

Lesson 1.1: The Nature of Science

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1	2-3	I can distinguish between observations and inferences.
2	4	I can use the Socratic Quiz as a learning tool to build my notes about observations and inferences.
3	5	I can use observations to make inferences while demonstrating that science is a collaborative enterprise.
4	6	I can explain how the "Mystery Boxes Activity" was a model for the nature of science by describing model strengths.
5	7-9	I can write a critique that explains how the "Mystery Boxes Activity" was a model for the nature of science.

Task 1 Learning Target: I can distinguish between observations and inferences.

Directions: Take notes on the topic by completing the guided note sheet. See the next page for informational text.

1. Qualitative observations: *Define

****SKIP LINES/LEAVE SPACE FOR ADDITIONAL NOTES

- A. Example: The chameleon changes from brown to green.
- B. Example: *Give an example

****SKIP LINES/LEAVE SPACE FOR ADDITIONAL EXAMPLES

2. Quantitative observations: data involving _____ (usually requires scientific instruments such as a ruler, _____, etc.)

****SKIP LINES/LEAVE SPACE FOR ADDITIONAL NOTES

- A. Example: The chameleon is 5 inches long.
- B. Example: *Give an example

****SKIP LINES/LEAVE SPACE FOR ADDITIONAL EXAMPLES

3. Inferences: *Define

****SKIP LINES/LEAVE SPACE FOR ADDITIONAL NOTES

- A. Example: The chameleon changed color because the temperature increased.
- B. Example: *Give an example

****SKIP LINES/LEAVE SPACE FOR ADDITIONAL EXAMPLES

Task 1 Informational Text: Observations and Inferences

Jane Goodall has spent countless hours among the chimpanzees—quietly following them, taking notes, and carefully observing. Observing means using one or more of your senses to gather information. Your senses include sight, hearing, touch, taste, and smell. By using her senses, Jane learned what chimpanzees eat, what sounds they make, and even what games they play! During her time in Gombe, Jane made many surprising observations. For example, she observed how chimpanzees use sticks or long blades of grass as tools to “fish” out a tasty meal from termite mounds.



FIGURE 1 Observing: By patiently observing chimpanzees, Jane Goodall learned many things about chimpanzee behavior.

Like Jane, you use your senses to gather information. Look around you. What do you see? What do you hear and smell? You depend on your observations to help you make decisions throughout the day. For example, if it feels chilly when you wake up, you'll probably dress warmly.

Observations can be either quantitative or qualitative.

Quantitative observations deal with a number, or amount. Seeing that you have eight new e-mails in your inbox is a quantitative observation.

Qualitative observations, on the other hand, deal with descriptions that cannot be expressed in numbers. Noticing that a bike is blue or that a grape tastes sour are qualitative observations.

One day, Jane Goodall saw something peculiar. She watched as a chimpanzee peered into a hollow in a tree. The chimp picked off a handful of leaves from the tree and chewed on them. Then it took the leaves out of its mouth and pushed them into the tree hollow. When the chimp pulled the leaves back out, Jane saw the gleam of water. The chimp then put the wet leaves back in its mouth.

What was the chimpanzee doing? Jane reasoned that the chimpanzee might be using the chewed leaves like a sponge to soak up water. Seeing the chimp chew on leaves, put them in the hollow, and then squeeze the liquid out is an example of an observation. But Jane went beyond simply observing when she reasoned why the chimpanzee was doing these things. When you explain or interpret the things you observe, you are **inferring**, or making an inference.

Making an inference doesn't mean guessing wildly. Inferences are based on reasoning from what you already know. Jane knew that chimpanzees, like all other animals, need water, and that rainwater collects in tree hollows. She reasoned that the chimp was using chewed leaves to get the water out of the tree.

You, too, make inferences all the time. Because your brain processes observations and other information so quickly, you may not even realize when you have made an inference. For example, if you see your friend smile after getting back an exam, you might automatically infer that she got a good grade. Inferences are not always correct, however. Your friend's smile might not have anything to do with the test.

Task 2 Learning Target: I can use the Socrative Quiz as a learning tool to build my notes about observations and inferences.

1. Watch the Gas Testing Video Resource: <https://www.youtube.com/watch?v=tyhWF1EYtok>

2. Take the Socrative Quiz.

For each question you struggle with or get wrong, summarize the question and note key vocabulary.

Task 3 Learning Target: I can use observations to make inferences while demonstrating that science is a collaborative enterprise.

1. Make a notebook sheet like pictured:

Learning Target: I can...	
Box 1	Box 5
Box 2	Box 6
I hear... I smell...	
Golf Ball	
Box 3	Box 7
Box 4	Box 8



Hint: Use your senses to make observations.

2. Work in groups to make and record (qualitative and quantitative) observations about objects inside sealed boxes. Use your observations to make an inference/conclusion about what objects are in the sealed boxes. Circle your inferences.

3. Copy and complete the following sentences using key (sensory) details.

- a. In today's mystery box activity, my group and I _____.
- b. Many skills, approaches and attitudes helped me to reach my _____.
- c. Qualitative observations were most helpful for Box # _____ because _____.
- d. Quantitative observations were most helpful for Box # _____ because _____.
- e. Working collaboratively helped me because..._____.
- f. Curiosity helped me to think scientifically because..._____.
- g. Creativity helped me to think scientifically because.... _____.
- h. My prior knowledge/ past experiences were most helpful for Box # _____ because _____.

Task 4 Learning Target: I can explain how the "Mystery Boxes Activity" was a model for the nature of science by describing model strengths.

1. Copy and define the following vocabulary words as they may relate to science-
 1. Model:
 2. Strength:
 3. Consensus:

2. We will have a Science Conference by sharing our observations and inferences in order to reach a consensus as to what was in each mystery box.

3. For each statement, describe if it is a model strength. Explain why or why not...

HINT: If the part represents what scientists do, then it is model strength. The more strengths a model has, the more accurate it is for representing what it is supposed to represent.

 - a) We used observations to make inferences.
 - b) We worked collaboratively and received good ideas from our colleagues.
 - c) We formed a conference.
 - d) We reached a consensus on one or more boxes, but not on all.
 - e) We ran out of time. We did not get to explore all of the boxes.
 - f) We did not get to "open the boxes."

4. Check Your Understanding: How was the "Mystery Boxes Activity" a model for the nature of science?
 - ✓ We used observations to make inferences. If scientists also do this, it is a strength.
 - ✓ We worked collaboratively and received good ideas from our colleagues. If this also happens to scientists, it is a strength.
 - ✓ We formed a conference. If this also happens in science, it is a strength.
 - ✓ We reached a consensus on one or more boxes, but not on all. If this also happens in science, it is a strength.
 - ✓ We ran out of time. We did not get to explore all of the boxes. If this also happens to scientists, it is a strength.
 - ✓ We did not get to "open the boxes." If this also happens in science, it is a strength.

Task 5 Learning Target: I can write a critique that explains how the "Mystery Boxes Activity" was a model for the nature of science.

Critique: How was the “mystery boxes” activity an effective model for the way that scientists study the natural world?

Introduction

- ✓ Briefly describe the activity (in 3-4 sentences):
 - What did you do? (small group and science conference)
- ✓ Establish a thesis statement:
 - The “mystery boxes” activity was an effective model for _____.
- ✓ Your word choice should encourage readers to continue reading.

Body

- ✓ Provide evidence for your thesis:
 - Describe the activity in greater detail. (small group and science conference)
 - What were the strengths to the model?
 - What skills, approaches and attitudes did you use to reach your conclusions? Do scientists also use these skills? Provide examples.

Conclusion

- ✓ Restate your thesis in a different way:
 - Through this activity, I was better able to understand how _____.
- ✓ Leave off with a fresh idea:
 - How did the activity also address the limits of science?

Words and Phrases To Use and Define in Your Writing

collaboration	inference	quantitative observation
consensus	limits of science	qualitative observation

	3	2	1
Introduction and Thesis (CCLS ELA.W.7.1A)	Clearly and interestingly introduces a topic in a manner that follows from the task and purpose.	Introduce a topic in a manner that follows generally from the task and purpose.	Introduce a topic in a manner that does not logically follow from the task and purpose.
Support of Topic (CCLS ELA.W.7.1B)	Relevant, telling, quality details give the reader important information that supports the thesis.	Supporting details and information are relevant, but key issues or portions are unsupported. There is a need for more supporting details.	Supporting details and information are typically unclear or not related to the topic.
Conclusion (CCLS ELA.W.7.1E)	The conclusion clearly and interestingly follows from the topic and information presented.	The conclusion follows generally from the topic and information presented.	The conclusion is illogical or unrelated to the topic and information presented.
Domain Specific Vocabulary (CCLS ELA.W.7.2D)	Exhibits skillful use of vocabulary that is precise and purposeful. All domain specific vocabulary words are used correctly and thoroughly.	Exhibits reasonable use of vocabulary that is precise and purposeful. Few vocabulary words are missing and/or are not used correctly/thoroughly.	Lacks use of vocabulary that is precise and purposeful. Several vocabulary words are missing and/or are not used correctly/thoroughly.
Control of Conventions (CCLS ELA.W.2)	Demonstrates grade-appropriate command of conventions, with few errors that do not hinder comprehension.	Demonstrates emerging command of conventions, with some errors that may hinder comprehension.	Demonstrates a lack of command of conventions, with frequent errors that hinder comprehension.

NAME:

Mystery Boxes Model

Introduction

Hook: _____

Introduce activity and materials: _____

Thesis Statement: _____

Body Paragraph 1

Describe the “observation” activity:

Describe the “conference:”

Body Paragraph 2

Describe strengths to the model:

What skills, approaches and attitudes did you use to reach your conclusions? Do scientists also use these skills? Provide examples.

Conclusion

Restate thesis:

Restate 1 main point from each body paragraph:

Conclude with a fresh idea (How did the activity also address the limits of science?):
