Big Idea 2- Description

A: Scientific knowledge is based on empirical evidence, and is appropriate for understanding the natural world, but it provides only a limited understanding of the supernatural, aesthetic, or other ways of knowing, such as art, philosophy, or religion.

B: Scientific knowledge is durable and robust, but open to change.

C: Because science is based on empirical evidence it strives for objectivity, but as it is a human endeavor the processes, methods, and knowledge of science include subjectivity, as well as creativity and discovery.

Big Idea 2- Benchmarks- Grade 6

- **SC.6.N.2.1**: Distinguish science from other activities involving thought.
- **SC.6.N.2.2**: Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.
- **SC.6.N.2.3**: Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.

Big Idea 2- Benchmarks- Grade 7

- **SC.7.N.2.1**: Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.

Big Idea 2- Benchmarks- Grade 8

- **SC.8.N.2.1**: Distinguish between scientific and pseudoscientific ideas.
- **SC.8.N.2.2**: Discuss what characterizes science and its methods.

**What Is Science?**

Science is the search for understanding. Scientists seek to better understand the natural world through a systematic process. This process of making observations, formulating questions, collecting data, analyzing data, and formulating conclusions provides a means of exploring the natural world and how the natural world works. The knowledge that is gained by this process can be used to validate and/or verify a hypothesis or reject a hypothesis through repeated testing and further investigation.
Throughout your students’ studies, you should continuously engage them in the question *What is science?*. Students should remember that science is the search for understanding through a systematic process. This process includes specific actions (i.e., making observations, formulating questions, collecting data, analyzing data, and formulating conclusions) that scientists take in order to be certain that an experiment is repeatable. Challenge students not only to participate in their own investigations but to critique the work of others (e.g., the MythBusters).

**Instructional Ideas**

1. Present the glossary term **scientist** to students.
2. Have students complete the What I Know and What I Want to Know sections of a KWL chart about the term **scientist**. Some suggested questions to get them started are:
   - What do scientists do?
   - How do scientists do their work?
3. First, allow students to work independently; then have them share their answers with a partner. Finally, allow each group to report the answers back to the entire class. Build a class KWL chart to record the responses.
4. Show the students the glossary terms **scientific method** and **investigate**. Be sure to explain that scientists perform investigations and do their work within the scientific method.
5. Allow students to refine their answers and begin to complete the What I Learned section of the KWL chart.
6. Have students Jigsaw read (or read together as a class) the reading passage **Case of the Curious Circuit**. Students should focus on how the scientific process can be used and how this process can help solve a mystery.

**How Does the Scientific Process Work?**
Since science is based upon a systematic process of inquiry, it is grounded in evidence. Evidence is the basis for all scientific understanding. Through repetitive trials and repeated experiments, different scientific theories have been created and scientific laws have been proven. As students’ progress through the year, remind them to support their findings with evidence.

This isn’t to say that our scientific understanding cannot change. The beauty of the scientific process is that everything in our natural world is open to change, as new evidence or
interpretations are developed. As we develop new technology, we can begin to study our natural world in a different, and often much deeper, way. Think of the development of the telescope, for example. Before the telescope was invented, the only way humans could study the stars and planets was by using observations they made with their eyes. When the telescope was invented, it improved the ability of humans to see things that were farther away. This led to new discoveries and a deeper understanding of our solar system, galaxy, and universe.

Throughout your students’ studies, they will encounter places in history where one theory replaced a preexisting theory, or new scientific knowledge replaced old scientific knowledge. Students should keep in mind that through using the systematic scientific process, science can change and adapt as new information is learned, new technology is discovered, or new interpretations are made.

**Instructional Ideas**
1. Have students work in pairs to describe the scientific process.
2. Have groups report out their descriptions of the scientific process and maintain a chart in front of the class with the class answers. Tell students that you will be focusing on collecting data, analyzing data, and formulating conclusions.
3. Ask students to compare the ways that something can be proven: by direct evidence or by inference.
4. Show the terms *evidence* and *inference* in order to clarify student thinking about evidence.
5. Ask students to read the reading passage *Element 118 Off the Charts for Now.*

**Who Are Scientists?**
Scientists are all of us! Scientists come from all kinds of backgrounds and possess varied talents, interests, and goals. Anyone who uses a scientific process to answer a question could be considered a scientist.

Throughout your students’ studies, you will encounter scientists who made many contributions to the field of science. It is important to point out to students that scientists from every gender, race, background, and ethnicity have contributed to our scientific understanding.

**Instructional Ideas**
1. Present the terms **scientist**, **scientific method**, and **investigate**.
2. Have students create a mind map of the characteristic features of scientists.
3. Have students share their mind maps with the class. Create a class list of the characteristics of scientists and place it in the front of the room.
4. Divide the class into two groups. Assign each group one of the reading passages (A Shocking Discovery, and Science and Technology: Breaking the Sound Barrier; Speed of Sound).

5. After reading the reading passage, have students work in their groups to create a T-chart. On the left-hand side of the chart, have them write The Class Says and on the right-hand side, have them write I Say. Have the students use the class list of the characteristics of scientists to list all of the characteristics that the person in each passage has in common. On the right-hand side, have students identify new characteristics of a scientist as demonstrated by the person in each reading.

6. Have the student groups report out about their reading to the class, identifying the new characteristics of scientists that they observed in the reading.