Big Idea 1 - The Practice of Science

Big Idea 2 - The Characteristics of Scientific Knowledge

SC.5.N.1.2
Explain the difference between an experiment and other types of scientific investigation

SC.5.N.1.5
Recognize and explain that authentic scientific investigation frequently does not parallel the steps of the "scientific method"

SC.5.N.1.3
Recognize and explain the need for repeated experimental trials

SC.5.N.1.4
Identify a control group and explain its importance in an experiment

SC.5.N.1.6
Recognize and explain the difference between personal opinion/interpretation and verified observation

SC.5.N.2.1
Recognize and explain that science is grounded in empirical observations that are testable, explanation must always be linked with evidence

SC.5.N.2.2
Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others.
# Big Idea 1 and 2 Vocabulary Words and Definitions

<table>
<thead>
<tr>
<th><strong>WORD</strong></th>
<th><strong>DEFINITION</strong></th>
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<tbody>
<tr>
<td>Conclusion</td>
<td>The result of an experiment that answers the question asked before the experiment began</td>
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<td>Control Group</td>
<td>The experimental setup to which you will compare all the other setups. The things that will stay the same during an experiment.</td>
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<td>Communicate</td>
<td>To share the results of investigations with others</td>
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<td>Data</td>
<td>Information</td>
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<td>Dependent Variable</td>
<td>The variable in an experiment that can be measured</td>
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<td>Evidence</td>
<td>Information collected during a scientific investigation</td>
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<tr>
<td>Experiment</td>
<td>A procedure carried out under controlled conditions to test a hypothesis</td>
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<td>Hypothesis</td>
<td>A statement that can be tested and will explain what can happen in an investigation. (prediction)</td>
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<tr>
<td>Independent Variable</td>
<td>The variable that changes in an experiment</td>
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<td>Inference</td>
<td>An idea or a conclusion based on an observation</td>
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<td>Models</td>
<td>When a scientist cannot experiment on the real thing, they use models. For example: if something is too large, too small, or too dangerous.</td>
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<tr>
<td><strong>Observation</strong></td>
<td>Information collected by using all the senses</td>
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<tr>
<td><strong>Opinion</strong></td>
<td>A personal belief or judgment that does not need to be backed up with evidence</td>
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<td><strong>Procedures</strong></td>
<td>The steps followed in an experiment</td>
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<td><strong>Repetition</strong></td>
<td>Repeating an experiment to make sure the results are accurate</td>
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<td><strong>Replication</strong></td>
<td>Making sure your experiment could be conducted by someone else to confirm the findings</td>
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<tr>
<td><strong>Science</strong></td>
<td>The study of the natural world through observation and investigation</td>
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<td><strong>Scientific Methods</strong></td>
<td>Different ways that scientists perform investigations and collect reliable data</td>
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<tr>
<td><strong>Variable</strong></td>
<td>Any condition that can be changed in an experiment</td>
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Big Idea 1 and 2

Notes

I. What all scientists do

   A. They try to explain how and why things in the natural world happen

   B. They answer questions by doing investigations

       1. plan and conduct experiments to gather evidence

       2. use that evidence to explain their observations

       3. draw conclusions based on the evidence

       4. collect information using the senses

       5. make inferences

       6. form opinions

       7. communicate or share the results of their investigations

II. What are some types of investigations?

   A. Start with a question

       1. scientists observe the world and then ask questions based on their observations

   B. Plan an investigation

       1. scientists use scientific methods to conduct investigations

       2. investigations differ depending on the question

           a. experiment - an investigation in which all the conditions are controlled
b. models are sometimes used to represent real objects or processes because some things are just too big, too far away, or too uncontrollable

c. make repeated observations to study processes in nature without disturbing them (field study)

III. Steps in experimentation

A. Ask questions

1. what would you like to test?

B. Hypothesize

1. this is a statement that can be tested and will explain what could happen in an experiment

   a. think about what you already know, talk to other people, do some research

C. Design an experiment

1. has two or more setups so you can compare results

   a. variable – any condition in an experiment that can be changed
   b. you can only test one variable at a time
   c. control – the setup to which you compare all the others
   d. which conditions should stay the same and which should be changed?

D. Carry out the procedure (do the experiment)

1. the procedure is the steps you follow in your experiment

2. list the steps in order
3. it is a good idea to repeat the procedure several times

4. if you get similar results, you will have more evidence to support your conclusions, and your results are valid

E. Record and analyze data

1. your data could be what you observed in your experiment and could be recorded in a list, sentence, or paragraph. It could also be a chart or table that you complete

F. Draw conclusions and evaluate the hypothesis

1. conclusions must be supported with evidence

2. decide if your hypothesis is supported or not

3. it is OK if your hypothesis was incorrect - if it is incorrect, try rethinking your hypothesis - then design a new experiment to test it

4. that is what scientists do - they build on what they learned!

G. Share your results!

1. scientists use many different kinds of displays - graphs, charts, written reports, computer graphics

IV. What are some science tools?

A. Field studies

1. collecting net

2. hand lens

3. cameras

B. In the lab

1. microscopes (both light and electron)
2. droppers

3. pipette – similar to a dropper, but more exact

4. computers

C. For measuring

1. rulers, meter sticks, tape measures (length)

2. clocks, stopwatches, timers, calendars (time)

3. thermometers (temperature)

4. balance scales (mass)

5. spring scales (force, weight)

6. graduated cylinders, measuring cup, beaker (volume of a liquid)