

Nature of Science

Lesson 4: Scientific Investigation

Today's focus

I will:

- Understand the importance of repeated trials
- Identify and/or explain the need for replication.
- Identify a control group and/or explain its importance in an experiment.

Bellringer:

Four students are planning to do science projects. Only one of the projects is an experiment.

Name	Project
Selene	demonstrate different types of motion
Walden	compare weights of puppies in a litter as they grow
Mya	show the distance between planets in the solar system
Sasha	test different brands of battery to see which lasts longest

Which student is doing an experiment?

- a. Selene c. Mya
b. Walden d. Sasha

Reading: How does a scientist find clues?

- Sometimes a scientist _____ the answer to the scientific question, this is called a _____.
- A scientist must design a _____ to test the prediction.
- Scientists must change one _____ to see if it affects the experiment the way that was predicted.
- They must _____ the results to the _____, a group that did not have the variable changed.
- The scientist gets clues to the answer by _____ and _____ the experimental data.

Science Notes:

Control Group and Test Group

Every experiment must have two groups:
a control group and a test/experimental group.

	Control Group	Test/Experimental Group
Definition	A group in a scientific experiment that serves as a reference for comparison to the experimental group; a group that is _____ by the factor being tested.	The group in an experiment being _____ by the factor being tested.
Bubble Lab Example		

Nature of Science

Variables

When carrying out an **experiment**, scientists **control variables**.

	Independent Variable	Dependent Variable	Constant Variables
Definition	The variable which is _____ _____ (what is being tested/I change).	The variable which _____ _____ of what is being tested.	The variables which are _____ _____ in the experiment.
Bubble Lab Example			

Going Up Lab

Materials:

❖Your Group ❖1 Tennis Ball ❖1 Meter Stick ❖Various Floor Surfaces (Grass, Concrete, Tile)

Procedure:

- Place the 0-cm mark of the meter stick on the first surface you will test to observe the height the ball bounces.
- One partner will hold the tennis ball so the bottom of the ball is lined up with the 100-cm mark.
- Drop the ball from the 100-cm mark.
- Have a partner observe the height of the bottom of the tennis ball when it bounces on its first bounce. Record your data.
- Repeat steps 1 through 4, twice more on the same surface.
- Repeat steps 1-5 on two more surface types.

Floor Surface	Trial 1	Trial 2	Trial 3
Grass			
Concrete			
Tile			

Reading:

Replicating Investigation

Scientists carefully record and _____ their materials and procedures. This process ensures other scientists are able to _____ the exact _____ investigation to _____ their _____.

When scientists follow the _____ procedures with the same tools, they should have _____ results.

Repeated Trials

Scientists _____ trials at least _____ times. This ensures their data is more _____ and _____.

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Writing Prompt:

Explain the difference between repeated trials and replication, and why both are very important in the scientific process.

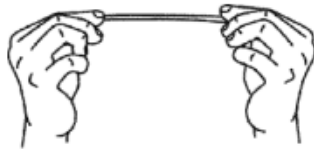
Exit Ticket:

4. Barack did an experiment to test the amount of iron in different types of fruit juices.



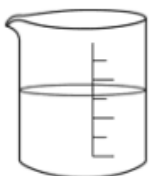
What is the **best** reason why Barack should record the steps of his experiment in his report of the results?

- to test each type of fruit juice the same way
 - to be sure the experiment can be repeated to confirm the results
 - to be sure he uses the same amount of fruit juice for each test
 - to be sure he does not repeat the test using the same fruit juice twice
5. Zack is testing whether temperature affects the distance a rubber band can be stretched before it breaks. He heats some rubber bands in the microwave oven. He puts some on the kitchen counter. He puts some in the refrigerator and some in the freezer.

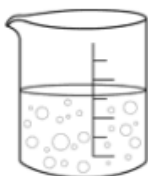


Which set-up is the control group?

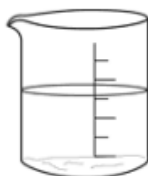
- rubber bands on the counter
 - temperatures of the rubber bands
 - distance the rubber bands can stretch
 - number of rubber bands in each group
6. For an experiment, Rosalinda set up four beakers as shown below.



A
water +
1 teaspoon
baking soda



B
vinegar +
1 teaspoon
baking soda



C
cooking oil +
1 teaspoon
baking soda



D
milk +
1 teaspoon
baking soda

Which variable is being tested in the experiment?

- Size of the measuring cup
- Amount of baking soda
- Amount of liquid
- Type of liquid