Science

Content Area: **Science**
Course(s): **Science 4**
Time Period: **Trimester 1**
Length: **15 Days**
Status: **Published**

Unit Overview

In this unit students learn about the role of the scientist and about the scientific method.

Essential Questions

What is science?

What questions do scientists ask?

How do scientists use tools?

How do scientists answer questions?

How do scientists draw conclusions?

Content

Scientists ask questions about what they observe in the natural world.

Scientists use tools to measure objects, gather information and stay safe.

Scientists answer questions by using the scientific method.

Scientists use data to draw conclusions.

Skills

Describe questions scientists ask and explain how scientists find answers to their questions.

Identify tools that scientists use and explain how to properly and safely use these tools.

Describe different scientific methods scientists use to answer questions.

Explain how scientists keep records in order to share conclusions with other scientists.

Assessments

"Tools Needed for Experimentation" Student- Made Catalog

Gummy Bear Experiment Following the Scientific Method

Scientific Method Take Home Project

Student Scientific Method Performance Based Assessment

Vocabulary Word Card

Application of Content Knowledge Assessment

Lessons/Learning Scenarios

Lesson 1: What is science? What questions does a scientist ask? (Intro/Lesson 1)

What is science (introduction)?

- Students will work in six groups of four and talk about what science is. Each group member will write group thoughts on an oversized post it. Give students five minutes for this activity.
    - After five minutes, students will join a new group and share thoughts. If they have any same thoughts as a new group member then highlight it. Discuss if member thoughts are applicable to the topic- do they make sense as to what science is. While in this group they will write down any thoughts they feel are good ideas that they would want to bring back to their original group.
    - Report back to original group.
    - Discuss as a whole group.

Questions a scientist would ask…

- Transition lesson- we know what science is but how do we know what we know about science today… a scientist had to ask a question.
    - Students give synonyms for words meaning to ask a question.
    - Show students Pearson Successnet Chapter 1 video on "inquiry".
    - Break students up into small groups and give them a set of questions. Students will work together in the group to decide if it is a type of questions a scientist would ask or not.
        - Students will be given role cards to make sure everyone participates.
            - Role 1: Read the question
            - Role 2: State whether you believe it is a question a scientist would ask or not.
            - Role 3: Write on a post it note (to stick on the back of the question) peer's reasoning if it is a question a scientist would ask or not.
            - Role 4 (if needed): stick in pile of question vs. non question a scientist would ask.
            - Discuss together as a whole group, calling on random members from each group.
            - Think-Pair-Share: After a scientist asks a question… what happens next? Investigation. Discuss what other professions do investigations and how that

field connects or brings in science.

*Materials for this lesson: Oversized post it notes, Pencils, Pearson SuccessNet, Laptop, Projector, Highlighter, Question cards for each group, Post it notes for each question card

Lesson 2: What questions does a scientist ask? How do scientists use tools? (Lesson 1 Continued and Lesson 2)

- Review what inquiry is and what an investigation is.
- Observing rocks activity- set purpose for activity… to conclude why keeping records are important to the scientific community.
    - Stations will be set up around the room with different rocks and hand lens. Paper will be out next to each rock with an assortment of different colored markers. Students will make observations pertaining to four different rocks and write their observations on the supplied paper, writing in a different colored marker than the previous peer wrote in. Students will only be given two minutes per rock to observe. Students will also examine what peers have written.
    - After allotted time, put some observations under the LUNA and examine what students have written. Students analyze the purpose of the activity: Think-Pair-Share their thoughts.
        - Discuss why keeping records is so important for scientists to share thoughts and now have to reinvent the wheel and see if their information is valid and how it compares to other scientists observations.
        - Discuss research process and why that is important and how it leads into experimentation.
            - Intro tools needed for experimentation catalog project
                - Project details: Students will be partnered up and will research four tools a scientist would use for experimentation. After four tools have been identified, each student in the pair will be responsible for two apiece. Students will write a catalog description (using sensory words/adjectives) for the object. Students will set reasonably determined prices for objects and state what other profession these tools would be beneficial for. Students will write their name under their tool for grading purposes. After the information has been collected, students may use Microsoft Publisher or PowerPoint to create a "catalog" of items.
                - Before students start project: review how to research and proper terms to use and how to determine reasonable prices for items. Also, show sample project and review rubric for grading, as well as sample catalogs to view.
                - Students will then begin research.

*Materials: Rocks, Hand lens, Paper, Various Colored Markers, Laptop, Projector, LUNA, Catalog Project Materials, Sample Catalogs, Laptop Cart

Lesson 3: How do scientists use tools? (Lesson 2 continued)

- Students will finish any research needed.
- Students will independently write their catalog descriptions using writing resources.
    - Conference with teachers as needed

- Students will work together to create catalog.

*Materials: Student Notes, Pencils, Laptop Cart, Writing References

Lesson 4: How do scientists use tools? (Lesson 2 continued)

- Students will finish working together to create and print catalog.
- Think-Pair-Share: What are the main ideas that we have learned in science that are important for us to know?
  - Discuss as group
  - Students will take notes on the "scientist" graphic organizer to use as a reference sheet when preparing for the test (will be used as a study guide)

*Materials: Laptop Cart, "Scientist" Graphic Organizer, Pencils, Laptop, Projector, LUNA, Pen

Lesson 5: How do scientists answer questions? (Lesson 3)

- Discuss in small groups- once scientists decide they are going to complete an experiment pertaining to their question, what do they do then? What method or system would they use to carry out the experiment?Develop one common question (Do gummy bears change size when placed in different kinds of liquid solutions?)
  - Teachers walk around and listen to conversation.
    - Teachers report out to whole group what they have heard.
    - View Safari Montage Video "Real World Science: The Scientific Method" (runs 18 minutes 18 seconds long).
      - Model to students how to take notes on a video and why note taking is important.
      - Discuss video and decide how to consolidate down the scientific method into a way that is easy to remember.
        - Teach students "The Scientific Method Rap" (found on Pinterest)
        - Begin "Gummy Bear Science" experiment to explore the scientific method in small groups but yet guided whole group setting.
          - Students will be put in mixed ability level groups (ideally groups of four)
          - Groups will be given four different colored gummy bears and students will make observations pertaining to the gummy bears (each student in the group will be responsible for giving at least one observation) to be stated on the guideline sheet.
          - Discuss in small group what questions a person could develop based on their observations with the gummy bears
            - Teachers listen to group discussion and report out to whole group.
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- Students will discuss in their group and develop a hypothesis through making a connection as their support. Each student in the group can have a different hypothesis.
- Discuss independent and control variables pertaining to the experiment.Review ruler and measuring
  - Label cups

    - Measuring utensils
    - Same brand of liquids and gummy bears for each group
    - Each group putting same colored gummy bear in each type of liquid
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- Students in each group will split into two smaller groups, based on self assessed strengths. Two students will label the cups and measure in the liquid solutions in each cup. Two students will measure the original length of the gummy bears.
- Whole group will take note of physical description of gummy bears using writing references- sensory words/adjectives list.
- Students drop gummy bears in liquid solutions and take note of what time they gummy bears were dropped.
- Lesson closing- why is it important to note the time the gummy bears were dropped in the liquid solution?

*Materials: Laptop, Projector, Safari Montage, Paper, Pencils, Gummy Bear Science Experiment Materials, Graphic Organizer for Experiment, LUNA, Writer's References

Lesson 6: How do scientists answer questions? How do scientists draw conclusions? (Lesson 3 continued/Lesson 4)

- Review what scientists write in their "procedure" section of their documents and how crucial it is to write exact amounts and exact time durations of the experiment, as well colors that were put in different liquid solutions.
    - Inquire why all of this is important- so others can repeat the experiment in the exact manner.
    - Write together the procedure we have done thus far for this experiment.
    - Students take gummy bears out of liquid solutions (noting time duration on procedure sheet) and each student is responsible for measuring one gummy bear. They should switch with a partner and measure their partner's as an accurate measurement technique.
    - Students will note on graphic organizer the length of gummy bear during the second day (emphasize they are measuring length, not width) and finding the change in length.
        - Discuss whether this would be addition or subtraction to find the change in length.
        - Students will note the physical description of the gummy bear now.
        - Model to students how to organize their data in a way that it would be understandable and beneficial to themselves and other scientists.
        - Model to students how to make a double bar graph in Excel to chart the length of each of the gummy bears on day one and day two (students will also make the chart as they are subdivided down to pairs within their groups) and print to attach onto sheet.
        - Students will also choose a method to present their visual observations over the two days.
        - Lesson closing- what do scientists do with this data after they collected it?

Lesson 7: How do scientists answer questions? How do scientists draw conclusions? (Lesson 3 continued/Lesson 4)

- Model to students how to share results with other scientists.
- Each group will split into two sub groups and share their results with two other sub group populations. Students will record results that the other scientists have gathered from their experiments.
- Students report back to their groups the data that they have learned from the other groups.
- Determine why other scientists results are important and why the experiment should be repeated (to see if results are far off from what you arrived at, maybe there was a mistake that happened in the experiment, etc.)
- Students will work in their lab groups to form a conclusion based on their own particular data and to state whether their hypothesis was correct or not.
- Students fill in their "scientists" graphic organizer of main chapter points (they have started this in Lesson 4).
- Review student take home project in reference to the scientific method.

*Materials: Lab Graphic Organizer, Post It Notes, Pencils, Take Home Project Directions, LUNA, Laptop, Projector

Lesson 8: Carrying Out An Experiment (Encompasses all lessons but especially Lessons 3 and 4)

- Students view Safari Montage: Bill Nye: Do-It-Your-Self-Science (runs 22 minutes 59 seconds in length) to have another exposure of how science experiments are done and to observe safety methods scientists use when conducting experiments.
- Discuss safety methods scientists use when completing a science lab.
- Introduce student experimentation performance assessment: Students will have a choice of four different science experiments. Students will choose which experiment s/he would like to partake in and from there, teachers will pair students according to level (same level grouping). This will be a performance assessment which will constitute the "test grade" for this chapter. Teacher will observe and be given lab graphic organizers to complete independently with his/her partner.
    - Choice 1: Dissolving M&M- idea for graph- time how long each color takes to dissolve the "M" off (Pinterest)
    - Choice 2: Dancing Raisins- idea for graph- use two or three different brands of raisins and graph time it takes to start "dancing" (Pinterest)
    - Choice 3: How Many Paperclips Can Fit in a Full Glass of Water? (Pinterest)
    - Choice 4: Sinking Abilities- idea for graph- graph time it takes to sink (Pinterest)
    - Students will make pre experiment observations and document the experiment question on the lab form. Students will also make his/her hypothesis in accordance to the question. They will also complete any prep work needed before they actually conduct the experiment tomorrow.

*Materials: Laptop, Projector, Safari Montage, Generic Lab Form, Pencils, Paper, Lab Materials

Lesson 9: Carrying Out An Experiment- Continued (Encompasses all lessons but especially Lessons 3 and 4)

Students will complete science experiment and complete lab analysis on lab report form.

*Materials: Generic Lab Form, Pencils, Lab Materials, Laptop Cart

Lesson 10: Carrying Out An Experiment- Continued (Encompasses all lessons but especially Lessons 3 and 4)

Students will complete lab analysis on lab report form.

*Materials: Generic Lab Form, Pencils, Lab Materials, Laptop Cart

Lesson 11: Word Card Vocabulary Review For Chapter 1 (Encompasses all lessons)

- Students will be given one of the following Chapter 1 vocabulary words: inquiry, investigation, tool, scientific method, hypothesis, evidence, procedure, inference; to use as the word on their "word card" (that will be put on an oversized index card). This will be counted as a grade!
- With this card, the students will have to complete the following tasks…
    - Illustrate/Provide a visual for the word
    - Finish the sentence stem pertaining to the word that requires the student to use the meaning in context correctly
    - Provide dictionary spelling
    - Articulate part of speech
    - Provide definition of the word
    - Find the word in a source other than the dictionary (could be textbook or have them search it on the computer)
    - Provide synonym for the word

*Materials: Science Textbook, Oversized Index Cards With Sentence Stem Already On It, Pencils, Crayons/Colored Pencils, Dictionary/Thesaurus, Laptop Cart?

Lesson 12: Knowledge Application Assessment Component (Encompasses all lessons)

- Student will take a written application of concepts assessment pertaining to this chapter.

*Materials: Pencils, Assessment

Lessons 13 and 14: Scientific Method Take Home Project Presentation (Encompasses all lessons)

- Students will present their projects to the class and tell about the following concepts:
    - Materials
    - Hypothesis
    - Independent and Controlled Variables
    - Procedure
    - Data Analysis
    - Conclusion
    - While each student is presenting, their peers will have post it notes to write down any questions

they have, pertaining to the project, to ask the presenter at the conclusion of the presentation.

*Materials: Student Projects, LUNA, Laptop, Projector, Grading Rubric

Standards

SCI.3-4.5.1.4.A.1	Demonstrate understanding of the interrelationships among fundamental concepts in the physical, life, and Earth systems sciences.
SCI.3-4.5.1.4.A.2	Use outcomes of investigations to build and refine questions, models, and explanations.
SCI.3-4.5.1.4.A.3	Use scientific facts, measurements, observations, and patterns in nature to build and critique scientific arguments.
SCI.3-4.5.1.4.B.1	Design and follow simple plans using systematic observations to explore questions and predictions.
SCI.3-4.5.1.4.B.2	Measure, gather, evaluate, and share evidence using tools and technologies.
SCI.3-4.5.1.4.B.3	Formulate explanations from evidence.
SCI.3-4.5.1.4.B.4	Communicate and justify explanations with reasonable and logical arguments.
SCI.3-4.5.1.4.C.1	Monitor and reflect on one's own knowledge regarding how ideas change over time.
SCI.3-4.5.1.4.C.2	Revise predictions or explanations on the basis of learning new information.
SCI.3-4.5.1.4.D.1	Actively participate in discussions about student data, questions, and understandings.
SCI.3-4.5.1.4.D.2	Work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories.
SCI.3-4.5.1.4.D.3	Demonstrate how to safely use tools, instruments, and supplies.

Resources

Pearson SuccessNet

Question cards for each group

Rocks

Hand lens

Catalog Project Materials

Sample Catalogs

"Scientist" Graphic Organizer

Safari Montage

Gummy Bear Science Experiment Materials

Graphic Organizer for Experiment

Take Home Project Directions

Generic Lab Form