

# Scientific Method Investigation

Designed by Michael Campbell

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## Overview:

This activity is designed to review the scientific method in a multi-step investigation starting with identifying the parts of the scientific method and moving to design an experiment with the scientific method. This is designed for middle/high school science students.

This investigation takes water as the conceptual approach and utilizes the Theory of Multiple Intelligence in hopes of reaching as many students as possible in their learning styles. The activities require students to take active roles in the learning process by incorporating a multimedia analysis of the scientific method, discussion and student designed and tested experiment. It can very easily be modified for a more rigorous lesson or to focus on the properties of water.

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## Standards:

(Maryland Science Goal 1: Skills and Processes)

1. The student will recognize that real problems have more than one solution and decisions to accept one solution over another are made on the basis of many issues. (1.1.1)
2. The student will pose scientific questions and suggest investigative approaches to provide answers to questions. (1.2.x)
3. The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication. (1.4.x)

**Objectives** – At the end of this unit, students will be able to:

- Identify the steps of the Scientific Method
- Design an experiment using the scientific method
- Design charts and/or graphs to collect and analyze data

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## List of Equipment:

- Computer with PowerPoint (recommend version 2007)
- DVD Player
- LCD Projector
- Document Camera (Overhead or Chalk/White Board will also work)

## Materials:

- Plastic Pipette (~1mL) – 1 per student
- Penny Coin – 1 per student
- Cup or Beaker with water– 1 per pair
- Paper towels
- Mythbusters Episode 1: Walk or Run in the Rain
  - <http://store.discovery.com/mythbusters-season-1-dvd-set/detail.php?p=84881>

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**Planning Ahead:** Prior skills and knowledge students will need

Knowledge:

- Some background on the Scientific Method is helpful but not necessary

**Activity Lesson Overview:****I. Time:** 50min Period**II. Lesson Plan:****a. Opening:** (10 min)

1. Begin class with the warm-up on slide 2 of the PowerPoint. Allow a couple of minutes for students to respond on their own and then discuss responses as a class.
2. Lead students toward the idea that problem solving is done every day from this discussion (slide 3 on the PowerPoint). Use questioning such as 'how does weather affect your daily dress' or 'what do you do if you know you'll miss a couple days of school'. Try to get them working through the process of the scientific method without telling them that is what they're doing. When they offer a solution to a question ask them 'what other options they have' and 'why would they choose that approach' to lead them through reasoning.
3. Use slides 4 and 5 to review the scientific method and explain any question for a given step. While doing this, pass out the Scientific Method Investigation handout and prepare your MythBusters DVD (see materials for ordering information).

**b. Development:** (35 min)

1. Go over the handout quickly explaining that the MythBusters are testing the question "is it better to walk or to run in the rain" and that their task is to identify the steps of the scientific method in their experiment.
2. Start the DVD and use the chapters to skip ahead to the "Walk or Run in the Rain" portion of the video. Pause the DVD as you see needed to answer questions or point out interesting parts.
  - Notice, the Research step is often missed by students. During the video the Mythbusters will meet with other scientist who have tested this question and discuss results and process they used.
3. *While the video is playing, make sure the penny lap materials are ready to go.*
4. After the video ends you may need to allow a few moments for students to finish writing their answers then go over the chart.
5. Next move to the experiment design part of the lesson. Leave slide 10 up to help students process through their plans. Planning shouldn't take more than 5 minutes.
  - Pass supplies out during this step.
6. Have students start their test as soon as they are ready.
7. As students finish have them write their final number of drops in an area of the room where the class can see. Students should then complete the analysis/conclusion handout section.

- Give students reminders about remaining time. I recommend at 10 and 5 minutes remaining.

c. **Closing:** (5 min)

1. Review the class data posted and ask questions from the analysis/conclusion section of the handout. Try to focus on why the results varied (differences in experimental design, how water was dropped, side of the coin, etc.) and how they could be made uniform.
2. Assign the remaining question for homework.

**III. Suggested Assessments:**

- a. Informal questioning: try to call on as many students as possible. You may wish to draw names out of a cup or give a reward to participating.
- b. Handout

**IV. Extensions:**

- a. This lesson can easily be extended into two or three 50min sessions. If more time is needed to fit your class dynamics or preferences focus on the video the first day and the penny lab the second day. For an extension, the Mythbusters re-visited the “Walk or Run in the Rain” experiment on Episode 38 and had different results. You could use this video to discuss the importance of reproducible results in experiments for science and then have students work as a class to make a uniform test for the penny lab and retest under specific, class designed procedures.

**V. Related Links/Resources:**

- a. **MythBusters:** <http://dsc.discovery.com/tv/mythbusters/>