

Material Preparation

MATERIALS

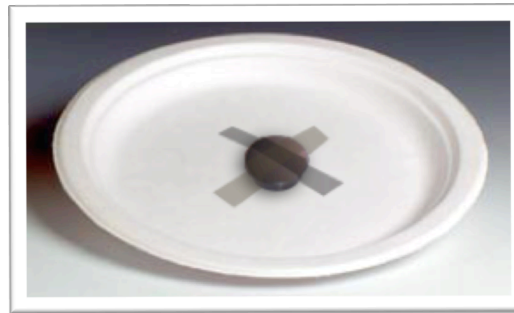
- strong ring magnet
- ten large metal paper clips
- clear tape
- 30 large paper plates
- sheet of 18" x 24" chart paper or poster board
- permanent marker

For each child:

- magnet wand
- paper plate
- 5-oz. cup containing ten large metal paper clips
- *Ask Me About Magnets* sticker

PREPARE IN ADVANCE

- Use clear tape to secure the ring magnet to the center of a paper plate.
- Add ten paper clips to each of the 5-oz. cups, one cup per child and one cup for the teacher.
- Prepare one *Prediction Chart* per group.



Prediction Chart

Name	Prediction: How many plates?
Jane	
Roy	
Sheila	
Robert	
Maria	

SET UP THE LESSON AREA

- Gather plate with ring magnet (magnet side facing down), ten paper plates, and cup with paper clips for the teacher.
- Place 20 paper plates in a stack near the ECHOS lesson area.
- Display the *Prediction Chart*.
- Set aside one paper plate, one magnet wand and one 5-oz. cup containing ten paper clips for each child.



For each child

OBJECTIVE

Children will test and compare magnetic strength and force.

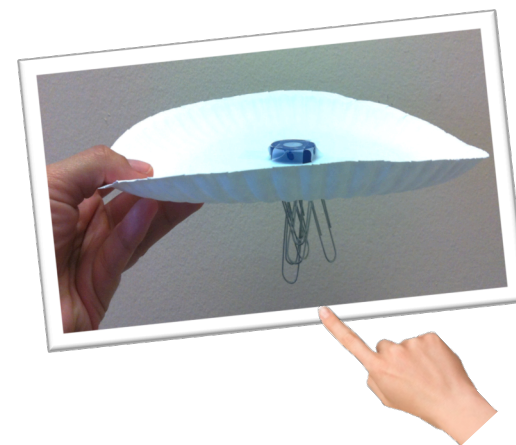
EXCITE

1. Gather the children in the ECHOS lesson area. Place the paper plate upside down on the table with the magnet hidden underneath and the bottom of the plate facing up. Place ten paper clips on the plate, directly above the magnet. **What do you think will happen when I turn this plate over?** Listen to the children's responses.
2. Hold up the paper plate. Carefully turn it over so that the paper clips are dangling from the plate. Watch and listen to the children's reactions.

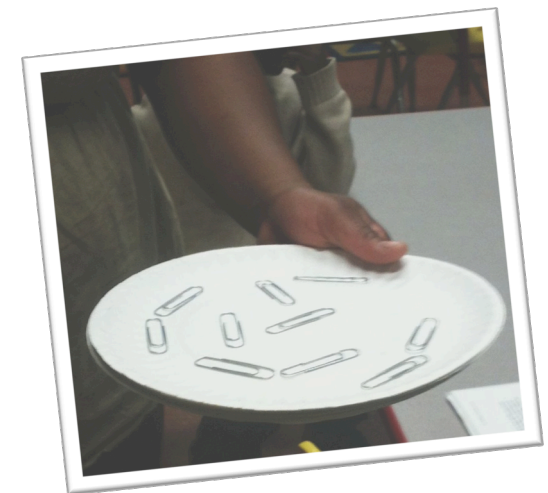


INTRODUCE

1. **Why are the paper clips hanging from the plate? Something must be holding them there. Can you figure out what it is?** Listen to the children's responses. **Let's look.** Show the magnet taped to the plate. **Yes, it's a magnet. The magnet on this side** (point to the magnet on the plate) **is holding the paper clips on the other side** (point to the paper clips dangling from the plate.)
2. **Is the magnet touching the paper clips? Look carefully.** Listen to the children's responses. **What's *between* the magnet and the paper clips?** Accept responses. **Yes, the plate is between the magnet and the paper clips. The magnet is strong enough to hold the paper clips, even through the paper *material* that the plate is made of.** Point to the paper clips.
3. **Something was pulling the paper clips toward the magnet. You can't see it, but it's all around the magnet. It's called a magnetic *force*.** Move your finger in a circle around the hanging paper clips as you say the words "*magnetic force*." Remove the paper clips and place the plate facing down on the table.



4. **Touch the paper plate with two fingers. This plate is made out of *thin* paper material. I have a question: What would happen if we added one more plate to make a *thick* pile?** Listen to the children's responses.
5. Place another plate on top. Hold the two plates together. **We'll see if the magnet can hold the paper clips now.**
6. **How many plates do we have now? Yes, two. Let's see if the magnetic force can pick up the paper clips through two plates.** Place the pile of paper clips on top of the two plates. Slowly turn the paper plates upside down. **Did it still work?** Accept responses. Remove the paper clips from the plates.
7. **Let's try to move the paper clips even farther away from the magnet. Let's make some predictions. How many plates do you predict it will take? You can predict up to 10.** Write each child's prediction next to his/her name on the prediction chart.
8. **Let's see if the magnet can pick up the paper clips through three plates.** Repeat with four and five and so on, until it's clear that the magnet does not pick up any paper clips through the plates.
9. **How many plates did it take to keep the magnet from picking up the paper clips?** Discuss results and predictions with the children.



Prediction Chart

Name	Prediction: How many plates?
Jane	3
Roy	5
Sheila	5
Robert	4
Maria	7

EXPLORE

1. **Now it's your turn. You're going to conduct an investigation to explore how magnetic force works through a paper plate.**
2. Give each child one paper plate and one cup with ten paper clips. **Place the paper clips on top of your plate.**
3. Give each child a magnet wand. **Hold the plate with one hand and use your other hand to hold the magnet wand under the plate. Try to move the paper clips.** Model and assist as needed.
4. **When you are ready, try it with more plates; add one at a time.** Give each child more paper plates from the stack as needed. **Move the paper clips with your magnet wand each time you add a paper plate.** Observe the children.
5. **Is the magnetic force strong enough to move all of the paper clips?** Listen to the children's responses.
6. Allow sufficient time for children to explore.




INTERACT

Interact to accommodate children's individual needs and strengths. Use these suggested strategies as needed:

- If children need assistance, they can pair up with a friend. One child can hold the paper plate while the other child moves the magnet wand.
- As an extension, use different types of plates, such as plastic or ceramic, to explore how magnetic force works through different materials.

OUTCOMES

1. Regroup the children in the ECHOS lesson area. **What did we discover today?**
Listen to the children's responses. If needed, use suggested prompts to elicit key concepts and vocabulary. Encourage responses from everyone.
 - **What happened when we tried to pick up the paper clips through the plates?**
 - **How many paper plates did it take to keep the magnetic force from picking up the paper clips?**
 - **What did you observe when you used the magnet wand?**
2. Recap and review the unit key concepts by asking and prompting children to recall something they learned from any of the prior *Magnificent Magnets* lessons.
3. Give each child an *Ask Me About Magnets* sticker. 

Remind the children to tell their family something they have learned about magnets.
4. After you have completed *Lesson #4: Powerful Forces* with all the children in your classroom, display the *Prediction Chart* in your science area.

VOCABULARY

- force
- between
- material
- thin
- thick

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Prediction Chart