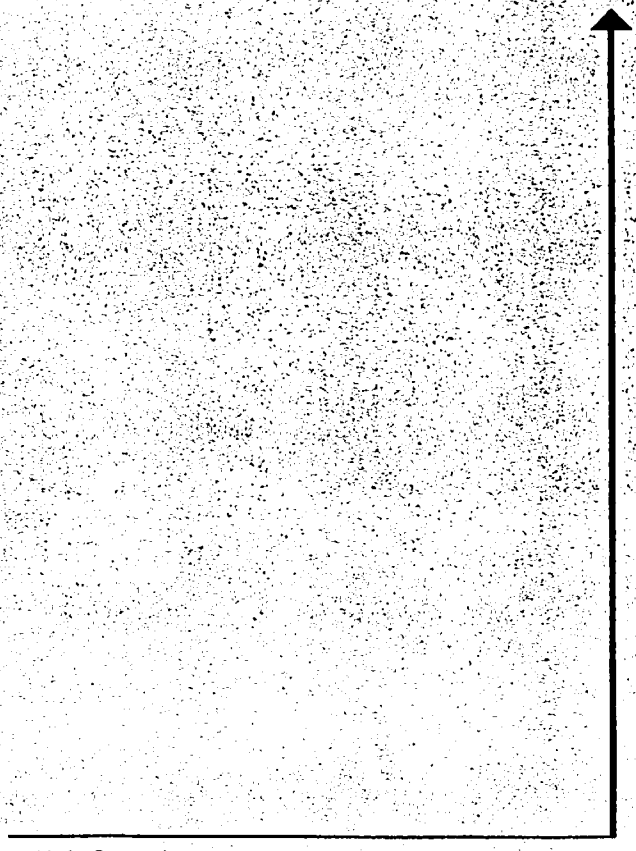
Science and Technology for Children®

Section 1
STC® Program Overview



2. Unit Overview
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Introduction

This section of the *Weather* Teacher's Guide provides a broad introduction to the unit. You may find it helpful to read through this section before you look at the other sections of the guide, which are more detailed.

The section begins with a lesson-by-lesson description of the science investigations that students will perform and the materials they will use. Reading this section will give you a good idea of the "storyline" of the unit and of the nature and purpose of classroom activities.

Goals for *Weather* come next; these are presented in terms of concepts, skills, and attitudes.

The third part of this section contains a detailed analysis of the alignment between *Weather* and the National Science Education Standards for science content for grades K through 4.

Lesson Structure, the next part of this section, briefly describes the key segments of the Teacher's Guide.

The next part—Teaching Strategies—provides both general and specific guidelines on how to facilitate student learning.

The part entitled Assessing Students' Progress summarizes the STC approach to evaluating student learning. Full details on assessment, including assessment tools, appear in Section 5 of this guide.

This Unit Overview ends with acknowledgments to the *Weather* development team, evaluators, national field-test participants, technical advisers, the STC Advisory Panel, the STC–II Advisory Panel, and the National Science Resources Center Advisory Board.

Overview of Student Investigations

Childhood is a time for wondering. Young children are typically curious and ask endless questions about their world and how it works. Their curiosity about weather may lead them to ask specific questions, but more often it may show itself in other ways. Think, for example, of a young child playing in the snow. Here, questions are probably not spoken but instead take the form of playful investigation as the child jumps in a snowdrift, watches a powdery snowball fall to pieces and a slushy one hold its shape, or blows on a snowflake and watches it melt. In whatever form the curiosity is expressed, the child is clearly seeking information.

The *Weather* unit was designed to draw upon and expand this natural curiosity and enthusiasm for finding out about weather. In doing so, it also provides a comfortable introduction to what may be students' first experience with the study of science.

Overview of Concepts, Skills, and Attitudes

In the *Weather* unit, students discover that cloud cover, precipitation, wind, and temperature are features of weather. They learn that these features can not only be observed with the senses but also measured with scientific instruments such as thermometers, wind scales, and rain gauges. Investigations of wind introduce students to the concept that air is a physical substance that surrounds us, takes up space, and has material properties. As they observe pie-tin puddles in the classroom, students are introduced to the processes of condensation and evaporation, both of which are part of the water cycle.

In the course of their investigations, students gain skills in using simple instruments to measure wind speed, temperature, and rainfall. They hone their observational skills as they study and classify various types of clouds. They obtain experience collecting, organizing, and interpreting long-term data. The lessons in this unit enable students to appreciate how weather changes and how it affects our daily lives, to make elementary weather forecasts, and to appreciate the importance of meteorology.

A Concept Storyline for *Weather* appears on page 4 of this section.

Lesson-by-Lesson Summary

Lesson 1, a pre-unit assessment, acknowledges children's interest in weather by starting with a brainstorming activity that invites them to discuss what they already know about this subject. They also discuss the current day's weather and how it affects their choice of clothing. In Lesson 2, students' observations become more focused as they concentrate on what their individual senses tell them about weather. In Lesson 3, students begin recording their observations on a long-term data collection device, the daily Weather Calendar. Keeping track of the weather on a daily basis lets them see how it changes from day to day and week to week.

In Lessons 4 through 14, students focus on observing, discussing, measuring, and recording data on the four weather features explored in the unit. These features are cloud cover, precipitation, wind, and temperature.

In Lesson 4, students learn how to work with a wind scale to estimate the speed of the wind. This is the first of the three simple scales they will use. The importance of scales is reinforced in Lessons 5 through 7, when students become acquainted with the Fahrenheit thermometer scale. They learn to read model and real thermometers, take daily temperature readings, and record their findings on a class Temperature Graph. They continue to practice reading thermometers in Lessons 8 and 9.

Precipitation becomes the focus of study in the next three lessons. In Lesson 10, students construct their third scale, a rain gauge, and practice measuring rainfall. In Lesson 11, they explore what happens to

rain after it has fallen. An experiment in Lesson 12 provides an opportunity for students to learn about appropriate clothing for rainy weather.

In Lessons 13 and 14, students turn their attention to the fascinating diversity of cloud appearances, categorizing an assortment of cloud photographs in different ways on the basis of their observations.

In Lesson 15, students compare an actual weather forecast with their own data. In Lesson 16, they refer to their data to form generalizations about the weather that has occurred in their own locale since the unit began.

Lesson 17, a post-unit assessment, is a follow-up to the class brainstorming session that took place during Lesson 1. Again, students answer the questions "What is the weather like today?" and "How did you decide what to wear to school today?" They then compare their answers with the responses they made to the same questions in Lesson 1. This experience enables the teacher to document students' progress and helps students realize how much they have learned about weather indicators such as temperature and how to measure them, how and why weather changes, and how weather affects our daily lives.

By the end of the unit, children will have approached weather phenomena both in ways that were already familiar to them, by using their senses, and in new ways, by using the tools of science to measure weather features and record data. Their new scientific and practical knowledge will have contributed to their understanding of weather and the way it affects their lives.

Weather Concept Storyline

Unifying Concept
The physical world is made of materials that can be identified by their unique properties and is organized into interconnected systems.

Unit Concept
Weather changes from day to day and season to season. Weather can be described by measurable features, such as temperature and rainfall.

Grade-Level Concept
The sun, air, and water cycle work together to give us weather. Measurements and records help us predict weather and make decisions about our daily lives.

Subconcept 1
Weather is characterized by features such as temperature, wind speed and direction, and precipitation.

Lesson 1: Pre-Unit Assessment: Sharing What We Know about Weather
Students discuss what they know and would like to know about weather.

Lesson 2: Observing the Weather
Students use their senses to observe the weather.

Subconcept 2
Weather may be quantified using tools such as thermometers, rain gauges, and wind speed and direction indicators.

Lesson 3: Recording the Weather
Students collect data on cloud cover and precipitation.

Lesson 4: Estimating Wind Speed
Students observe, describe, and record wind speed.

Lesson 5: Reading a Thermometer
Students observe and discuss thermometers as tools that measure temperature.

Lesson 6: Making a Model Thermometer
Students read and record temperature on a thermometer and relate temperatures to appropriate clothing and activities.

Lesson 7: Comparing Inside and Outside Temperatures
Students record indoor and outdoor temperatures and compile a class graph.

Lesson 8: Measuring Water Temperature
Students measure and record temperatures of hot and cold water.

Lesson 9: Experimenting with Color and Temperature
Students investigate the relationship between color and the absorption of heat.

Lesson 10: Making a Rain Gauge
Students measure the amount of rainfall using simple rain gauges.

Subconcept 3
Water exists in solid, liquid, and vapor states. Clouds and fog are made up of droplets of water.

Lesson 11: Exploring Puddles
Students learn about evaporation as they observe and record changes in a pie-tin puddle.

Lesson 13: Observing Clouds
Students observe, draw, and discuss cloud formations.

Lesson 14: Classifying Clouds
Students sort cloud pictures using their own systems and according to three defined cloud types—stratus, cumulus, and cirrus.

Subconcept 4
Understanding the elements of weather helps us plan our daily lives.

Lesson 12: Testing Rainy Day Fabrics
Students conduct experiments with fabrics to determine which materials are suitable for wearing in wet weather.

Subconcept 5
Humans can use their observations and records to understand and forecast the weather. Scientists who do this are called meteorologists.

Lesson 15: Comparing Forecasts to Today's Weather
Students make forecasts for the next day's weather and compare their predictions with what actually occurs.

Lesson 16: Summarizing Our Weather Observations
Students tally their weather data and summarize the weather characteristics over a long period of time.

Lesson 17: Post-Unit Assessment: Sharing What We Know about Weather
Students reflect on and discuss what they have learned.

Unit Goals

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.

Alignment of This Unit with the National Science Education Standards

Introduction

Published by the National Research Council in 1996, the National Science Education Standards (NSES)* call for a new vision of science literacy for all students. They set forth criteria that each school district can use as a basis for designing a science program that best meets the needs of its students.

This section summarizes the results of a detailed analysis of the alignment between *Weather* and the NSES science content standards for grades K–4. *Weather* may be taught in kindergarten and grade 2, as well as in grade 1.

The language in this section is taken from the NSES. It includes three elements: (1) category titles (e.g., **Science as Inquiry**); (2) conceptual organizers (e.g., ***Abilities necessary to do scientific inquiry***); and (3) lists of fundamental concepts and principles (e.g., Plan and conduct a simple investigation). In some cases, the original NSES language has been shortened or paraphrased. Only language that is applicable to the unit has been included.

Charts showing the alignment of all 24 STC units with the NSES science content standards for K–4 and 5–8 appear in Section 1 of this guide.

Alignment of *Weather* with the Grades K–4 Science Content Standards

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.

*National Research Council. 1996. *National Science Education Standards*. Washington, D.C.: National Academy Press.

- 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.

Types of resources

- Resources are things we get from the living environment to meet the needs of a population.
- Some resources are basic materials, such as air and water.

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

More Information on STC® and the NSES

To download information about the alignment of the STC curriculum with the NSES, go to the STC Web site at www.carolina.com/STC, and click on Correlations. Or call 800-227-1150 and request a copy of *STC Meets the Standards*.

Information about the alignment of STC units with specific state or district standards may also be available from the publisher at the 800 number.

STC® and National Math and Language Arts Standards

Detailed information on the correlations between STC units and the Principles and Standards for School Mathematics, issued by the National Council of Teachers of Mathematics, and the Standards for the English Language Arts, developed by the National Council for Teachers of English and the International Reading Association, is also available online.

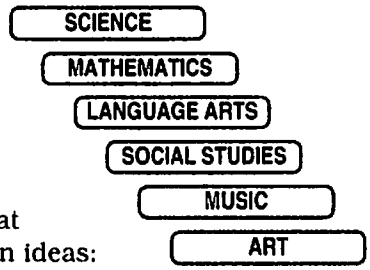
Go to the STC Web site at www.carolina.com/STC, and click on the appropriate item under Correlations.

Lesson Structure

Each investigation in the Teacher's Guide has a number of common components; many lessons have additional components, such as Assessments. By familiarizing yourself with the purpose and content of each of these components, you'll find it easier to organize the investigations and facilitate student learning.

Each lesson in the *Weather* Teacher's Guide is divided into the following major sections:

- **Overview:** A brief description that places the lesson's investigation into context.
- **Objectives:** Specific learning objectives for the lesson.
- **Background:** Brief explanations of key science concepts covered in the lesson as well as information on how to use the materials and organize the investigation.
- **Materials:** A list of all the materials needed for the lesson.
- **Preparation:** Description of how to set up the materials students will use in the lesson.
- **Procedure:** Step-by-step guidelines for facilitating the classroom investigation. Some lessons include illustrated Student Instructions sheets.
- **Final Activities:** Opportunities for students to reflect on and apply what they've done.
- **Extensions:** Suggestions for activities that relate science learning to other areas of the curriculum. Look for these icons that highlight extension ideas:



In addition, many lessons contain the following components:

- **Assessment:** Suggestions for assessing students' progress. These assessments complement the pre- and post-unit assessments provided in Lessons 1 and 17, respectively, and the Additional Assessments (see Section 5).
- **Reading Selections:** *Weather* contains three Reading Selections.

  Lesson 2: Observing the Weather with a Meteorologist
  Lesson 11: Inventing Umbrellas
  Lesson 12: A Coat to Keep You Dry

  For more information about reading in the STC classroom, see Section 7 of this guide.
- **Preparation for Lesson ... :** Instructions on advance preparations appear from time to time at the end of a lesson. These instructions often relate to the care of living organisms or to materials that you or your students need to bring in from home.

Blackline Masters

Reproducible materials used in student investigations include Student Record sheets, Student Activity sheets, Student Instructions sheets, Reading Selections, and blackline masters. The Materials section of each lesson of the Teacher's Guide (see Section 4) provides information on how many copies of these items you will need. For classroom use, you may make an overhead transparency of a specific page or item in the Teacher's Guide.

Other Lesson Components

- **Management Tips** appear throughout the unit.

- A **Glossary** for this unit (see Section 4) is a resource for both teachers and students. The definitions are not unit specific and are intended to apply across the STC curriculum. The definitions are provided to facilitate discussion and may serve to enhance other unit activities. Under no circumstances should students be required to memorize the words or definitions presented in the glossary.

Teaching Strategies

As noted in Section 1, STC Program Overview, lessons in the STC curriculum are based on a learning cycle that is grounded in research on how children learn.

1. First, children **focus** on what they know about a subject and what they would like to know about it. In other words, lessons begin with students' existing knowledge and experience.
2. Usually working in pairs, children then **explore** a scientific concept or phenomenon by completing a sequence of investigations.
3. Students **reflect** on what they've learned—by discussing findings with their teammates or classmates or by writing in their science notebooks.
4. Finally, students **apply** their new learning to real-life situations and to other topics in the elementary curriculum.

The teaching strategies described in this section can help you facilitate use of the STC learning cycle in your classroom.

Classroom Discussion

Class discussions, led by the teacher, are important vehicles for science learning. Research shows that the way questions are asked, as well as the time allowed for responses, can contribute to the quality of students' discussions.

When you ask questions, think about what you want to achieve in the ensuing discussion. For example, open-ended questions, for which there is no one right answer, will encourage students to give creative and thoughtful answers. You can use other types of questions to encourage students to see specific relationships and contrasts or to help them summarize and draw conclusions. It is good practice to mix these questions. It also is good practice always to give students "wait time" before expecting them to answer; this will encourage broader participation and more thoughtful answers. You will want to monitor responses, looking for additional situations that invite students to formulate hypotheses, make generalizations, and explain how they arrived at a conclusion.

Brainstorming

Brainstorming is a whole-class exercise in which students contribute their thoughts about a particular idea or problem. When used to introduce a new science topic, it can be a stimulating and productive exercise. It also is a useful and efficient way for the teacher to find out what students know and think about a topic. As students learn the rules for brainstorming, they will become increasingly adept in their participation.

To begin a brainstorming session, define for students the topics about which they will share ideas. Tell students the following rules:

- Accept all ideas without judgment.
- Do not criticize or make unnecessary comments about the contributions of others.
- Try to connect your ideas to the ideas of others.

Cooperative Learning Groups

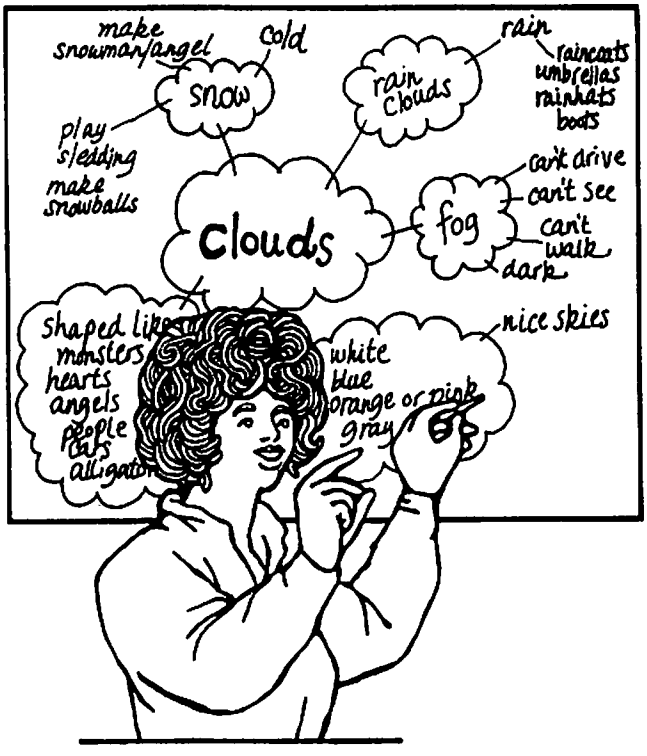
One of the best ways to teach hands-on science is to arrange students in small groups. There are several advantages to this organization. It provides a small forum for students to express their ideas and get feedback. It also offers students a chance to learn from one another by sharing ideas, discoveries, and skills.

With coaching, students who participate in cooperative learning groups can develop important interpersonal skills that will serve them well in all aspects of life. As students work, they will often find it productive to talk about what they are doing, resulting in a steady hum of conversation. If you or others in the school are accustomed to a quiet room, this new, busy atmosphere may require some adjustment.

Webbing

Webbing (sometimes called "concept mapping" or "clustering") enables you to record ideas in a graphic display with the main subject at the center, or nucleus, of the web. Webbing identifies relationships between related ideas and the nucleus. It helps students recognize what they already know about a subject and invites them to make as many associations as they can about it. Students can use webbing during a brainstorming session or to record ideas in their science notebooks.

In using the webbing concept, teachers may selectively analyze a number of different aspects of the lesson or unit. For example, a web could draw attention to a number of different linked ideas. These include concepts, processes, functions, properties, categories, descriptions, or systems that are characteristic of the lesson or unit. By identifying the topical focus of the web, students will have a more analytical understanding of the ideas that are being webbed.



Example of webbing an idea

Venn Diagrams

Venn diagrams are useful tools for recording information to be compared. Venn diagrams use two or more intersecting circles to represent different sets of information. Information that relates to one idea is written inside one of the circles. Information about a similar yet different idea is written inside another circle. Information common to both ideas is written in the area where the circles intersect.

Learning Centers

You may want to give supplemental science materials a permanent home in the classroom in a spot designated as the learning center. Students can use the center in a number of ways: as an "on-your-own" project center, as an observation post, as a reading nook for trade books, or simply as a place to spend unscheduled time when assignments are done. To keep interest in the center high, change the learning center or add to it often. Here are a few suggestions of items to include:

- Science trade books and other books, such as biographies, covering topics that are relevant to the unit (for specific suggestions, see Section 8)
- Audiovisual materials on related subjects
- Items contributed by students for sharing
- Additional hands-on activities for investigation

Assessing Students' Progress

Introduction

In the Science and Technology for Children program, assessment is an ongoing, integral part of instruction. Because assessment emerges naturally from the activities in the lessons, students are assessed in the same manner in which they are taught. They may, for example, perform experiments, record their observations, or make oral presentations. Such assessments permit the examination of processes as well as of products, emphasizing what students know and can do.

STC assessments are designed to focus on the science content and skills that are most important for students to learn. The assessments help determine students' scientific-reasoning skills as well as their understanding of science concepts. Because of their variety, the STC assessments offer opportunities for all students to demonstrate their strengths.

Assessment Strategies

STC assessment strategies used in *Weather* include the following:

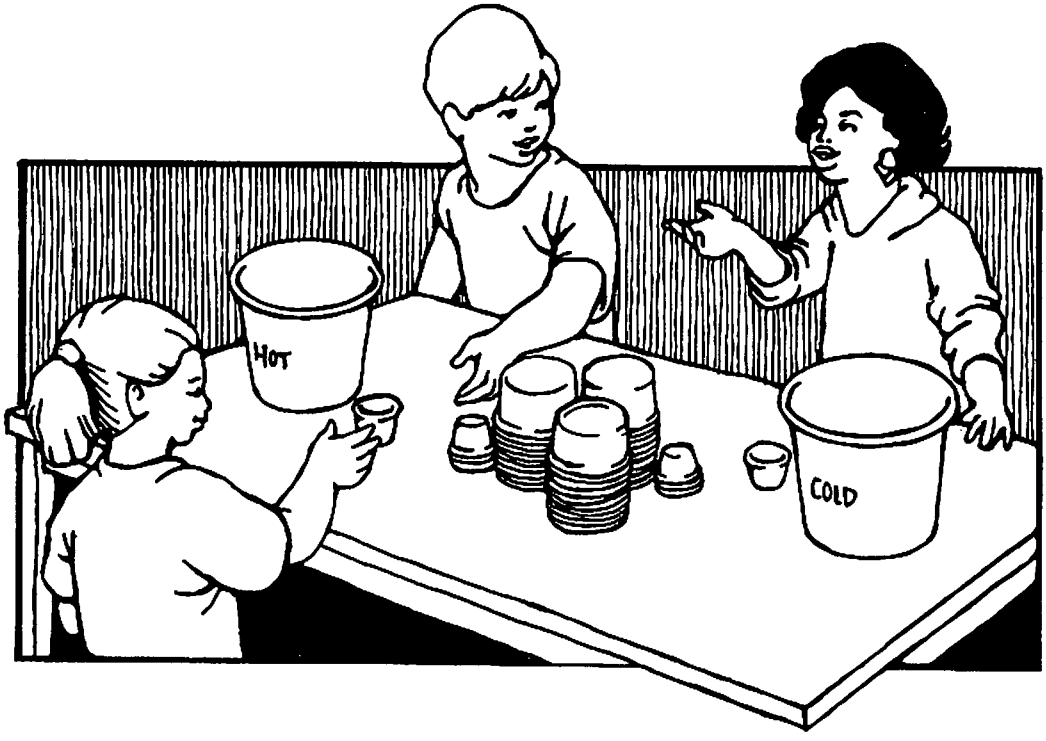
- Matched **pre-unit** (Lesson 1) and **post-unit** (Lesson 17) **assessments** that enable teachers to evaluate student growth.
- **Embedded assessments** that occur naturally within a unit and make assessment seamless with learning.
- **Additional Assessments** (also called Final Assessments) that offer a variety of opportunities to evaluate student progress. Some are performance-based assessments that challenge students to use their science materials to solve new problems. Others include teacher review of student work products, oral presentations, and paper-and-pencil tests. The Additional Assessments are found in Section 5 of this guide.
- **Student self-assessments** that allow students and teachers to track progress.

All STC assessment activities have been evaluated by researchers from the Program Evaluation Research Group at Lesley College, Cambridge, MA.

The STC assessments are consistent with assessment criteria set forth in the National Science Education Standards. These national standards state that assessments provide much more than a benchmark for student progress; they are the primary feedback mechanism in the science education system.

For more information about assessment of student learning in *Weather*, specific assessment tools, and an assessment grid that you can photocopy and use in your classroom, please see Section 5.

Introduction



The *Weather* unit kit (Item Number 97-1201), available from Carolina Biological Supply Company, includes a Teacher's Guide, teacher resource video, and supplies and apparatus for approximately 8 weeks of instruction for a class of 30.

The Teacher's Guide contains blackline masters, student activity sheets, and stories that may be reproduced in unlimited quantities for use in your classroom. Spanish translations of the blackline masters and student activity sheets may be printed from the *STC® en espanol* CD-ROM, which is included in the kit. Items used up during the students' classroom investigations can be replaced through line-item ordering (in small quantities and bulk) or in a convenient refurbishment set.

The information in this section is designed to help you inventory, organize, prepare, and manage the materials needed to teach *Weather*. The section also includes information on safety in the science classroom, both generally and specific to *Weather*. A sample Safety Contract is included to help ensure that your students and their parents are aware of the proper science classroom procedures and behaviors necessary for a successful hands-on science experience.

We suggest that you review the Materials Management and Safety Information sections, beginning on pgs. 8 and 9, respectively, for an overview of preparing and using the materials in this unit and for important safety guidelines.

Unit Kit Materials List and Reordering Information

Most of the items that the teacher and students will need during this unit are supplied in the *Weather* unit kit (designed to accommodate a class of up to 30 students) from Carolina Biological Supply Company.

The Materials List chart on pgs. 5–6 provides information about all kit materials, including a description of the item as it appears in the materials lists of individual lessons in Section 4: Unit Investigations and Blackline Masters, how the item is described on the kit's packing list, in which lesson(s) the item is used, and the quantity used per lesson. This chart, which lists items in alphabetical order, is designed as a quick reference guide to the materials supplied in your kit and should be used to assist you in managing and reordering those materials. The quantity used per lesson appears on the Materials List chart in parentheses after the corresponding lesson number. This information shows, at a glance, in which lessons an item is used and the quantity used during each lesson. This information will help you when it is time to reorder materials because it will enable you to calculate the total number of a particular item that is used throughout this unit.

Items that are not supplied in the kit are listed in the chart under "Needed But Not Supplied Materials," which appears on pg. 7. Items not included in the kit are commonly available in most schools or can be brought from home.

Reordering Materials

All materials needed for *Weather* are available from Carolina Biological Supply Company. You may order an entire kit, a packet of consumable materials, or individual items.

***Weather* Unit Kit (Item No. 97-1201):** The entire unit kit contains a Teacher's Guide, teacher resource video, and supplies for a class of up to 30 students.

***Weather* Refurbishment Set (Item No. 97-1204):** Many of the items in the *Weather* unit kit may be reused. However, some of the items will be consumed during the teaching of the unit and will need to be replenished. You may purchase the consumable materials for *Weather* by ordering the *Weather* Refurbishment Set.

Individual Items: You may also purchase individual items for the *Weather* unit kit from Carolina. Simply request the item as described in the second column of the Materials List chart, pgs. 5–6, or use the Parts Order Form at www.carolina.com/stc/units/weather.asp.

For more information on reordering kit materials and for prices, call Carolina at 800-227-1150.

Materials List

This Materials List chart is a cross-reference guide for the materials supplied in the *Weather* unit kit (Item Number 97-1201). It gives the description of each item as it is listed in the lessons of the Teacher's Guide, and provides the cross-reference description of the item as it appears on the kit's packing list, which you will find in the *Weather* unit kit box(es). Please note that the metric and English equivalent measurements in this unit are approximate. For additional information about the materials in this unit kit, please contact Carolina at 800-227-1150 or www.carolina.com.

Item Description in Teacher's Guide	Item Description on Packing List	Lesson Number (Quantity Used)
Aluminum pie plate, 20 cm (8 in) diameter	Pack of 8 8in aluminum pie tins	11 (8), 12 (8)
Backing for small model thermometer	Pack of 31 8in model fahrenheit thermometer backings	6 (31)
Black construction paper, 23 × 28 cm (9 × 11 in)	Pack of 50 9×12in black construction paper	9 (15)
Clear packing tape	55-yd roll of 2in clear packing tape	10 (30 × 11 cm [4.5 in] long)
Cotton ball	Pack of 300 cotton balls	13 (600)
Date stamp	Date stamp	3 (1), 4 (1)
Hole punch	Hole punch	5 (1), 6 (1)
Large plastic cup, 473 mL (16 oz)	Pack of 30 16-oz plastic cups	8 (30), 10 (30)
Light blue construction paper, 23 × 28 cm (9 × 11 in)	Pack of 50 9×12in light blue construction paper	13 (30)
Medium plastic cup, 296 mL (10 oz)	Pack of 30 10-oz plastic cups	12 (30)
Piece of cotton fabric, 15 cm (6 in) square	Pack of 8 6×6in cotton fabric	12 (8)
Piece of cotton/polyester fabric, 15 cm (6 in) square	Pack of 8 6×6in cotton/poly fabric	12 (8)
Piece of nylon fabric, 15 cm (6 in) square	Pack of 8 6×6in nylon fabric	12 (8)
Piece of stiff tagboard, 5 × 18 cm (2 × 7 in)	Pack of 31 2×7in tagboard	4 (31)
Piece of white fabric, 10 × 15 cm (4 × 6 in)	Pack of 31 4×6in white fabric	4 (31)
Piece of wool fabric, 15 cm (6 in) square	Pack of 8 6×6in wool fabric	12 (8)
Plastic pail, 3.8 L (1 gal)	1-gal plastic pail	8 (2), 11 (2), 12 (2)
Poster board, 29 × 73.5 cm (11½ × 29 in)	Poster board, 29×73.5cm, 11½×29in	5 (1)
Post-it® note, 7.6 cm (3 in) square	3×3in Post-it® notes pad	1 (30 sheets)
Post-it® note, 7.6 × 12.5 cm (3 × 5 in)	3×5in Post-it® notes pad	3 (100), 4 (1)
Red crayon	Pack of 31 red crayons	5 (30), 6 (31), 7 (30), 8 (30), Assessment 4 (30)
Red marker	Red marker	5 (1), 7 (1)
Rubber band	Pack of 15 rubber bands	12 (30)
Set of 11 weather stamps	Pack of 11 weather stamps	3 (1), 4 (1), 16 (1), Assessment 1 (1)
Set of nine cloud photographs	Weather cloud photograph pack, 10 Sets of 9 Cards	14 (10)

Item Description in Teacher's Guide	Item Description on Packing List	Lesson Number (Quantity Used)
Sheet of large graph paper with 2.5 cm (1 in) square	Pack of 3 sheets of large graph paper	7 (3)
Shoelace, 61 cm (24 in)	Pack of 31 shoelaces	6 (31)
Small plastic cup, 118 mL (4 oz)	Pack of 10 4-oz plastic cups	8 (10), 11 (8), 12 (8)
Stamp pad	Stamp pad	3 (1), 4 (1), Assessment 1 (1)
Thermometer	Pack of 31 8in fahrenheit thermometers	5 (31), 6 (31), 7 (30), 8 (30), 9 (30)
Transparent tape	13.8-yd roll of ½in transparent tape	2 (1), 7 (1), 9 (1)
Weather calendar	Pack of 3 weather calendars	3 (3), 4 (1), 7 (1), 15 (1)
White construction paper, 23 × 28 cm (9 × 11 in)	Pack of 50 9×12in white construction paper	9 (15)
White shoelace, 142 cm (56 in)	White shoelace, 142 cm (56 in)	5 (1)

Needed But Not Supplied Materials

The following chart lists the materials that are needed for teaching *Weather*, but are not supplied in the *Weather* unit kit from Carolina Biological Supply Company. These items are commonly available in most schools or can be brought from home. Designed as a quick reference guide, the chart shows the materials that are needed for each of the 17 lessons. It will enable you to begin gathering the materials needed ahead of time.

Description in Teacher's Guide	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Assm't 3
Colored markers	×							×	×				×	×	×	×	×	×
Crayons	×			×						×	×	×						×
Newsprint	×	×		×				×	×	×			×	×	×	×	×	
Overhead transparency sheets		×																
Staplers				×							×							
Glue or paste					×								×	×				
Masking tape					×					×								
Meter stick or yard stick					×													
Scissors					×					×	×			×				
Pencils						×							×					×
Paper towels or sponges								×			×	×						
Watering can or plastic milk carton										×								
Food coloring											×							
Weather from the local paper															×			

Materials Management

This section was created to help you manage the materials in *Weather* more easily.

Inventory and Preparation of Materials

Inventory

Before beginning the module, solicit the assistance of student or adult volunteers to inventory the materials in the box(es) of the *Weather* unit kit. Suggested steps for the inventory include the following:

- Identify each item in the box(es).
- If desired, rearrange or combine similar materials.
- Remove the materials that you will prepare before starting the module.
- Label the outside of each box with its contents.

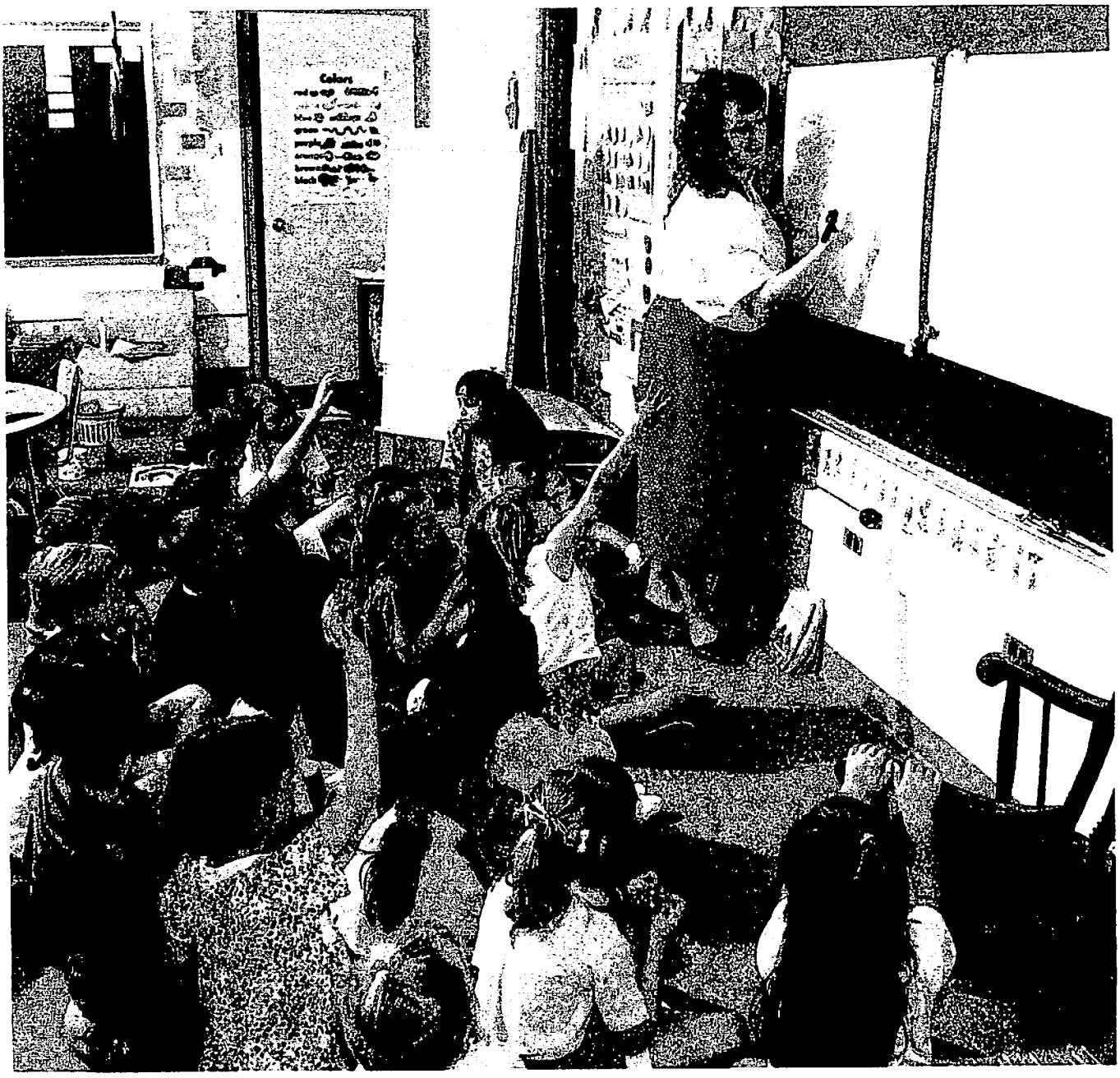
Organization of Materials

To help ensure an orderly progression through the unit, you will need to establish a system for storing and distributing materials. Being prepared is the key to success. Here are a few suggestions:

- Read through the Materials List chart and the Needed But Not Supplied Materials chart on pgs. 6–8. Begin to collect the items you will need that are not provided in the kit.
- Organize your students so they are involved in distributing and returning materials. If you have an existing network of cooperative groups, delegate the responsibility to one member of each group.
- Organize a distribution center and instruct your students to pick up and return supplies to that area. A cafeteria-style approach works especially well when there are large numbers of items to distribute.
- Look at each lesson ahead of time. Familiarize yourself with the background information, and think about how to organize and distribute the materials for each lesson.
- Plan to be flexible. The weather will not necessarily accommodate teaching the lessons in this unit in sequence. If necessary, the lessons listed below can be postponed and taught later in the unit when the weather is suitable.

  Lesson 4: Estimating Wind Speed
  Lesson 9: Experimenting with Color and Temperature
  Lesson 10: Making a Rain Gauge
  Lesson 11: Exploring Puddles
  Lesson 13: Observing Clouds
- Become familiar with the safety tips that appear in some lessons.
- **Management Tips** are also provided throughout the unit.

Contents



LESSON 1

Pre-Unit Assessment: Sharing What We Know about Weather

Overview and Objectives

This introductory lesson will provide you with a pre-unit assessment of your students' current knowledge of weather. Students' discussion of the day's weather and how they decide what to wear will give you a sense of their awareness of weather and how it affects their daily lives. Comparing this discussion with a parallel discussion at the end of the unit will help you assess the growth in their knowledge. As students describe today's weather in Lesson 1, they are introduced to the idea that they can learn more about weather through observation. This activity sets the stage for Lesson 2, when they begin to observe weather features and record information about them more formally.

- Students observe and describe today's weather.
- Students discuss how they decide what to wear to school each day.
- Students organize information about their favorite types of weather on a class graph.

Background

Weather affects all of us—even very young children—almost every day. First-graders, who are experienced at observing their surroundings informally, will already have some ideas of their own about weather. Lesson 1 is designed to give you a sense of how your students understand weather as the unit begins.

By asking students the first pre-assessment question—"What is the weather like today?"—you will focus class discussion on a specific topic, instead of opening a discussion of weather in general. In response to the question, students will begin to share their observations about today's weather. As this process of observing the daily weather develops over the course of the unit, students will acquire a clearer sense of how weather changes. The activities in Lesson 1 will also help prepare them to make more formal observations of the weather during the rest of the unit.

You may discover that students do not make clear distinctions between the signs of weather and other observations of nature, seasons, and holidays. For example, when asked what the weather is like today, they may respond, "The leaves are brown," or "It's almost winter." As they practice observing various features of the weather throughout the unit, however, you can expect their observations to reflect actual weather conditions much more regularly.

Your students' responses to the second pre-unit assessment question—"How do you decide what to wear to school each day?"—may reflect little decision making on their part. For example, some students may say that someone in their family selects their

clothes for them, and others may not even think about what they wear. However, by the end of the unit, their responses to the same question may reflect an increased awareness of the clothing they might want to wear in different types of weather.

As the unit begins, some students may not have much to say in response to these pre-unit assessment questions, especially if they have had little experience in group discussions. However, by the end of the unit, they may be able to share their observations much more readily and in greater detail.

Materials

For each student

1 Post-it™ note, 7.6 cm (3 in) square
Crayons

For the class

3 sheets of newsprint
1 marker

Preparation

1. At the top of one sheet of newsprint, write "Date," "Time," and "Location," with blanks for recording the date, time of day, and place the weather is observed. Also write the title on the chart—"What is the weather like today?"
2. On the second sheet of newsprint, write today's date and the question, "How do you decide what to wear to school each day?"
3. On the third sheet of newsprint, create a graph with the title, "Our Favorite Weather." Figure 1-1 illustrates this graph.
4. You may find it helpful to copy the poem "It's Hot" (see **Procedure,** Step 1) on a large sheet of newsprint so that students can see the poem as it is read aloud.

Procedure

1. Read the poem "It's Hot," by Shel Silverstein, to the class.

It's Hot

It's *hot!*
I can't get cool,
I've drunk a quart of lemonade.
I think I'll take my shoes off
And sit around in the shade.

It's *hot!*
My back is sticky,
The sweat rolls down my chin.
I think I'll take my clothes off
And sit around in my skin.

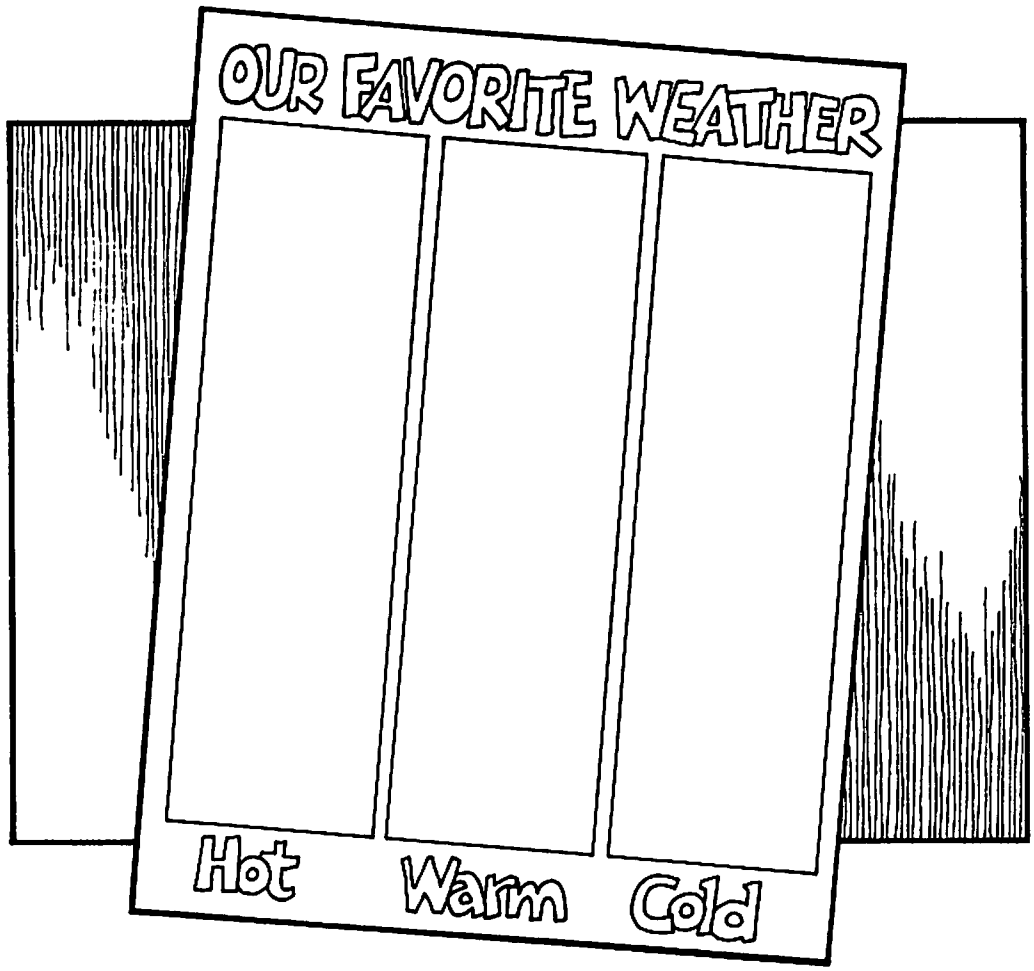
It's *hot!*
I've tried with 'lectric fans,
And pools and ice cream cones.
I think I'll take my skin off
And sit around in my bones.

It's *still* hot!

Reprinted, with permission, from *A Light in the Attic* (New York: HarperCollins Publishers, 1981), pg. 84. ©1981 Shel Silverstein.

Figure 1-1

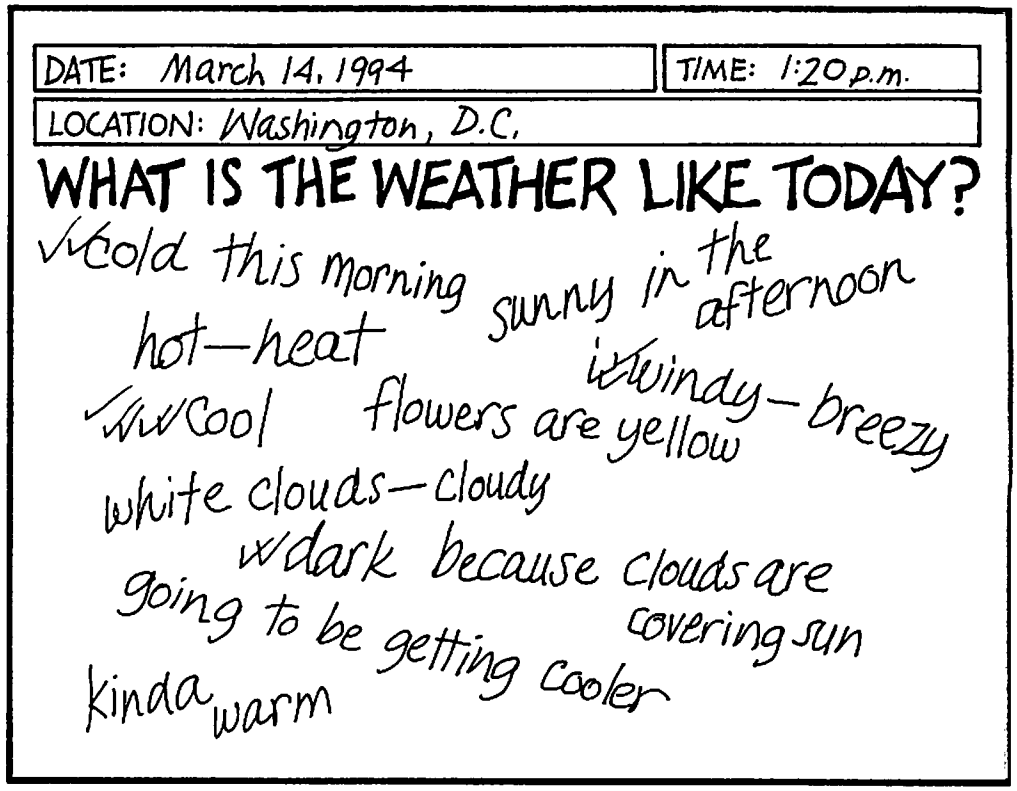
Graph to show students' favorite weather



2. Ask students to briefly compare today's weather with the weather described in the poem. Then explain that for the next several weeks the class will be studying weather.
3. Start the brainstorming session by asking students to discuss the question "What is the weather like today?" with a partner. Then encourage each pair of students to share their observations with the rest of the class.
4. On the chart "What is the weather like today?" fill in the date and time of day observations are made and the name of your town or city. Record students' observations; if more than one student says the same thing (for example, "It's cold this morning"), record the observation only once, but put a check mark next to it for each repetition. Figure 1-2 illustrates a chart filled in with observations; some have check marks indicating that they were repeated.
5. Ask students how they decide what to wear to school each day. Encourage them to think about how they decided to wear the clothes they have on. Record their responses on the newsprint chart.
6. Save both pre-unit assessment charts for use at the end of the unit.

Figure 1-2

Student observations about today's weather



Final Activities

1. Show students the graph "Our Favorite Weather," and read the words "Hot," "Warm," and "Cold." Let them know that they will complete the graph to show which kinds of weather the class likes best.
2. Invite students to discuss the different kinds of clothing they wear for different kinds of weather—hot, cold, rainy, snowy.
3. Give students crayons and one Post-it™ note each. Ask them to draw a picture of themselves dressed for the kind of weather they like best.
4. Have students put their self-portraits in the appropriate columns on the graph. (They might also enjoy seeing what kind of weather you like best.)
5. When students are finished, ask them to help you count the pictures in each column. Record this number on the graph.
6. Write one or more sentences summarizing the data on the graph. For example: We have _[twenty-two]_ students in our class. _[Seven]_ like cold weather best. _[Twelve]_ like hot weather best. _[Three]_ like warm weather best. Our class likes _[hot]_ weather best.

Extensions

MATHEMATICS

1. Have students make a class graph showing how many prefer wet and how many prefer dry weather, or have them make a graph showing their favorite activities in their favorite weather, such as swimming in hot weather or sledding in cold weather.

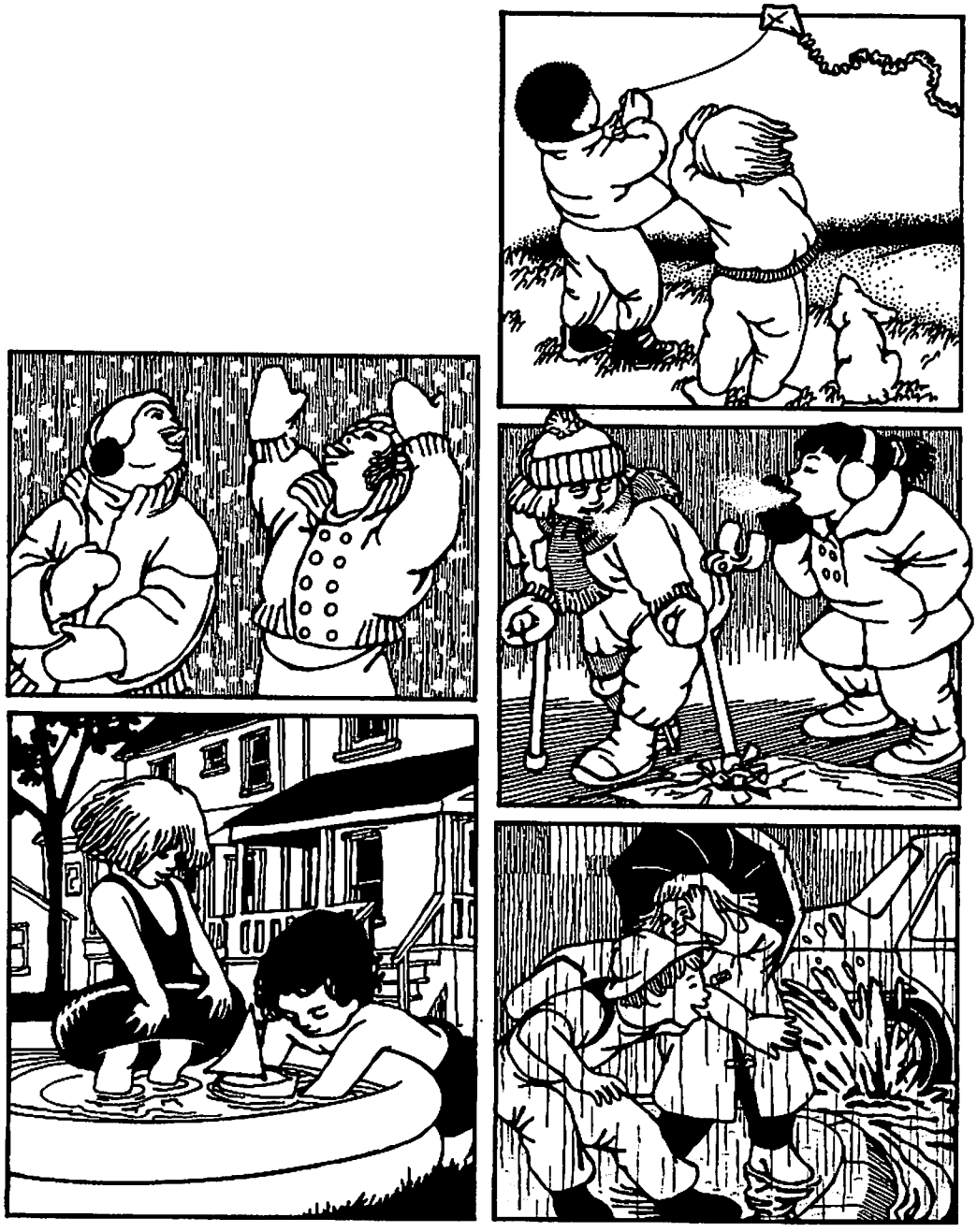
LANGUAGE ARTS

2. Students may enjoy looking through a book such as *Weather Words*, by Gail Gibbons, which illustrates and defines some basic terms.

   Note: See Sections 7 and 8 in this guide for the full citation and an annotation for each book mentioned in this unit.

Figure 1-3

Clothes for different types of weather



Assessment

In Section 2 of this guide, you will find a detailed discussion about the assessment of students' learning. The specific goals for this unit are summarized in Unit Goals in Section 2.

In this lesson, the brainstorming charts entitled "What is the weather like today?" and "How do you decide what to wear to school each day?" are the first half of the matched pre- and post-unit assessments, which are important components of the assessment of your students' growth and learning. (The post-unit assessment is in Lesson 17.)

One of the most powerful ways to assess young children's progress is by direct observation. Guidelines to help you assess your students' growth are provided in many other lessons, but you may also want to refer back to the guidelines in this first lesson from time to time.

Observational Guidelines

One goal of this unit is for students to become more aware of the weather and how it affects their lives. To help you assess the growth of your students' awareness throughout the unit, it is particularly helpful to observe the following:

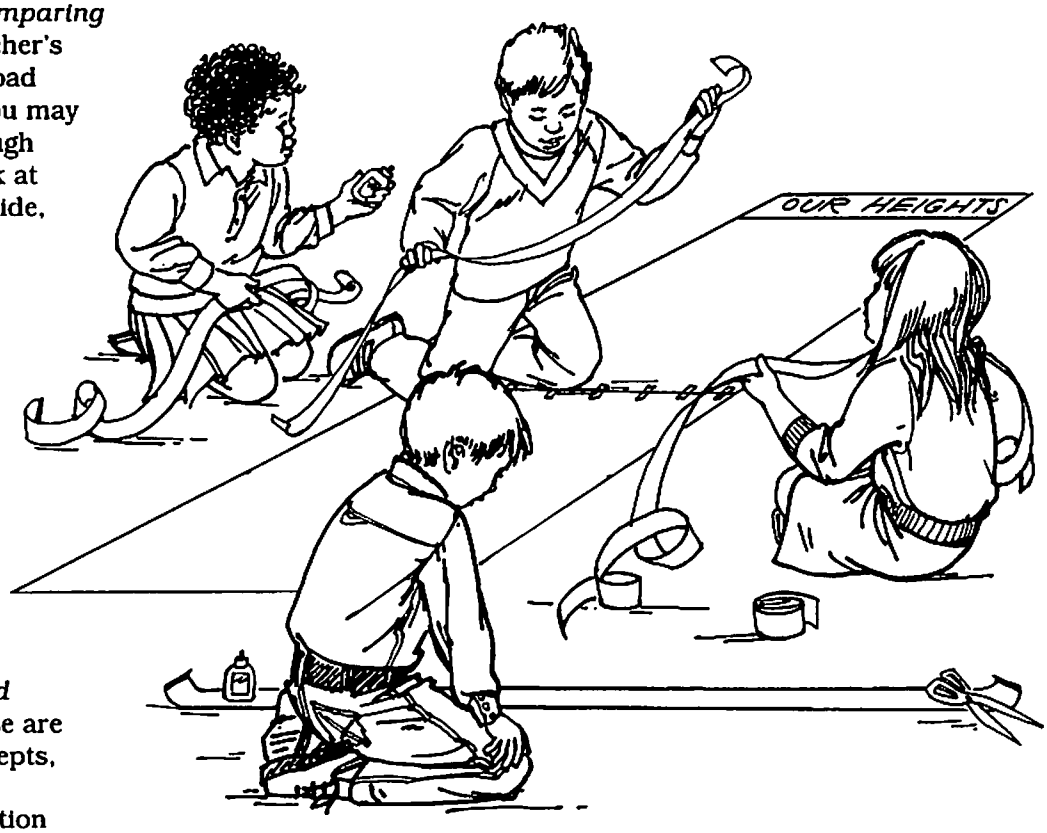
- Which features of the weather your students mention during class discussions
- Whether students' observations become more specific as the unit progresses
- Whether students mention the weather spontaneously
- Whether students refer to different senses when they describe the weather
- Whether students describe ways in which the weather affects their lives
- Whether students' comments reflect their awareness that weather changes from day to day

Science and Technology for Children®

Section 1
STC® Program Overview

Introduction

This section of the *Comparing and Measuring* Teacher's Guide provides a broad introduction to the unit. You may find it helpful to read through this section before you look at the other sections of the guide, which are more detailed.



The section begins with a lesson-by-lesson description of the science investigations that students will perform and the materials they will use. Reading this section will give you a good idea of the "storyline" of the unit and of the nature and purpose of classroom activities.

Goals for *Comparing and Measuring* come next; these are presented in terms of concepts, skills, and attitudes.

The third part of this section contains a detailed analysis of the alignment between *Comparing and Measuring* and the National Science Education Standards for science content for grades K through 4.

Lesson Structure, the next part of this section, briefly describes the key segments of the Teacher's Guide.

The next part—Teaching Strategies—provides both general and specific guidelines on how to facilitate student learning.

The part entitled Assessing Students' Progress summarizes the STC approach to evaluating student learning. Full details on assessment, including assessment tools, appear in Section 5 of this guide.

This Unit Overview ends with acknowledgments to the *Comparing and Measuring* development team, evaluators, national field-test participants, technical advisers, the STC Advisory Panel, the STC–II Advisory Panel, and the National Science Resources Center Advisory Board.

Overview of Student Investigations

Children naturally make comparisons. At one time or another, many children have stood back to back with a friend to find out who is taller. They have placed a foot next to that of a classmate to find out whose foot is longer. They have gone shopping and "matched" their bodies to different-size clothing to find clothes that fit. All these experiences involve comparing, which lays the foundation for matching and, subsequently, measuring.

Comparing and measuring are important science skills. When scientists do experiments, they often need to measure; that is, using numbers and standard units of measure, they describe such properties as length, volume, weight, and temperature. Similarly, when students do classroom experiments, they will need to have developed skills in measuring these properties. Even outside the classroom, students have frequent opportunities to measure and compare, for example, when they assemble toy models, fit pieces into jigsaw puzzles, or chart their heights. In fact, comparing and measuring are key ways children make sense of their lives. *Comparing and Measuring*, a 17-lesson unit designed for first-graders, gives students a variety of experiences in comparing, matching, and measuring.

Overview of Concepts, Skills, and Attitudes

This unit introduces students to a number of concepts relating to comparing and measuring. Students begin by comparing their heights. They then match their heights using a strip of adding-machine tape. This investigation introduces students to the idea that fair comparisons require a common starting line. Next, students use a novel measuring unit—their own feet. They find, through investigations and reading, that nonstandard units of measure produce unpredictable results. Standard units of measure—in this case, a Unifix Cube™—are more reliable and versatile measuring tools. A standard tool also makes it easier for them to share their results.

Having recognized the importance of standard units of measure, students create their own measuring tools. They discover that different measuring tasks require different tools; a tape, for example, enables them to measure the circumference of an object, as well as its height or length. An understanding of these basic concepts prepares students to use standard measuring units such as inches and centimeters.

This unit gives young students experience in observing differences and similarities among objects and placing objects in serial order on the basis of height or length. It offers opportunities to use standard and nonstandard units of measure and to organize information on graphs and charts. Students learn to use groups of tens to quantify large numbers of units. These experiences help them understand the importance of measuring accurately and the usefulness of measuring tools and units.

A Concept Storyline for *Comparing and Measuring* appears on page 4 of this section.

Lesson-by-Lesson Summary

Lesson 1 begins with a class brainstorming session in which students discuss what it means to compare. They begin to recognize that when they identify similarities and differences, they are comparing. As a pre-unit assessment lesson, it provides you with a sense of the kinds of comparisons students are making at present and the methods they use to make them.

In the next three lessons, students continue to explore making comparisons. In Lesson 2, they make life-size cutouts of their bodies and use the cutouts to compare their heights. This experience prepares students for matching their heights with adding machine tape in Lesson 3. Students begin to see that when matching the tape to an object, they need to determine both a beginning and an ending point. In Lesson 4, students match the

lengths of their arms and legs and record their results on a representational bar graph. When comparing the information on the arm and leg graphs with the information on the height graph from Lesson 3, students begin to recognize the importance of a common starting line.

In the first four lessons, students compare and match lengths either their own size or smaller. In Lesson 5, students are challenged to match larger objects. As they discuss which object might be the largest, students are introduced to the idea of making predictions. In Lesson 6, students begin to discover that matching distance is another facet of matching length. They flip toy Flippers™ and use adding machine tape to represent the distance the Flippers™ have traveled.

In Lesson 7, students make the transition from matching to measuring length by quantifying nonstandard units of measure—in this case, their own feet. Through their measuring activities and a reading selection, students are introduced to the idea that using nonstandard units of measure produces varied results. In Lesson 8, students continue to get varied results as they use different sets of standard objects to measure the same lengths. For example, students who use pencils to measure an object achieve different results from those who use wooden spools to measure it. In addition, students now begin to think about why it is helpful to label their results with the name of the unit they have used to measure. These experiences lay the foundation for Lesson 9, in which the entire class uses the same standard unit to measure. In addition to discovering less variation in their results, students begin to see that using a common standard unit produces results that can be expressed using a common language.

In Lesson 10, students are introduced to a measuring unit that they will use in the next six lessons—Unifix Cubes™. As students connect and stack the cubes, they determine that the cubes are a more versatile tool and that they can be used to measure vertically as well as horizontally. In Lessons 11 and 12, students use larger numbers of cubes to measure larger objects, and gain experience in counting by groups of 10.

In Lesson 13, students make a measuring tool that represents 10 Unifix Cubes™. Students discuss how this tool—a paper measuring strip—eliminates the need for actual Unifix Cubes™. In Lesson 14, students face the challenge of measuring objects that are longer than their measuring strips. Lesson 15 builds on the idea that using an appropriate measuring tool makes it easy to measure long objects. Students create a 100-unit measuring tape and listen to a reading selection to reinforce this concept. In addition, students discover that the measuring tape enables them to measure circumference as well as the length or height of an object.

In Lesson 16, students use their measuring tapes to measure how far they can make the Flippers™ travel. Students expand their awareness that measuring is an extension of matching when they compare the methods and results recorded in Lesson 6 with those in this lesson. Lesson 16 also serves as an embedded assessment of the comparing, matching, and measuring skills students have learned during the unit.

Lesson 17, a post-unit assessment, is a follow-up to the class brainstorming session and other activities that took place during Lesson 1. Students revisit their record sheets and class lists. They make suggestions for clarifying or revising the observations on the lists. Using tools they have used throughout the unit, students and their partners identify ways in which they are similar and different from one another and record and discuss their findings. These experiences enable the teacher to document students' progress and help students realize how much they have learned about comparing and measuring.

Comparing and Measuring Concept Storyline

Unifying Concept
Length and distance are measured with reference to a standard unit.

Unit Concept
The relative sizes of objects and distances between them may be determined by comparisons. Absolute measurement requires the use of standard units.

Grade-Level Concept
Measuring with standard units is a more accurate means of determining size or distance than is comparing or measuring with nonstandard units.

Subconcept 1
Relative lengths may be compared by using a variety of frames of reference.

Lesson 1: Pre-Unit Assessment: Comparing How We Are Alike and Different
Students use observation and everyday objects to make comparisons.

Lesson 2: Let's Make Body Cutouts
Students use body tracings to compare their heights.

Lesson 3: Matching Our Heights
Students compare their heights with adding-machine tape.

Lesson 4: Matching Lengths of Arms and Legs
Students use adding-machine tape to compare the lengths of their limbs.

Lesson 5: Comparing Objects
Students compare the sizes of various objects in the classroom.

Lesson 6: Matching Distance
Students use adding-machine tape to compare and match distances.

Subconcept 2
Use of nonstandard units of measure produces varying results.

Lesson 7: Using Our Feet to Measure
Students use a nonstandard unit to measure length.

Lesson 8: Using Different Standard Units of Measure
Students learn that using different standard lengths produces varying answers.

Subconcept 3
Use of standard units produces consistent results.

Lesson 9: Measuring with a Standard Unit
Students use a standard length as a unit of measurement.

Lesson 10: Exploring with Unifix Cubes™
Students experiment with a new unit of measurement.

Lesson 11: Counting Large Numbers of Units
Students use Unifix Cubes™ to measure large objects.

Lesson 12: Measuring the Height of the Teacher
In an embedded assessment, students use Unifix Cubes™ to determine their teacher's height.

Subconcept 4
Different calibrated devices may be used to measure distances and the lengths of objects of different sizes and shapes.

Lesson 13: Making a Measuring Strip
Students make a more versatile standard length for measurement.

Lesson 14: Measuring with a Measuring Strip
Students explore how to measure objects longer than their standard length.

Lesson 15: Making a Measuring Tape
Students learn the advantages of using a tape divided into 100 uniform units.

Lesson 16: Using a Measuring Tape to Measure Distance
Students use a measuring tape to measure distance and compare the results of measuring and matching.

Lesson 17: Post-Unit Assessment: Sharing What We Know about Comparing and Measuring
Students discuss and reflect on what they have learned.

Unit Goals

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.

Alignment of This Unit with the National Science Education Standards

Introduction

Published by the National Research Council in 1996, the National Science Education Standards (NSES)* call for a new vision of science literacy for all students. They set forth criteria that each school district can use as a basis for designing a science program that best meets the needs of its students.

This section summarizes the results of a detailed analysis of the alignment between *Comparing and Measuring* and the NSES science content standards for grades K–4. *Comparing and Measuring* may be taught in kindergarten and grade 2, as well as in grade 1.

The language in this section is taken from the NSES. It includes three elements: (1) category titles (e.g., **Science as Inquiry**); (2) conceptual organizers (e.g., ***Abilities necessary to do scientific inquiry***); and (3) lists of fundamental concepts and principles (e.g., Plan and conduct a simple investigation). In some cases, the original NSES language has been shortened or paraphrased. Only language that is applicable to the unit has been included.

Charts showing the alignment of all 24 STC units with the NSES science content standards for K–4 and 5–8 appear in Section 1 of this guide.

Alignment of *Comparing and Measuring* with the Grades K–4 Science Content Standards

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.

*National Research Council. 1996. *National Science Education Standards*. Washington, D.C.: National Academy Press.

- 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

More Information on STC® and the NSES

To download information about the alignment of the STC curriculum with the NSES, go to the STC Web site at www.carolina.com/STC, and click on Correlations. Or call 800-227-1150 and request a copy of *STC Meets the Standards*.

Information about the alignment of STC units with specific state or district standards may also be available from the publisher at the 800 number.

STC® and National Math and Language Arts Standards

Detailed information on the correlations between STC units and the Principles and Standards for School Mathematics, issued by the National Council of Teachers of Mathematics, and the Standards for the English Language Arts, developed by the National Council for Teachers of English and the International Reading Association, is also available online.

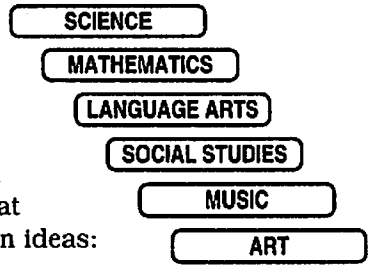
Go to the STC Web site at www.carolina.com/STC, and click on the appropriate item under Correlations.

Lesson Structure

Each investigation in the Teacher's Guide has a number of common components; many lessons have additional components, such as Assessments. By familiarizing yourself with the purpose and content of each of these components, you'll find it easier to organize the investigations and facilitate student learning.

Each lesson in the *Comparing and Measuring* Teacher's Guide is divided into the following major sections:

- **Overview:** A brief description that places the lesson's investigation into context.
- **Objectives:** Specific learning objectives for the lesson.
- **Background:** Brief explanations of key science concepts covered in the lesson as well as information on how to use the materials and organize the investigation.
- **Materials:** A list of all the materials needed for the lesson.
- **Preparation:** Description of how to set up the materials students will use in the lesson.
- **Procedure:** Step-by-step guidelines for facilitating the classroom investigation. Some lessons include illustrated Student Instructions sheets.
- **Final Activities:** Opportunities for students to reflect on and apply what they've done.
- **Extensions:** Suggestions for activities that relate science learning to other areas of the curriculum. Look for these icons that highlight extension ideas:



In addition, many lessons contain the following components:

- **Assessment:** Suggestions for assessing students' progress. These assessments complement the pre- and post-unit assessments provided in Lessons 1 and 17, respectively, and the Additional Assessments (see Section 5).
- **Reading Selections:** *Comparing and Measuring* contains two Reading Selections.

  Lesson 7: The Very Big Umbrella
  Lesson 15: The Long, Long Measuring Tool

  For more information about reading in the STC classroom, see Section 7 of this guide.
- **Preparation for Lesson ... :** Instructions on advance preparations appear from time to time at the end of a lesson. These instructions often relate to the care of living organisms or to materials that you or your students need to bring in from home.

Blackline Masters

Reproducible materials used in student investigations include Student Record sheets, Student Activity sheets, Student Instructions sheets, Reading Selections, and blackline masters. The Materials section of each lesson of the Teacher's Guide (see Section 4) provides information on how many copies of these items you will need. For classroom use, you may make an overhead transparency of a specific page or item in the Teacher's Guide.

Other Lesson Components

- **Management Tips** appear throughout the unit.

- A **Glossary** for this unit (see Section 4) is a resource for both teachers and students. The definitions are not unit specific and are intended to apply across the STC curriculum. The definitions are provided to facilitate discussion and may serve to enhance other unit activities. Under no circumstances should students be required to memorize the words or definitions presented in the glossary.

Teaching Strategies

As noted in Section 1, STC Program Overview, lessons in the STC curriculum are based on a learning cycle that is grounded in research on how children learn.

1. First, children **focus** on what they know about a subject and what they would like to know about it. In other words, lessons begin with students' existing knowledge and experience.
2. Usually working in pairs, children then **explore** a scientific concept or phenomenon by completing a sequence of investigations.
3. Students **reflect** on what they've learned—by discussing findings with their teammates or classmates or by writing in their science notebooks.
4. Finally, students **apply** their new learning to real-life situations and to other topics in the elementary curriculum.

The teaching strategies described in this section can help you facilitate use of the STC learning cycle in your classroom.

Classroom Discussion

Class discussions, led by the teacher, are important vehicles for science learning. Research shows that the way questions are asked, as well as the time allowed for responses, can contribute to the quality of students' discussions.

When you ask questions, think about what you want to achieve in the ensuing discussion. For example, open-ended questions, for which there is no one right answer, will encourage students to give creative and thoughtful answers. You can use other types of questions to encourage students to see specific relationships and contrasts or to help them summarize and draw conclusions. It is good practice to mix these questions. It also is good practice always to give students "wait time" before expecting them to answer; this will encourage broader participation and more thoughtful answers. You will want to monitor responses, looking for additional situations that invite students to formulate hypotheses, make generalizations, and explain how they arrived at a conclusion.

Brainstorming

Brainstorming is a whole-class exercise in which students contribute their thoughts about a particular idea or problem. When used to introduce a new science topic, it can be a stimulating and productive exercise. It also is a useful and efficient way for the teacher to find out what students know and think about a topic. As students learn the rules for brainstorming, they will become increasingly adept in their participation.

To begin a brainstorming session, define for students the topics about which they will share ideas. Tell students the following rules:

- Accept all ideas without judgment.
- Do not criticize or make unnecessary comments about the contributions of others.
- Try to connect your ideas to the ideas of others.

Cooperative Learning Groups

One of the best ways to teach hands-on science is to arrange students in small groups. In *Comparing and Measuring*, some materials and procedures are based on groups of four. There are several advantages to this organization. It provides a small forum for students to express their ideas and get feedback. It also offers students a chance to learn from one another by sharing ideas, discoveries, and skills.

With coaching, students who participate in cooperative learning groups can develop important interpersonal skills that will serve them well in all aspects of life. As students work, they will often find it productive to talk about what they are doing, resulting in a steady hum of conversation. If you or others in the school are accustomed to a quiet

room, this new, busy atmosphere may require some adjustment.

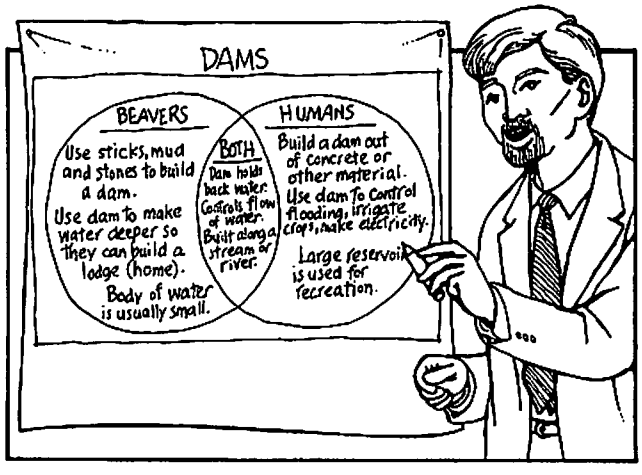
Webbing

Webbing (sometimes called "concept mapping" or "clustering") enables you to record ideas in a graphic display with the main subject at the center, or nucleus, of the web. Webbing identifies relationships between related ideas and the nucleus. It helps students recognize what they already know about a subject and invites them to make as many associations as they can about it. Students can use webbing during a brainstorming session or to record ideas in their science notebooks.

In using the webbing concept, teachers may selectively analyze a number of different aspects of the lesson or unit. For example, a web could draw attention to a number of different linked ideas. These include concepts, processes, functions, properties, categories, descriptions, or systems that are characteristic of the lesson or unit. By identifying the topical focus of the web, students will have a more analytical understanding of the ideas that are being webbed.

Venn Diagrams

Venn diagrams are useful tools for recording information to be compared. Venn diagrams use two or more intersecting circles to represent different sets of information. Information that relates to one idea is written inside one of the circles. Information about a similar yet different idea is written inside another circle. Information common to both ideas is written in the area where the circles intersect.



Example of a Venn diagram

Learning Centers

You may want to give supplemental science materials a permanent home in the classroom in a spot designated as the learning center. Students can use the center in a number of ways: as an "on-your-own" project center, as an observation post, as a reading nook for trade books, or simply as a place to spend unscheduled time when assignments are done. To keep interest in the center high, change the learning center or add to it often. Here are a few suggestions of items to include:

- Science trade books and other books, such as biographies, covering topics that are relevant to the unit (for specific suggestions, see Section 8)
- Measuring tools such as rulers, yardsticks, and tape measures that students can use to practice measuring skills
- Objects of various sizes and shapes for students to measure
- Audiovisual materials on related subjects
- Items contributed by students for sharing
- Additional hands-on activities for investigation

Assessing Students' Progress

Introduction

In the Science and Technology for Children program, assessment is an ongoing, integral part of instruction. Because assessment emerges naturally from the activities in the lessons, students are assessed in the same manner in which they are taught. They may, for example, perform experiments, record their observations, or make oral presentations. Such assessments permit the examination of processes as well as of products, emphasizing what students know and can do.

STC assessments are designed to focus on the science content and skills that are most important for students to learn. The assessments help determine students' scientific-reasoning skills as well as their understanding of science concepts. Because of their variety, the STC assessments offer opportunities for all students to demonstrate their strengths.

Assessment Strategies

STC assessment strategies used in *Comparing and Measuring* include the following:

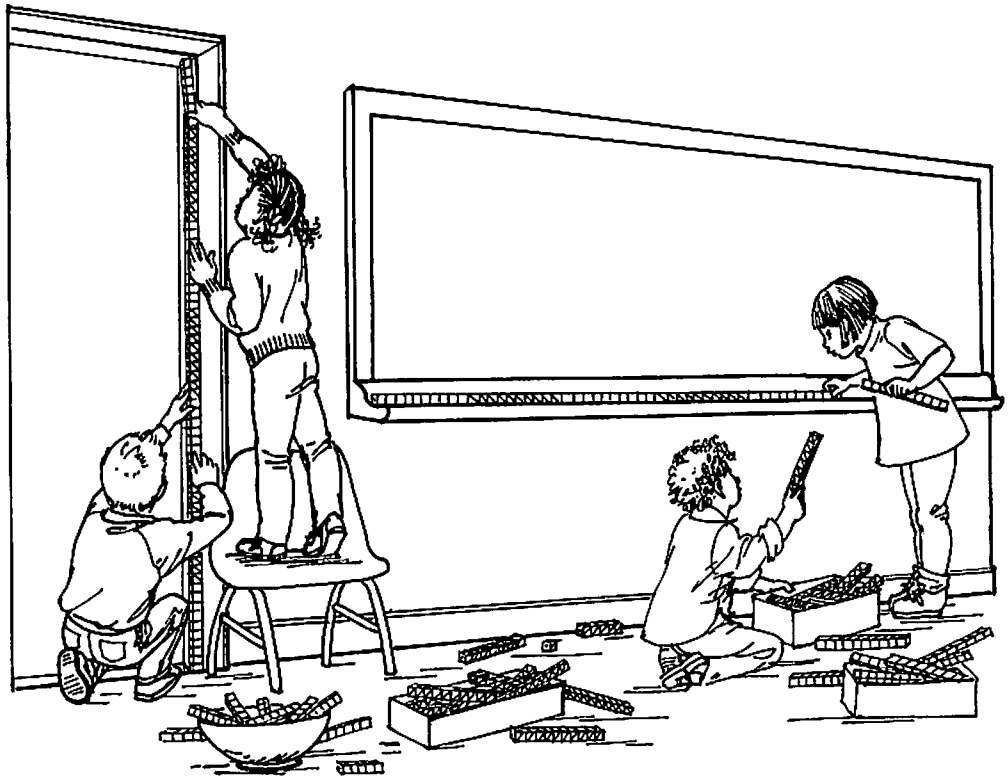
- Matched **pre-unit** (Lesson 1) and **post-unit** (Lesson 17) **assessments** that enable teachers to evaluate student growth.
- **Embedded assessments** that occur naturally within a unit and make assessment seamless with learning.
- **Additional Assessments** (also called Final Assessments) that offer a variety of opportunities to evaluate student progress. Some are performance-based assessments that challenge students to use their science materials to solve new problems. Others include teacher review of student work products, oral presentations, and paper-and-pencil tests. The Additional Assessments are found in Section 5 of this guide.
- **Student self-assessments** that allow students and teachers to track progress.

All STC assessment activities have been evaluated by researchers from the Program Evaluation Research Group at Lesley College, Cambridge, MA.

The STC assessments are consistent with assessment criteria set forth in the National Science Education Standards. These national standards state that assessments provide much more than a benchmark for student progress; they are the primary feedback mechanism in the science education system.

For more information about assessment of student learning in *Comparing and Measuring*, specific assessment tools, and an assessment grid that you can photocopy and use in your classroom, please see Section 5.

Introduction



The *Comparing and Measuring* unit kit (Item Number 97-1301), available from Carolina Biological Supply Company, includes a Teacher's Guide, teacher resource video, and supplies and apparatus for approximately 8 weeks of instruction for a class of 30. The Teacher's Guide contains blackline masters, student activity sheets, and stories that may be reproduced in unlimited quantities for use in your classroom. Spanish translations of the blackline masters and student activity sheets may be printed from the *STC® en espanol* CD-ROM, which is included in the kit. Items used up during the students' classroom investigations can be replaced through line-item ordering (in small quantities and bulk) or in a convenient refurbishment set.

The information in this section is designed to help you inventory, organize, prepare, and manage the materials needed to teach *Comparing and Measuring*. The section also includes information on safety in the science classroom, both generally and specific to *Comparing and Measuring*. A sample Safety Contract is included to help ensure that your students and their parents are aware of the proper science classroom procedures and behaviors necessary for a successful hands-on science experience.

We suggest that you review the Materials Management and Safety Information sections, beginning on pgs. 7 and 8, respectively, for an overview of preparing and using the materials in this unit and for important safety guidelines.

Unit Kit Materials List and Reordering Information

Most of the items that the teacher and students will need during this unit are supplied in the *Comparing and Measuring* unit kit (designed to accommodate a class of up to 30 students) from Carolina Biological Supply Company.

The Materials List chart on pg. 5 provides information about all kit materials, including a description of the item as it appears in the materials lists of individual lessons in Section 4: Unit Investigations and Blackline Masters, how the item is described on the kit's packing list, in which lesson(s) the item is used, and the quantity used per lesson. This chart, which lists items in alphabetical order, is designed as a quick reference guide to the materials supplied in your kit and should be used to assist you in managing and reordering those materials. The quantity used per lesson appears on the Materials List chart in parentheses after the corresponding lesson number. This information shows, at a glance, in which lessons an item is used and the quantity used during each lesson. This information will help you when it is time to reorder materials because it will enable you to calculate the total number of a particular item that is used throughout this unit.

Items that are not supplied in the kit are listed in the chart under "Needed But Not Supplied Materials," which appears on pg. 6. Items not included in the kit are commonly available in most schools or can be brought from home.

Reordering Materials

All materials needed for *Comparing and Measuring* are available from Carolina Biological Supply Company. You may order an entire kit, a packet of consumable materials, or individual items.

***Comparing and Measuring* Unit Kit (Item No. 97-1301):** The entire unit kit contains a Teacher's Guide, teacher resource video, and supplies for a class of up to 30 students.

***Comparing and Measuring* Refurbishment Set (Item No. 97-1304):** Many of the items in the *Comparing and Measuring* unit kit may be reused. However, some of the items will be consumed during the teaching of the unit and will need to be replenished. You may purchase the consumable materials for *Comparing and Measuring* by ordering the *Comparing and Measuring* Refurbishment Set.

Individual Items: You may also purchase individual items for the *Comparing and Measuring* unit kit from Carolina. Simply request the item as described in the second column of the Materials List chart, pg. 5, or use the Parts Order Form at www.carolina.com/stc/units/comparing.asp.

For more information on reordering kit materials and for prices, call Carolina at 800-227-1150.

Materials List

This Materials List chart is a cross-reference guide for the materials supplied in the *Comparing and Measuring* unit kit (Item Number 97-1301). It gives the description of each item as it is listed in the lessons of the Teacher's Guide, and provides the cross-reference description of the item as it appears on the kit's packing list, which you will find in the *Comparing and Measuring* unit kit box(es). Please note that the metric and English equivalent measurements in this unit are approximate. For additional information about the materials in this unit kit, please contact Carolina at 800-227-1150 or www.carolina.com.

Item Description in Teacher's Guide	Item Description on Packing List	Lesson Number (Quantity Used)
Blue crayon	Pack of 15 blue crayons	1 (15), 6 (15), 13 (15), 15 (15), 17 (15)
Blue flipper	Pack of 15 blue flippers	6 (15), 16 (15)
Blue Unifix® Cube	Pack of 150 blue Unifix® Cubes	1 (750), 10 (300), 11 (750), 12 (750), 13 (750), 17 (750), Assessment 1 (20), Assessment 3 (20)
Plastic spoon	Pack of 100 plastic spoons	1 (100), 8 (90), 9 (225), 17 (100), Assessment 1 (20), Assessment 3 (20)
Post-it® notepad, 8 × 13 cm (3 × 5 in)	3×5in Post-it® notes pad	9 (1)
Red crayon	Pack of 16 red crayons	1 (15), 6 (15), 13 (15), 15 (15), 17 (15)
Red flipper	Pack of 15 red flippers	6 (15), 16 (15)
Red marker	Red marker	1 (1), 2 (1), 4 (1), 5 (1), 6 (1), 7 (1), 8 (1), 9 (1), 12 (1), 13 (1), 14 (1)
Red Unifix® Cube	Pack of 150 red Unifix® Cubes	1 (750), 10 (300), 11 (750), 12 (750), 13 (750), 17 (750), Assessment 1 (20), Assessment 3 (20)
Resealable plastic bag, 23 × 30 cm (9 × 12 in)	Pack of 30 9×12in resealable plastic bags	1 (30), 4 (15), 6 (30), 8 (30), 9 (15), 10 (30), 11 (15), 12 (30), 13 (30), 15 (30), 17 (15)
Roll of masking tape	36yd roll of ¾in masking tape	7 (1)
Roll of pink adding machine tape	Roll of pink adding machine tape	1 (15), 3 (15), 4 (15), 6 (15), 7 (15), 12 (15), 15 (15), Assessment 1 (1), Assessment 3 (1)
Roll of yellow adding machine tape	Roll of yellow adding machine tape	3 (15), 4 (15), 5 (8), 6 (15), 9 (15), 15 (15), 17 (15)
Small wood spool, 4 cm (1½ in)	Pack of 100 small wood spools	1 (100), 8 (90), 9 (225), 17 (100), Assessment 1 (20), Assessment 3 (20)
Toothpick	Box of flat toothpicks	1 (100), 8 (90), 9 (225), 17 (100), Assessment 1 (20), Assessment 3 (20)
Unsharpened pencil	Pack of 100 unsharpened pencils	1 (100), 8 (90), 9 (225), 17 (100), Assessment 1 (20), Assessment 3 (20)
Wood coffee stirrer	Pack of 250 wood coffee stirrers	1 (100), 8 (90), 9 (225), 17 (100), Assessment 1 (20), Assessment 3 (20)

Needed But Not Supplied Materials

The following chart lists the materials that are needed for teaching *Comparing and Measuring*, but are not supplied in the *Comparing and Measuring* unit kit from Carolina Biological Supply Company. These items are commonly available in most schools or can be brought from home. Designed as a quick reference guide, the chart shows the materials that are needed for each of the 17 lessons and Assessments 1 and 2. It will enable you to begin gathering the materials needed ahead of time.

Description in Teacher's Guide	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Assm't 1	Assm't 2
Newsprint	×		×	×	×	×	×	×	×			×		×		×	×		×
Scissors	×	×	×	×	×	×	×						×		×			×	
Assorted markers		×	×	×	×											×			×
Crayons		×					×				×	×		×			×		
Large sheets of paper to trace body outlines		×																	
Pencil		×						×			×			×		×			
Glue			×	×		×			×						×				
Science journal				×															
Paper, 22 × 28 cm (8½ × 11 in)					×				×										×
Large beach umbrella							×												
Gift wrap or craft paper																		×	
Shoebox																		×	
Tape																		×	

Materials Management

This section was created to help you manage the materials in *Comparing and Measuring* more easily.

Inventory and Preparation of Materials

Inventory

Before beginning the module, solicit the assistance of student or adult volunteers to inventory the materials in the box(es) of the *Comparing and Measuring* unit kit. Suggested steps for the inventory include the following:

- Identify each item in the box(es).
- If desired, rearrange or combine similar materials.
- Remove the materials that you will prepare before starting the module.
- Label the outside of each box with its contents.

Organization of Materials

To help ensure an orderly progression through the unit, you will need to establish a system for storing and distributing materials. Being prepared is the key to success. Here are a few suggestions:

- Read through the Materials List chart and the Needed But Not Supplied Materials chart on pgs. 5–6. Begin to collect the items you will need that are not provided in the kit.
- Organize your students so they are involved in distributing and returning materials. If you have an existing network of cooperative groups, delegate the responsibility to one member of each group.
- Organize a distribution center and instruct your students to pick up and return supplies to that area. A cafeteria-style approach works especially well when there are large numbers of items to distribute.
- Look at each lesson ahead of time. Familiarize yourself with the background information, and think about how to organize and distribute the materials for each lesson.
- Minimize cleanup by providing each working group with a cleanup box. Students can put disposable materials into this box and clean off their tables at the end of each lesson.
- **Management Tips** are also provided throughout the unit.

Safety Information

Most school districts, schools, and teachers have their own safety procedures for science class. STC materials are designed to be used under the supervision of a teacher in a suitably equipped classroom. Although STC procedures are designed to be safe and STC provides Safety Tips in lessons that require them, it is the teacher's responsibility to ensure that the safety regulations of the local school district are discussed with students and enforced uniformly. Teachers may wish to develop a Safety Contract that students and parents must sign before students can engage in science classroom activities. (A sample Safety Contract appears on pg. 9.)

General Safety Guidelines

When planning the lessons and discussing safety precautions with students, note the following points:

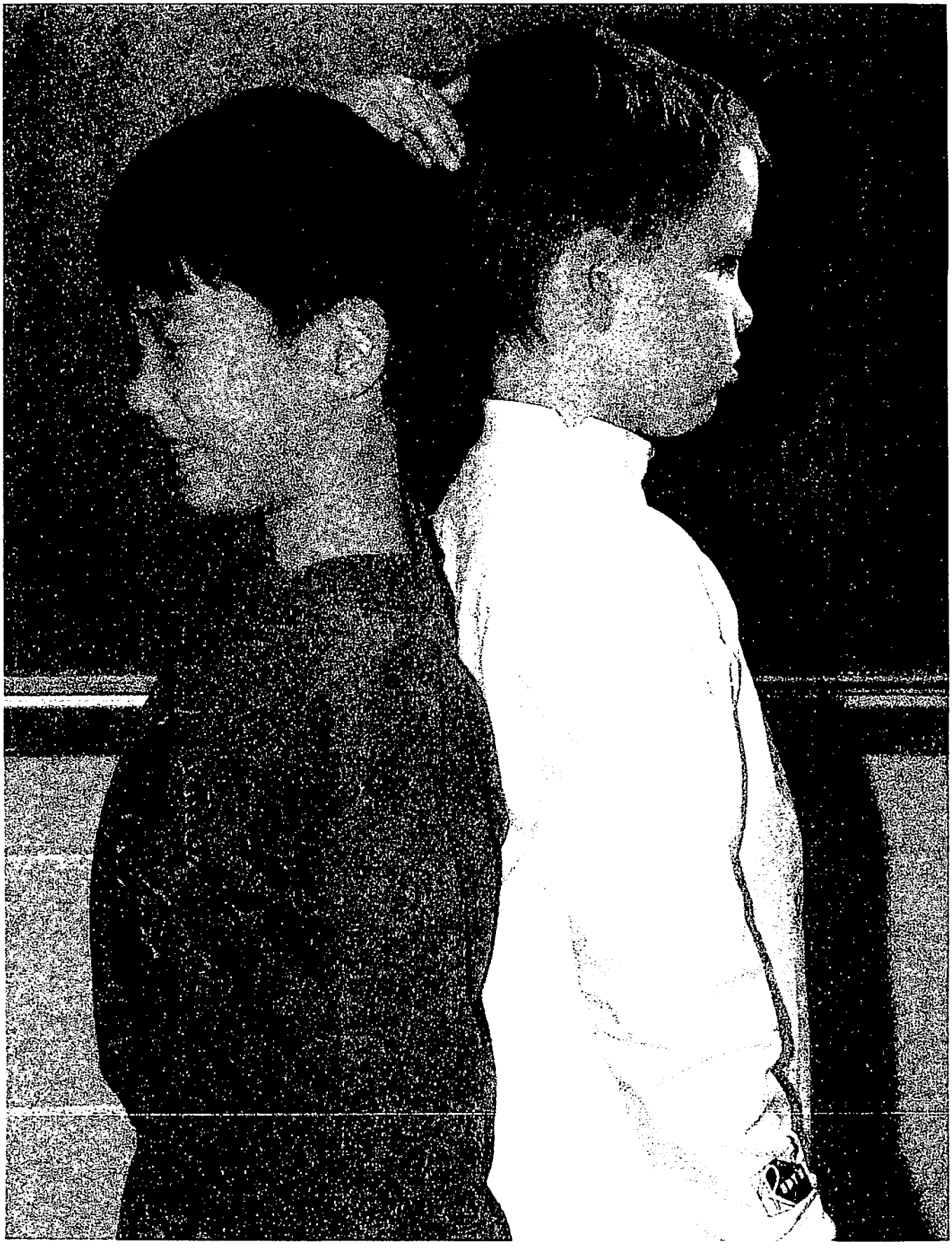
- Emphasize each student's responsibility for practicing safe science classroom procedures.
- Remind students that every substance in science class should be treated as a chemical, even if it is a common food.
- Remind students to wash their hands before leaving the science classroom.
- Advise students that classroom behavior that is disruptive or dangerous or that interferes with another student's right to learn may result in the disruptive student being removed from the class.

Other Safety Considerations

Safety Notes

This unit does not contain anything of a highly toxic nature, but common sense dictates that nothing be put in the mouth. In fact, it is good practice to tell your students that, in science class, materials are never tasted. Remind students small object included in this kit are not toys. They should be used only as instructed.

Contents



LESSON 1

Pre-Unit Assessment: Comparing How We Are Alike and Different

Overview and Objectives

In this first lesson, students are introduced to comparing as a way to observe similarities and differences. Students describe ways they are alike and different and have the opportunity to use simple tools such as coffee stirrers, pencils, and spoons to aid in measuring and making comparisons. Both activities will provide assessment information on students' ability to observe, compare, and communicate ideas. Students' written observations and the ideas they suggest when compiling a class list give you further information about the specific comparisons they make. By contrasting this information with parallel information at the end of the unit, you will be able to assess the growth in each student's ability to compare and measure and the methods they use for each. The activities in this lesson set the stage for Lesson 2, where students will use life-size cutouts of their bodies to continue exploring ways of comparing.

- Students discuss what it means to compare and measure.
- Students observe each other and identify similarities and differences.
- Students discuss their comparisons.
- Students record their observations.
- Students have the opportunity to make comparisons using various everyday objects such as coffee stirrers, pencils, and spoons.

Background

Why have a science unit on comparing and measuring? When scientists do experiments, they often need to measure; that is, using numbers and standard units of measure, they describe such properties as length, volume, weight, and temperature. Similarly, when students do experiments, they will need skills in measuring these properties.

Even outside of the classroom, students frequently measure and compare; for example, when they make kites, wrap presents, or chart their heights. In fact, measuring and comparing are key means through which students make sense of their lives. In this unit, students will gain experience in using measuring tools to obtain information and to solve problems. They will follow the developmental sequence of comparing, matching, and measuring as they observe similarities and differences and match and measure lengths, heights, and distances.

Comparing is the first step in the developmental sequence of attaching meaning to a numerical measurement. When a child yells, "I jumped farther than Joseph," he or she is making a visual estimate of the two distances jumped and comparing them. To confirm if one jump was truly farther than the other jump, the child could **match** each distance to a piece of rope and compare the lengths of the two pieces of rope. However, if the child wanted to numerically quantify how much farther his or her jump was, the student would need to measure the distance of both jumps and compare the measurements to get the difference.

In this lesson, students begin by brainstorming what they already know about comparing and measuring. They then observe the differences and similarities among themselves. Some students may want to use materials in the classroom or distribution center to help them make comparisons. For example, a student may use toothpicks and say, "My arm is eight toothpicks long." Another student may not use numbers and standard units but simply match his arm against the length of his classmate's and say, "my arm is longer than yours." Or those students who have worked with Unifix Cubes™ before may know to hook the cubes together and use them to assign a specific value to the length of an object.

This is an unstructured activity; you will leave it up to students as to what—if any—materials from the distribution center they will use in making their comparisons. By not directing students toward any specific use of materials, you achieve baseline assessment information on their comparing and measuring abilities.

Many students' initial observations may focus on similarities and differences in physical appearance, such as hair or skin color, types of clothes or shoes, and gender. Depending partly on their developmental level, some students may make linear comparisons, such as indicating who is taller or shorter. At the end of the unit, you will compare students' observations in this lesson with those in the post-unit assessment in Lesson 17. At that time, you can expect students' comparisons to be more diverse and to demonstrate what students have experienced in the course of the unit.

Materials

For each student

- 1 copy of **Record Sheet 1-A: Looking at My Partner and Me**
- 1 package of crayons, including one red crayon and one blue crayon
- 1 resealable plastic bag with which to collect materials, 23 × 30 cm (9 × 12 in)
- 1 scissors

For the class

- 2 sheets of newsprint
- 1 marker
- 1,500 Unifix Cubes™, separated by color
- 1 container of each of the following:
  - 100 wood coffee stirrers
  - 100 unsharpened pencils
  - 100 plastic spoons
  - 100 toothpicks
  - 100 small wood spools, 4 cm (1½ in)
- 15 rolls of adding machine tape

Notes: All items that you must photocopy appear in this Teacher's Guide at the end of the lesson in which they will be used.

Materials from the distribution center can be collected and returned in the resealable bags. This procedure can be followed throughout the unit. Students can also use shoe boxes, foam meat trays, or plastic jugs in which to collect materials.

Preparation

1. Label a sheet of newsprint "What We Know about Comparing and Measuring." Write today's date and lesson number on it.
2. Label the second sheet of newsprint "Ways We Are Alike and Different" and write the date on it.

Management Tip: Throughout this unit, students generate many charts and lists that provide a record of the discoveries they are making. To make it easier to refer back to a specific chart for assessment purposes, teachers have found it helpful to record the date and lesson number on each chart. If possible, display the charts in the classroom throughout the unit so that students may refer to them. If space is a problem, you may consider rotating the charts, hanging them on a wire "clothesline" in the classroom, or binding them together into a "Big Book."

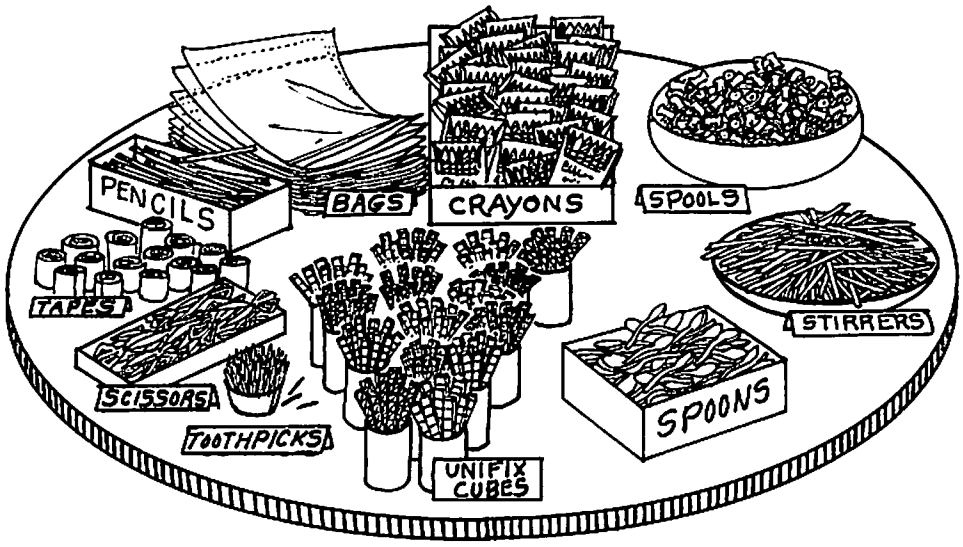
3. Set up a distribution center in your classroom (see Figure 1-1). You will need to find containers such as shoe boxes, file folder boxes, or plastic tubs to hold the materials.

   Following are the steps for setting up a distribution center:

   - Select one large area of the room.
   - Place all of the materials on a large table, windowsill, or several desks that have been pushed together.
   - Arrange the materials in separate containers. Before each lesson, place a label on each container indicating what it holds. (In this lesson, students will take as many of each material as they want. In subsequent lessons, the label will also need to indicate how many of each item the students should take.) Make sure students have enough space to walk by when gathering materials.

Figure 1-1

Distribution center



4. Arrange students in pairs.
5. Copy **Record Sheet 1-A: Looking at My Partner and Me** for each student.

Procedure

1. Introduce students to this unit by letting them know that for the next eight weeks, they will be exploring comparing and measuring.
2. Ask students to think about what they know about comparing and measuring. After a few minutes, have them share their thoughts with the class. Record these thoughts on the "What We Know about Comparing and Measuring" chart. To help stimulate student discussion, you may want to ask questions such as the following:
   - When have you compared before? When have you measured before?
   - How did you compare? How did you measure?
   - Why were you comparing? Why were you measuring?

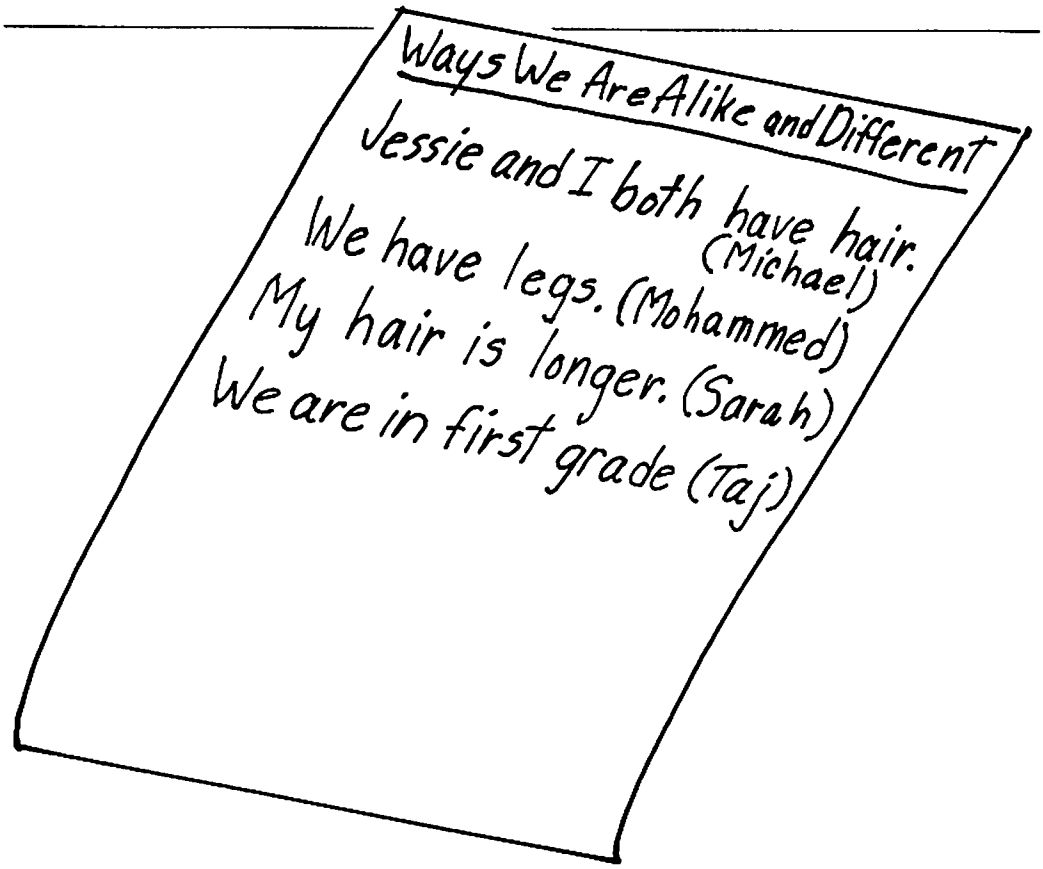
   Save this chart for use in the post-unit assessment.
3. Display the "Ways We Are Alike and Different" chart. Let students know you would like partners to decide on one way they are like each other and one way they are different from each other. Let students know that when they look at how things are alike and different, they are comparing. Invite students to use any materials in the classroom or distribution center to help them find out about their partners.
4. After a few moments, ask students to share their thoughts. To encourage discussion, ask the class questions such as the following:
   - In what way are you and your partner alike?
   - How are you and your partner different?
   - Did you use any materials from the distribution center to help make your comparisons?
   - How did these materials help you make comparisons?
5. Record students' thoughts on the chart (see Figure 1-2).
6. Leave the chart on display for use in the next lesson.

Final Activities

1. Pass out and review **Record Sheet 1-A: Looking at My Partner and Me.** Ask students to do the following:
   - Write your name and today's date on the record sheet.
   - Draw a picture of yourself and your partner. Write your partner's name in the box with his or her picture.
   - Draw a red circle around the part of the picture that shows one way you and your partner are alike.
   - Draw a blue circle around the part of the picture that shows one way you and your partner are different.
   - Write one or two sentences describing each likeness and difference.
2. On the chalkboard, you may want to write sentence starters such as the following:
   - I am like my partner because _____.

Figure 1-2

Sample chart of students' ideas



- One way I am different from my partner is _____.
- My partner and I _____.

3. Invite students to share and discuss their drawings with the class.
4. Collect the record sheets and save them for use in the post-unit assessment.

Extensions

LANGUAGE ARTS MATHEMATICS

1. Ask students to look through old magazines and catalogs for pictures of objects such as cars, animals, food, and families. They can cut the pictures out and group like objects together. Students can glue the pictures to newsprint and label and discuss their ideas.

LANGUAGE ARTS SOCIAL STUDIES

2. Have children bring in pictures of the people in their families and share ways the families are alike and different.

LANGUAGE ARTS

3. Read *People*, by Peter Spier (see Section 7 of this guide).

MATHEMATICS

4. Begin a height chart for each child and record his or her height throughout the year.

Assessment

In Section 2 of this guide, you will find a detailed discussion about the assessment of students' learning. Specific goals for this unit are summarized in Unit Goals of Section 2.

The brainstorming chart "Ways We Are Alike and Different" is the first half of a matched pre- and post-unit assessment. The second half appears in Lesson 17: Post-Unit Assessment. Both are important components of your assessment of students' growth and learning.

Students' writings and drawings about what they observe and discover can provide evidence of the progression of their ideas. These materials will also alert you to students' questions and give you insights into topics in which they are especially interested. You may want to review your students' record sheets periodically or conduct individual science meetings that give each student an opportunity to share some of the ideas he or she has written about. You may also want to keep an observation log to aid in the assessment process throughout the unit.

To assess students in this lesson, look at their record sheets and observe students during the activities. As you do so, ask yourself the following questions:

- How do students define comparing and measuring?
- What similarities do students observe and describe?
- What differences do students observe and describe?
- Do students describe any differences that are linear, such as differences in height?
- Do record sheet entries demonstrate students' ability to distinguish between similarities and differences?
- If students used materials from the classroom or distribution center, how did they use them to make comparisons?

Record Sheet 1–A

Name: _____

Date: _____

Looking at My Partner and Me

My partner	Me

OBJECTS AROUND US

Physical Science

(duration- 2 weeks)

Focus	Science	Math	Language Arts
Lesson Unit Overview	Objects can be described in terms of the materials they are made of and their physical properties. Once you know about the physical properties of an object you can predict how that object will interact with other objects.	Explain to students that when they sort objects so that all the objects in one group are alike in some way they are classifying. Explain that classifying helps people organize things.	Read; "The House Book" by Shirley Frederick. Student should work with partners to sort blocks by color, size, and shape. Then have student to build a house.
Learning Goals	Goal 3	Goal 2 Goal 3	Goal 1 Goal 2 Goal 3
Objectives NSE Standards	3.01 3.02 NSE Standard A,B,C,D,E	2.01 2.02 3.01 3.02 NSE Standard A,B,C,D,E	1.01 1.04 2.01 2.04 2.06 3.01 3.02 3.04 NSE Standard A,B,C,D,E
Assessment Evaluation	Show children a picture of tools being used. Ask children how does this tool help children and teachers. Help children identify tools you find in different settings. Invite children to think how each tool makes work easier.	Ask children to examine the tools and then work together to create groups for classifying them. After the children have sorted the tools, ask children to describe their group. How did you sort? How are the tools in each group the same? Can you think of another way to sort the tools?	Use tools in dramatic play. (toy, carpenters, doctors, cooling tools) Provide a variety of tools for children to explore and use in dramatic play center. Encourage children to make up and act out stories that have characters working with tools.