

More Than Experiments

How scientists choose evidence-gathering methods.

SC.7.N.1.3 “Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.”

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline the sentence that describes the planned experiment, circle the independent and dependent variables plus the controlled conditions, and number the two nonexperimental investigations 1 and 2.

Ways to Investigate

- ① Scientists can learn in more than one way. At a marsh, a class might visit each month, record the kinds of birds they see, and compare their notes over a year. This is an observation study. The students do not choose a condition to change. Their records can reveal patterns, such as which birds appear during colder months. Scientists also use observations to describe volcanoes, track storms, and identify fossils. These investigations add knowledge even though no one changes a variable or tests a planned cause-and-effect question.
- ② An experiment begins with a question about how one factor affects another. In a classroom investigation, students grow bean plants with different hours of light each day. They change only the hours of light, the independent variable, and measure plant height, the dependent variable. To make the test fair, they keep the seed type, pot size, soil, water amount, and temperature the same. These controlled variables help the class connect any height differences to light rather than another cause. Repeating the test can make the evidence stronger.
- ③ Some investigations combine observations with measurements but are still not experiments. During a lunar eclipse, astronomers measure the Moon's brightness at regular times and use the results to describe how Earth's shadow moves across it. They cannot change the eclipse, hold other sky conditions constant, or assign a different shadow to another Moon. The investigation is valuable because careful measurements improve predictions and explanations. Scientific knowledge comes from experiments, observations, field studies, models, and other evidence-based investigations. The method must fit the question scientists can realistically investigate.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 What makes the marsh bird investigation an observation study instead of an experiment?

2 What are the independent variable and dependent variable in the bean plant experiment?

3 Name two controlled variables in the bean plant experiment. Why do controlled variables matter?

4 Give two reasons the lunar eclipse investigation is not an experiment, and state one way its measurements are useful.

3 YOUR TURN _____ Your own words

Write four sentences about investigations connected to your school or neighborhood. In sentence 1, describe a nonexperimental investigation and the evidence it would collect. In sentences 2 and 3, describe an experiment, naming its independent variable, dependent variable, and two controlled variables. In sentence 4, explain how the nonexperimental investigation can still add scientific knowledge.

PART 1 • READ AND MARK

Underline the sentence that describes the planned experiment, circle the independent and dependent variables plus the controlled conditions, and number the two nonexperimental investigations 1 and 2. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What makes the marsh bird investigation an observation study instead of an experiment?	Students record and compare bird sightings, but they do not choose a condition to change.
2	What are the independent variable and dependent variable in the bean plant experiment?	The independent variable is hours of light each day. The dependent variable is plant height.
3	Name two controlled variables in the bean plant experiment. Why do controlled variables matter?	Possible controls include seed type, pot size, soil, water amount, and temperature. Keeping them the same helps connect height differences to light rather than another cause.
4	Give two reasons the lunar eclipse investigation is not an experiment, and state one way its measurements are useful.	Astronomers cannot change the eclipse or assign a different shadow to another Moon, and they cannot hold other sky conditions constant. Measurements can improve predictions and explanations of Earth's shadow moving across the Moon.

PART 3 • YOUR TURN (SAMPLE ANSWER)

To learn where earthworms are most common on the school grounds, I would count earthworms in equal-sized soil samples from several places without changing the sites. The independent variable in an experiment would be shade, and the dependent variable would be soil moisture. I would keep plot size, soil depth, and water added the same. The earthworm counts can add knowledge about where earthworms live, even though the investigation does not change a variable.

Accept equivalent descriptions that correctly distinguish changing and controlling variables from observing or measuring naturally occurring events. For the open response, accept any feasible investigation pair that correctly identifies the experimental variables and explains the value of nonexperimental evidence.