

Teacher Instructions

Title: A Measuring Adventure

Grade Focus: 3, 4, 5

Subject: Math

Technology Integration: Discovering the Internet, Imaging, PowerPoint Presentation

Recommended Time to Completion: 3 Days

INTRODUCTION:

This set of lessons has students using measuring tools (rulers, tape measures) to measure stuffed animals, and then work in teams to create their own measuring system.

PREREQUISITE EXPERIENCE:

Students should be familiar with the basics of measurement. They should have had experience using a ruler, yardstick and other measurement tools and units. They should also be familiar with Microsoft Word and PowerPoint.

Important Vocabulary Words to Review:

Attribute

Unit

TEACHER PREP TIME: 1- 2 Hours

Review these training videos from Nortel LearniT

- Imaging, <http://nortellearnit.org/technology/Imaging/>
- PowerPoint Presentations, http://nortellearnit.org/technology/PowerPoint_Presentations/

If you have access to United Streaming, these videos may be used to introduce measurement:

- Discovering Math: Measurement (Grades 3-5). Discovery Channel School. 2005.
unitedstreaming. 11 March 2008
<http://streaming.discoveryeducation.com/>

- Measured Steps. Region 10. 2008.
unitedstreaming. 11 March 2008
<<http://streaming.discoveryeducation.com/>>

"Discovery Education streaming is a digital video-on-demand and online teaching service to help improve students' retention and test scores; it is aligned to U.S. state and provincial standards." If you do not have access to United Streaming, you can sign up for a free 30 day trial at www.unitedstreaming.com

MATERIALS:

- Books: *Measuring Penny*, by Loreen Leedy ISBN: 0-8050-6572-5 and *How Tall, How Short, How Far Away?* By David Adler and Nancy Tobin ISBN:0-8234-1632-1. To ensure availability, check with your library or purchase the book prior to teaching the lesson.
- A variety of stuffed animals, action figures, etc. students provide to measure (You will need one "creature" per partner pair; you may need a few extras if students don't bring them in).
- Chart paper (or projector for laptop)
- Rulers, tape measures, yardsticks
- Adding machine tape (paper on small rolls)
- Laptop lab or technology lab
- Materials to make displays- construction paper, markers, scissors, etc.

PROJECT:

Students will read the book, *Measuring Penny*, and measure stuffed animals like the character Lisa did in the book. After reading *How Tall, How Short, How Far Away* by David Adler and Nancy Tobin, students will create their own system of measuring distance. As a final review, students will measure the stuffed animals again using their own systems and make a chart to compare the measurements from Day 1 to the final day. They will create a multimedia presentation of their system and their work with the stuffed animals using PowerPoint.

ASSESSMENT/GRADING:

Students will be assessed based upon a rubric offered in the Evaluation section of the lesson.

TIME MANAGEMENT TIP:

Students will work in groups to expedite the process.

Engage

Engage

Listen to your teacher read the book, *Measuring Penny*, by Loreen Leedy. "Lisa has a homework assignment to measure something in as many ways as she can, using standard and nonstandard units. "Use your imagination!" is the last instruction the teacher gives the students. Lisa chooses her Boston terrier and the fun begins. She measures Penny and a variety of other dogs. In the process, readers learn that Penny's nose is one inch long. Her tail is one biscuit long. She is bigger than a pug, smaller than a cocker spaniel, and weighs about the same as a Shetland Sheepdog. Lisa measures how much her pet eats, how high she jumps, how much time it takes to care for her, how much money is invested in her, how fast Penny runs, and a variety of other doggie traits." The School Library Journal review, 1998, by Jane Claes, T. J. Lee Elementary School, Irving, TX

1. Think about the different ways Lisa measured Penny. Make a *list* of the ways Lisa measured Penny (length of tale, width of paw prints, how much Penny drinks, etc.) on chart paper (or on laptop using a projector). Then, next to each way Penny was measured, identify the unit Lisa used (dog biscuits, centimeters, cups of water, respectively). Draw the lines to show that you have a chart that shows what attribute of Penny was measured, and what unit was used to measure it, and put a label above each column.
2. How can we use measurements to describe a creature? How do we decide what unit to use to measure a given attribute? How are measurement systems created? How do measurement systems work? How do we measure length (ex. Height) or circumference (like around a head)? What are other attributes we might measure? How do we make a chart to compare measurements? Discuss with your partner some possible answers to these questions. Share with your class your answers.
3. Look at your teacher's stuffed animal or creature. What types of attributes could you measure it on? Make a list on chart paper or on the dry erase board. Your job today will be to take the stuffed animal or creature you have, and working with a partner,

you will measure different attributes and make a chart of your findings. Measure what makes sense for your creature. Today, you are going to use these measuring tools: rulers, tape measures and yardsticks.

Explore

Explore

1. Today you are going to add to your chart your own measurement system. Listen to your teacher read *How Tall, How Short, How Far Away*. "A lively discussion of the history of measurement that incorporates some hands-on activities. Students may be surprised to learn that in ancient Egypt, parts of the body were used as measuring tools; a digit was the width of one finger, and a palm was the width of four fingers. Terms such as span and cubit are similarly defined. Explanations progress from Egyptian methods to the customary (or inch-pound) to the metric system. Readers are encouraged to use these various systems to measure their height and think about what units they could use for distances." *School Library Journal Review*, Edith Ching, St. Albans School, Mt. St. Alban, Washington, DC, 1999. "How did people long ago measure things? What were some advantages to that system? Disadvantages? If you wanted to make your own measuring system, how might you start?"
2. Watch your teacher make a measuring unit using the size of their hand to make a "unit". (Teachers -- roll off a piece of adding machine tape, measure the width of your hand using the end as one side of your hand, and then mark and cut to make a single unit. Call your unit a "hand") What happens when your teacher measures the desk's width using the "hand" measurement system? How many "hands" does it take? What do you think a "half hand" would look like?
3. Each partner pair will receive a strip of adding machine tape and you are to design your own measuring system. You need to figure out:
 - What are you going to base your unit on? (You can't use the one you modeled during the mini-lesson- other ideas might be the length of a foot, circumference of a head, the length of the tale of yesterday's creature, etc.)
 - Make a "unit" with the adding machine tape.
 - Decide on a name for the unit
 - How many units go into the next unit up? Make one.

- What will you call it?
- Label the $\frac{1}{2}$ mark on each unit.

Make sure you document your work in a chart.

Explain

Explain

1. Now, measure your stuffed animal again using your measurement system. How does your measurement system vary from the original one you measured? Keep a log of your results.
2. Toward the end of the classroom time, have a discussion about what you have experienced today. What is the most interesting or surprising attribute that you measured? What types of problems did you run into as you started making your system? What did you learn during this activity?

Elaborate

Elaborate

1. Create a multimedia display with PowerPoint and digital photos of your findings.

Criteria for the presentation:

- Chart from MS Word showing the attributes measured and the measurements in the customary system and the student's self created unit.
- Samples of the units created
- A chart or explanation regarding your made-up unit (Example, How many of the first unit makes the second unit? What the unit was based on?)
- Mathematical Understandings: a paragraph or list of what your group learned by doing this project/ what the presentation shows about mathematics
- Title and appropriate labels and captions
- Visual effect: clear layout, neatness, clarity of written work (spelling, grammar, sentence structure, etc.)
- Optional elements: digital photo to show the creature you measured, conversion chart- How many inches make up your unit?

Review these training videos from Nortel LearniT

- Imaging, <http://nortellearnit.org/technology/Imaging/>
- PowerPoint Presentations, http://nortellearnit.org/technology/PowerPoint_Presentations/

Evaluate

Evaluate

This project has several points for evaluation:

- Observation of students using measurement tools
- Creation of the new measurement system and the ability to explain what they did.
- Product: presentation of their findings.

Student: _____

Date: _____

Measuring Penny Project Rubric

	Level 1	Level 2	Level 3	Level4
<p><u>Investigation</u> $\frac{1}{1^{st}}$ Observation of Use of Measurement Tools Date: _____</p>	<p>Trouble using ruler correctly, starting point, overlaps or gaps, does not know how to write measurements.</p>	<p>Uses ruler with overlap or gaps in iteration, but uses two or more tools to measure length. Writes measurements correctly.</p>	<p>Accurately measures in customary system using rulers and one other tool, writes the measurement correctly.</p>	<p>Accurately measures with any tool, can measure from any point on the ruler (doesn't have to start at 0). Uses abbreviations as accurately as written unit.</p>
<p><u>Investigation</u> $\frac{1}{2^{nd}}$ Observation of Use of Measurement Tools Date: _____</p>	<p>Trouble using ruler correctly, starting point, overlaps or gaps, does not know how to write measurements.</p>	<p>Uses ruler with overlap or gaps in iteration, but uses two or more tools to measure length. Writes measurements correctly.</p>	<p>Accurately measures in customary system using rulers and one other tool, writes the measurement correctly.</p>	<p>Accurately measures with any tool, can measure from any point on the ruler (doesn't have to start at 0). Uses abbreviations as accurately as written unit.</p>
<p><u>Investigation</u> $\frac{2}{2}$ Development and Presentation of New Measurement System Date: _____ _____</p>	<p>Incomplete system, trouble connecting units to make a bigger unit "ruler." Units may be inconsistent in the ruler, trouble with fractional parts, trouble using it to measure, difficulty explaining system</p>	<p>Complete system with unit and bigger unit, although there may be inconsistencies between unit marks. Fractional parts may be incorrect, difficulty explaining the system.</p>	<p>Complete measurement system with unit and bigger unit. Half- marks correctly placed in both "rulers." Able to explain clearly how it works.</p>	<p>Complete measurement system with unit, bigger unit and even bigger unit. Halves and fourths are marked correctly on all rulers. Can explain clearly.</p>

<p><u>Investigation 3</u> Product 1: Measurement Chart in Word</p> <p>Date: _____</p>	<p>Missing or with sections incomplete or missing.</p>	<p>Errors in chart: attributes not clearly labeled, documentation of customary units or made up system units incomplete or containing errors. Less than five attributes measured</p>	<p>Correctly created chart with three columns. Data regarding five or more attributes measured, customary measures, and made up unit measures documented correctly.</p>	<p>Correctly created chart with ten attributes correctly measured and documented.</p>
<p><u>Investigation 3</u> Product 2: Presentation of Findings Part A: Samples of created units</p> <p>Date: _____</p>	<p>Examples would not be usable to measure with, missing or incorrect labels</p>	<p>Examples of two created units (basic unit and bigger unit) show inconsistencies, or missing labels or fractional parts,</p>	<p>Examples of created units/ rulers are clear (basic unit and bigger unit), consistently drawn, labeled with whole numbers and halves. Explanation is clear.</p>	<p>Examples of created units are without errors, three unit rulers created (basic unit, bigger unit and: even bigger unit OR smaller unit) Explanation very exact and clear.</p>
<p>Product 2, Part B: Mathematical Understandings</p>	<p>Missing write up about mathematical understandings, or incorrect statements, or difficult to understand.</p>	<p>Does not address areas described in Level 3, or some incorrect statements.</p>	<p>Statements made are correct. Write up includes: information about equivalent units within the same system, choice of unit based on attributes measured, and some comparison between the customary system and their made up system (with a reference to the chart).</p>	<p>Includes the information from Level 3, with the addition of information regarding the size of the unit and the number of units for a given attribute.</p>
<p>Product 2, Part C: Poster and Class Presentation</p> <p>Date: _____</p>	<p>Student did not share in the completion of the display, Incomplete or missing display, Class presentation confusing or incomplete.</p>	<p>Student did not equally share in the creating of the display or in the presentation to the class; display cluttered, confusing or missing parts; presentation unclear.</p>	<p>Student participated fully in creating display and in presenting it to the class; Visual display clear with labels, captions, and all parts present & complete.</p>	<p>Student met requirements of Level 3, and shared something extra about the project- new revelations, extensions, etc.</p>

PowerPoint Project Evaluation Rubric

Criteria	Unsatisfactory	Needs Improvement	Satisfactory	Exemplary
Research	Limited research, from limited sources	Somewhat well researched from somewhat varied sources.	Well researched, from various sources	Thorough research from varied sources presenting different points of view
Storyboard / planning	Limited planning evident	Some planning evident	Planning evident	Thorough planning evident
Content	Lacks detail	Some detail	Good detail	Excellent detail
Technology Use to Demonstrate Understanding	Technology use with little purpose	Technology use with some purpose	Technology use with purpose	Intuitive technology use with specific purpose
Overall Final Project	Inconsistent and inappropriate aesthetics and technical functionality	Somewhat consistent and appropriate aesthetics and technical functionality	Consistent and appropriate aesthetics and technical functionality	Consistent, creative and appropriate aesthetics and technical functionality

Extend

Extend

Consider these suggestions for extending this lesson.

1. Research other measurement systems- how did people weigh things before they had scales? Did other cultures have specific measurement systems?
2. Extend the measurement system you created to measure longer and shorter distances.
3. Create a measurement system for weight and/or volume.
4. Put together a class book showing the measurements of the different creatures that were brought in.
5. Make an instructional display (video, multi-media display with PowerPoint, etc.) for another class to explain the mathematical understandings you discovered while doing this project.

Related Resources

1. [Measure it](http://www.funbrain.com/measure/index.html) (http://www.funbrain.com/measure/index.html)- practice using a ruler - inches and centimeters
2. [Measurement Game](http://www.funbrain.com/cgi-bin/meas.cgi?A1=s&A2=0&A3=0) (http://www.funbrain.com/cgi-bin/meas.cgi?A1=s&A2=0&A3=0)- Click on the measurement that matches the length of the object.
3. [Perimeter Practice](http://www.beaconlearningcenter.com/WebLessons/AdamAnt/page1.htm) (http://www.beaconlearningcenter.com/WebLessons/AdamAnt/page1.htm)- Adam Ant walks the perimeters and teaches how to find the perimeter of an object.
4. [Perimeter of a Square](http://www.aaamath.com/B/geo78_x8.htm) http://www.aaamath.com/B/geo78_x8.htm- calculate the perimeter of a square with given dimensions
5. [Perimeter of a Rectangle](#) - calculate the perimeter of a square with given dimensions
6. [Measurement Equivalents](http://www.aaamath.com/B/geo78_x7.htm) http://www.aaamath.com/B/geo78_x7.htm- match game with standard equivalent measurements, such as pounds, ounces, pints, cups, etc
7. [Estimator](http://shodor.org/interactivate/activities/estim/index.html) http://shodor.org/interactivate/activities/estim/index.html - Practice estimation skills by determining the number of objects, length, or area. (parameters: error tolerance)
8. [Shape Surveyor](http://www.funbrain.com/poly/index.html) http://www.funbrain.com/poly/index.html - Calculate the area or perimeter of the rectangle and receive pieces of the puzzle.

9. [Fish Tales](#)

http://www.compasslearningodyssey.com/sample_act/math1_2/01MADB03a-fish_tails_v2.swf - Measure the fish with the ruler. Sort by size.