Objective: Students will be able to:

- Define and practice the first three steps of the Scientific Method.
- Make observations related to a specific question.
- Form a hypothesis.

Time Required: One class period

Materials Needed:

- Printed copies of the "Observation Worksheet" for each student (included)
- Scientific Method graphic (included)
- A baseball game to observe (either live or recorded)

Vocabulary:

Scientist - A person who is studying or has expert knowledge of one or more of the natural or physical sciences

Experiment - A test, conducted under controlled conditions, that is made to demonstrate a known truth or to examine the validity of a hypothesis

Scientific Method - A procedure for scientific discovery consisting of observation, research and experimentation for the purpose of testing a hypothesis

Observation - The action or process of observing something or someone carefully in order to gain information

Hypothesis - A testable, temporary prediction about how a scientific investigation or experiment will turn out.
Applicable Common Core State Standards:

**CCSS.ELA-Literacy.RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

**CCSS.ELA-Literacy.RI.3.4, RI.4.4, RI.5.4** Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade-appropriate topic or subject area*.

**CCSS.ELA-Literacy.RI.4.3, RI.5.3** Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

**CCSS.ELA-Literacy.W.3.7** Conduct short research projects that build knowledge about a topic.

**CCSS.ELA-Literacy.W.3.8** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

**CCSS.ELA-Literacy.W.4.7** Conduct short research projects that build knowledge through investigation of different aspects of a topic.

**CCSS.ELA-Literacy.W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

**CCSS.ELA-Literacy.W.5.7** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

**CCSS.ELA-Literacy.W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

Additional Relevant National Learning Standards:
(Based on Mid-continent Research for Education and Learning)

**Science. Standard 12. Level II [Grade 3-5]**. Understands the nature of scientific inquiry
1. Begin by asking students what a scientist does and ask them to name some different types of scientists. Some examples of scientists include...
   - **Biologist**: A scientist who studies living organisms
   - **Geologist**: A scientist who studies changes in the earth’s surface and core
   - **Paleontologist**: A scientist who studies life that existed in prehistoric times

2. Explain that a scientist is someone who studies something and becomes an expert in one or more elements of the scientific world. Today, the students will become “basebologists.”

3. As “basebologists,” students will be using the **scientific method** to help them learn about the game. Explain that the scientific method is how all scientists approach learning about the world around them.

4. Post the scientific method graphic provided with this lesson, or use another one of your choice.

5. Focus on the first step of the scientific method: asking a question. Explain that before a scientist begins an **experiment**, they must have a reason to do it. They need to have a question that can be answered through investigation and observation.

6. As a class, brainstorm a variety of questions that could be asked about the game of baseball. Questions can be related to rules, equipment, fans, food, etc... Some possible questions include.
   - What type of bat is better? Wood or aluminum?
   - Do batters hit better in warm or cold weather?
   - Do right handed batters get more hits than left handed batters?
   - What type of ballpark food is the most popular?

7. You may find it useful to offer some examples of questions that will **not** work for an experiment – questions that are not testable – just to ensure that students understand the concept. For example, “Was Babe Ruth the greatest player of all time?” will not be testable in an experiment.
8. Choose one of the questions (one that is relatively easy to test) to focus on for the remainder of this lesson.

9. Explain that after a scientist identifies a question, the next step in the scientific method is to form a **hypothesis**. A hypothesis is a testable, temporary prediction about how a scientific investigation or experiment will turn out.

10. In order to form a good hypothesis, it helps to do background research. Research gives you the background knowledge you need in order to form a good hypothesis. Provide each student with a “Basebology 101: Observation Worksheet” (included).

11. Have each student write down the class question on the top of the Observation Worksheet. During the activity, students will be asked to make careful observations related to the question. Their observations will help them create a hypothesis later.

12. Begin the activity.
1. Arrange for the class to attend a live baseball game or a baseball practice session (minor league, community games or high school games are just as good as a major league game), or watch a baseball game on television.

2. Make sure that each student has his or her Observation Worksheet, and has written down the class question.

3. During the game, circulate among the students and make sure that they are writing down appropriate observations related to the question.

4. At the conclusion of the game, ask students to share their observations. Ask students how their observations might help them answer the question.

5. Review the concept of a hypothesis. It is a testable, temporary prediction about how a scientific investigation or experiment will turn out. Ask each student to form his or her own hypothesis based on the observations made while observing the baseball game. It is perfectly acceptable for students to have differing hypotheses. Examples include:
   - Aluminum bats are better than wood bats.
   - Batters hit better in cold weather.
   - Left handed batters get hits more often than right handed batters.
   - Hot dogs are the most popular ballpark food.


Conclusion:

To conclude this lesson and check for understanding, have each student explain, in writing, why they believe their hypothesis may be correct, and list ideas for ways they could test their hypothesis.
The Scientific Method

1. Ask a question
2. Do background research
3. Construct a hypothesis
4. Test your hypothesis by doing an experiment
5. Analyze your data and draw a conclusion
6. Report your results (Was your hypothesis correct?)
Basebology 101: Observation Worksheet

The Question:

___________________________________________________
___________________________________________________

My Observations:

___________________________________________________
___________________________________________________
___________________________________________________
___________________________________________________
___________________________________________________
___________________________________________________
___________________________________________________
___________________________________________________
___________________________________________________
___________________________________________________
___________________________________________________

My Hypothesis:

___________________________________________________
___________________________________________________