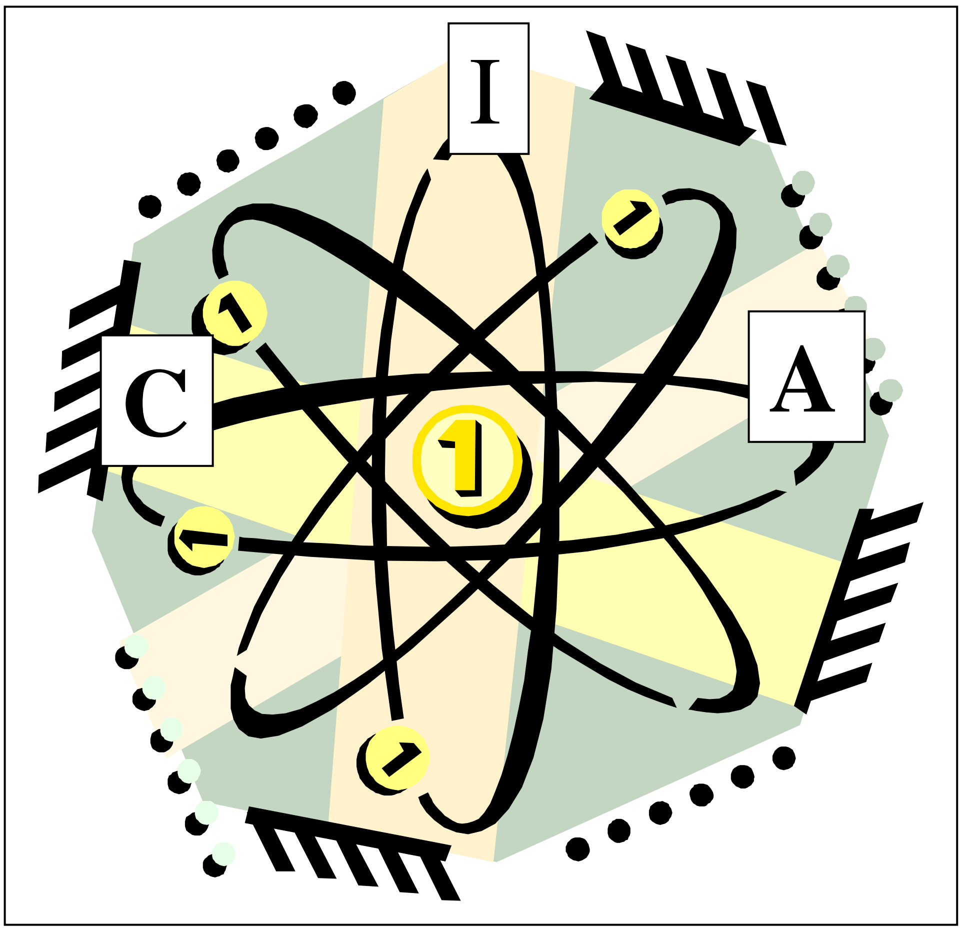
Curriculum, Instruction, Assessment (CIA) Alignment

Science, Grade 1
Unit 2: Force and Motion

Task Analysis and Hands-on Investigations



Ronald Blocker, Superintendent
Orange County Public Schools
Orlando, Florida

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Subject Area: Science
Strand C: Force and Motion
Grade: 1

Benchmarks

SC.C.1.1.2: The student knows that there is a relationship between force and motion.
SC.C.2.1.1: The student knows that one way to change how something is moving is to give it a push or a pull.

TASK ANALYSIS The student…
MAGNETIC FORCE
• determines that certain parts of a magnet are stronger than others.
• demonstrates that magnets attract and repel each other.
• classifies objects, including metals and nonmetals, according to their behavior with magnets.
• uses magnets to make some things move without being touched by the magnet.

MAGNET DETECTIVES

BENCHMARK and TASKS
SC.C.2.1.1 The student knows that one way to change how something is moving is to give it a push or a pull.

- The student classifies objects, including metals and nonmetals, according to their behavior with magnets.
- The student uses magnets to make some things move without being touched by the magnet.

KEY QUESTION
What will a magnet attract?
Can a magnet make some objects move without touching them?

BACKGROUND INFORMATION
There are three different kinds of magnets: natural, permanent, and temporary. **Natural magnets** are found in some rocks that contain a lot of iron. **Permanent magnets** are made out of steel (hard iron) or other magnetic alloys. They are strong and hold their magnetism for a long time. **Temporary magnets** are weak and last only a short time. An **electromagnet** is an example of a temporary magnet. All metals are not magnetic.
Magnets usually have two **poles** – north-seeking and south-seeking. Like poles **repel** and unlike poles **attract** each other. Bar magnets have poles at each end. Horseshoe magnets are bar magnets that have been bent into that shape. The poles of ring magnets are on their flat sides. Magnets are strongest at their poles and weakest midway between them.
Every magnet has a **magnetic field**, which interacts with the magnetic fields of objects containing iron or other magnetic materials. Magnetic fields can pass through both magnetic and nonmagnetic materials.

MATERIALS

Teacher
3 magnets
piece of clothing w/a pocket
scissors or 2 large paper clips
Magnets and *Using Magnets* (Benchmark Education Co.)

Per group
container of small objects (chalk, pencil, crayon, paper clip, matchbox car, button, key, brad, marker, nail, bottle cap, eraser, etc.)
variety of magnets
We Think, We Know sorting sheet

TEACHING TIPS
1. Any object that is attracted to a magnet may be substituted for the scissors.
2. Place the small objects in a bag or a box lid for each group.

ENGAGE
Do either or both of the following engaging activities:
1. Wear a piece of clothing with a pocket.
   Hide a magnet in the pocket.
   Casually bring a pair of scissors or two large paper clips to the outside of the pocket.
   Remove your hand and let the scissors/clips remain stuck to your clothing.
   Some students may say you have a magnet in your pocket.

2. Before students arrive, place two magnets on the overhead projector.
   Turn on the overhead projector.
   Place the magnets so they repel each other.
   Bring one toward the other, and let the students see the second one *scoot* away from the other.
   Then turn the magnets so they attract.
   When one jumps toward the other, the class will probably identify the objects as magnets.

EXPLORE Part 1

1. Place students in groups and distribute the bags/containers of small objects and the *We Think and We Know* worksheet to each group.
2. Have students remove one item at a time from the container and predict whether or not the item will "stick" to the magnet.
3. The item should then be placed in the appropriate box on the *We Think* part of the sorting sheet.
4. After all items have been placed in the appropriate *We Think* boxes, distribute the magnets.
5. The students should test the items one at a time and then place each object in the appropriate *We Know* box.

EXPLAIN

Have the groups examine their *yes* and *no* collections.
Ask:
How are the objects in the "yes" box alike?
How are the objects in the "no" box alike?
What will a magnet attract?

EXPLORE Part 2

1. Have students place a magnet above each object without allowing the magnet to touch the object. Gradually lower the magnet until the object moves without being touched.
2. Have students use different kinds of magnets to try and move the objects.

EXPLAIN

Discuss observations.
Ask:
What happened?
Did all the objects move?
Did they move the same way when you used different magnets?
Was any work done?
How do we know work was done?

EXTEND/APPLY

1. Discuss how magnets are used in everyday life (magnets at junk yards to pick up cars, magnets to pick up pins, magnets on cabinet doors, paper clip holders, etc.).
2. Ask: *Have you ever seen someone at the beach with a metal detector trying to find any jewelry or money that has been lost in the sand?*
   What do you think may be inside the metal detector?
3. Have the students bring objects from home that they would like to explore with the magnets. Set up a center with various magnets so the students may check the objects.
4. Read *Magnets* and *Using Magnets.*

ASSESSMENT

Display some items that they have not had an opportunity to observe. Thinking about what they now know about objects that stick to magnets, have them predict which of the new items would go in the yes and no boxes. Ask them to give reasons for each of their predictions.

WE THINK

YES	NO

WE KNOW

YES	NO

MAGNETIC MOTION

BENCHMARKS and TASK

SC.C.1.1.2 The student knows that there is a relationship between force and motion.

SC.C.2.1.1 The student knows that one way to change how something is moving is to give it a push or a pull.

- The student demonstrates that magnets attract and repel each other.

KEY QUESTION

What happens when magnets come near each other?

BACKGROUND INFORMATION

Magnets usually have two poles – north-seeking and south-seeking. Like poles **repel** and unlike poles **attract** each other. Bar magnets have poles at each end. Horseshoe magnets are bar magnets that have been bent into that shape. The poles of ring magnets are on their flat sides. Magnets are strongest at their poles and weakest midway between them. Permanent magnets are made of steel (hard iron) or magnetic alloys. Iron, nickel, and cobalt are attracted to magnets. Alloys such as steel and alnico are also attracted to magnets.

MATERIALS

Teacher
2 magnets
string

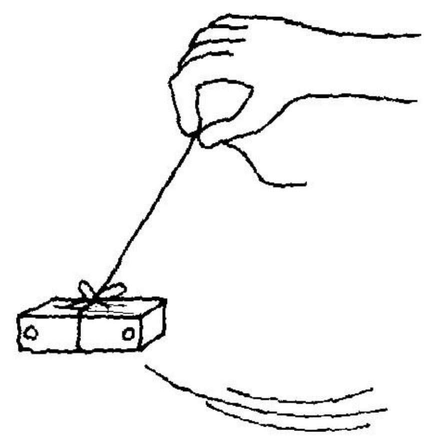
Per pair of students
2 strong bar magnets with the north and south poles marked as directed in the **Teaching Tips** below
1 styrofoam tray, file folder, or tag board

TEACHING TIPS

Label each bar magnet with a red dot on the north pole and a blue dot on the south pole.

ENGAGE

Suspend a magnet so that it is allowed to swing freely as shown in the illustration. (The magnet should be labeled with the red and blue dot as directed in **Teaching Tips**.) Bring a second magnet near the swinging magnet and ask students to observe what happens. Discuss what will happen to the swinging magnet when the red end of the second magnet is placed near the red end of the swinging magnet. Repeat by bringing the red end of the magnet to the blue end of the swinging magnet. Have students observe and describe the action of the magnets.



EXPLORE

1. Have students work in pairs. Give each pair two bar magnets and one tray, folder or tag board. Direct the students to hold the flat surface of the tray in one hand with a magnet resting on top.
2. Demonstrate how to hold a second magnet under the flat tray (with the other hand) to make the magnet on the tray move without actually touching it. Challenge students to move the magnet in as many ways as possible without touching it.

EXPLAIN

1. Give each pair an opportunity to share ways they moved the magnet by demonstrating to the rest of the class.

   Ask:

   Why do you think the magnet on the surface moved without the other magnet actually touching it?
   What happened when the blue ends of both magnets came near each other?
   What happened when the red ends of both magnets came near each other?
   What happened when the red end of one magnet came near the blue end of the other magnet?

2. At this time introduce the terms ***repel*** **and** ***attract***.
3. Using two magnets, have several students demonstrate repelling and attracting.
   Ask:
   When two magnets attract each other, what kind of force do we call that? (pull)
   When two magnets repel each other, what kind of force do we call that? (push)

EXTEND/APPLY

Direct students to draw a maze on the styrofoam tray, file folder, or tag board. Then try to move a magnet placed on the tray around the maze by using a second magnet under the tray.

ASSESSMENT

Ask and discuss:
You are in the driveway with your brother and drop a box of small nails. You need to pick them up quickly before someone drives in the driveway. What is the fastest way to pick up the nails?

1. *sweep them up*
2. *wave a magnet close to the magnets*
3. *pick them up by hand*

MAGNET MAGIC OR MAGNET SCIENCE?

BENCHMARK and TASK

SC.C.1.1.2: The student knows that there is a relationship between force and motion.

- The student demonstrates that magnets attract and repel each other.

KEY QUESTION

How will ring magnets react to each other?

BACKGROUND INFORMATION

Magnets usually have two poles – north-seeking and south-seeking. Like poles **repel** and unlike poles **attract** each other. Bar magnets have poles at each end. Horseshoe magnets are bar magnets that have been bent into that shape. The poles of ring magnets are on their flat sides which allow us to stack them on a pencil or dowel and observe the repulsion created by like poles. If the force is strong enough, the upper magnet will appear to float above the bottom magnet. This is similar to how the Maglev train is levitated above the track.

MATERIALS

Per pair of students

unsharpened pencil
4 to 5 ring magnets
clay (used to anchor the pencil)

TEACHING TIP

Use new, unsharpened pencils for safety reasons.

ENGAGE

1. Have students share the many ways people use magnets at home, school, and at work.
2. Ask: *Now that we know magnets attract and repel each other, what do you think will happen when we put two ring magnets together?*
   Discuss what the children predict.

EXPLORE

1. Give each group a pencil, several ring magnets, and a ball of clay.
2. Show the students how the clay will be used to stand the pencil upright. Allow time for the children to set up their clay and pencil.
3. Tell the students to place the ring magnets on the pencil.
4. Challenge the children to find a way to make their magnets float.

EXPLAIN

1. Allow the students to share what they observed before asking questions.
2. Ask:
   Why did the magnets attract on one side, but float when turned upside down?
   If you did not use a pencil what would happen?
   Do the spaces between the magnets change as more ring magnets are added?
   What happens when we use bug repellent?
   Do the bugs come to the spray?
   How is this like a magnet?
   What happens when we use ant bait?
   Do the ants come to the bait?
   How is this like a magnet?
   When two magnets attract, is this a push or a pull?
   When two magnets repel, is this a push or a pull?

EXTENSIONS

1. Create a pattern with the magnets – repel, attract, repel, etc.
2. Can you make your magnets bounce?
   Record observations in a student journal.
3. Have students pretend they are magnets and demonstrate attract and repel.

ASSESSMENT

Draw a picture of what happened when you placed the magnets on the pencil.

MIGHTY MAGNETS

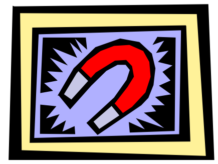
BENCHMARKS and TASK

SC.C.1.1.2 The student knows that there is a relationship between force and motion.
SC.C.2.1.1 The student knows that one way to change how something is moving is to give it a push or a pull.

- The student determines that certain parts of a magnet are stronger than others.

KEY QUESTION

Which part of the magnet is the strongest?



BACKGROUND INFORMATION

Magnets usually have two poles – north-seeking and south-seeking. Like poles **repel** and unlike poles **attract** each other. Bar magnets have poles at each end. Horseshoe magnets are bar magnets that have been bent into that shape. The poles of ring magnets are on their flat sides. Magnets are strongest at their poles and weakest midway between them.

MATERIALS

Teacher

class chart or Tree Map
horseshoe magnet
The Mystery of Magnets (MacMillan Science Bks)
Magnets (Newbridge)

Per group

assortment of magnets (horseshoe, ring, bar, U-shaped, disc)
30 paper clips
1 sheet of acetate
small container of iron nuggets
shoebox lid or small tray
Mighty Magnets recording sheet

Per student

pencil

ENGAGE

1. Hold up a horseshoe magnet and ask:
   What do you think will happen if I hold this magnet over some paper clips?
   Allow time for students to share their predictions.
2. Ask:
   Do you think that the magnet will hold the same number of paper clips all over or will more stick to some places on the magnet than to other places?

EXPLORE

1. Divide the class into groups. Give each group several different shaped magnets and about 30 paperclips in a shoebox lid or on a tray.
2. Ask each student to select a magnet and make a sketch of it on the data sheet.
3. Have students investigate which parts of their magnets are the strongest. Direct students to hang a paper clip on the magnet. Add paper clips, one at a time, to the first paper clip to make a chain until the magnet will no longer hold any more on the chain. Do this on different parts of the magnet and record on the *Mighty Magnets* recording sheet.

EXPLAIN

1. Ask:
   Are there places on your magnet that attracted more paper clips than other places?
   What places on your magnet held the most paper clips?
2. Have students tape their drawings on a class chart or Tree Map labeled with the name of the types of magnets used.
3. For each type of magnet ask:
   Do you see a pattern that can help us determine where on the magnet the most paper clips were picked up?
   Which part of a magnet is the strongest?
   Did all magnets react in the same way?
4. Instruct students to take turns moving a paper clip along the length of the magnet.
   Ask: *What did you notice as you moved the paper clip along the length of the magnet?*
5. Introduce the word "poles" at this time. Have students look at magnets in the classroom and note whether or not they are labeled with an *N* and an *S*. Explain that the *N* refers to the north pole and *S* refers to the south pole. Reinforce their observations about the strongest part of the bar magnet. Encourage them to use the word poles in describing that part.
6. Review *attract* as a pull and *repel* as a push.

EXTEND/APPLY

1. Distribute a bar magnet, a sheet of acetate, and a small container of nuggets to each group. Have students place the magnet under the sheet of acetate and sprinkle the nuggets on top. Allow time for students to observe and sketch the pattern created by the nuggets.
2. Ask:
   Where on the magnet were most of the nuggets attracted?
   What does this tell us about the strongest part of the magnet?
3. Read and discuss *The Mystery of Magnets* and *Magnets*.

EXTENSION

This is an appropriate time to label the four walls or corners (your compass will tell you where the label should be placed) of your classroom as North, South, East, or West. Use a compass to determine where "north" is and label with NORTH on a piece of cardstock. Continue with the other directions. Refer to them throughout the year.

ASSESSMENT

Have students draw or write in their journals where the strongest part of a magnet is located.

MIGHTY MAGNETS

Names____
Trace each magnet.
Try to attach a paper clip chain to different parts of the magnet. Make Xs to show where you attached the paper clips.

Bar Magnet	Horseshoe Magnet	Ring Magnet