# Chapter 15



## Beverly Keane: Mighty Magnets on the Move

My name is Beverly Keane. I am a Science Lab teacher in Chicago. I see myself as a curator of science experiences and a facilitator of constructivist learning projects. I am a life-long learner and am currently enrolled in the Michigan State University Wipro Urban STEM Fellowship Program. In this program I am learning about educational technology and pedagogical practices and theory, as well as science and math content. I am also learning how to utilize technology in the classroom in a meaningful way.

About me personally; my greatest gratification in life comes from being a proud mother of three and a grandmother of three marvelous grandchildren. I also like to travel, garden, bike, hike kayak, knit and read. I like to read classics & fiction and do not have a favorite book. My favorite movies are Forest Gump, Planes, Trains and Automobiles, and Quest for Fire.

# MIGHTY MAGNETS ON THE MOVE

*Grade Level:* Primary – Grade 1

*Content Area Topic:* Physical Science

*Content Area Standard(s):*
Unit 2: Forces and Motion
From A Framework for K-12 Science Education- Chicago Pubic Schools
Science and Engineering Practices
Disciplinary Core Ideas:
Component Ideas

PS2: Motion and Stability: Forces and Interactions
- PS2.A: Forces and Motion
- PS2.B: Types of Interactions
- PS2.C: Stability and Instability in Physical Systems

PS3: Energy
- PS3.C: Relationship between Energy and Forces



ETS1: Engineering Design
- ETS1.A: Defining and Delimiting an Engineering Problem
- ETS1.B: Developing Possible Solutions
- ETS1.C: Optimizing the Design Solution

ETS2: Links among Engineering, Technology, Science, and Society
- ETS2.B: Influences of Engineering, Technology, and Science on

IL State Learning Standards
Content Skills
- 12.D Know and apply concepts that describe force and motion and the principles that explain them.
- 12.D.1a Identify examples of motion.
- 12.D.1b Identify observable forces in nature.
- 11.A Know and apply the concepts, principles, and processes of scientific inquiry.
- 11.B Know and apply the concepts, principles, and practices of technological design.
- 13.A Know and apply accepted practices of science.
- 13.B Know and apply concepts that describe the interaction between science, technology, and society.

*Learning Objective(s):*
Students will be able to determine that a magnet can attract through other objects such as water and paper/cardboard based on evidence.

*Key Ideas:*
- The motion of an object can be changed by forces (pushing or pulling). (PS2.A, PS2.C
- Scientists sometimes learn about things around them by doing something to the things and observing what happens. (ETS1.A, ETS1.B)
- Scientists compare their observations with observations of others. (ETS1.C)

*Crosscutting Concepts:*
- Asking questions (for science) and defining problems (for engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information



*Suggested Time Allotment:*
One Lab Period – 90 minutes

*Sequence in Learning:*
Briefly review requisite and subsequent lesson(s).

This lesson is part of a primary physics unit entitled "Science in the Toy Box" which was adapted from the Science Anytime series by Harcourt Brace. During this unit, students learn about force and motion. They learn that force is a push or a pull and that there are various forces such as the forces exerted by wind, water, gravity, etc. After studying each type of force, students make a toy that utilizes the force they were focusing on in that particular lab. When learning about force in general, students are introduced to magnetic force. They experiment with magnets and learn that magnets have both north and south poles. Students learn that a magnetic field exists within a magnet, but also extends beyond it. They learn that magnets have both a pulling force-attraction, and a pushing force called repel. In this lesson students investigate whether or not a magnet's force can also pass through other materials.

In a subsequent lesson, students will dig deeper into what magnets attract. They will learn that magnets attract some metals but not all metals. We dispel the common misconception that magnets attract all metals. To conclude our lessons on magnetic force, students will learn that magnets attract to items containing iron, cobalt, steel, or nickel and it is related to electricity. Students then begin learning about electrical force.

*Materials & Resources Needed:*

- Clear plastic cups – One for each student or if preferred one for each group of students.
- Water
- Paper clips
- Pre-made magnet sticks (hot glue a magnet to the end of a craft stick and then tape for extra security)
- Paper Plates
- Car stickers, pre-made car copies, or have students make their own cars
- Crayons or Markers

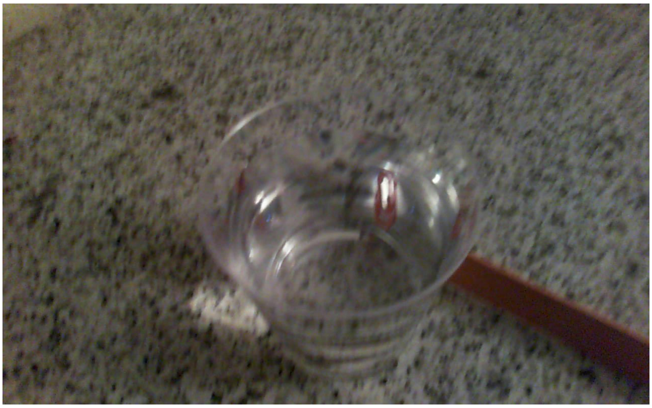
MATERIALS BEFORE STARTING



*Lesson Activities & Sequence:*
Grouping: Students sit in table groups of four students.

Introduction: 15 Minutes
I begin the lesson by connecting to prior knowledge about magnets. I ask the students to show me with their hands what attract looks like and the students clap their hands together and hold them together. Then they show me what repel looks like and they act out pushing their hands away from each other.
After this quick review, I tell the students that I have been thinking about a scientific question and ask the students if they will experiment to find the answer for me. I then ask them to make a hypothesis about whether or not magnetic forces will attract objects through other objects. I make a data table on the board to record each student's answer of yes or no. We then count the tallies and record the total number of each type of response.

Test # 1 Water - 30 minutes
I pass out a tray to each table. Each tray contains four plastic cups ¾ full of water, four paper clips, four paper towels, and four magnet sticks. Students are then directed to keep their cups in the tray, pick up a paper clip and drop it into the cup of water. They are then told to use their magnet's attractive force to test to see if they can pull the paper clips out of the water and the cup. The students then freely experiment to see how they can use the magnet stick outside of the cup to pull the paperclip to the top of the cup or go around the cup, etc. After the students have finished experimenting and pulling their paper clips from the cup I ask the students if magnets can attract through water. They respond yes. We go back to our hypothesis data on the board and briefly discuss it. I tell students to dry off their paper clip with the paper towel and hold on to their paperclips and magnet sticks. I then collect all trays. We then move on to the paper plate test.



Test # 2 Paper Plate – 45 Minutes

Students are given a paper plate. Students are directed to place their paperclip on top of their paper plate and place their magnet stick underneath the paper plate. Students then experiment trying to move the paper clip around the plate using the attractive forces of the magnet. Students will determine that magnets can attract through paper or cardboard. We go back to our data table and form a conclusion together about whether or not magnetic forces will attract objects through other objects. To conclude the lesson, we will make a toy that utilizes magnetic forces. Students are given crayons or markers to create towns with roads on their paper plates. As they are working on their roads I attach a car sticker to their paper clip. The students then play/experiment using the attractive force of a magnet to drive their cars around the town they created.


Students separate their town into four sections by drawing a road. They decorate each section of their “town” with things like their house, school, stores,, etc. or however they want using crayons and stickers. Students put a sticker of a car or draw their own car and we attach the sticker or drawing to the paper clip. Students can then use the attractive force of a magnet to drive their car all over their imaginary town. Students are given a bag to take their town, magnet stick and paperclip car home. Students are assigned homework to teach someone in their family that magnetic force can attract objects through other objects using their models.

*Proficiency:*

What meeting the expectations manifests as is working groups of engaged students experimenting to find the answer to an inquiry question. I will evaluate the students based on observation of their experimental procedures. I will also listen to and note the students' observations and verbal responses as these should indicate understanding of the scientific principle. At the end of the lesson, students will be able to state that magnets can attract through water and paper. They will be able to prove this statement by using their magnet stick to move their car around the paper. Students should also be able to generate questions about other objects that magnets can attract through such as cardboard, table or desk tops, etc.

An exit slip can be used to determine whether students understand the concept and process.

**MAGNETS ON THE MOVE EXIT SLIP**



Is the attractive force of a magnet a pushing or pulling force?
Can a magnet attract objects through water (liquids)?
Can a magnet attract through other objects (solids)?
What other objects do you think magnets can attract through?

Classroom teachers can use a textbook chapter test on magnetic force. Watching a BrainPop on magnetic force can be used for review and assessment.

*Teachers As Learners:*

What worked for the group as learners when they experienced the lesson? Where are places where the group was confused or had trouble transitioning? What suggestions are there for the teacher to better help students with the lesson? What did the teacher do well?
My colleagues thought that the lesson was very interactive and engaging. They stated that there is so much interactivity and opportunity for extension. They had questions about wrapping up the lesson and whether the product would go home or not.

*Elements of Pretty Good Practice:*

- Summarize the pedagogical strategies used that helped with the lesson's delivery.

- This lesson is derived from the Chicago Academic Standards for Science as well as NGSS standards
- Assessing prior knowledge occurs before the lab activity. The inquiry method is used. Students discuss the question and make an individual hypothesis before the lab activity begins. We tally all responses and convert tally marks to numbers to include a mathematics element. Students use this recorded data later in the lesson to confirm or refute their hypothesis when forming a conclusion. The lesson is active. Students use their imagination and artistic interpretations to design their own towns on the paper plate.

*Modifications and Adaptations:*

Differentiation Measures-

- The exact procedure can be modeled for students needing more help or for students needing more challenge they can experiment to determine the best procedure.
- This lesson can be adapted for second grade by changing the mediums which the magnetic force would work through. Students could generate a list of items that they would like to test such as aluminum foil, wood, the table, the human body. My colleagues offered the following comments as to adapting the lesson:
- The drawing itself was an extension of the activity. Maybe changing the volume of the glass, creating a data table tallying total responses, changing the density of the liquid such as attracting through syrup rather than water. Maybe put two or three plates together to change the thickness of the cardboard that the magnetic force would need to work through. Maybe assigning another activity that shows what objects are magnetic.



*Questions Arisen:*

My colleagues wondered how to wrap up the lesson quickly and efficiently with a reinforcement of the core idea.

*Peer Feedback:*

What suggestions did your colleagues share related to your teaching demo?

My colleagues wondered how I would wrap this up in the end. My colleagues thought a discussion at the end to tie it up and drive home the conclusion to the inquiry question would be helpful.

*Related Resources/Ideas*

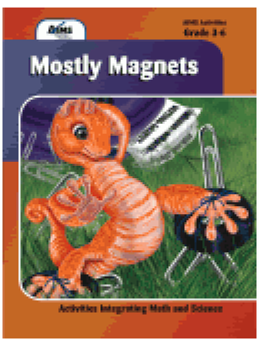
If applicable

Magnetic Math:

Contact Us: 1.888.733.2467     FAX: (559) 255-6396


Mostly Magnets Lab The free sample(s) below contains the table of contents, and a free activity from this book.
**Note:** All files are pdf documents requiring Adobe Reader.
Preview & Sample Activity

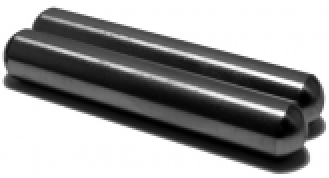





Mostly Magnets (3-5)

*Related Products:*


Magnetic Field Viewer (Set of 5)
$15.95





Cow Magnet
$5.95

Ring Magnets (Set of 25)