Scientific Inquiry

1-1 The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

1-1.1 Compare, classify, and sequence objects by number, shape, texture, size, color and motion, using standard English units of measurement where appropriate.
Taxonomy Level: 2.6-B Understand Conceptual Knowledge

Previous/Future knowledge: In kindergarten, students compared objects by using nonstandard units of measurement (K-1.4) and classify objects by observable properties (including size, color, shape, magnetic attraction, heaviness, texture, and the ability to float in water) (K-5.1). In 2nd grade (2-1.2), students will begin using metric units of measurement when they use tools. In 3rd grade, students will classify objects by two of their properties (3-1.1) and classify objects or events in sequential order (3-1.2). In 6th grade (6-1.3), students will use a dichotomous key to classify organisms and objects.

It is essential for students to know that objects have observable properties such as number, shape, texture, size, color, and motion (direction and speed). These properties can be used to compare, classify, and sequence objects.

- Objects can be compared by observing using the five senses.
- Objects can be classified according to observed similarities or differences.
- Objects can be sequenced, or put into an order, by an attribute such as size or number.

Standard English units should be used where appropriate when making measurements of objects. For example, rulers should measure to the nearest whole inch; time can be measured in hours to the nearest half hour.

It is not essential for students to classify observations as qualitative or quantitative or use metric units of measurement. Smaller units of distance (smaller than an inch) and time (seconds) are not essential. Temperature measurements are not essential for science but may be appropriate for math academic standards.

Assessment Guidelines:
One objective of this indicator is to *compare* objects by number, shape, texture, size, color, and motion, using standard English units of measurement where appropriate; therefore, the primary focus of assessment should be to detect similarities and differences between objects using the properties in the indicator. However, appropriate assessments should also require students *recognize* the property used to compare objects.

Another objective of this indicator is to *classify* objects by number, shape, texture, size, color, and motion, using standard English units of measurement where appropriate; therefore, the primary focus of assessment should be to group objects using the properties in the indicator. However, appropriate assessments should also require students *recognize* the property used to group objects.

Another objective of this indicator is to *sequence* objects by number, shape, texture, size, color, and motion, using standard English units of measurement where appropriate; therefore, the primary focus of assessment should be to place objects in an orderly arrangement using the properties listed in the indicator. However, appropriate assessments should also require students *recognize* the property used to place objects in an orderly arrangement.

Scientific Inquiry

1-1 The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

1-1.2 Use tools (including rulers) safely, accurately, and appropriately when gathering specific data.
Taxonomy Level: 3.2-B Apply Conceptual Knowledge

Previous/Future knowledge: In kindergarten (K-1.2), students used magnifiers and eyedroppers to safely, accurately and appropriately to gather data. In future grades, students will continue to use these tools, when appropriate, as well as use new tools when collecting scientific data. A complete list of tools can be found in Appendix A of the Academic Standards.

It is essential for students to know that every simple scientific investigation provides information. This information is called *data*. Data can be simple observations or numbers.

It is essential for students to know that different tools are needed to collect different kinds of data.

- A *ruler* is a measurement tool that can be used to measure the length, width, or height of an object or the distance between two objects.
  - When using a ruler, make sure to begin measuring from the zero (0) mark, not necessarily the edge of the ruler.
  - Ruler measurements should be made to the nearest whole inch (in).

It is essential for students to use care when handling rulers when gathering data.

- Some rulers may have a sharp, metal edge on them.
- Care should be taken not to break the ruler.

It is also essential for students to use tools from previous grade levels that are appropriate to the content of this grade level, such as eyedroppers or magnifiers, to gather data.

NOTE TO TEACHER: See previous grade information regarding how to use each tool.

It is not essential for students to use other measuring tools at this time such as meter sticks, meter tapes, or yardsticks. However, an introduction to other appropriate tools is acceptable if relevant to instruction.

Assessment Guidelines:
The objective of this indicator is to *use* tools safely, accurately, and appropriately when gathering data; therefore, the primary focus of assessment should be to apply correct procedures to the use of rulers and other tools essential to the grade level that would be needed to conduct a science investigation. However, appropriate assessments should also require students to *identify* appropriate uses for magnifiers and eyedroppers; *illustrate* the appropriate tool for an investigation using pictures, diagrams, or words; *recall* how to accurately determine the measurement from the tool; or *recognize* ways to use science tools safely, accurately, and appropriately.

Scientific Inquiry

1-1 The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

1-1.3 Carry out simple scientific investigations when given clear directions.
Taxonomy Level: 3.1-A Apply Factual Knowledge

Previous/Future knowledge: This is the first time students are introduced to procedures for carrying out simple scientific investigations. The development of these skills will serve as the basis for all future science investigations. In 2nd grade (2-1.1), students will carry out simple scientific investigations to answer questions. In 4th grade (4-1.3), students will summarize the characteristics of a simple scientific investigation that represent a fair test. In 5th grade (5-1.3), students will plan and conduct a controlled scientific investigation and manipulate variables. Students will further develop their skills with scientific investigations and technological design in middle school.

It is essential for students to follow clear, simple directions to carry out a *simple scientific investigation*. Clear directions for a scientific investigation may include instructions to:

- Identify the question to be investigated
- Make a prediction (possible answer to the question)
- Decide what materials are needed for the investigation
- List steps to follow to carry out the investigation
- Record observations
- Communicate observations (for example through verbal discussion, pictures, diagrams, note-booking, etc.)

To make a *prediction*:

- Make observations and think about what is known about the object or event.
- Tell what will happen next.

Making *observations* is a way of learning about the world around us.

- A *scientific observation* is one that anyone can make and the result will always be the same. For example, the plant is green, has three leaves, and feels smooth.
- An *unscientific observation*, or an opinion, is one that not everyone may agree on. For example, the flower is pretty.
- Observing does not mean just looking at something. It involves the use of several or all of the five senses (seeing, hearing, smelling, touching, and tasting) using appropriate observation methods for each sense, such as wafting an odor so that its smell can be described or gently touching the edges of seashells to determine their textures.
- Tasting in science should only be done with the permission of the teacher under controlled conditions.
- Observing helps to find out about objects (their characteristics, properties, differences, similarities) and events (what comes first or last, or what is happening at a particular moment).

NOTE TO TEACHER: Students do not need to devise their own questions for investigations. Data charts and graphs should also be prepared and provided for the students. The directions should be presented visually or orally in a manner that is suited to the students' levels of development.

It is not essential for students to devise the steps to carry out a scientific investigation or know the terms manipulated and responding variable.

Scientific Inquiry

1-1 The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

Assessment Guidelines:

The objective of this indicator is to *carry out* simple scientific investigations when given clear directions; therefore, the primary focus of assessment should be to follow the steps for completing a simple investigation when provided with the steps. However, appropriate assessments should also require students to *compare* observations and predictions; *identify* and *use* appropriate materials when conducting a simple scientific investigation; or *recognize* scientific observations.

Scientific Inquiry

1-1 The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

1-1.4 Use appropriate safety procedures when conducting investigations.
Taxonomy Level: 3.2-C Apply Procedural Knowledge

Previous/Future knowledge: In all grades students use appropriate safety procedures when conducting investigations that are appropriate to their grade, tools, and types of investigations.

It is essential for students to know that care should be taken when conducting a science investigation to make sure that everyone stays safe.

Safety procedures to use when conducting science investigations may be

- Be careful with sharp objects and glass. Only the teacher should clean up when something breaks.
- Follow all directions for completing the science investigation.
- Follow proper handling of plants in the classroom.
- Keep objects away from the face unless instructed by the teacher.
- Keep workplace neat. Clean up after an activity.
- Practice all of the safety procedures associated with the activities or investigations conducted.
- Tell the teacher about accidents or spills right away.
- Wash hands after each activity.
- Wear goggles or aprons when appropriate.

It is essential for students to use tools safely and accurately when conducting investigations, including rulers.

NOTE TO TEACHER (safety while working with students):

- Teacher materials have lists of "Safety Procedures" appropriate for the suggested activities. Students should be able to describe and practice all of the safety procedures associated with the activities they conduct.
- Most simple investigations will not have any risks, as long as proper safety procedures are followed. Proper planning will help identify any potential risks and therefore eliminate any chance for student injury or harm.
- Teachers should review the safety procedures before doing an activity.
- Lab safety rules may be posted in the classroom and/or laboratory where students can view them. Students should be expected to follow these rules.
- A lab safety contract is recommended to notify parents/guardians that classroom science investigations will be hands-on and proper safety procedures will be expected. These contracts should be signed by the student and the parents or guardians and kept on file to protect the student, teacher, school, and school district.
- In the event of a laboratory safety violation or accident, documentation in the form of a written report should be generated. The report should be dated, kept on file, include a signed witness statement (if possible) and be submitted to an administrator.
- Materials Safety Data Sheets (MSDS) will be found in kits if necessary.
- For further training in safety guidelines, you can obtain the SC Lab Safety CD or see the Lab Safety flip-chart (CD with training or flip-chart available from the SC Department of Education).

Scientific Inquiry

1-1 The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

It is not essential for students to go beyond safety procedures appropriate to the kinds of investigations that are conducted in a first grade classroom.

Assessment Guidelines:
The objective of this indicator is to *use* appropriate safety procedures when conducting investigations; therefore, the primary focus of assessment should be to apply correct safety procedures while conducting an investigation. However, appropriate assessments should also require students to *identify* safety procedures that are needed while conducting an investigation; or *recognize* when appropriate safety procedures are being used.