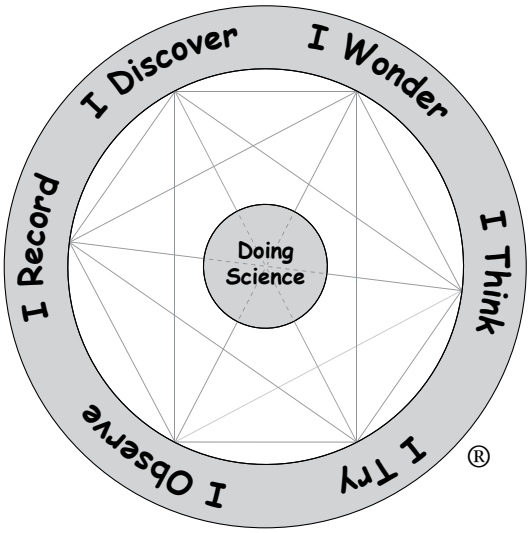
Doing Science

Lesson 0



A QUICK LOOK

Overview

Students sharpen their awareness of scientific thinking as they conduct informal experiments with gravity and then reflect on the processes they engaged in. In the context of these experiences, they are introduced to the work of scientists and to the Science Companion "I Wonder" circle, which provides a visual representation of many of the facets of scientific inquiry, exploration, and discovery.

Key Notes

- Teach this lesson at the beginning of the school year, preferably as the first science lesson. Reinforce the central ideas of the lesson throughout the year to help students develop an understanding and appreciation of science and of their own work as scientists.
- This lesson introduces students to the "I Wonder" circle, as a tool to understanding the conceptual process of experimentation. In latter lessons and skill builders the students will learn some more formal elements of experimental design.
- If time is limited, consider doing the Science Talk portion of the Reflective Discussion during a separate session.

NOTES

Big Idea

Doing science involves wondering, thinking, trying, observing, recording, and discovering. Scientists use experiments to test out their ideas and observations.

Process Skills

- Designing a simple experiment
- Observing
- Recording
- Reasoning
- Communicating

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Notes

Standards and Benchmarks

As students plan and conduct their own investigations, then share and reflect on what they've done, they begin to address Science as Inquiry Standard A (Abilities Necessary to Do Scientific Inquiry and Understandings About Scientific Inquiry) and The Nature of Science Benchmark 1B (Scientific Inquiry).

Lesson Goals

1. Collaborate with a small group to design and conduct informal experiments.
2. Generate and express ideas about science.
3. Think about what an experiment is. Start to use experiments to test ideas and answer questions.
4. Use the "I Wonder" circle to better understand what it means to do science.
5. Appreciate their own abilities as scientists.

Assessment

Observe students as they plan and conduct their explorations, and listen to their ideas during the introductory and reflective discussions. Use these observations to get a sense of their baseline understanding of what it means to do science and whether they see themselves as scientists. In every Science Companion unit, students have numerous opportunities to act as scientists and, in the process, to develop their understanding of science and to practice science skills. These are important goals of the Science Companion curriculum.

Materials

Item	Quantity	Notes
Classroom Supplies		
Small containers that can be closed or sealed	2 per group	Use recycled containers all of the same type. Clean empty milk cartons from the lunchroom work well, or yogurt cups
Various small weighty objects such as rocks, erasers, balls, coins or washers	Several per group	These need to fit in containers.
Scrap paper, cut into half and quarter size sheets	Several per group	
Scraps of cloth, feathers, or other light objects (optional)	Several per group	
Curriculum Items		
Poster: "I Wonder" Circle		Use for introductory discussion
Science Notebook, inside front cover (optional)		This has another copy of the "I Wonder" circle
Teacher Master "Experimenting with Gravity"	At least 3 sheet per group, plus several extra sheets	Recording sheets for the exploration

Preparation

- ❑ Review the **Teacher Reference Materials** article, "Developing the Child Scientist," which describes science talks and the "I Wonder" circle.
- ❑ Set up the supplies in a way that are easily accessible. Students will be working in groups of three or four.
- ❑ Hang up the **"I Wonder" circle poster** where it can be seen for a class discussion.
- ❑ Make three copies of the **Teacher Master "Experimenting with Gravity"** for group, plus some extras.

Teaching the Lesson

Engage

Introductory Discussion

1. Introduce the goal of today's lesson: to think about what scientists do, to think about what and experiment *is*, and how scientist use experiments to test ideas.
2. In order to think about these things in a tangible way, the class will break into small groups of scientists and conduct some very simple, very open-ended experiments about gravity.

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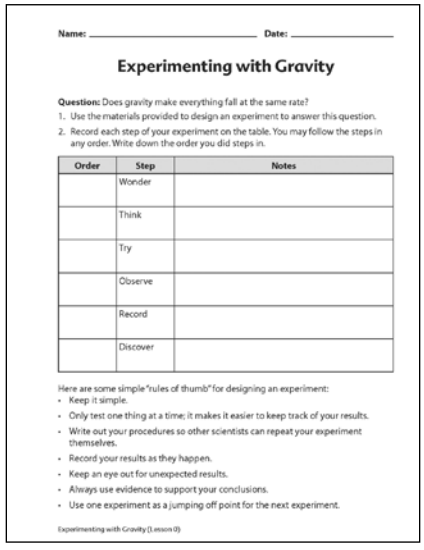


Name: _____ Date: _____

Experimenting with Gravity

Question: Does gravity make everything fall at the same rate?

1. Use the materials provided to design an experiment to answer this question.
2. Record each step of your experiment on the table. You may follow the steps in any order. Write down the order you did steps in.

Order	Step	Notes
	Wonder	
	Think	
	Try	
	Observe	
	Record	
	Discover	

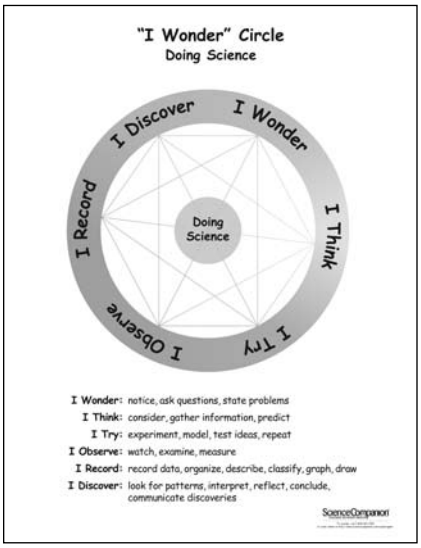
Here are some simple "rules of thumb" for designing an experiment:

- Keep it simple.
- Only test one thing at a time; it makes it easier to keep track of your results.
- Write out your procedures so other scientists can repeat your experiment themselves.
- Record your results as they happen.
- Keep an eye out for unexpected results.
- Always use evidence to support your conclusions.
- Use one experiment as a jumping off point for the next experiment.

Experimenting with Gravity (Lesson 0)

Teacher Master

Notes



"I Wonder" poster

3. Examine the "I Wonder" circle poster with the class, encouraging them to share their thoughts and questions.
   - Review the title of the poster (Doing Science) and the words on the outside of the circle.
   - Ask the students how they think the words and the circle relate to "doing science." Through discussion, help them realize that doing science involves all of the actions on the circle.
   - Point that the words on the circle do not need to be followed in any particular order. Demonstrate by tracing out a couple of paths.
4. Drop an object. Ask the class if they think gravity makes everything fall at the same rate (some may say yes, some no, it doesn't matter). Now, ask the class how they could test out what they think: to see if they are right, if they're wrong, if they're a little bit right but there's more going on.
5. Go back to "I Wonder" circle to start the students thinking about how they use the steps in the circle to design experiments. (*For example, at "try" they think about design, for "record" they write down what happens, for "discover" they make conclusions about what happened, which often leads to a new "I think" to try out next…)*

Explore

Working as Scientists

1. Divide the class into groups and distribute the materials and recording sheets.
2. Briefly review the recording sheet. Make sure everyone knows where to start (by dropping objects in a designed way and observing how they fall). Each group will probably want one member to record their experiments as they develop and conduct them.
3. Encourage the students to try out several variations with the materials. Trial and error is good. Remind students to be thinking *both* about gravity, and about what experiments *are*.
4. Give the students 10–15 minutes to conduct their explorations and record their results—longer if they are engaged. Circulate as the groups work.

Management Note: You may need to help the groups stay on task, extend their investigations, or record their information. You should also note examples of scientific thinking and processes that you can raise during the reflective discussion.

Reflect and Discuss

Sharing and Synthesizing

1. Bring the class together to share their experiments. Ask them to share both how they went about setting up experiments, and what they learned from their results.

2. Ask the class what kind of gravity experiments they might try next, if they could use any sort of materials or equipment they wanted…

Science Talk

Management Note: The science talk can be conducted during a separate session. Schedule it so that children will have plenty of time to share and discuss their thoughts and ideas.

End with a science talk centered around one or more of the following questions (or one that arose from the class explorations):

- What do scientists do?
- How do scientists get their ideas? What do they do to test out ideas?
- How do scientists make discoveries? How do they prove a discovery is really true?
- What is an experiment?

Use the science talk as an opportunity to elicit the student's ideas about doing science and the role of experiments in science to test out ideas and to make discoveries.

1. You may want to gather the group in an informal circle. It helps if the students can see each others faces. Tell them that they are going to have a "science talk," a discussion among themselves about a science question. Establish the following guidelines for a science talk:
    - This is a time to discuss questions and ideas. There is not just one answer to the question.
    - Participants listen carefully to others, respect each other's ideas, and let everyone have a turn.
    - Students should try to connect their ideas with those of other children (They might agree or disagree with another person's idea, or they may have a related idea or question.)

Notes

A science talk is an open-ended discussion about a science question or topic. In a science talk, the focus is on sharing and exploring Student's ideas and thinking, rather than reaching any "correct" or predetermined conclusions. Science talks are an important component of the Science Companion curriculum.

Notes

Teacher Note: Initially, you may need to help students make these connections. (So your idea is a little bit different than John's, right? How does your idea connect with Sara's? It sounds like you agree with what Lisa said.) As they gain experience, students will begin to make and point out these connections on their own.

2. Pose the science talk question you chose and provide plenty of time for a variety of ideas and responses.
3. After the discussion, you may want to briefly re-cap the main ideas and conclusions of your group. Remember, this is the starting point, as students gain experience with experimentation and experimental design over the course of the science year, their ideas about doing science will expand and change.

Ongoing Learning

Maintenance

- Put the poster of the "I Wonder" circle on the wall in the Science Center. As the class progresses through lessons, encourage students to identify the words that best capture what they are doing now and what they will be doing next.
- Feel free to "customize" the "I Wonder" circle to meet your needs. Among other things, you might:
    - Laminate your poster so you can use dry-erase markers to draw on it, then erase. (This would be handy for marking different pathways through the center of the circle in conjunction with different lessons or activities.)
    - Include additional words generated by your class or emphasized by local standards.
    - Poke a hole in the center of the circle and, using a brad fastener, insert an arrow (like a spinner). Children can then move the arrow so that it points to the word that corresponds to the aspect of science that children are engaged in or talking about.

Extending the Lesson

Further Science Exploration

Invite an experimental scientist from your community to visit your class and talk about what how they "do science."

Art Extension

Students can draw themselves as scientists doing science. Compile these drawings into a class book or a display entitled "We Are Scientists." You might want to exhibit Student's drawings with their observation sheets from this lesson's exploration.

Social Studies Extension

Students can investigate a scientist and their work. As they report their findings, encourage students to make connections to the "I Wonder" circle by highlighting what the scientist wondered, thought, tried, observed, and discovered. Students can do this activity at any point during the year.

NOTES

Name: _____ **Date:** _____

EXPERIMENTING WITH GRAVITY

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