

Exploring God's World with Fourth Grade Science

Lesson 1: The Scientific Method

Parents: Only the linked web pages in this course have been previewed; subsequent links on the website pages themselves are not recommended content.

Week 1: Question, Research, and Predict

Week 1 Assignments:

1. Assigned Reading Section 1
2. Worksheet

Week 2: Experiment and Conclude

Week 2 Assignments:

1. Assigned Reading Section 1
2. The Scientific Method Hands-on Lab (optional)
3. Lesson 1 Quiz

Science Detectives Mystery:

What Is the Scientific Method? Part 1

Reading Section 1

What is the scientific method, and why in the world do you need to know about it? I have something big to tell you. You have probably been using the scientific method without even realizing it!

The **scientific method** is a process for experimentation used in science observation to answer scientific questions.

The scientific method is broken down into the following steps:

- Ask a question
- Do background research
- Construct a hypothesis
- Experiment to test your hypothesis
- Analyze data and form a conclusion

Here is a website that has more information about the scientific method:

<https://www.ducksters.com/science/scientificmethod.php>

Step One: Ask a Question

The first step in the scientific process is to ask a scientific question. A scientific question is a question that can be measured through an experiment. Think about questions you have asked that may relate to science. Here are some examples:

Which is heavier, a rock or a cotton ball?

If water is heated, what is the outcome?

There is an endless variety of questions in science! Scientific mysteries can be solved with the scientific process. Step one isn't difficult at all. Just ask a scientific question!

Step Two: Do Background Research

What does it mean to research? When you research, you investigate something. If you were to do research on your favorite animal, you would be gathering information about your favorite animal from different sources. Sources can include books and the Internet.

Next, we're going to conduct research about your favorite animal.

Where can you start researching? You can find information about a topic in books, magazines, and on the Internet. We'll be researching our favorite animals using the Internet.

Assignment

Complete Worksheet 1: *Research Your Favorite Animal*

Step Three: Construct a Hypothesis

A scientific hypothesis is a prediction of what might happen after a scientific experiment. To form a hypothesis, you would find facts from your background research to predict what the results of the experiment will be at conclusion.

Here is an example of a hypothesis when using the steps of the scientific method.

Question: Will water become a solid in the refrigerator?

Background Research:

- Water becomes a solid when it freezes.
- Freezing temperature is 32 degrees Fahrenheit.
- Refrigerator temperatures are commonly between 35 degrees and 40 degrees.

Hypothesis:

Water will not become a solid in the refrigerator.

Next week you'll learn about the final steps in the scientific method and conduct an experiment of your own!

Lesson 1 Vocabulary

Use the reading from this week to complete vocabulary definitions.

Scientific Method

Scientific Question

Research

Hypothesis

SAMPLE

Reading Section 2

Science Detectives Mystery:

What Is the Scientific Method? Part 2

Last week we learned about the first three steps in the scientific method.

- Step One: Ask a Question
- Step Two: Do Background Research
- Step Three: Construct a Hypothesis

This week we're continuing Lesson 1 by learning about the final steps in the process.

Step Four: Experiment

Now that you have asked a question, conducted background research, and formed a hypothesis, it's time for the experiment. An experiment usually consists of three things:

1. **Independent Variables:** These are changes to or around the subject of the experiment. For example, differing amounts of heat, cold, moisture, or light on the specimen.
2. **Control:** This is a specimen that does not have variables that change. The environment it is exposed to is constant.
3. **Dependent Variable:** This is the reaction to the independent variable. If your independent variables for an experiment were to be different temperatures, the dependent variable would be the reaction to each temperature level.

We'll put this step into action at the end of the reading to help you better understand the use of variables.

The experiment step is also when you'll collect data to prove or disprove your hypothesis. In some cases, this is listed as a separate step in the scientific method. There is no right or wrong way to collect data as long as it is factual. You can use notebook paper or a data worksheet so long as the information is valid.

Printable science experiment data worksheet:

<https://www.thoughtco.com/science-report-forms-1832449#step5>

Collect data by keeping notes about your experiment. List your **independent variables** and write down each reaction. Take notes on your **controlled variable** and the difference between the **controlled** and **dependent variable** reactions.

Step Five: Conclusion

Once you have asked a question, performed background research, formed your hypothesis, conducted an experiment, and collected your data, it's time to conclude your research and share your results.

Using your data as a reference, answer your original scientific question using the data and respond to your original hypothesis.

- State your scientific question.
- State whether your hypothesis was correct. Why or why not?
- Explain the experiment and the scientific reactions you observed.
- List important data collected to prove the results of your experiment.
- Conclude with a statement based on facts that answers your original question.
- Share your results with the scientific community.

Are you ready to use the scientific method? Conduct the optional lab: High, Medium, or Low?

High, Medium, or Low?

Lab 1

Please note: This is a very basic experiment to get started with the **scientific method. Please focus on the steps of the experiment to show your child how the scientific method is put into action.*

Supplies

- Sauce Pan
- Water
- Cooktop

Experiment

**Do not conduct this experiment without the help of a grownup.*

Have you ever boiled water on your kitchen cooktop? By now, you already know that water boils over high heat. But can it also boil over medium heat? Will water ever boil on a cooktop using medium heat or low heat? We're about to find out!

Using the Scientific Method-Putting the Steps into Practice

Step One: Ask a question

We would like to know if water boils over cooktop temperatures other than high heat. The first step requires us to form a question. The question for this experiment is:

Can water boil at a medium temperature?

Step Two: Do background research

You're going to need to do some background research about boiling water. Use the Internet as a resource. Here are keywords you can use:

- Water boiling point
- Temperature of boiling water
- Cooktop temperatures

You can also use any other search terms that will help you research.

Write down what you've found during your research.

Step Three: Construct a hypothesis

Use your research to form a prediction about the outcome of your experiment. For this experiment, we have two basic hypotheses:

Water can boil over medium heat.

Or

Water cannot boil over medium heat.

Choose one that is supported by your background research.

Step Four: Experiment

Gather the supplies for your experiment, including your notebook or worksheet for collecting data. We will have an **independent variable** and **dependent variable** for this experiment. Be sure to write down your data from the beginning of the experiment through the end.

Independent Variable: the cooktop temperatures of low, medium, and high

Dependent Variable: the water's reaction to the different temperatures

Control: observation time

Directions

1. Fill a medium saucepan with two cups of water.
2. Place the saucepan on a burner on your cooktop. (control)
3. Turn the burner on and set it to low heat. (independent variable)
4. Observe the water after 10 minutes. (dependent variable)
5. Carefully pour the water out and allow the saucepan and the burner to cool.
6. Repeat steps 1 and 2, using the same saucepan and burner.

7. Turn the burner on and set it to medium heat. (independent variable)
8. Observe the water after 10 minutes. (dependent variable)
9. Repeat steps 5 and 6.
10. Turn the burner on and set it to high heat. (independent variable)
11. Observe the water after 10 minutes. (dependent variable)

Did medium heat bring the water to a boil? What does your data show?

Heating the water on low heat adds a variable to the experiment and shows that the cooktop is heating at a temperature expected for the experiment. Heating water on high during the experiment shows evidence that the water is capable of boiling on the cooktop.

Review your data.

Step Five: Conclusion

Use your data to form a conclusion that answers your scientific question.

- Can water boil over medium heat?
- Show factual support for your conclusion.
- Explain the experiment and cite data collected from the experiment.
- Answer the scientific question.
- Share the results of your study with those around you.

Science Detectives: Research your Favorite Animal

Lesson 1 Worksheet

Use the Internet or books for answers to the following questions about your favorite animal.

1. What does your favorite animal look like? Describe its color, pattern, and size.
2. Where does the animal live?
3. What does the animal eat?
4. List any unique characteristics of your favorite animal you find during your research.

SAMPLE

Lesson 1 Quiz
The Scientific Method

Write the steps of the scientific method in the correct order in the spaces provided below.

Experiment Research Conclusion Question Hypothesis

Step One:

Step Two:

Step Three:

Step Four:

Step Five:

Use reading sections 1 and 2 to check your answers.

SAMPLE

Lesson 1 Quiz: The Scientific Method

Answer Key

Write the steps of the scientific method in the correct order in the spaces provided below.

Experiment Research Conclusion Question Hypothesis

Step One: **Question**

Step Two: **Research**

Step Three: **Hypothesis**

Step Four: **Experiment**

Step Five: **Conclusion**

Use reading sections 1 and 2 to check your answers.