Scientific Inquiry

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

K-1.1 Identify observed objects or events by using the senses.
Taxonomy Level: 1.1-A Remember Factual Knowledge

Previous/Future knowledge: As with other indicators at this grade level, students will experience their first formal introduction to important science skills and processes. The development of these skills will serve as the basis for all future science investigations. In 2nd grade (2-1.4), students will infer explanations regarding scientific observations and experiences. In 4th grade (4-1.1), students will classify observations as either quantitative or qualitative.

It is essential for students to know that 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).

It is not essential for students to identify observations as qualitative or quantitative.

Assessment Guidelines:
One objective of this indicator is to *identify* observed objects or events by using the senses; therefore, the primary focus of assessment should be to recall that observations are made using some or all of the five senses. However, appropriate assessments should also require students to *recognize* characteristics of objects or events that are made using the five senses; *match* an observation with the appropriate sense; or *recognize* the appropriate method of making an observation using each of the senses.

Scientific Inquiry

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

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

Previous/Future knowledge: As with other indicators at this grade level, students will experience their first formal introduction to important science skills and processes. The development of these skills and processes will serve as the basis for all future science investigations. This is the first time students are formally introduced to scientific tools and the procedures for using them safely, accurately and appropriately. 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. A *simple scientific investigation* is designed to answer a question. The information gathered in the investigation 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 *magnifier*, or hand lens, is a science tool that can be used to see details of objects that are too small to be seen clearly with unaided eyes.
  - A magnifier should be held between the eye and the object being viewed.
  - The magnifier should be moved back and forth until the object looks clear.
  - Magnifiers can be used to observe physical properties of objects.
- *Eyedroppers* are short tubes fitted with rubber bulbs at the top of the tube that are used to measure liquids by drops when gathering specific data.
  - Squeeze the bulb before inserting it into the liquid to obtain some of the liquid.
  - Eyedroppers can be used to add small amounts of liquids.

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

- Magnifiers should not be used to look at the Sun or burn objects.
- Some magnifiers and eyedroppers may be made of glass. Be careful not to drop them.
- Be careful not to scratch the lens of the magnifier.
- Do not use a magnifier if it is cracked or broken.
- Eyedroppers should be cleaned after each use.
- Classroom eyedroppers should not be used to put liquids in the eyes.

It is not essential for students to know how to use other tools at this time, such as rulers, measuring cups, or thermometers. However, an introduction to 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 magnifiers and eyedroppers 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

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

K-1.3 Predict and explain information or events based on observations or previous experience.
Taxonomy Level: 2.5-A and 2.7-A Understand Factual Knowledge

Previous/Future knowledge: As with other indicators at this grade level, students will experience their first formal introduction to important science skills and processes. The development of these skills and processes will serve as the basis for all future science investigations. In 2nd grade (2-1.4), students will infer explanations regarding scientific observations and experiences. In 3rd grade (3-1.4), students will predict the outcome of a simple investigation. This is the first time students have been introduced to the process skills of predicting and explaining. Students will use these skills to interpret observations throughout their scientific education.

It is essential for students to know that the observations made about objects or events and previous experiences can be used to predict what might happen. To make a prediction:

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

Observations can also be used to explain (communicate) what is happening in an investigation.

NOTE TO TEACHER: When predicting, students should form an idea about an expected result based on present knowledge, understandings, and observations. When explaining, students should use spoken words and drawings. Teachers may want to introduce students to other forms of communication such as diagrams, tables, or graphs to communicate information and ideas.

It is not essential for students to make inferences about objects or events or go beyond introductory skills of predicting and explaining at this time.

Assessment Guidelines:
One objective of this indicator is to *predict* information or events based on observations or previous experience; therefore, the primary focus of assessment should be to tell what will happen next based on observations or experiences. However, appropriate assessments should also require students to *recall* what is needed to make a prediction.

Another objective of this indicator is to *explain* information or events based on observations or previous experience; therefore, the primary focus of assessment should be to construct cause and effect models of what has happened based on their observations or experiences. However, appropriate assessments should also require students to *summarize* the major points about information or events.

Scientific Inquiry

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

K-1.4 Compare objects by using nonstandard units of measurement.
Taxonomy Level: 2.6-A Understand Factual Knowledge

Previous/Future knowledge: As with other indicators at this grade level, students will experience their first formal introduction to important science skills and processes. The development of these skills and processes will serve as the basis for all future science investigations. In 1st grade (1-1.1), students will compare, classify, and sequence objects by number using standard English units of measurement where appropriate. In 2nd grade (2-1.2), students will use tools and begin gathering specific data in US customary (English) and metric units of measurement.

It is essential for students to know that objects can be compared using *nonstandard units* (measurements of a known quantity such as fingers, counting bears, paper clips).

- A *measurement* includes a number (counting) and the name of how it was measured (labeling), for example the desk is 3 hands long.
- The nonstandard unit chosen should be appropriate to the object being measured.

Making comparisons can help to better understand the properties that are observed.

- For example, terms such as "as many as," "more than," "the same as," or "as long as" can be used to compare measurements of different objects.
- When comparing objects, the nonstandard unit must be the same.

NOTE TO TEACHER: Students need to experience comparing and measuring objects through exploration. They should understand the process of comparing and measuring with non-standard units before they are introduced to standard units in first grade.

It is not essential for students to use English or metric units of measurement.

Assessment Guidelines:
The objective of this indicator is to *compare* objects by using nonstandard units of measurement; therefore, the primary focus of assessment should be to give similarities and differences between objects based on measurements using nonstandard units. However, appropriate assessments should also require students to *identify* an appropriate nonstandard unit for a measurement of an object.

Scientific Inquiry

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

K-1.5 Use appropriate safety procedures when conducting investigations.
Taxonomy Level: 3.2-C Apply Procedural Knowledge

Previous/Future knowledge: As with other indicators at this grade level, students will experience their first formal introduction to important science skills and processes. The development of these skills and processes will serve as the basis for all future science investigations. Students will continue to use safety procedures 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 animals and 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 including magnifiers and eyedroppers safely and accurately when conducting investigations.

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

K-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 kindergarten 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.