have the E directly across from them, the E must stay where it is. This time they must turn their bodies (not the compass case) until the painted end of the needle is oriented (lined up) with the N. They should turn slowly on their heels watching the needle until it is aligned with the N. Some children may need assistance at this point. When the painted end of the needle is lined up with the N, the child can look up and be facing east.

Repeat the activity having the children face south, then west. Remind them that the letter (S, W) on the compass representing the direction in which they want to face must be directly across the center of the compass from them. When they have positioned the compasses correctly in their hands, they can begin to rotate their bodies until the painted end of the needle is aligned with the N. At that point, the children will be facing in the direction (S or W) that is directly across from them on the compass face.

Remind the children that compass needles are magnets and ask them to recall what they know about magnets that would enable a compass to help indicate direction.