3rd grade public research lesson on May 19, 2005 at the St. Josaphat School

Mathematics Lesson Plan for third grade

For the lesson on May 19, 2005
At St. Josaphat, Kathleen Fitzpatrick's class
Instructor: Kathleen Fitzpatrick
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1. Title of the Unit: Crafty Fractions

Goal of the Unit:

Students will investigate basic concepts of fractions.
Students will apply their understanding of fractions to model and solve problems.
Students will represent fractions using concrete, pictorial, symbolic representations.
Students will explore and recognize fractions that are equivalent and explain why they are the same.
Students will manipulate materials to show several examples of equivalent fractions.

Relationship of the Lesson in the Illinois Learning Standards for Mathematics.

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

A. Demonstrate knowledge and use of numbers and their representations in a broad range of theoretical and practical settings.

6.A.1b Identify and model fractions using concrete materials and pictorial representations.

D. Solve problems using comparison of quantities, ratios, proportions and percents.

6.D.1 Compare the numbers of objects in groups.

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This Lesson

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

A. Demonstrate knowledge and use of numbers and their representations in a broad range of theoretical and practical settings

6A1.a Identify and compare whole numbers, decimals and fractions using concrete materials and mathematical symbols and using the words "less than", "greater than", and "equal to."

6.A.1b Identify and model fractions using concrete materials and pictorial representations.

D. Solve problems using comparison of quantities, ratios, proportions and percents.

6.D.1 Compare the numbers of objects in groups.

Instruction of the Lesson

The study of fractions is foundational in mathematics, yet it is among the most difficult topics of mathematics for school students. Students have difficulty recognizing when two fractions are equal, putting fractions in order by size, and understanding that the symbol for a fraction represents a single number. Students also rarely have the opportunity to understand fractions before they are asked to perform operations on them such as addition

or subtraction (Cramer, Behr, Post, & Lesh, 1997). Through this lesson students will be able to recognize the patterns involved in equivalent fractions beginning with halves and progressing through thirds and fourths through the process of algebraic reasoning.

In our experience, we have found that our math series teaches fractions as the final unit, thereby not allowing enough time for students to develop a thorough understanding. The students were able to successfully identify and write the fraction for the shaded part of a whole. However, one challenge that students faced was the concept that they could not determine the size of the fraction unless they knew the size of the whole. Another challenge was that they did not understand how a fractional term fit on a number line or grasp the understanding of equivalency among fractions with unlike denominators. These skills are necessary to prepare students for subsequent years when they are responsible for more challenging tasks such as comparing fractions, proportions, decimals, and percentages.

The main focus of this lesson is for students to begin to notice the patterns within equivalent fraction relationships (1/2, 2/4, 3/6, 10/20). Once students understand and are able to extend such patterns, they will be more able to generalize. Allowing students to explore and discover on their own will promote a deeper understanding. Students will see the relationship of how the numerator and denominator change, but the size of the fraction remains the same.

Students will benefit from the use of physical objects when they are introduced to the concept of equivalent fractions. We chose to have the students make beaded necklaces, an activity, in which they could relate to their daily life. We felt the bead necklace was a good way to see the part-whole relationship in fractions, since the beads on the necklace are easy for the students to manipulate. No matter where they are placed on the necklace, the fractional part of the whole remains the same. In addition, they are easy for the educator to manipulate as they can change shape and size, but the idea of ½ or ¼ of the beads being one color will remain the same. We chose to make the lengths of the necklaces the same size and provide two different sized beads, the smaller beads being half that of the larger beads. We wanted the length of the necklace to be the same so as not to confuse the students with proportionality. Another benefit to using the necklace concept is the fact that the string can become a straight line when it is removed from the neck, providing a linear model for students to see the fractional relationship as on a number line.

Unit Overview

<u>Lesson 1: Introduction to Fractions:</u>

Students begin by journaling what they already know about fractions. Then, students will write new vocabulary words in their math journal: fraction, numerator, and denominator. Then we will have a class discussion about parts of a set and brainstorm sets that contain different things (ex. boys in class, girls in class, students with glasses). Then show items and let the students come up with the fractions (ex. sharpened/unsharpened pencils, green/red apples, twister board colors, and beads on a necklace). Next, students are given eight beads, four of which are the same color, to come up with as many fractions as they can. Through exploration or teacher guided practice, students will write fractions and see the relationship between 4/8 is equivalent to ½.

<u>Lesson 2: Fraction exploration of fractional parts of a whole</u>

Draw shapes on board or use pattern blocks to divide shapes into equal parts, shade different sections, and ask for the fraction of the shaded part and the non-shaded part.

Students will practice making fractions and seeing equivalency. Then, students will brainstorm where they notice fractions in their everyday life (ex. charts, pizza, brownies, cakes, windows, chalkboard, tile floors and ceilings, bookshelves, and quilt). Students will be asked how many ways they can divide a square into different equal parts. They will be asked by the teacher to fold a larger square to demonstrate for the class one or two ways that they came up with.

Lesson 3: Equivalent Fractions – Halves

Discuss with students how they are helping to make one square of a quilt in art class for our priest who is transferring parishes this year. Tell the students that the school board would like them to design their own quilt. Ask the students how many different ways they can design their quilts so that half of the quilt is their favorite color. Students are provided with graph paper with several blank quilt patterns. The quilt patterns will have 16 squares. The students will then share their solutions on the board. We will look at the different drawings and ask how some drawings, even though they are different, still show one half. Ask how students knew how many squares to fill in on their quilt to make it show one half of their favorite color? Teacher can shade a quilt that is more or less than one half and ask if it is also equal to one half. Teacher will also ask students if there are any other fractions they see with the examples on the boards. For example, ½ = 8/16 or 2/4 = 8/16.

For a follow-up activity, students are given 20 beads, and they are asked to show as many different ways as they can make half of the beads their favorite color.

Lesson 4: Equivalent Fractions – Fourths

Students will work in answering the following posing question: How many different ways can you shade the quilt to show ¼ of the squares to be your favorite color? They will again be given graph paper with several blank quilt patterns with 16 squares each. Teacher may have to prompt groups into thinking about how many different ways they can divide the 16 squares into groups of four. Students will then share their different drawings with the class. Through discussion the students will see that 4/16 = ¼.

For a follow-up activity, students are given 12 beads, and they are asked to show as many different ways as they can in order to make one fourth of the beads their favorite color. They will discuss how they determined the number of beads that equaled ¼.

Lesson 5: Equivalent Fractions – Halves and fourths

Fancy Fraction Beads – See lesson plan

Future Lessons:

This unit lends itself to further investigation using quilts and beads to explore thirds, fifths, sixths, etc. Lesson 5 will also be a great introduction to addition of fractions as well as reducing fractions, since students can easily see that ¼ + ¼ = 2/4 = ½. This unit will also lend itself to furthering parts of a whole instruction, such as ¼ of 24 is 6, ½ of 48 is 24, etc. Since the necklaces will actually be made and sold, it will also provide a great opportunity to experience bookkeeping and life skills that are involved in running a business.

Learning Process (or Plan of Lesson)

Steps, Learning Activities Teacher's Questions and Expected Student Reactions	Teacher's Support	Points of Evaluation
1. Introduction Students will revisit bead arrangements from the previous day depicting halves and fourths.	Teacher will display linear drawings of colored beaded arrangements and facilitate discussion of fractional parts.	Can students recognize and rename fractions that are equivalent?
2. Posing Problem As a fundraiser, the third grade is in charge of making and selling beaded necklaces for St. Josaphat's Summerfest this June. How many different ways can your group make a necklace to follow these rules: -1/2 of your beads must be blue -1/4 of your beads must be purple -1/4 of your beads must be red Our necklaces must all be the same length so there must be 24 large beads to make a necklace and 48 small beads to make a necklace.		
3. Solving Problem There will be six groups of students with four students in each group. Three of the groups will have the larger beads and need to make a necklace using 24 of the beads they are given. The other three groups will have the smaller beads and need to make a necklace using 48 beads. All groups are provided with the same length of string. **Anticipated Student Solutions** Students will divide group of beads in half, they may use repeated addition, missing factors, draw a picture, use dividing by 2 or 4, or see the relationship of 2/4 equaling 1/2 to find the correct number of each colored bead for their necklaces. One possible solution for the larger beaded necklaces: BBBBBBBBBBBBPPPPPPRRRRRR These beads can be displayed in any order as long as there are 12 blue beads, 6 purple beads, and 6 red beads. One possible solution for the smaller beaded necklaces: BBBBBBBBBBBBBBBBBBBBBBPPPPPPPPPPPPPRRRRRRRRRRRR These beads can be displayed in any order as long as there are 24 blue beads, 12 purple beads, and 12 red beads.	Teacher will provide groups with graph paper to record their solutions. Teacher will facilitate discussions within groups and provide prompts if needed. Encourage students to write the different fractions that they see.	Do the students use the correct amount of each color bead? Are the students able to properly write a fraction?
4. Comparing and Discussing Each group will share their solution and how they determined the number of beads to use. They will present the three fractions that they came up with for each color and any "a.k.a.'s" for that fraction. Other students may ask questions or lend a hand when necessary. Students will discuss as a whole group whether they notice any patterns among the fractions.	I will pick one solution from each group for students to string into a necklace and share with the class. I am looking for necklaces that look identical, but have varying number of beads (24 vs. 48) Groups will share in order of increasing difficulty. Necklaces that easily show the relationship	Are any groups stuck as to how to solve the problem? Do the students make the connection between ½, 12/24, and 24/48? ¼, 6/24, and 12/48? Through discussion, are students able to differentiate between ¼ of 24 and ¼ of 48?

5. **Summing up** Post Lesson Discussion: Your necklaces were such a hit that people requested bracelets to match. The bracelet is made of 16 beads. Who can tell me how many blue we will need? How many red? And how many purple if our rules stay the same? Have students reflect and write in their journals on what they learned from today's lesson.	Encourage open discussion.	Are students able to make the connection between the posing question and the post lesson discussion? Do they see the equivalency between these fractions?

Evaluation

In journals students will reflect on what they know about fractions. This will be compared to the journals written on the first day of the unit.

From students' journaling, reflection, and participation through discussion, the teacher will be looking for the following goals to be accomplished:

- Do students see the connection in finding equivalency by multiplying the numerator and the denominator by the same number?
- Do the students recognize a pattern through algebraic reasoning?