

Soil Science Curriculum

Content and lab derived from the USDA-NRCS Guides for Educators. Go to www.nrcs.usda.gov/soils for the Guides and additional pictures and diagrams. This lesson plan was adapted for South Dakota from the University of Nebraska Institute of Agriculture and Natural Resources, CROPWATCH.

January 2018

The Scientific Method

Approximately 60 minutes

Objectives

By the end of the lesson, students will know or be able to:

- List and describe the steps and details of the scientific method
- Build an experiment using the scientific procedure
- Conduct an experiment using the scientific procedure

Preparatory Work

- Review the www.sciencebuddies.org web site to review the process students will go through to identify an experiment

Materials

- One Guided Notes packet for each student
- Projector
- One computer with internet access per student

Enroll the Participants *(Approximately 3 minutes)*

Post the following task so that it is visible to all students as they enter the classroom:

Consider your career goals. Identify which of the following six pathways best fits your ideal career.

Animal Systems
Environmental Services/Natural Resources Systems
Food Products and Processing Systems
Plant Systems
Power, Structural and Technical Systems
Social Systems

Write down your career goal, which pathway best relates to it, and a question you have about the career.

Upon student completion of the task, discuss the following information with the class:

The pathways listed are the six pathways available through the Agriculture, Food and Natural Resources Career Cluster.

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The pathways are also the six categories for the FFA Agriscience Fair (if time permits, you could play the promotional video found under the Agriscience Fair tab at www.ffa.org.)

Because we are in a constant state of new information being generated in our world, students' careers will look much differently than careers in the past have looked – we will constantly be asking questions and seeking answers.

Often times we may be asked to research a topic or contribute to a larger project using researched data.

During this lesson, we will explore the scientific method and create and conduct our own experiment.

Provide the Experience – List and Describe the Steps and Details of the Scientific Method *(Approximately 30 minutes)*

Provide students with their Guided Notes packet and direct them to the web site www.sciencebuddies.org to complete their Guided Notes and to identify an experiment. Explore the web site prior to sending students to the web site so that you may provide guidance specifically around the topic selection.

Label the Information *(Times varies)*

Students complete their Guided Notes to learn the key parts of the scientific method.

Demonstrate the Relevance *(Time varies)*

Students identify their experiment topic and seek approval from the teacher. Following topic approval, students use their guided notes to design their experiment, and after approval is received from the teacher, begin conducting their experiment.

Review the Content *(Time varies)*

At the conclusion of the experiments, direct students to report their results to the class or to another pertinent group.

Celebrate Student Success *(Time varies)*

Take time throughout the duration of the experiment design and implementation to commend students for their efforts and independent work. After students share their results with their classmates, consider presenting each student with their own “Super Scientist” award.

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Guided Notes

Congratulations on learning all that you have about soil science thus far in the unit. As you approach the end of the unit, you will have the chance to engage in many different experiments, depending on the time available for your class. During this lesson, we will explore the scientific method and you will design and conduct your very own short experiment in preparation for more soil science experiments. Follow these simple steps to begin:

1. Log on to www.sciencebuddies.org.
2. Click on the orange "Project Guide" tab at the top of the page.
3. Click on the "Scientific Method" link.

Use the information found on the web site to complete the following tasks and questions:

1. What type of relationships are explored by scientists during experiments and research?

2. List the six steps of the scientific method:

3. What words might start our questions about observations we make in the world around us?

4. When we identify the question we want to ask at the start of an experiment, what characteristics must we ensure the question has?

5. What six guiding questions can we use during our background research?

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6. What is a model for writing a hypothesis?

7. A hypothesis must be _____, must answer the _____ and we must identify the variables. What are variables and how many variables should change at one time?

8. How do we ensure that we conduct a fair experiment?

9. If our hypothesis is proven incorrect, what is our next step?

10. If our hypothesis is proven correct once, what might we do next to ensure that the hypothesis is indeed correct?

11. List three ways we can communicate the results of an experiment.

Now that we know some basic information about the scientific method, start the process of constructing your experiment.

1. Click on the "Your Question" link under the section labeled "Ask a Question."
2. Click on "The Topic Selection Wizard" link."
3. Begin and complete the process of identifying your experiment topic by filling in the Wizard form and answering the questions that follow.
4. Identify your topic from the list provided (or come up with your own, using that list as a guide) and write it here:

5. Get your topic approved by your teacher.
6. Use the following form to construct your experiment.
7. Seek approval from your teacher of your experiment plans.
8. Begin your experiment using the scientific method.

The Scientific Method

Scientific Method Step	
What is the question?	
What sources are you using for the background research? Attach your research to this document.	
What is your hypothesis?	
How will you test your hypothesis? What supplies will you need? How much time will the experiment take? Who will be involved? What expenses might exist? Where will you conduct the experiment? How will you ensure safety during the process? Why did you choose this experiment? What are the variables? What type of environment is needed? Attach the larger plan to this document if needed.	
What data will/did you gather during the experiment? How will you organize the data? What conclusion(s) can you draw from the data?	
What are the results of your experiment?	