



TEACHER GUIDE

WHAT IS SCIENCE?

GRADES 3-5

COMMON MISCONCEPTIONS

- **Children cannot be scientists.**
All people are scientists, children included, when they observe and ask questions about the world around them and look for answers based on evidence. They act and think like scientists when they question claims to determine what evidence the claims are based on.
- **All scientists work in laboratories.**
Where scientists work depends on what they are studying. Many scientists study the natural world and spend their time collecting data outdoors, in the field. Some scientists work in laboratories because in a laboratory they have the option of creating specific conditions with controlled variables.
- **Scientific data is collected in experiments only.**
Experiments are one way that scientists collect data, but it is not the only way. Scientists also collect descriptive data, classifying data, and comparative data. Scientists build models to use to collect data and to show how systems and relationships work.
- **A person must have many years of education to do science.**
Years of education can help a person know more about a subject, and learn about how to conduct types of research, but as in the answer above (children cannot be scientists), everyone acts like a scientist when they observe and wonder about the world around them and actively think about how and why the world works as it does.
- **Science is challenging to understand and always involves a lot of formulas and numbers.**
Science is not always based on numbers and formulas. In some fields (physics, for example) formulas and numbers are critical for explaining interactions in the natural world; other fields (paleontology, geology) seek descriptive types of information to understand characteristics and processes.

THE NATURE OF SCIENCE

Science is both a body of knowledge and a process. The nature of science is considered a way of knowing and a human endeavor. Science addresses questions about the natural world using models, laws, mechanisms, and theories to explain natural phenomena. Scientific knowledge is based on collecting empirical evidence. Scientific knowledge is open to revision in light of new evidence, and assumes an order and consistency in natural systems.

SCIENTIFIC KNOWLEDGE

Knowledge in science is acquired through scientific research. Four factors are essential to the classification of information as scientific knowledge: (1) independent and rigorous testing, (2) peer review and publication, (3) measurement of error, and (4) acceptance within the scientific community. The main difference between scientific and other types of knowledge is that scientific knowledge must be testable. **All scientific research should be well-documented and replicable by other scientists.** Before results are published, they undergo a peer review process by experts in the field. The reviewers recommend to the journal if the work is ready to be released to the public or if more evidence is needed. They also advise the journal editors if the evidence presented is strong enough.

TYPES OF INVESTIGATIONS

There are different types of scientific investigations. Experimentation, sometimes called fair testing, is often what people think of when considering doing science. It consists of performing an action or process in a controlled manner, typically with one variable being tested. Description is a type of investigation that does not involve testing variables, but observes and describes patterns occurring in a process or system, or the characteristics of an organism, object, event, or place. Classifications recognize common characteristics among organisms, objects, or events, often categorizing them into groups. Comparative investigations explore differences in organisms, events, populations, or processes based on inherent characteristics or differing conditions.

MODELING

Modeling is a form of investigation in which something is interpreted through a constructed representation. Models can help to illustrate relationships and processes that can't be detected in other ways, or they can isolate part of an organism or process to understand its characteristics. Models play a very important role in science practice, but it must be understood that there will be degrees of accuracy.

CLAIM

A claim is a statement or an assertion that something is the truth. In a science investigation, a claim is a statement that answers the original question of an investigation.

