
**3rd grade public research lesson on May 21, 2004
at the National Teachers Academy Professional Development School**

Mathematics Lesson Plan for Third Grade

For the lesson on May 21, 2005

At National Teachers Academy, Tracey Carter's class

Instructor: Tracey Carter

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1. Title of the Lesson: Half Math Quilt
2. Goal of the Lesson:
 - To recognize and compare equivalent fractions
 - To recognize the relationship of numerator to the denominator in equivalent fractions
 - To demonstrate their reasoning through justification of their pattern being = to $\frac{1}{2}$ blue
 - To communicate their mathematical thinking clearly To value per collaboration for problem solving
 - 4 Relationship of the Lesson in the Illinois Learning Standards for Mathematics.

State Goal 6: Demonstrate and apply knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, and division), patterns, ratios and proportions.

- Demonstrate knowledge and use of numbers and their representations in a broad range of theoretical and practical settings.
- 6A1.a 6A2 Identify and compare whole numbers, decimals and fractions using concrete materials and mathematical symbols (<, >, =) and using the words "less than", "greater than" or "equal to"

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This Lesson
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- 6A1.a 6A2 Identify and compare whole numbers, decimals and fractions using concrete materials and mathematical symbols (<, >, =) and using the words "less than", "greater than" or "equal to"
- 6A1.b Identify and model fractions using concrete materials and pictorial representations.
- 6D2 Describe the relationship between two sets of data using ratios and appropriate notations (e.g., a/b)

3. Instruction of the Lesson
 - (a) Previously, students have learned that objects divided into two equal parts are designated fractions labeled $\frac{1}{2}$ for each part. Now, my students need to understand and learn the concept of equivalent fractions. That " $\frac{1}{2}$ " can look differently and be expressed in several ways based on the number of equal parts in the whole (denominator), in relation to the number of designated parts in the whole (numerator). In this lesson my students will discover the concept of equivalent fractions by comparing the designs they have created and comparing their corresponding fractions. Next, my students will learn to add and subtract fractions with like denominators before going to Fourth Grade. The understanding of

equivalent fractions now, is laying a firm foundation for the problem solving that is expected in the future for adding, subtracting, multiplying and dividing of fractions with unlike denominators.

- (b) My students have a visual understanding and can identify $\frac{1}{2}$ when all parts are consolidated. They have used manipulative such as Cuisenaire Rods to concretely explore and represent fractions. Using Origami paper to create fractions, they tore One Whole into 2 equal pieces or two units of $\frac{1}{2}$ each. One was glued to their paper and labeled, while the other was again folded, then torn into $\frac{1}{4}$, repeating the process until $\frac{1}{32}$ was glued down. Through this activity, my students were able to see the size relationship between their fractions. This led to their discovery that larger denominators represent smaller values, while smaller denominators represent larger values. I used literature to help students connect real world situations to the use of fractions, helping them to understand “why” fractions could be useful. I guided my students in creating number lines out of sentence strips to help them to visualize their value when added to whole numbers
- Day 2 4/8th lesson Challenge #1 Students were given a template on which to glue some triangles. The directions were that no sides of the colored triangles could touch. In this way, students were limited to using 4 triangles, thus guiding them to use 4 out of a total of 8 when labeling their pattern using a fraction.
 - Day 3 6/12th lesson Challenge #2 Students were given a template to glue some triangles. The directions were to cover $\frac{1}{2}$ of the total and write a fraction. Students had no problem counting the total of triangle to determine how many should be covered to represent $\frac{1}{2}$
- (c) The major focus of this lesson is to foster students conceptualization of equivalent fractions by exploring the relationships of numerator and denominators it relates to their quilt square pieces. Students will create quilt squares that are $\frac{1}{2}$ blue using a variety of shapes and other colors. They will present their designs and justify “how they know” Blue = $\frac{1}{2}$. By manipulating concretely and comparing the quilt square designs, students will discover the meaning of equivalent fractions.
- (d) The way to help students better understand equivalent fraction is by manipulating fractal parts and representing it as a fraction. (Reconstructing quilt squares), then comparing the results. Three variations of the quilt square design will be used to facilitate student’s generation of fractions with different denominators that are equivalent. By giving students opportunities to recognize and compare fractions after they have used manipulative and mentally manipulated them also, students will understand how parts of a whole can have the same value.

4. Learning Process (or Plan of Lesson)

Steps, Learning Activities Teacher’s Questions and Expected Student Reactions	Teacher’s Support	Points of Evaluation
1. Introduction Review some of the quilt squares from previous lessons (e.g. 4/8th, 6/12th) that equaled $\frac{1}{2}$	-Need students to discuss which fraction they believe covered more of the quilt square. 4/8ths or 6/12ths -Students will display symbols to represent their beliefs >, <, =	

<p>Posing Problem</p> <p style="text-align: center;"><u>Half Math Quilt</u></p> <p>Third Grade is having a contest to design the quilt that will hang on One-Half of the lobby of our school-NTA.</p> <ul style="list-style-type: none"> • Can you create fancy quilt squares where Blue = $\frac{1}{2}$? • How could you do this? • How do you know blue is = to $\frac{1}{2}$? 	<p>-Students will work in pairs using the pre-cut paper to design quilt squares where blue = $\frac{1}{2}$</p> <p>-Students arrange pieces and determine the corresponding fraction</p> <p>-After students have written their fraction, they may rearrange their pieces and glue them</p>	
<p>Solving Problem</p> <p style="text-align: center;">Anticipated Students' Solutions</p> <ul style="list-style-type: none"> • Students will count total pieces in design to determine the value of $\frac{1}{2}$. • Students will cover $\frac{1}{2}$ of design with blue, then rearrange them artistically • <u>Following table demonstrates blue possibilities that equal $\frac{1}{2}$ of quilt square</u> 	<p>Students will think the larger denominator will have the most blue.</p> <p>Students will think that the larger pieces of blue together = $\frac{1}{2}$ and the smaller pieces arranged farther apart are $< \frac{1}{2}$</p>	<p>-Do students count the pieces in the design to determine the value of $\frac{1}{2}$?</p> <p>-Do students cover $\frac{1}{2}$ of design to determine number of pieces needed? And then rearrange them?</p>
<p>Comparing and Discussing</p> <p>Students will express the amount of blue(a) used in relation to the total number of pieces(b) to generate fractions(a/b) for later comparison.</p> <p>Everything in mathematics has a specific name. These are all equal to $\frac{1}{2}$. What do you think these types of fractions are called?</p>	<p>“How do you know?”</p> <p>“What do you notice about these fractions?”</p>	<p>Do students make the connection that $\frac{2}{4}$ths, $\frac{4}{8}$ths and $\frac{8}{16}$ths are all equal to $\frac{1}{2}$?</p> <p>A fraction is = to $\frac{1}{2}$ if, $2 \times \text{numerator} = \text{denominator}$</p>
<p>Summing up: Students will respond to the following prompt in their math journals:</p> <p>Which would you pick for a snack three whole brownies or six halves of a brownie? Explain why?</p>		<p>Students will share their responses after journaling</p>


				2						
		2					2			
2			8		4		4			
		1			1					
1						2				
fractions	4/8	2/4		4/8	2/4			2/4		
	8/16		8/16	8/16	4/8	4/8		4/8		

Table of Anticipated Student Responses that equal $\frac{1}{2}$ of quilt square

5. Evaluation-
 - When did student's thinking of equivalent fractions begin to solidify?
 - Were students able to accurately represent their fraction? And label it using numerator and denominator?
 - Did students clearly articulate justification when challenged in support of their fraction?
 - Were students misconceptions corrected as a result of peer discussions?
 - Did student use \geq, \leq, \equiv during their discussions or representations?
6. **Extension:** Pose the following question:
If you removed $\frac{1}{2}$ of your blue pieces, how would you express the blue left on your quilt square as a fraction?
7. Unit Overview-Equivalent Fractions
 - Day 1 Introduction to Fractions
 - Students review the ideas of whole and part, numerator and denominator
 - Day 2 & 3 Review: Fractional Parts and Relationships
 - Students use various manipulative such and Cuisenaire Rods, tangrams, and pattern blocks to explore fractional parts and relationships
 - Day 4 Research Lesson 1 Quilt Math -NTA (5/21/05) See Lesson Plan
 - Day 5 ... Research Lesson 2 Fancy Fraction Beads – St. Josophat(5/19/05) See Lesson Plan
 - Day 6 Introduction to addition of fractions with like denominators

A
 $\frac{4}{4}$

B
 $\frac{16}{16}$

C
 $\frac{8}{8}$

