Cincinnati Public Schools

Remote Learning Plan

Grade 7

SCPA - 7 Science Moraga

Week 8- Science Inquiry

Student Name_____ Bell _____

Weekly Outcomes:

- **Learning Outcome - Week 8: Scientific Inquiry- Conduct an scientific investigation**
- **Directions** - Do your Reading and Questions for the week. Then select and complete activities from the menu for that week. **OR** or go one Schoology
- **Task** - Complete Reading Comprehension and the Read and Respond Non Fiction for the week and 100 points worth of work from the menu **for the week.**
- **How do I know if my work is good?**
    - Information is accurate.
    - All parts of the question are answered completely.
    - Work is detailed and completes the required task.
    - If applicable, work is colorful and visually appealing.
- **What if I need help?**
    - Visit www.discoveryeducation.com and read the Engage and Explore tabs for the following lessons (Do this through Schoology on the left hand side bar)
        - 1.1 Using Scientific Method
    - Visit http://studyjams.scholastic.com/studyjams/jams/science/index.htm and explore the slide shows/videos listed below. Once finished, complete the "Test Yourself" activity.
        - Scientific Inquiry

Week 8: Scientific Inquiry- Conduct a scientific investigation

Investigations in Science

Investigations are at the heart of science. They are how scientists add to scientific knowledge and gain a better understanding of the world. Scientific investigations produce evidence that helps answer questions. Even if the evidence cannot provide answers, it may still be useful. It may lead to new questions for investigation. As more knowledge is discovered, science advances.

What is the Scientific Method?

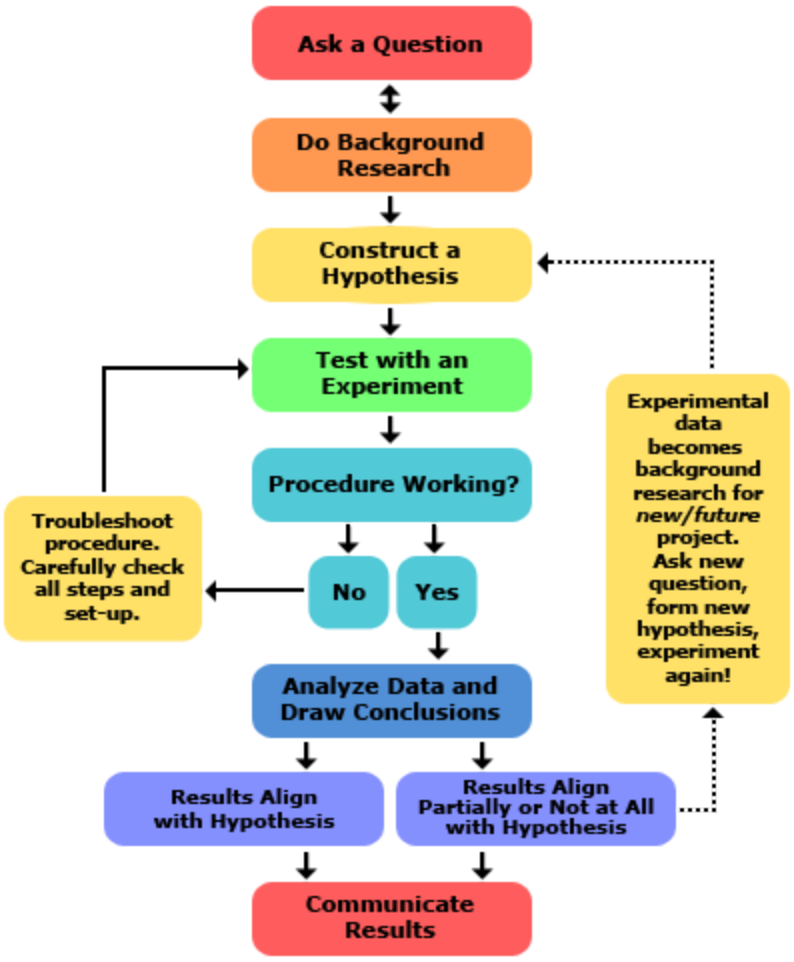
The scientific method is a process for experimentation that is used to explore observations and answer questions. Does this mean all scientists follow *exactly* this process? No. Some areas of science can be more easily tested than others. For example, scientists studying how stars change as they age or how dinosaurs digested their food cannot fast-forward a star's life by a million years or run medical exams on feeding dinosaurs to test their hypotheses. When direct experimentation is not possible, scientists modify the scientific method. In fact, there are probably as many versions of the scientific method as there are scientists! But even when modified, the goal remains the same: to discover cause and effect relationships by asking questions, carefully gathering and examining the evidence, and seeing if all the available information can be combined in

to a logical answer.

Even though we show the scientific method as a series of steps, keep in mind that new information or thinking might cause a scientist to back up and repeat steps at any point during the process. A process like the scientific method that involves such backing up and repeating is called an iterative process.

Whether you are doing a science fair project, a classroom science activity, independent research, or any other hands-on science inquiry understanding the steps of the scientific method will help you focus your scientific question and work through your observations and data to answer the question as well as possible.

Steps of a Scientific Investigation



Scientists investigate the world in many ways. In different fields of science, researchers may use different methods and be guided by different theories and questions. However, most scientists follow the general steps outlined in the Figure below. This approach is sometimes called the scientific method. Keep in mind that the scientific method is a general approach and not a strict sequence of steps. For example, scientists may follow the steps in a different order. Or they may skip or repeat some of the steps.

Steps of the Scientific Method

1. Ask a Question The scientific method starts when you ask a question about something that you observe: How, What, When, Who, Which, Why, or Where? For a science fair project some teachers require that the question be something you can measure, preferably with a number.

2. Do Background Research Rather than starting from scratch in putting together a plan for answering your question, you want to be a savvy scientist using library and Internet research to help you find the best way to do things and ensure that you don't repeat mistakes from the past.

3. Construct a Hypothesis A hypothesis is an educated guess about how things work. It is an attempt to answer your question with an explanation that can be tested. A good hypothesis allows you to then make a prediction:

"If _____*[I do this]* _____, then _____*[this]*_____ will happen." State both your hypothesis and the resulting prediction you will be testing. Predictions must be easy to measure.

4. Test Your Hypothesis by Doing an Experiment Your experiment tests whether your prediction is accurate and thus your hypothesis is supported or not. It is important for your experiment to be a fair test. You conduct a fair test by making sure that you change only one factor at a time while keeping all other conditions the same. You should also repeat your experiments several times to make sure that the first results weren't just an accident.

5. Analyze Your Data and Draw a Conclusion Once your experiment is complete, you collect your measurements and analyze them to see if they support your hypothesis or not.

Scientists often find that their predictions were not accurate and their hypothesis was not supported, and in such cases they will communicate the results of their experiment and then go back and construct a new hypothesis and prediction based on the information they learned during their experiment. This starts much of the process of the scientific method over again. Even if they find that their hypothesis was supported, they may want to test it again in a new way.

6. Communicate Your Results To complete your science fair project you will communicate your results to others in a final report and/or a display board. Professional scientists do almost exactly the same thing by publishing their final report in a scientific journal or by presenting their results on a poster or during a talk at a scientific meeting. In a science fair, judges are interested in your findings regardless of whether or not they support your original hypothesis.

The general steps followed in the scientific method.

Using the Scientific Method: a Simple Example

A simple example will help you understand how the scientific method works. While Cody eats a bowl of cereal (Figure below), he reads the ingredients list on the cereal box. He notices that the cereal contains iron. Cody is studying magnets in school and knows that magnets attract objects that contain iron. He wonders whether there is enough iron in a flake of the cereal for it to be attracted by a strong magnet. He thinks that the iron content is probably too low for this to happen, even if he uses a strong magnet.

Cody makes an observation that raises a question. Curiosity about observations is how most scientific investigations begin.

Q: If Cody were doing a scientific investigation, what would be his question and hypothesis?

A: Cody's question would be, "Is there enough iron in a flake of cereal for it to be attracted by a strong magnet?" His hypothesis would be, "The iron content of a flake of cereal is too low for it to be attracted by a strong magnet."

Cody decides to do an experiment to test his hypothesis. He gets a strong magnet from his mom's toolbox and places a dry flake of cereal on the table. Then he slowly moves the magnet closer to the flake. To his surprise, when the magnet gets very close to the flake, the flake moves the rest of the way to the magnet.

Q: Based on this evidence, what should Cody conclude?

A: Cody should conclude that his hypothesis is incorrect. There is enough iron in a flake of cereal for it to be attracted by a strong magnet.

Q: If Cody were a scientist doing an actual scientific investigation, what should he do next?

A: He should report his results to other scientists.

Summary

- Investigations are at the heart of science. They produce evidence that helps scientists answer questions and better understand the world.
- Most scientists follow the same general approach to investigation, which is called the scientific method. It includes the following steps: ask a question, do background research, construct a hypothesis, test the hypothesis by doing an experiment, analyze the data and draw a conclusion, and report the results.

Revie

1.What is the role of investigation in science?

2List the steps of the scientific method.

3. Assume that Cody used a weak magnet and the flake of cereal was not attracted to it. What conclusion might he have drawn then?

PRACTICE WORKSHEET 1 SCIENTIFIC INQUIRY

NAME_____

DATE_____ PERIOD_____

"GOLF BALL REBOUND"

DESCRIPTION OF EXPERIMENT

A student's retired uncle plays a lot of golf. He wants to know which brand of golf ball he should use to get the best bounce on the fairway. He asks her to test 5 brands of golf ball to see which has the best bounce. She takes one ball of each of the 5 brands and drops them once from a height of 1.5 meters on the sidewalk outside her house. She records the bounce height for each brand. She concludes that the Srixon brand of golf ball has the best bounce and shows the data table to her uncle.

Golf Ball Brand	Drop Height (m)	Bounce Height (m)
Titleist	1.5	0.72
Callaway	1.5	0.82
Srixon	1.5	0.83
Nike	1.5	0.75
TaylorMade	1.5	0.68

ANALYZE THE EXPERIMENT

1. What is the **I**ndependent **V**ariable (**IV**)?

2. What is the **D**ependent **V**ariable (**DV**)?

3. What are two variables that are kept **C**onstant?

4. Is a ***Control*** used for this experiment? If so, describe the control.

5. Name two **S**ources **o**f **E**rror (**SoE**) for this experiment and explain to what extent each **SoE** affected the data. (2pts.)
   a.
   b.

6. Why is the conclusion **reliable/not reliable**? (Circle one and explain.) (2pts.)

HELPFUL TERMS

TERMS	MEANINGS
INDEPENDENT VARIABLE (**IV**)	THE FACTOR YOU PURPOSELY CHANGE IN AN EXPERIMENT
DEPENDENT VARIABLE (**DV**)	THE FACTOR THAT CHANGES BECAUSE OF THE INDEPENDENT VARIABLE
VARIABLE	A FACTOR THAT CHANGES
CONSTANT	A VARIABLE THAT PURPOSELY DOESN'T CHANGE DURING AN EXPERIMENT
CONTROL	A TEST SUBJECT THAT DOES NOT GET EXPOSED TO THE **IV**
HYPOTHESIS	EXPECTED OUTCOME OF AN EXPERIMENT
DATA	MEASUREMENTS OR OBSERVATIONS GATHERED FOR ANALYSIS
CONCLUSION	OBJECTIVE STATEMENT THAT FOLLOWS THE ANALYSIS OF DATA AND OBSERVATION
OBJECTIVE	NOT INFLUENCED BY PERSONAL FEELINGS OR OPINIONS
SOURCE OF ERROR	AN IMPORTANT VARIABLE THAT CHANGED THAT WASN'T SUPPOSED TO CHANGE
INVALIDATE	TO REFUTE OR REJECT, TO MAKE INCORRECT
OUTLIER	A DATA POINT FAR FROM THE AVERAGE VALUE

TIPS

1. The **independent variable** is the thing that is being changed on purpose in an experiment. The *entire point* of the experiment is to test the effect of this variable on *something else*. This is plotted on the X axis of a graph or as the first variable of a data table. This is usually the first column that contains different values.
2. The **dependent variable** is the thing that changes *because* the independent variable changed. It's also known as the responding variable because it *responds* to the independent variable. This is the one you are measuring because you don't know what effect, if any, the independent variable had. This is plotted on the Y axis of a graph or as the second variable on a data table. This is usually the second column that contains different values.
3. **Constants** are things that are kept *the same on purpose* or they might mess up, or skew, the data and, therefore, the conclusion of the experiment.
4. A **control** is a test subject or group that does not get exposed to the **IV.** If testing how the amount of music affects plants growth, the control group of plants would get no music at all.
5. **Sources of Error** can be found where variables changed that weren't supposed to. These variables should have been controlled (*by you!)* to make sure your data is accurate. Some sources of error are within your control, and some aren't. Name a factor that probably affected your data one way or another. Explain whether the source of error you name is a big deal or not. Did it barely affect the data? *What effect would the source of error have on the data?* Would it make the numbers bigger, smaller, or neither? Why?
6. **Is the conclusion reliable?** Choose one and say why. Is the source of error big enough to invalidate the conclusion? Did it *really* affect the data enough to make it *unreliable*? Explain.

LAB: Scientific Inquiry: Penny Boat Lab

Purpose: To design a boat that will hold as many pennies as possible without sinking

Pre-lab: Part A: Define the following terms:

(a) Independent variable:

(b) Dependent variable:

(c) Hypothesis:

Part B: Read the following scenario concerning a lab experiment and answer the questions below:

Scientific Method – Puppy Experiment

Sample Group #1: 6 puppies in group; each puppy weighs 6 lbs and has short brown fur and was not given a vitamin supplement.

Sample Group #2: 6 puppies in group; each puppy weighs 6 lbs and has short brown fur and was given a vitamin supplement

From the information given above identify the following:

1. What is the difference between the two sample groups of puppies?

2. Based on the difference in the sample groups, write a hypothesis for this experiment?

3. Identify the following from the above experimental set-up:

   a. Experimental group = _____

b. Control group = _____

c. Independent variable = _____

d. Dependent variable =_____

4. What is the benefit of having a control group?

Lab

Materials: (per group of students)

1 small plastic container 1 bag of pennies 1 metric ruler

1 piece of graph paper 1 8 cm x 8 cm square of Aluminum foil paper towels

Procedure:

1. Fill the plastic container with water until it reaches a ¾ fill capacity.

2. Obtain a piece pre-measured aluminum foil. If none is available then use a ruler to measure a 8 cm x 8 cm. Design and build your boat. Describe its design under the data section.

3. Place your boat it the water filled container and watch it float.

4. Make a guess as to how many pennies your boat will hold. Record it under the data section.

5. Now add one penny to the boat at a time until the boat starts to sink. Record your number under the data section. Take your boat out and re-add the amount of pennies before the boat sank. Call the teacher over to see your boat and to record how many pennies your boat held before it sank.

6. Clean up any spilled water and wipe down your work area. Carefully dump out the water in the container into nearest sink. Dry off the pennies and return to the designated location in the lab in their baggie. Please turn your boat into the teacher at the end of the class. Record your group's data on the table at the front and complete the class data table.

7. Complete and graph the class data into a bar graph. Please remember to answer all the questions in the data and conclusion sections. Complete and attach the bar graph to the lab.

Data:

1. Name of my boat:_____

Table 1:

My estimate of how many pennies my boat will hold:	Actual amount of pennies my boat will hold:

2. Describe your boat design:

Conclusion and Questions:

Part A: Read each statement below and the circle the letter of the best answer that completes the statement or answers the question.

1. The quantity of pennies that your boat will carry before it sinks is the ____ variable because it would vary depending on the design of your boat.

(a) independent (b) dependent

2. The design of your boat would be your _____ variable because it is the main variable being tested.

(a) independent (b) dependent

Part B: Read and answer the question below:

3. How could you have created a better design for your boat?