4th grade public research lesson on May 5, 2003 at the St. Josaphat School

Mathematics Unit Plan for Grade Four

For the lesson on May 5, 2003
At St. Josaphat School, Ms. Couri's class
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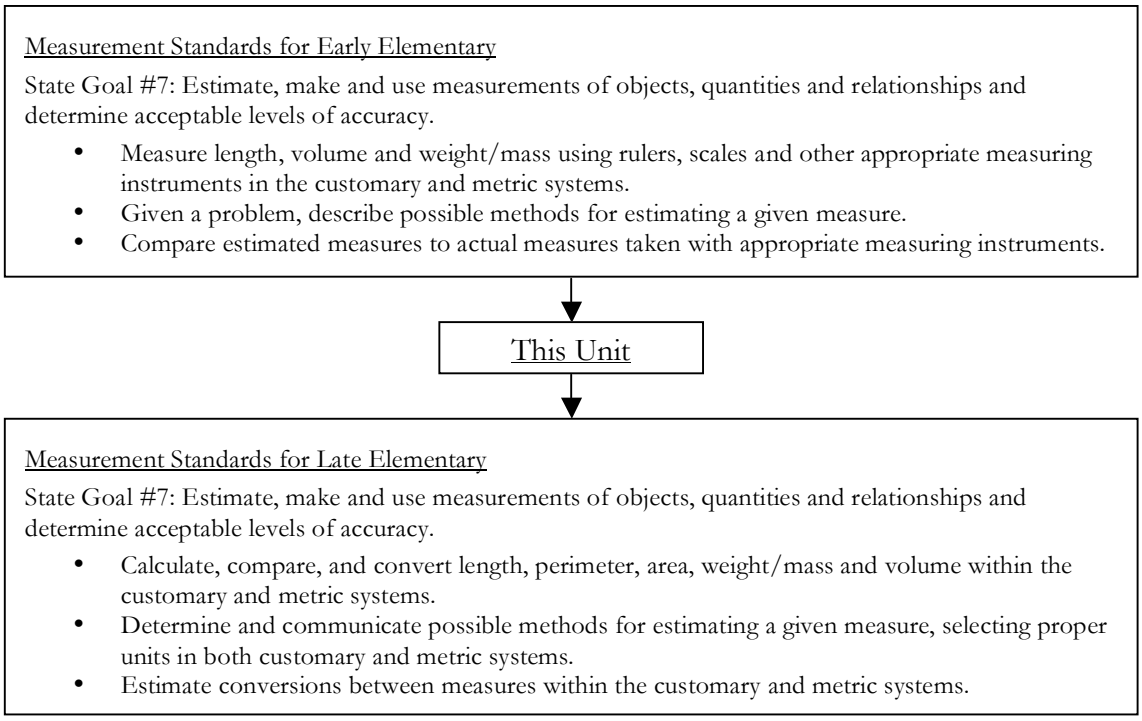
1. Title of the Unit: Measurement and Conversion of Units in a Recipe
2. Goal of the Unit:
   - This unit will provide students with a strong connection between the study of measurement and the practical application of conversion in their daily lives.
   - Students will gain a deeper understanding of different and appropriate measurement tools.
3. Relationship of the Unit in the Illinois Learning Standards for Mathematics.



4. Instruction of the Lesson

When discussion began concerning the focus of this unit, measurement was decided upon for various reasons. Measurement has long been a challenging topic for students across the world, and particularly at St. Josaphat School. Even the creators of this lesson admitted to struggling with measurement as a sub-topic of mathematics. There seemed to be a missing link between the students' study of measurement and their ability, willingness, and desire to relate that study to their everyday lives. In this multicultural world of trade and travel, students should be equipped with the skills needed to convert measurement units between the metric and customary systems. Students struggle to carry with them measurement lessons from their early education, experiences that allowed them to concretely examine the

differences between two objects of measurement, to their later, more abstract study of measurement in the upper grades. This lesson serves as a memorable experience, using both concrete and formal mathematical skills, to provide that important connection between prior experience and current and future measurement objectives.

The Illinois Standards expect students to be able to estimate, make and use measurements of objects, quantities and relationships and to determine acceptable levels of accuracy by the fourth grade. This lesson serves to formalize students' experience with measurement by posing a problem that will require students to apply prior knowledge to the given situation to follow the recipe. Students will calculate and convert measurements and units by experimenting with tools and the given materials, and also by using their mathematical computation skills. This lesson will enable students to use estimation skills as well as formal calculations and conversions in math.

Prior to this lesson, students have experienced hands-on activities in the area of measurement. Students have been able to explore measurement tools of different shapes and sizes, and have performed informal experiments with those tools. Students' experience prior to the lesson has been with concrete comparison between measurement tools. For example, if students were shown two containers filled to different levels on a scale, they would be expected to know which container held more fluid by observing which side of the scale was lower. Their experience up to this point has been one of informal comparisons between measurements and open and informal discussions of units.

This lesson focuses on the students' experience to formally convert units in the customary system. Students will be given an activity to participate in that will build a strong connection with their experience in class with measurement and their ability to measure in their everyday lives. By intentionally limiting the measurement tools that students are able to use, students will also gain a deeper appreciation into the existence of and availability of the most appropriate tools in a given situation.

5. Unit Overview:

<u>Day 1: What's in your kitchen?</u>

Reading a recipe, Sequencing, Vocabulary, Exploration of tools.

Students are given a recipe to read. The recipe contains words and instructions with which the students will have to be familiar in order to follow the recipe. (i.e. "packed", "rounded") Students will examine the recipe and identify words and instructions they do not understand. Students will bring measuring instruments from home. Students will identify tools (cup, $\frac{1}{2}$ cup, tablespoon, teaspoon, etc.) and compare by size and shape. Students will be given the recipe with baking instructions in an incorrect order. Students will need to determine appropriate sequence of instructions.

<u>Day 2: What's at the store?</u>

Introduction of tools, Estimate and Predict capacity, Measure, Add fractions.

Examine products as purchased at store. (i.e. 5lb. bag of flour, 12 oz. bag of chocolate chips, box of baking soda, etc.) Can I get the needed amount for the recipe out of the ingredient as purchased? How many batches of cookies could I make with one 5lb. bag of flour? Students will explore how many ½ cups in a cup, ¼ cups in a cup, teaspoons in a tablespoon, tablespoons in a cup, etc. Students can create conversion charts in their math

journals from this activity. Students will estimate how many measurements of each tool they think will make the next measurement, then measure to check accuracy of estimation.

Day 3: Trouble in the kitchen (Today's Research Lesson)

Day 4: Are we ready now?

Baking. Students will be re-presented with all available tools for measurement. Students will determine *most* appropriate tools for measuring ingredients. Each group will be responsible for measuring and adding different ingredients using the most appropriate tools for their measurement. Class will work together to make a batch of chocolate chip cookies.

Day 5: What if?

Proportion, Computation and Follow-Up. Students will be given the recipe again. How could we double this recipe? How could we prepare only half the number of cookies? (introduce multiplying and dividing fractions) Also, what if the recipe was presented in inappropriate units of measure? Can you use the conversions you've learned to put it into the *most* appropriate units?

6. Learning Process (or Plan of Lesson)

Steps, Learning Activities Teacher's Questions and Expected Student Reactions	Teacher's Support	Points of Evaluation
1. Introduction The teacher will explain that there is a problem today. We cannot make the cookies as planned because the St. Josaphat kitchen only has tablespoons! Chocolate Chip Cookies: $2\frac{1}{4}$ cup all-purpose flour 1 tsp. baking soda 1 tsp. Salt 1 cup butter $\frac{3}{4}$ cup granulated sugar $\frac{3}{4}$ cup packed brown sugar 1 tsp. vanilla extract 2 large eggs 2 cups chocolate chips	Tell the students the problem as a story. Show students the written recipe and the supply of tablespoons.	Do the students understand that the appropriate tools are not available?

2. Posing Problem Can you follow this recipe for chocolate chip cookies by using only a tablespoon? Students may respond: • No, we need a cup, ¼ cup, and a teaspoon in order to follow the recipe. • Yes, we need to figure out how many tablespoons equal each measure.	Encourage students to talk freely about their ideas for solving the problem. If students are having difficulty, refer them back to the tables they made in their math notebooks.	Do the students recall the relationship between measuring tools? Do the students understand that the needed measurements can be made with only a tablespoon? Do the students understand the relationship between a smaller measurement to equal a larger as conversion?
3. **Solving Problem** Groups of students will use tablespoons to equal the following necessary measures: $2\frac{1}{4}$ cups all-purpose flour, 1 tsp. baking soda, 1 cup butter, $\frac{3}{4}$ cup granulated sugar, and 2 cups chocolate chips. Have groups of students predict how many tablespoons will equal their assigned measure. If students finish measuring with time to spare, they can predict how many tablespoons will equal the other measures.		
Anticipated Students' Solutions • You can't measure the teaspoon because the tablespoon is too big. • If I can figure out how many tablespoons are in a cup, I could figure out how many tablespoons make a ½ cup, ¼ cup, or 2 ¼ cup. • If I knew how big a cup was, I could fill it using a tablespoon and count the number of tablespoons I used. - Encourage students to talk about their ideas for solving the problem. - Give the students containers marked with the appropriate measures. 1 cup = 16 tbsp. 2 cups = 32 tbsp. $2\frac{1}{4}$ cups = 36 tbsp. $\frac{3}{4}$ cup = 12 tbsp. 1 tsp. = $\frac{1}{3}$ tbsp.		
4. **Comparing and Discussing** - Each group gives a small group presentation on how they measured and what their outcome was. - Other students may ask questions. - After all presentations, each group should tell which measuring tools would have been most appropriate for their ingredient and why. ▪ 1 cup for measuring a cup ▪ 1 cup for measuring 2 cups ▪ 1 cup and $\frac{1}{4}$ cup for measuring $2\frac{1}{4}$ cups ▪ $\frac{1}{4}$ cup for measuring $\frac{3}{4}$ cup ▪ 1 tsp. for measuring a tsp.	Facilitate discussion among groups. Provide prompts when needed. Remind students to refer to their conversion table in their notebooks.	Did students come up with the correct number of tablespoons to equal their measure? Were their predictions accurate? Were they able to choose the most appropriate tools for their ingredient?

5. Summing up Post-Activity Discussion: How can we use a tablespoon to measure 1 cup, $\frac{1}{4}$cup, $\frac{3}{4}$cup, and a teaspoon? Conclusion: You have to either have the most appropriate tool or know how many of one measurement equals another. Ask students to write in their notebooks what they learned from today's lesson.	Encourage students to talk freely about the activity. Remind students of the strategies they used during the lesson. Write students' conclusions on the blackboard.	Were students able to make the connection between today's activity and previous lessons with conversion?

7. Evaluation
    - Did students demonstrate the ability to choose the most appropriate tool?
    - Did students demonstrate the ability to convert between units?

Appendix I

Name: _____

Chocolate Chip Cookies!

Directions: Number the directions in the correct order.

_____ Combine flour, baking soda, and salt in small bowl.

_____ Place the balls of dough onto ungreased cookie sheet about 2 inches apart.

_____ Preheat the oven to 375 degrees Fahrenheit.

_____ Read the recipe.

_____ Stir in chocolate morsels.

_____ Take out all the ingredients and put them next to the utensils.

_____ Put pan into the oven.

_____ Beat butter, granulated sugar, brown sugar, and vanilla extract in large mixer bowl until creamy.

_____ Get the measuring cups, spoons, bowls, mixer, and pans ready.

_____ Let stand for 2 minutes; remove to wire rack to cool completely.

_____ Roll the dough into small balls.

_____ Bake for 9 to 11 minutes or until golden brown. Remove the pan from the oven.

_____ When the cookies are cool, enjoy eating them!

_____ Gradually beat in flour mixture.

_____ Add eggs one at a time, beating well after each addition.

Appendix II

Chocolate Chip Cookie Recipe

2 1/4 cups of all-purpose flour
1 tsp. baking soda
1 tsp. salt
1 cup (2 sticks) butter or margarine, softened
3/4 cup granulated sugar
3/4 cup packed brown sugar
1 tsp. vanilla extract
2 large eggs
2 cups (12 oz pkg.) Nestle Toll House semi-sweet chocolate morsels

1. Preheat oven to 375 degrees Fahrenheit.
2. Combine flour, baking soda, and salt in small bowl.
3. Beat butter, granulated sugar, brown sugar, and vanilla extract in large mixer bowl until creamy.
4. Add eggs one at a time, beating well after each addition.
5. Gradually beat in flour mixture.
6. Stir in chocolate morsels.
7. Drop mixture by rounded tablespoons, 2 inches apart, onto ungreased cookie/baking sheets.
8. Bake for 9 to 11 minutes or until golden brown.
9. Let stand for 2 minutes; remove to wire rack to cool completely.