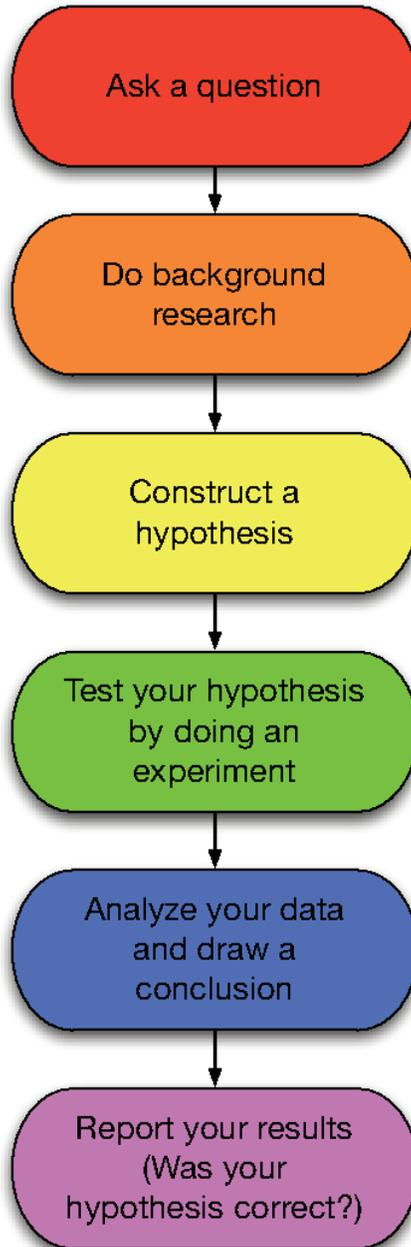


# THINK LIKE A SCIENTIST!

## Formation and Revision of Hypotheses

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### The Scientific Method



# Tennessee 4-H Youth Development

## *Think Like a Scientist!*

### *Formation and Revision of Hypotheses*

#### **Skill Level**

Beginner

#### **Learner Outcomes**

*The learner will be able to:*

- Use reasoning and problem-solving skills.
- Reformulate ideas based on newfound knowledge.
- Describe aspects of the nature of science
- Draw real-world connections to science

#### **Educational Standard(s) Supported**

4.ETS.2.3: Explain how engineers have improved existing technologies to increase their benefits, to decrease known risks and to meet societal demands (artificial limbs, seatbelts, cell phones).

5.ETS.2.3: Identify how scientific discoveries lead to new and improved technologies.

#### **Success Indicator**

*Learners will be successful if they:*

Successfully work in groups to form a hypothesis

#### **Time Needed**

20 Minutes

#### **Materials List**

- Activity Sheet
- 12 words that form a sentence
- Whiteboard
- Dry erase markers

#### **Introduction to Content**

This activity will teach ideas about the nature of science. It contains no specific science content knowledge. Students gather information and work towards a closer approximation of a sentence. There is built-in ambiguity and several answers are possible.

#### **Introduction to Methodology**

Despite the artificiality of this activity, some aspects of the experience closely resemble real-life science. It can be used to teach students about the self-correcting nature of science, the tentative nature of scientific knowledge, and science as an ongoing endeavor. For example, as the students are given new words, they will change their ideas of what the story may be about.

The parallel here to the way science works is that scientists will change their ideas, explanations, hypotheses or theories as they gather more information.

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## Terms and Concepts Introduction

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**Scientific Method** — The rules and procedures for the pursuit of knowledge involving the finding and stating of a problem, the collection of facts through observation and experiment, and the making and testing of ideas that need to be proven right or wrong.

**Scientist** — A person who is trained in a science and whose job involves doing research or solving problems.

**Hypothesis** — An idea or theory that is not proven, but leads to further study.

## Setting the Stage and Opening Questions

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*Say, “Today, you are going to be scientists. An ancient tablet has been found in the desert with words preserved on it. However, that tablet has broken into pieces. The scientists digging at the site are able to only excavate a few pieces at a time. What does the tablet say? Scientists all over the world are trying to decipher the ancient text.”*

*Have the students identify the steps of the scientific method.*

*Discuss with the students this question: “What do each of these steps mean and what makes each step unique?”*

## Experience

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- Divide class into groups of four to six students. Each group will be scientists from different parts of the world.
- Pass out one “Think Like a Scientist Activity Sheet” to each group.
- *Say to the class, “I have 12 words that form one long sentence found on the ancient tablet. The goal will be for each group of scientists to form the correct sentence from the words that have been found.”*
- Ask a volunteer to choose four cards at random from your word list. Display those words on the board. Have each group work cooperatively and write what they think the ancient text says on their worksheet (Hypothesis 1). This must be a 12-word sentence using only the four words drawn. *After they have done this, ask them, “Would it would help to have more information?”* They will, of course, answer yes.
- Have another volunteer choose four more words. Have each group work cooperatively to record their new 12-word sentence on the worksheet (Hypothesis 2) using the eight words they have been given. *After they have done this, ask them, “Did your idea of the sentence change with more information?”* Discuss briefly. Does everyone have the same hypothesis so far? Why or Why not? Discuss the possible reasons why groups have different answers. Ask them how this might be similar to a scientist in the laboratory or a paleontologist digging up ancient bones. (Scientists may not have all the information.) Ask why scientists might not agree on explanations of things. (Scientists may have different information or interpret things differently.)
- Have a final volunteer choose the final four words. Each group will use the 12 words given to synthesize the final sentence found on the ancient tablet. (Hypothesis 3).
- Allow groups to share with the class what they think the ancient text says. Chances are that the groups will still not have exactly the same sentences. Ask why they didn't. Ask why scientists may not have the same explanations for things even though they may have exactly the same information. (They may have come with different background information or interpret the same information differently.)
- Ask students to describe real-world examples of how scientists once thought something was correct based on the evidence they had, but today new evidence has shown that something else is correct. Examples include the world was once flat; the sun went around the Earth; that a man could never walk on the moon; etc.
- Finish the activity by revealing the correct sentence and comparing it to each group's results.

## Tips for Engagement

Children are more engaged by using their imagination. This is why this activity works so well. Students enjoy “imagining they are a scientist” too. Students also enjoy the competitiveness of this lesson, as they see which group will correctly figure out the ancient text.

Make sure to take time to set the “stage” at the beginning of the activity to engage the students' imaginations.

## Share

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Ask the students: “*What were each of your hypotheses?*”

## Process

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- *Take a poll of students using the following prompt:* “Did your hypothesis change with new information?”
- Lead students in a discussion as to why are all of their sentences were different.

## Generalize

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*Have the students discuss the following question:* “Why might scientists not agree on a conclusion for a problem even though they all have the same information?”

## Apply

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- Have students brainstorm how this activity applies to real-life scenarios that scientists face.
- *Have students respond to this:* “Do scientists often face the same issues that you did today?”

### Life Skill(s) from TIPP's for 4-H

#### 4<sup>th</sup> Grade

Participate in 4-H club meetings by saying pledges, completing activities and being engaged. (Head Thinking)

Follow instructions. (Heart)

Gather relevant information for decision-making. (Hands)

#### 5<sup>th</sup> Grade

Participate in 4-H club meetings by saying pledges, completing activities and being engaged. (Head)

Speak clearly and effectively in group settings. (Hands)

## References

Al Janulaw and Judy Scotchmoor. *Dog and Turnip Activity*. The University of California Museum of Paleontology. Retrieved July 20, 2015. [www.ucmp.berkeley.edu/education/dynamic/session4/sess4\\_act1.htm](http://www.ucmp.berkeley.edu/education/dynamic/session4/sess4_act1.htm)  
Liz LaRosa. *D & T Activity*. Retrieved July 16, 2015. <http://middleschoolscience.com/2015/02/16/dogs-and-turnips-dt-activity/>

***Supplemental Information***  
***Think Like a Scientist***

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*Below is a sample sentence that can be used with this activity. Any sentence with 12 words that has a variety of word arrangements can be used as well.*

**4-H  
is  
a  
community  
of  
youth  
learning  
leadership,  
citizenship  
and  
life  
skills.**

# Think Like a Scientist!

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### Supplemental Material

# Think like a Scientist Activity



1. Four words will be chosen each round.
2. Write the words in the box to your left below.
3. Using only the words given during each round, what do you think the 12-word sentence is?

<b>Words</b>	<b>Hypothesis # 1:</b>
	<b>Hypothesis # 2:</b>
	<b>Final Hypothesis</b>

Discussion: Share your group's final hypothesis with the class.

- Did your hypothesis change with the addition of new information?
- Was your group's hypothesis similar or different to the others?
- Did all the groups come to the same conclusion? Why or why not?
- Do you think scientists formulate the same explanations or conclusions even when given exactly the same information? Explain.