

Science and Technology for Children™

FIRST-GRADE UNITS

Grade	Life, Earth, and Physical Sciences and Technology			
1	Organisms	Weather	Solids and Liquids	Comparing and Measuring
2	The Life Cycle of Butterflies	Soils	Changes	Balancing and Weighing
3	Plant Growth and Development	Rocks and Minerals	Chemical Tests	Sound
4	Animal Studies	Land and Water	Electric Circuits	Motion and Design
5	Microworlds	Ecosystems	Food Chemistry	Floating and Sinking
6	Experiments with Plants	Measuring Time	Magnets and Motors	The Technology of Paper

First-Grade STC™ Units and the NSES (K–4)

National Science Education Standards for Grades K–4	Organisms	Weather	Solids and Liquids	Comparing and Measuring
Science as Inquiry				
Abilities necessary to do scientific inquiry	●	●	●	●
Understandings about scientific inquiry	●	●	●	●
Physical Science				
Properties of objects and materials		●	●	●
Position and motion of objects			●	●
Light, heat, electricity, and magnetism			●	
Life Science				
Characteristics of organisms	●			
Life cycles of organisms	●			
Organisms and environments	●		●	
Earth and Space Science				
Properties of earth materials			●	
Objects in the sky		●		
Changes in earth and sky		●	●	
Science and Technology				
Abilities of technological design				●
Understandings about science and technology	●	●	●	●
Abilities to distinguish between natural objects and objects made by humans	●	●		
Science in Personal and Social Perspectives				
Personal health		●	●	
Characteristics and changes in populations				
Types of resources	●			
Changes in environments	●		●	
Science and technology in local challenges		●	●	
History and Nature of Science				
Science as a human endeavor	●	●	●	●
Unifying Concepts and Processes				
Systems, order, and organization	●	●	●	●
Evidence, models, and explanation	●	●	●	●
Constancy, change, and measurement	●	●	●	●
Evolution and equilibrium				
Form and function	●		●	●

Organisms

Narrative Summary

This unit provides hands-on experiences that help students develop an understanding of and sensitivity to living things. Students create and maintain a woodland habitat containing pine seedlings, moss, pill bugs, and Bess beetles or millipedes. They also set up and observe a freshwater habitat into which they introduce elodea and cabomba plants, pond snails, and guppies. With both plants and animals in each habitat, students have the opportunity to observe how these organisms coexist. Through studying the needs and characteristics of a variety of organisms, the students are able to draw conclusions about how plants and animals are similar and different. In a final lesson, students apply to humans what they have learned about organisms, exploring how human beings are similar to and different from other living things.

Science Content

In this unit, students observe and compare living things to identify their characteristics and resource needs. Students are encouraged to use their own observations to support their ideas about the similarities and differences between plants and animals. The diversity of living things is introduced through readings about interesting and exotic plants and animals. Students explore life cycles through their own observations and questions.



Assessment

In a matched pre- and post-unit assessment, each student draws a living thing and writes about what it needs to live and be healthy. Students also share what they know and want to know about plants and animals and how they are alike and different. Through this matched assessment, students are likely to appreciate how much they have learned about the needs of living things. Throughout the unit, students maintain

journals in which they record their observations of a plant they grow from a seed. Class stories, which describe how seeds grow, and planting cards, which serve as laboratory notebooks, allow for assessment of students' daily observations. Record sheets track development of students' ideas about their classroom organisms. Teachers can use learning goals and progress charts provided to evaluate student progress and communicate that progress to parents. Additional assessments at the close of the unit include suggestions on assessing student work samples, setting up student meetings, and inviting students to make presentations that assess concepts, skills, and attitudes developed throughout the unit.

Goals for *Organisms*

In this unit, students explore the similarities and differences between plants and animals. Through their experiences, students are introduced to the following concepts, skills, and attitudes.

Concepts

- We use our senses to observe the world around us.
- Organisms have basic needs, such as food, water, air, space, and shelter.
- Each type of organism has specific needs, such as type of food, amount of water, amount of light, amount of space, and type of shelter.
- There is a wide diversity of living things on earth.
- Organisms grow, change, and die over time.
- Some plants grow from seeds. The roots grow first and then the stem.
- Plants have similarities, such as the ability to grow and the need for water, light, space, and air.
- Animals have similarities, such as the ability to move and the need for food, water, space, and shelter.
- Plants and animals have similarities, such as basic needs, ability to grow and change, and death.
- Humans are similar to other organisms. Humans have basic needs and also grow, change, and die.

Skills

- Observing and describing the characteristics of seeds and plants.
- Planting seeds and observing and recording their growth.
- Observing and describing the characteristics of a variety of plants and animals in woodland and freshwater environments.
- Recording observations in words and drawings.
- Making comparisons among a variety of plants and animals.
- Communicating ideas through writing, drawing, and discussion.
- Reading to enhance understanding of the basic needs of organisms and the diversity of life.
- Applying what students know about plants and animals to what students know about themselves.
- Maintaining plants and animals outside their natural environments.

Attitudes

- Developing an interest in exploring the characteristics of plants and animals.
- Gaining an awareness of the diversity of life.
- Developing positive attitudes toward different forms of life.
- Developing an awareness that humans are similar to other living things.
- Developing a sensitivity to the needs of living things.



Organisms

Fundamental Concepts and Principles Addressed (K–4)

Science as Inquiry

Abilities necessary to do scientific inquiry

- Ask a question about objects, organisms, and events in the environment.
- Plan and conduct a simple investigation.
- Employ simple equipment and tools to gather data and extend the senses.
- Use data to construct a reasonable explanation.
- Communicate investigations and explanations.

Understandings about scientific inquiry

- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
- Scientists use different kinds of investigations, depending on the questions they are trying to answer.
- Simple instruments, such as magnifiers and rulers, provide more information than scientists obtain using only their senses.
- Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations.
- Scientists make the results of their investigations public.
- Scientists review and ask questions about the results of other scientists' work.

Life Science

Characteristics of organisms

- Organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms.

- Each plant or animal has different structures that serve different functions in growth and survival. For example, humans have distinct body structures for walking, holding, seeing, and talking.

Life cycles of organisms

- Plants and animals have life cycles that include being born, developing into adults, reproducing, and eventually dying. The details of this life cycle are different for different organisms.
- Animals closely resemble their parents.

Organisms and their environments

- All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.
- An organism's patterns of behavior are related to the nature of that organism's environment, including the kinds and number of other organisms present, the availability of food and resources, and the physical characteristics of the environment.
- All organisms cause changes in the environment where they live. Some of these changes are detrimental to the organism or the organisms, whereas others are beneficial.
- Humans depend on their natural or constructed environments.

Science and Technology

Understandings about science and technology

- People have always had questions about their world. Science is one way of answering questions and explaining the natural world.
- Scientists and engineers often work in teams with different individuals doing different things that contribute to the results.
- Tools help scientists make better observations and measurements. They help scientists see, measure, and do things that they could not otherwise see, measure, and do.

Abilities to distinguish between natural objects and objects made by humans

- Some objects occur in nature; others have been designed and made by humans.

Science in Personal and Social Perspectives

Types of resources

- Air, water, and soil are basic resources.

Changes in environments

- Environments are the space, conditions, and factors that affect an individual's ability to survive.

History and Nature of Science

Science as a human endeavor

- Many people choose science as a career. Many people derive great pleasure from doing science.

Unifying Concepts and Processes

Systems, order, and organization

Evidence, models, and explanation

Constancy, change, and measurement

Form and function

Weather

Narrative Summary

This unit introduces first-graders to the concept of weather and how it affects their lives. Using a variety of tools, students observe, discuss, measure, and record data on cloud cover, precipitation, wind, and temperature. They learn how to read a thermometer and construct a rain gauge to measure precipitation. They also study cloud formations and use a wind scale to estimate the speed of wind. To apply their new skills and knowledge, students compare their own weather predictions with an actual weather forecast and use the weather data they have collected to form generalizations about the weather in their own locale.

Science Content

Throughout this unit, students use science tools to extend their senses. Students engage in scientific inquiry by setting up several simple investigations on the effect color has on temperature and heat absorption. Math skills are used in context when students apply a scale to their measurements and create graphs. Long-term data collection is emphasized when students take responsibility for collecting data, recording it in a class weather calendar, and making reports to their classmates. Students use data to look for patterns and learn to make predictions. Reading selections extend the unit's content by addressing the career of meteorology and the history and invention of the umbrella and mackintosh raincoat.



Assessment

In Lesson 1, students observe the day's weather and then discuss how they might use this information to decide what they will wear to school. A class graph serves as a means of organizing information about students' favorite types of weather. This pre-unit assessment, matched to a post-unit assessment following Lesson 16, serves as a basis for assessing students' growth in knowledge. Throughout the

unit, assessments are incorporated, or embedded, into the lessons. Lesson 8, which serves as an embedded assessment, asks students to apply what they have learned about temperature to a new situation. By measuring the temperatures of hot, cold, and mixed hot and cold water, students demonstrate growth in learning to read and record temperature. At the close of the unit, students make sense of their data on wind speed, cloud cover, precipitation, and temperature by comparing their weather predictions with those of a meteorologist. Additional assessments at the end of the unit include developing and presenting student-made weather reports, drawing pictures of different types of weather, and presenting weather information to visitors. Students can also revisit a temperature activity from earlier in the unit.

Goals for *Weather*

In this unit, students' observations and activities expand their awareness of weather, its features, and its effects on their daily lives. Their experiences introduce them to the following concepts, skills, and attitudes.

Concepts

- Weather changes from day to day and week to week.
- Features of weather include cloud cover, precipitation, wind, and temperature.
- Tools used to measure different features of weather include wind scales, thermometers, and rain gauges.
- Meteorologists are scientists who study, observe, and record information about the weather and who use that information to forecast the weather.
- Weather affects the decisions people make about the clothing they will wear and about their outside activities.

Skills

- Observing the weather by using the senses.
- Discussing and recording information about weather features.
- Using simple tools to estimate wind speed and measure temperature and rainfall.
- Observing differences in types of clouds.
- Conducting experiments and drawing conclusions about appropriate clothing for different types of weather.
- Organizing weather data on graphs and long-term data collection charts.
- Interpreting and summarizing long-term weather data.

Attitudes

- Increasing awareness of weather.
- Appreciating how weather affects daily life.
- Recognizing that measurements and long-term records are useful and help us learn more about weather.



Weather

Fundamental Concepts and Principles Addressed (K–4)

Science as Inquiry

Abilities necessary to do scientific inquiry

- Ask a question about objects, organisms, and events in the environment.
- Plan and conduct a simple investigation.
- Employ simple equipment and tools to gather data and extend the senses.
- Use data to construct a reasonable explanation.
- Communicate investigations and explanations.

Understandings about scientific inquiry

- Scientific investigations involve asking and answering a question and comparing the answer to what scientists already know about the world.
- Scientists use different kinds of investigations, depending on the questions they are trying to answer. Types of investigations include describing events, classifying them, and doing a fair test (experimenting).
- Simple instruments, such as magnifiers and thermometers, provide more information than scientists obtain using only their senses.

Physical Science

Properties of objects and materials

- Objects have many observable properties, including size, shape, color, and temperature. These properties can be measured using tools, such as thermometers.
- Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects.
- Materials can exist in different states—solid, liquid, and gas. Some common materials, such as water, can be changed from one state to another.

Earth and Space Science

Objects in the sky

- The sun, moon, stars, clouds, birds, and airplanes all have properties, locations, and movements that can be observed and described.
- The sun provides the light and heat necessary to maintain the temperature of the earth.

Changes in the earth and sky

- Weather changes from day to day and over the seasons. Weather can be described by measurable quantities, such as temperature, wind direction and speed, and precipitation.
- Objects in the sky have patterns of movement.

Science and Technology

Understandings about science and technology

- People have always had questions about their world. Science is one way of answering questions and explaining the natural world.
- People have always had problems and invented tools and techniques (ways of doing something) to solve problems.
- Scientists and engineers often work in teams with different individuals doing different things that contribute to the results.
- Women and men of all ages, backgrounds, and groups engage in a variety of scientific and technological work.
- Tools help scientists make better observations, measurements, and equipment for investigations. They help scientists see, measure, and do things they could not otherwise see, measure, and do.

Abilities to distinguish between natural objects and objects made by humans

- Objects can be categorized into two groups, natural and designed.

Science in Personal and Social Perspectives

Personal health

- Safety and security are basic needs of humans. Safety involves freedom from danger, risk, or injury. Student understandings include following safety rules.

Science and technology in local challenges

- People continue inventing new ways of doing things, solving problems, and getting work done. New ideas and inventions often affect other people.

History and Nature of Science

Science as a human endeavor

- Science and technology have been practiced by people for a long time.

- Men and women have made a variety of contributions throughout the history of science and technology.
- Many people choose science as a career. Many people derive great pleasure from doing science.

Unifying Concepts and Processes

Systems, order, and organization

Evidence, models, and explanation

Constancy, change, and measurement

Solids and Liquids

Narrative Summary

In this unit, students investigate the similarities and differences in a variety of common solids and liquids. First, they observe, describe, and compare a collection of solid objects, focusing on such properties as color, shape, texture, and hardness. They also perform tests to determine whether the objects roll or stack and float or sink, as well as whether they are attracted to a magnet. Investigations of liquids center on how various liquids look and feel, their fluidity, how they mix with water, and their degree of absorption. In a final lesson, students compare the properties of solids and liquids and identify how they are similar and different.

Science Content

Solids and liquids have observable properties that can be described and compared. Some properties of solids and liquids are shape, color, texture, miscibility, and fluidity or viscosity. These properties can be used to sort the solids and liquids studied in the classroom and to investigate new materials. Physical science concepts studied include motion, magnetism, and buoyancy as they relate to solids and liquids. Reading selections in the unit address pollutants, weather, and rocks.



Assessment

In Lesson 1, students are asked to observe, describe, and compare two solids—a spoon and a steel ball. Students’ oral descriptions of these objects and a written description of what they know about solids provide a pre-unit assessment of their skills in observing and describing the properties of solids. Lesson 10 serves as a pre-assessment for the second half of the unit, in which students observe and

describe the properties of liquids. Following Lesson 16 is a post-unit assessment that is matched to Lessons 1 and 10 and helps determine students’ growth in concepts and skills throughout the unit. An activity called “guess my reason” helps in assessing students’ observational skills. This opens up the possibility of many “right” answers. Embedded assessments in Lessons 9 and 15 challenge students to apply what they have learned in the unit as they conduct tests to learn more about two new solids and liquids. Additional assessments at the end of the unit include an investigation in which students mix cornstarch and water, suggestions for helping students share what they have learned with visitors, and strategies for reviewing student work.

Goals for Solids and Liquids

In this unit, students expand their awareness of the properties of solids and liquids. Their experiences introduce them to the following concepts, skills, and attitudes.

Concepts

- Solids and liquids can be described by their properties.
- Some properties of solids are color, shape, ability to roll or stack, hardness, magnetic attraction, and whether they float or sink.
- Some properties of liquids are color, tendency to flow, degree of viscosity or fluidity, whether they are miscible with water, and whether they float or sink in water.
- Tests can be performed to investigate properties of solids and liquids that cannot otherwise be observed.

Skills

- Observing and describing the properties of solids and liquids.
- Conducting tests to investigate the properties of solids and liquids.
- Sorting solids into groups on the basis of their properties.
- Comparing similarities and differences among solids.
- Comparing similarities and differences among liquids.
- Applying tests to investigate new solids and liquids.
- Comparing the properties of solids with the properties of liquids.
- Communicating ideas, observations, and experiences through writing, drawing, and discussion.

Attitudes

- Accepting that there is more than one way to describe solids and liquids.
- Recognizing the importance of organizing information and results on charts.
- Developing an interest in investigating the physical world.



Solids and Liquids

Fundamental Concepts and Principles Addressed (K–4)

Science as Inquiry

Abilities necessary to do scientific inquiry

- Ask a question about objects, organisms, and events in the environment.
- Plan and conduct a simple investigation.
- Employ simple equipment and tools to gather data and extend the senses.
- Use data to construct a reasonable explanation.
- Communicate investigations and explanations.

Understandings about scientific inquiry

- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
- Scientists use different kinds of investigations, depending on the questions they are trying to answer.
- Simple instruments, such as magnifiers, provide more information than scientists obtain using only their senses.
- Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge).
- Scientists make the results of their investigations public; they describe the investigations in ways that enable others to repeat the investigations.
- Scientists review and ask questions about the results of other scientists' work.

Physical Science

Properties of objects and materials

- Objects have many observable properties, including size, weight, shape, and color.
- Objects are made of one or more materials, such as paper, wood, and metal. Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects or materials.
- Materials can exist in different states.

Position and motion of objects

- The position of an object can be described by locating it relative to another object or the background.
- An object's motion can be described by tracing its position over time.
- The position and motion of objects can be changed by pushing or pulling. The size of the change is related to the strength of the push or pull.

Light, heat, electricity, and magnetism

- Magnets attract and repel each other and certain kinds of materials.

Life Science

Organisms and their environments

- When an organism's environment changes, some plants and animals survive and reproduce, and others die or move.
- Humans change environments in ways that can either be beneficial or detrimental for themselves and other organisms.

Earth and Space Science

Properties of earth materials

- Earth materials include solid rocks. These materials have different physical properties that make them useful in different ways.

Changes in the earth and sky

- Weather changes from day to day and over the seasons.

Science and Technology

Understandings about science and technology

- People have always had questions about their world. Science is one way of answering questions and explaining the natural world.
- Scientists and engineers often work in teams with different things that contribute to the results.

- Women and men of all ages, backgrounds, and groups engage in a variety of scientific and technological work.
- Tools help scientists make better observations, measurements, and equipment for investigations.

Science in Personal and Social Perspectives

Personal health

- Safety and security are basic needs of humans. Safety involves freedom from risk or danger.

Changes in environments

- Changes in environments can be natural or influenced by humans. Some changes are good, some are bad, and some are neither good nor bad. Pollution is a change in the environment that can influence the health, survival, and activities of organisms, including humans.

Science and technology in local challenges

- People are inventing new ways of doing things, solving problems, and getting work done.

History and Nature of Science

Science as a human endeavor

- Men and women have made a variety of contributions throughout the history of science.
- Many people choose science as a career. Many people derive great pleasure from doing science.

Unifying Concepts and Processes

Systems, order, and organization

Evidence, models, and explanation

Constancy, change, and measurement

Form and function

Comparing and Measuring

Narrative Summary

In this unit, students explore the concepts that underlie the science skills of comparing and measuring. The lessons are based on a developmental sequence that includes three activities: comparing, matching, and measuring. Initially, students compare lengths by matching measuring tape to their own heights and the lengths of their arms and legs. They make the transition from matching to measuring length by quantifying

nonstandard units of measure (in this case, their own feet) and discover that using nonstandard units of measure produces varied results. Finally, students use standard units of measure, such as Unifix Cubes® and measuring strips, to measure height, width, and distance. In so doing, students begin to understand key measuring concepts, such as using beginning and ending points, a common starting line, and standard units of measure.

Science Content

This unit emphasizes observation, description, and relative measurement. It also introduces standard units. Students use their own height and the size of various parts of their bodies to explore measurement concepts and develop systems for comparison. By comparing body cutouts, students develop an awareness of themselves and others. Students



are introduced to simple measuring tools and units. This unit connects easily with technology, mathematics, measurement, and graphing. It prepares students for the introduction of formal measuring, as well as the use of standardized units commonly used in science.

Assessment

Lesson 1 of this unit begins as students discuss what it means to compare and measure.

This pre-unit assessment

provides insight into students' knowledge of the kinds of comparisons they make in their lives and the methods they use to make them. In an embedded assessment, students have the opportunity to apply their understanding of measurement and make comparisons by selecting the appropriate unit of measurement, measuring accurately, and stating reasonable comparisons. This provides the opportunity to assess the comparing, matching, and measuring skills that students have gained during the unit. Following Lesson 16, a post-unit assessment is matched to the pre-unit assessment in Lesson 1. Additional assessments, such as the task of wrapping a gift, offer students further challenges in comparing, matching, and measuring.

Goals for *Comparing and Measuring*

In this unit, students' observations and activities expand their awareness of comparing and measuring. From their experiences, they are introduced to the following concepts, skills, and attitudes.

Concepts

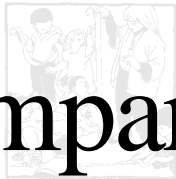
- Comparing involves observing similarities and differences.
- One way to make comparisons is by matching.
- Using beginning and ending points and placing units end to end are important factors when measuring.
- Nonstandard units of measure produce varying results.
- Standard units of measure produce more consistent results than nonstandard units and make it possible to share information.
- Different units and tools can be used to measure objects.
- Long tools make it easier to measure long objects.
- A common starting line is required to make fair comparisons.

Skills

- Observing similarities and differences among objects.
- Describing similarities and differences among objects.
- Placing objects in serial order on the basis of height or length.
- Communicating observations, ideas, and questions through discussion, drawing, and writing.
- Organizing information on representational graphs and charts.
- Making predictions about the relative lengths and sizes of objects.
- Using standard and nonstandard units of measure.
- Using groups of tens to quantify large numbers of units.
- Measuring using beginning and ending points.
- Interpreting results of measurements.

Attitudes

- Developing an awareness of self and others by comparing height, length of arms and legs, and body cutouts.
- Developing an appreciation of the usefulness of measuring in our daily lives.
- Becoming comfortable using a variety of measuring tools and units of measure.
- Recognizing the importance of developing strategies for counting large numbers.
- Appreciating the importance of organizing information on graphs and charts.



Comparing and Measuring

Fundamental Concepts and Principles Addressed (K–4)

Science as Inquiry

Abilities necessary to do scientific inquiry

- Ask a question about objects, organisms, and events in the environment.
- Plan and conduct a simple investigation.
- Employ simple equipment and tools to gather data and extend the senses.
- Use data to construct a reasonable explanation.
- Communicate investigations and explanations.

Understandings about scientific inquiry

- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know.
- Scientists use different kinds of investigations, depending on the questions they are trying to answer.
- Simple instruments, such as rulers, provide more information than scientists obtain using only their senses.
- Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge).
- Scientists make the results of their investigations public.
- Scientists review and ask questions about the results of other scientists' work.

Physical Science

Properties of objects and materials

- Objects have many observable properties, including size and shape, and can be measured using tools, such as rulers.
- Properties can be used to separate or sort a group of objects.

Position and motion of objects

- The position of an object can be described by locating it relative to another object or the background.
- An object's motion can be described by tracing and measuring its position over time.
- The position and motion of an object can be changed by pushing or pulling. The size of the change is related to the strength of the push or pull.

Science and Technology

Abilities of technological design

- Identify a simple problem.
- Propose a solution.
- Communicate a problem, design, and solution.

Understandings about science and technology

- People have always had questions about their world. Science is one way of answering and explaining questions about the natural world.
- People have always had problems and invented tools and techniques (ways of doing something) to solve problems.
- Scientists and engineers often work in teams with different individuals doing different things that contribute to the results.
- Women and men of all ages, backgrounds, and groups engage in a variety of scientific and technological work.
- Tools help scientists make better observations, measurements, and equipment for investigation.

History and Nature of Science

Science as a human endeavor

- Many people derive great pleasure from doing science.

Unifying Concepts and Processes

Systems, order, and organization

Evidence, models, and explanation

Constancy, change, and measurement

Form and function