

**Grade Level:** 4-5 (self-contained classroom – language disabilities)

**Subject Matter:** Science

**Title:** The Scientific Method & Magnetism

**Overall idea/rationale:** To learn about the Scientific Method, and the steps that are involved in a simple scientific investigation.

The National Science Education Standards state, "As students focus on the processes of doing investigations, they develop the ability to ask scientific questions, investigate aspects of the world around them, and use their observations to construct reasonable explanations for the questions posed."

As per NSTA: "Physical science in grades K-4 includes topics that give students a chance to increase their understanding of the characteristics of objects and materials that they encounter daily."

**Instructional Objectives:**

*Students will be able to:*

- Formulate questions on a scientific topic.
- Employ simple equipment to gather and record data.
- Develop a hypothesis.
- Draw conclusions based on observations and knowledge.
- Communicate about investigations and explanations.
- Organize and display data.
- Distinguish between those materials that magnets attract and or do not attract.
- Work cooperatively with a peer.

**National Science Education Standards (National Science Teachers Association):**

- **Content Standard A:** As a result of activities in grades K-4, all students should develop abilities necessary to do scientific inquiry and understanding about scientific inquiry
- **Content Standard B:** As a result of the activities in grades K-4, all students should develop an understanding of the properties of objects and materials, position and motion of objects, and of light, heat, electricity, and magnetism

**Time Required:** Two 45-minute sessions

**References:**

Is There a Method to this Madness? Exploring the Scientific Method. *From a Distance* Website: NASA Learning Technologies Project. <http://www.edu.ssc.nasa.gov/fad/detail.asp?offset=30&LessonID=33>

National Science Teachers Association. <http://www.nsta.org/>

UTeach Outreach: University of Texas. [http://www.utexas.edu/cons/uteachoutreach/students/create\\_lab/](http://www.utexas.edu/cons/uteachoutreach/students/create_lab/)

Core Knowledge: <http://www.coreknowledge.org/CK/resrcs/lessons/298AmazingMags.htm>

### **Lesson One:**

Students are introduced (though a few did learn about it last year) to the Scientific Method. They are walked through the steps using a simple experiment: What will hit the floor first, a flat sheet of paper or a crumpled piece of paper?

### **Materials:**

- Poster displaying all steps of the Scientific Method
- Two pieces of plain white paper

**Key Vocabulary:** hypothesis, conclusion

### **Learning Activity:**

1. (Activate prior knowledge) Ask students to recall anything they know about the Scientific Method. Provide purpose by discussing the science fair that will be held in January, and that each student will be required to work on an experiment at home to present in class.
2. Bring students' attention to the poster delineating each step of the Scientific Method. Read through each of the steps aloud. Return to the first step bringing in the example of a simple science experiment.
3. **Question:** Introduce the question of what will hit the floor first, a flat sheet of paper or a crumpled piece of paper.
4. **Research:** Discuss with students the ways that we can research paper (i.e., Internet, library, talking to people, etc.) Make a couple of contrived observations on the nature of paper, crumpled and flat.
5. **Hypothesis:** Lead students to develop a hypothesis about what piece of paper would hit the floor first giving them the sentence starter: I predict that ... Stress the importance of the need of a hypothesis to prove or disprove.
6. **Experiment:** Discuss with students how they can set up an experiment. Point out how "all must be the same" (all other variables constant) except that one piece of paper is crumpled. (i.e., the paper must be of the same type and size, paper must drop from the same height.) Invite two students to the front of the classroom to participate in the experiment.
7. **Results:** Discuss whether their hypothesis was correct or not.
8. **Conclusion:** Stress to students the need to write down their conclusion. Provide a starter sentence: Based on my results, I conclude that...
9. (Closure): Have students run through steps one last time. Preview next lesson.

## **Lesson Two:**

By experimenting with magnets, students get a hands-on experience using the Scientific Method. The kids may already have a general idea of how magnets work (attract certain metals) but may have not put that much thought into what else they can, or cannot attract. Direct them towards making an educated guess about what they think magnets will attract in the objects supplied.

### **Materials:**

- Poster displaying all steps of the Scientific Method
- Scientific Method Rubric (on chart paper)
- Experiment Data Sheet
- Magnetic wands (or other magnets)
- Aluminum foil
- Pennies
- Nickels
- Paper clips
- Items in their desk

**Key Vocabulary:** magnetic

### **Learning Activity:**

1. (Activate prior knowledge) Ask students to recall all they know about the Scientific Method from the previous lesson. Review the steps as shown on the poster.
2. Display rubric on large paper and discuss how their work will be assessed. Stress that working cooperatively with their partner is an important part of their work. (The students' cooperative learning skills are still developing.)
3. Ask students about what a magnet is, and what attract means. Provide definitions on the board or on chart paper.
4. Then, hand out Magnet Experiment Data Sheet, and explain each section. Ask the kids what they think is going to be attracted ("stick to"), and what won't, to magnets. Instruct the students to write their names on the top of the data sheet.
5. Pass out the magnetic wands. Let the kids experiment with the magnets by letting them try to use the magnets on their desks, their paper, crayons and whatever else is nearby.  
**\*\*IMPORTANT:** It might be a good idea to tell students which objects they should not test with magnets, i.e. computer screens, computer disks, audio cassette tapes, etc.
6. Let them form an educated guess, a hypothesis, i.e. "Metal objects are attracted to magnets," after the initial experimentation.
7. Display the aluminum foil, the coins, and the paper clips and ask the kids what they think will be attracted to the magnets.

8. Pass the foil, coins, and paper clips out and allow them to experiment again with their magnets.
9. Ask the children again about these results and let them reform their ideas.

### **Expected Results and Explanations:**

Obviously most kids know that nonmetals won't be attracted, but many will not realize that most metals won't either. Help them form their hypothesis and then when the new data are introduced, (the non-attraction of the coins and the foil) help them revise their ideas. Make sure they understand that this is how the Scientific Method works: having an educated guess, testing their guess, and reforming their ideas. Try not to get distracted trying to explain why some metals aren't attracted, they just aren't. Expect them to have weird additional questions, but don't discourage this. Instead, tell them that it's part of the Scientific Method to keep getting new questions every time you get an answer.

### **Adaptations/Accommodations:**

Universal design principles were followed to support all students:

- Students are paired with partners that compliment strengths of each student.
- Sentence starters support students' need for organization.
- A word bank is provided at the bottom of the data sheet to help with spelling/word retrieval.

### **Assessment/Evaluation:**

Students will be assessed using a rubric. Students are evaluated by showing reasonable responses on the Student Experiment handout. As part of the rubric, they will be evaluated on their ability to work with their peer. They will also be informally evaluated by their ability to communicate their observations and explanations.

## Science Experiment Data Sheet

Purpose (What do you want to learn? The Question): What do **MAGNETS** attract?

**Research:** Do your research! Observe what your magnet attracts ("sticks to"). What did you find out?

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**Hypothesis** (Your "educated guess;" what you think will happen):

I believe that

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**Materials:**

1.	2.
3.	4.
5.	6.

**Experiment** (the procedure; the steps):

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**Your data results:**

Item	Attracted to Magnet (circle answer)
	YES / NO

**Conclusion:**

I learned that

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WORD BANK

Magnet	Paper Clip	Attract	Nickel	Penny	Foil Paper
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