Science
First Grade

Unit 1
COMPARE AND MEASURE

INTRODUCTION

Comparing and measuring is not only an essential life skill but a natural way for us to explore the world we live in. In Comparing and Measuring unit students will describe and understand such properties as length, volume, weight and temperature. In this unit students will become aware standard and non standard measurement and practice measuring using both. This unit directly aligns with mandated science and math skills.

SCIENCE STANDARDS AND INDICATORS

Conceptual Theme: Science and technology in Society- How do science and technology affect the quality of our lives?

Content Standard 1.4: The properties of materials and organisms can be described more accurately through the use of standard measuring.

Core Science Inquiry Expected Performances:
AINQ.2 Use senses and simple measuring tools to collect data
AINQ.7 Use standard tools to measure and describe physical properties such as weight, length and temperature
AINQ.8 Use nonstandard measures to estimate and compare the sizes of objects

CMT Expected Performance A17- Estimate, measure and compare the sizes and weighs of different objects and organisms using standard and nonstandard measuring tools.

Grade Level Concept: Various tools can be used to measure, describe and compare different objects and organisms.

SCIENCE INQUIRY: Scientific inquiry is a thoughtful and coordinated attempt to search out describe, explain and predict natural phenomena.

SCIENCE LITERACY: Science literacy includes speaking listening, presenting, interpreting, reading and writing about science.

SCIENCE NUMERACY: Mathematics provides useful tool for the description, analysis and presentation of scientific data and ideas.

BIG IDEA

Various tools can be used to measure, describe, and compare different objects and organisms.

ALIGNMENT TO OTHER STANDARDS

MATH

3.3b2 - Use estimation physical referents and non standard units to sort and compare objects

3.3c1- Explore using the standard units if inch and centimeter to estimate and measure length
3.3b3- Explore using measurement tools such ad thermometers, basic rulers and balance scales to measure temperature, length and weight.

Key Science Vocabulary: centimeter, meter, gram, kilogram, milliliter, liter, graduated cylinder, thermometer, Celsius, Fahrenheit

SCIENCE CONTENT STANDARD 1.4

CONCEPTUAL THEME:

Science and Technology in Society - How do science and technology affect the quality of our lives?

CONTENT STANDARD:

1.4 – The properties of materials and organisms can be described more accurately through the use of standard measuring units.

GRADE-LEVEL CONCEPT: ◆ Various tools can be used to measure, describe and compare different objects and organisms.

GRADE-LEVEL EXPECTATIONS:

1. Observations can be expressed in words, pictures or numbers. Measurements add accuracy to observations.
2. Objects and organisms can be described using nonstandard measurement units, such as hand-lengths, pencil-lengths, handfuls, etc.
3. Standard measurement units are more accurate than nonstandard units because they have consistent values agreed on by everyone. For example, "My caterpillar is one finger long" is much less accurate than "My caterpillar is 4 centimeters long."
4. Scientists and nonscientists all over the world use the metric system of measurement. In the United States, the customary measurement system is used in daily life. Equivalent values between the two systems can be estimated (for example, 1 inch is a little more than 2 centimeters).
5. Specific tools are used to measure different quantities:
    a. Metric rulers are used to measure length, height or distance in centimeters and meters; customary rulers measure length, height or distance in inches, feet or yards.
    b. Balances and scales are used to compare and measure the heaviness of objects. Grams and kilograms are units that express mass; ounces and pounds are units that express weight.
    c. Graduated cylinders, beakers and measuring cups are tools used to measure the volume of liquids. Volume can be expressed in milliliters (mL), liters (L), cups or ounces.
    d. Thermometers are tools used to measure temperature; thermometers can indicate temperature in degrees Celsius or degrees Fahrenheit, or both.

KEY SCIENCE VOCABULARY: centimeter, meter, gram, kilogram, milliliter, liter, graduated cylinder, thermometer, Celsius, Fahrenheit

CMT EXPECTED PERFORMANCES

A17

Estimate, measure and compare the sizes and weights of different objects and organisms using standard and nonstandard measuring tools.

ESSENTIAL KNOWLEDGE:

- Observation can be expresses in words or numbers. Measurements add precision to observations.
- Objects and organisms can be described using non standard measurement units, such as hands-lengths, pencil-lengths, handfuls, etc.
- Standards measurement units are more accurate than nonstandard units because they have consistent values agreed upon by everyone; compared to "My caterpillar is 2cm longer this week than last week.
- Scientists all over the world use the metric system of measurement. In daily life in the United States the customary system is used.
- Specific tools are used to measure different attributes.
- Metric rulers are used to measure length, height or distance in centimeters and meters; customary rulers measure length, height or distance I inches, feet or yards.
- Balances and scales are tools used to measure the weight (mass) of an object or organism. Weight can be expressed in grams and kilograms or pounds and ounces.
- Beaker and graduated cylinder are metric tools used to measure volume of liquids. Volume can be expressed in milliliters (ml) or liters (l)
- Measuring cups and spoons are customary tools used to measure the volume if liquids or powers. These tools express volume in terms teaspoons, tablespoons, ounces or cups.
- Thermometers are tools used to measure temperature. Thermometers can indicate temperature in degrees of Celsius degrees of Fahrenheit or both.

CONCEPTS

- Properties such as, temperature, time, distance, length, weigh
- Comparing involves observing similarities and differences
- Comparing can be done by matching
- A common starting line is required to make fair comparisons
- Estimating size and weight
- Understanding how to use beginning and ending points for measuring
- A unit of measurement based on an object for comparison
- Understand difference between standard and nonstandard forms of measurement and how to produce consistent results
- How to use nonstandard measurement
- How to use standard measurement
- Time is a form of measurement
- Selection of tools can affect the accuracy of measurement

SKILLS: Students will be able to do:

- Observe and describe similarities and differences of object s
- Place objects in serial order base on size, height, length
- Communicate observations, ideas and formulate and record data about properties of objects and organism
- Organize information on representational graphs an charts
- Using standard an nonstandard units of measurements
- Measure using beginning and ending points

- Read results of measurements
- Make predictions and estimations on measurements of length volume
- Comparing volume, length, weight

ESSENTIAL QUESTIONS TO GUIDE INSTRUCTION AND ASSESSMENT:

- What is measurement?
- Why do we measure things?
- What is standardized measurement?
- What is non standardized measurement?
- What properties can measure?
- What tools do we use to measure?

MATERIALS AND SUPPLIES

- STC Comparing and Measuring Kit
- See Resources

OBJECTIVES AND GOALS

LESSON ONE
Compare how we are alike and Different

- 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, pencil, and spoons.

LESSON TWO
Let's Make Body Cutouts

- Students trace each other's body outlines
- Students cut out the outlines.
- Students compare similarities and differences among the cutouts.
- Students arrange the cutouts in serial order from shortest to tallest.

LESSON THREE
Matching Our Heights

- Students match their height with machine tap.
- Students arrange the tapes in serial order from shortest to longest on a representational graph.
- Students discuss how they determined beginning and ending points.

LESSON FOUR
Matching Length of Arms and Legs

- Students guess which team member has the longest arm and the longest leg.
- Students match the length of their arms and their legs and graph their results in serial order from shortest to longest.
- Students discuss why it is important to use a common starting point when making comparisons.
- Students compare the information on the arm and leg graphs with the information on the height graph from lesson 3.

LESSON FIVE
Comparing Objects

- Students discuss the difference between a guess and a prediction.
- Students predict which of several objects is the longest and which is the shortest.

- Students use adding machine tape to match the length of the large object.
- Students discuss the results recorded on a class graph.

LESSON SIX
Matching Distance

- Students discuss various way of matching distance.
- Students explore how to make the “Flippers” move.
- Students compare the distance of three jumps.
- Students use adding machine tape to match distance.
- Students discuss their results and observations.

LESSON SEVEN
Using Our Feet to Measure

- Students take five heel-to-toe steps and match the length covered
- Students record the results on graph paper
- Students discuss and compare the results
- Students discuss why the tapes are different length.
- Students listen to and discuss a story nonstandard unit’s measure.

LESSON EIGHT
Using Different Standard Units of Measure

- Students discuss what they now know about measuring.
- Student measure the length of objects using various sets of standard units
- Students record the results.
- Students compare and discuss their result.

LESSON NINE
Measuring with a Standard Units

- Students use coffee stirrers to measure the length of object.
- Students record, compare, and discuss their results.
- Students tape matched to the length of the object.
- Students label their results with the name of the unit.

LESSON TEN
Exploring with Unifix Cubes

- Students reflect on what they have learned measuring in last three lessons.
- Student compare coffee stirrers with “Unifix Cubes” as units if measure.
- Student measure using “Unifix Cubes”.
- Students discuss their measuring experiences.

LESSON ELEVEN
Counting Large Numbers of Unit

- Students measure long objects using “Unifix Cubes”.
- Students record their results.
- Students discuss why it is useful to group cubes into tens when measuring.

LESSON TWELVE
Measuring the Height of the Teacher

- Students predict the height of the teacher in “Unifix Cubes”.
- Students use Unifix Cubes to measure a strip of adding. Machine tape that represents the teacher’s height.
- Student record their results.
- Students compare and discuss their results.

LESSON THIRTEEN
Making a Measuring Strip

- Students discuss the relative usefulness of the different measuring units they have explored.
- Student use “Unifix Cubes” to make their own measuring strips.
- Students compare their measurement strip with a stick of 10 Unifix Cubes.
- Students discuss the advantage of using the measuring strips rather than “Unifix Cubes”.

LESSON FOURTEEN
Making a Measuring Tape

- Students measure objects that are longer than their measuring strips
- Students compare and discuss the strategies they used to measure the objects.
- Students discuss the advantages and disadvantages of measuring strips.

LESSON FIFTEEN
Making a Measuring Tape

- Student’s measure objects that are longer than their measuring strips.
- Students compare and discuss the strategies they used to measure the objects.
- Students discuss the advantages and disadvantage of measuring strips.

LESSON SIXTEEN
Using a Measuring Tape to Measure Distance

- Students predict how far they can make the flippers travel
- Students use their measuring tape from lesson 15 to determine the longest distance that a flippers travel.
- Students record their results
- Students compare the results obtained by measuring with the results obtained by matching.

Significant Task

Post-Unit Assessment

Overview

This post-unit assessment is matched to the pre-unit assessment in Lesson 1. By comparing the individual and class responses from these activities with those from Lesson 1, you will be able to document and assess students' learning over the course of the unit. During the first lesson, students drew themselves and a partner and wrote about the ways they were alike and different. They also developed two class lists entitled "What We Know about Comparing and Measuring" and "Ways We Are Alike and Different." When they revisit these activities during the post-unit assessment, students are likely to appreciate how much they have learned about comparing and measuring.

Materials

FOR EACH STUDENT

1 copy of **Record Sheet 1-A:** Looking **at My Partner and Me** (on pg. 21)
1 package of crayons, including one red crayon and one blue crayon

FOR EVERY TWO STUDENTS

1 resealable plastic bag for collecting materials, 23 x 30 cm (9 x 12 In)

FOR THE CLASS

2 sheets of newsprint
Class lists from Lesson 1: "What We Know about Comparing and Measuring" and "Ways We Are Alike and Different"
1,500 Unfix 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 (1.5 in)
15 rolls of adding machine tape
Crayons

Preparation

1. Label one sheet of newsprint "What We Know about Comparing and Measuring" and label the other "Ways We Are Alike and Different." Date the sheets and post them in the classroom.
2. Set up the distribution center in your classroom as you did in Lesson 1.
3. Pair students with the same partners they had in Lesson 1.
4. Copy Record Sheet 1-A**:** Looking at My Partner and Me for each student.

Procedure

1. 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?

2. 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. Invite students to use any materials in the classroom or distribution center to help them find out about their partners.

3. After a few moments, ask students to share their thoughts. To encourage discussion, ask the class questions such as the following:
   - 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?

4. Record students' thoughts on the "Ways We Are Alike and Different" chart.
5. Ask students to share how they obtained their information. Then display the original lists from Lesson 1. Here are some ways to use the lists to assess student progress:
   - Ask students to identify statements they now know to be true.
   - What experiences during the unit helped them confirm these statements?
   - Asking questions such as "How do you know that?" and "What happened next?" may be helpful.
   - Ask students to correct or improve statements and give reasons for their corrections.
   - Ask students to point out information on their new lists that is not on the original ones.

6. Pass out and review Record Sheet 1-A**:** Looking at My Partner and Me. Then ask students to do the following:
   - Write your name and today's date.
   - 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.

7. On the chalkboard, you may want to write sentence starters such as the following:
   - I am like my partner because
   - One way I am different from my partner is
   - My partner and I

8. Invite students to share their drawings with the class.

9. Collect the record sheets and have the students return their materials to the distribution center.

10. As you compare the class lists and record sheets from the post-unit assessment with those from Lesson 1, note the following:
    - Do students' post-unit observations show greater detail than those from Lesson 1?
    - Do students' post-unit comparisons about likenesses and differences include measuring? For example, do students use Unifix Cubes" to find out the length of their partner's arms?
    - Do students choose standard units of measure? If so, which units do they choose?
    - When students measure, do they use beginning and ending points and a common starting line?
    - Do they label the units in their measurements?

RESOURCES

Web Sites

http://www.nyu.edu/pages/mathmol/textbook/statesofmatter.html
http://www.grc.nasa.gov/WWW/K-12/airplane/state.html
http://www.usoe.k12.ut.us/curr/science/sciber00/7th/matter/sciber/intro.htm
http://www.chem4kids.com/files/matter_intro.html
http://www.nyu.edu/pages/mathmol/textbook/4gradecover.html
http://www.mcwdn.org/Physics/Matter.html
http://www.sci.tamucc.edu/~eyoung/measureliterature.html
http://www.aaamath.com/mea.html
http://convertplus.com/en/
http://www.sciencemadesimple.com/conversions.html
http://ga.water.usgs.gov/edu/characteristics.html
http://www.apples4theteacher.com/measure.html
http://www.quiz-tree.com/Units_of_Measurement_main.html

Literacy Books

Let's Measure with Tools; Christine N. Casteel (Big Book)
Once I Was Very Small; Elizabeth Ferber
The Biggest; Nicole Irving
Inch by Inch; Leo Lionni

How Big Were the Dinosaurs?; Bernard Most
How Big Is a Foot; Rolf Myller
How Much Is a Million? David Schwartz
People; Peter Spier
A Big Fish Story; Joanne Wylie
Actual Size, Jenkins
Actual Size; Jenkins,
A House for Hermit Crab; Carle,
Alley Oop!; Mayer
A Pig is Big; Florian,
Armadillo Rodeo; Brett,
Block City; Stevenson
Carrie Measures Up; Aber
Come Away From the Water; Burningham & Cape
Counting on Frank; Clement
Fannie in the Kitchen; Hopkinson
Farmer Mack Measures His Pig; Johnston
Fish Fry Tonight; Koller
How Big is a Foot?: Myller
How Tall, How Short; How Far Away; Adler
How to Weigh an Elephant; Barner
The 100-Pound Problem; Dussling
If You Hopped Like a Frog; Schwartz
Inch by Inch; Lionni
Inchworm and a Half: Pinczes
Is the Blue Whale the Biggest Thing There Is?; Wells
Jack & the Beanstalk; Briggs
Just a Little Bit; Tompert
Keep Your Distance; Herman
Long, Short, High, Low, Thin, Wide; Fey
Lulu's Lemonade; Derubertis

Extension Act ivies

Relay Race; Have an outdoor relay race measuring the distance of each relay
Long Jump: Compare long jump height with distance you have jumped. Graph the correlations

Field Trips:

Dinosaur State Park; Compare Dinosaur foot prints with others animals prints
Peabody Museum; Measure how many students' bodies laying head to toes equal the length of the Dinosaur.

Links to United Streaming

For this unit, go to http://www.unitedstreaming.com
Search strand: Measurement