Fractions Aren't Freaky!

Lyndsay Burns

Introduction

Fractions. Yikes. If you are a fourth grade teacher like me, who fears fractions, then this unit is for you. Many students ask the same question: "Why do I need to know about fractions?" In a way their question is completely valid. Think about how many times a day, without knowing it, that you encounter fractions: eating only half your sandwich at lunch, making a recipe for dinner or baking, dividing up workspace, etc. We use fractions to help up represent a part over a whole. If we didn't use fractions, time would only be measured on the hour instead of the quarter hour or half hour. This unit is made to help make this abstract concept a little more clearly.

I am a fourth grade teacher at a large urban school in North Carolina. There are currently 906 students enrolled in the school, and this enrollment increases daily. Of these 906 students, 6% are Asian, 59% are African-American, 10 % are Hispanic, and 18 % Caucasian. 52% of these students live in poverty and 66% of the students are on free and reduced lunches (take a moment and look at all those fractions. Think of the information they conveyed). In the fourth grade, there are 8 fourth grade teachers. I have 21 students in my classroom, 7 students have Individualized Education Plans (IEPs) and 4 students have 504 plans for behavior.

Rationale

According to state standards, fourth grade students must study fraction concepts in math. This is tested on their End of Grade tests (EOG) as well as Formatives throughout the school year. Fourth grade students must have number sense, with an understanding of place value using numbers one-hundredth up through ten thousand. Students must also solve fraction problems using models, diagrams and reasoning about fractions and relationships among the fractions of: halves, fourths, eighths, thirds, sixths, twelfths, fifths, tenths, hundredths, and mixed numbers. Students must also be able to add and subtract fractions with like denominators and decimal fractions through the hundredths.

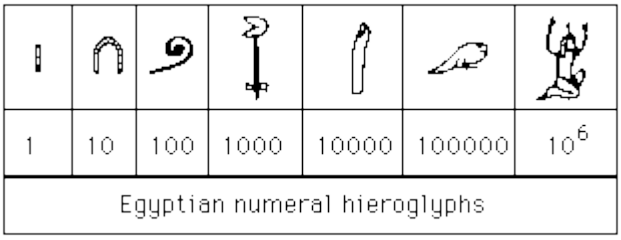
Content Background Knowledge:

The students should have some background knowledge of fractions from third grade. (NCSCOS Third Grade: **1.05** -Use area or region models and set models of fractions to explore part-whole relationships. Represent fractions concretely and symbolically (halves, fourths, thirds, sixths, eighths). Compare and order fractions (halves, fourths, thirds, sixths, eighth s) using models and benchmark numbers (zero, one-half, one); describe comparisons. Model and describe common equivalents, especially relationships among halves, fourths, eighths, thirds and sixths. Understand that the fractional relationships that occur between zero and one also occur between every two consecutive whole numbers. Understand and use mixed numbers and their equivalent

fraction forms.)

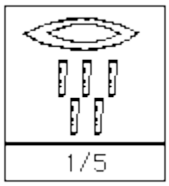
History of Fractions:

Fractions come from the Latin word “fracto” which means “to break”. Fractions first came about with the Egyptians in about 1800 BC. The Egyptians used a Base 10 system (similar to what we use today). They had symbols for 1, 10, 100, 1000, 10000, 100000, and 1000000. They used hieroglyphics to represent these numbers:



[i]

Egyptians created unit fractions. In the unit fraction they used 1 as the numerator and a mouth picture to represent a part above the number to make it into a unit fraction:

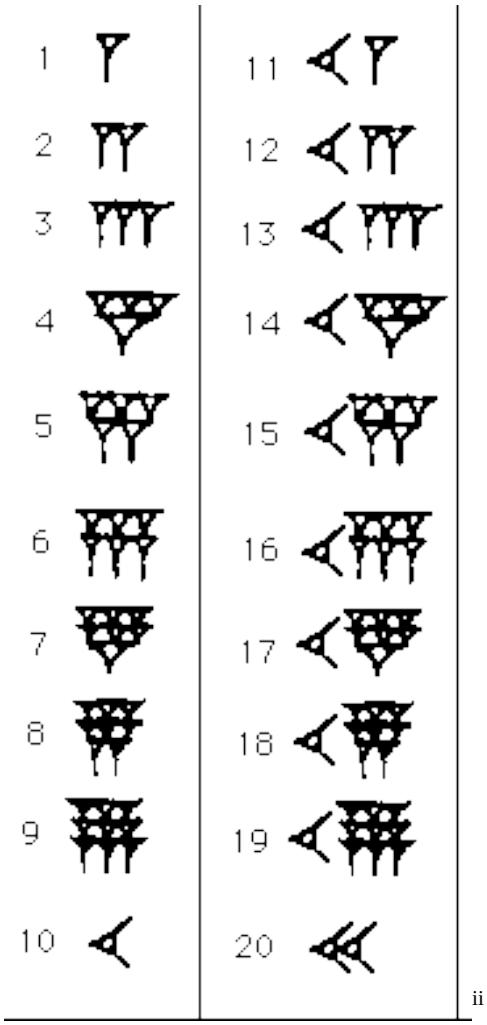


This represents one-fifth.

Ancient Romans had a slightly different take on fractions. Ancient Romans only used words to describe the part over the whole. Their number system was based on a unit of weight which was called “as”. One “as” was made up of 12 uncia (which to my understanding is a half a pound). Thus, fractions were based out of 12. Written word fractions were found to be extremely difficult to do computations with.

Babylonians used a number system based on 60. They group the numbers into groups of 60 instead of grouping numbers into 10’s like we do. They also grouped their numbers into 10. In terms of fractions, Babylonian mathematicians extended numbers to include fractions into sixtieths (equivalent to the tenths, and hundredths place).

Babylonians also used symbols to represent their numbers:



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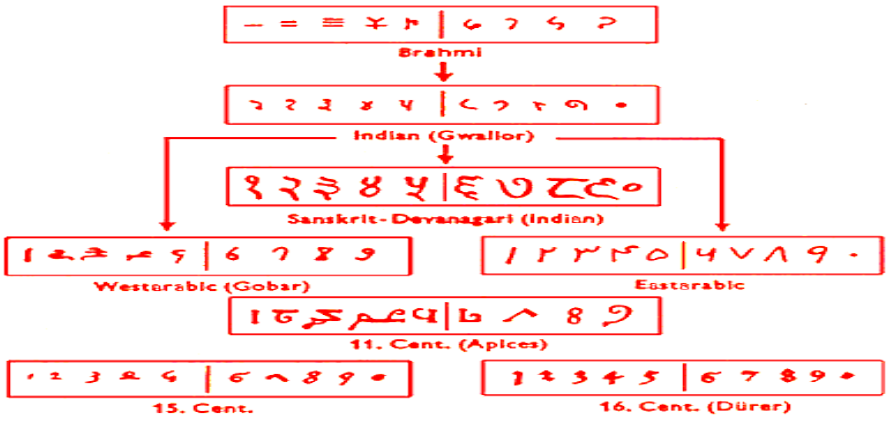
There was no zero or decimal point in this number system, until they added it in 311 BC. Their way of writing fractions is due to the number system they created which has three main ideas: Each figure has a symbol which isn't like the value it represents, the value of the figure depends on the position of it within the entire number, and a zero is needed to mean nothing and also to fill the place of units that are missing.

In 500 AD the Indians changed again how to write fractions. They called the symbols they used to represent numbers as Brahmi-which included nine symbols and a zero:

iii 

In India, fractions were written much like ours is written now, only they didn't add the line to separate the numerator and denominator. For example:

$$\frac{7}{15} = \frac{7}{15}$$

The Arabs are the ones who added the line to help us decipher between the numerator and denominator which can be written horizontally or slanted.

Since 17th Century Europe, we now have a way of comparing whole numbers with each other, separating them into parts out of the whole. Fractions can be represented in different ways. One way is in a ratio of two numbers.

For example 3:5.

Another way fractions can be represented is through a "decimal fractions" (aka decimals) where the denominator is a power (base) of 10. This is determined by the number of digits to the right of the decimal point.

For example: 0.75= 75/100

And the third way fractions can be represented is in a percentage where the denominator is always 100.

For Example: 50/100= 50%

There are five different "types" of fractions.

1. Proper Fractions: fractions where the numerator is less than the denominator:
    a. ¾, 6/7, ¼
2. Improper Fractions: fractions where the numerator is greater than the denominator:
    a. 12/5, 9/2
3. Mixed Numbers: this is the sum of the whole number and proper fraction:
    a. 3 ½, 4 ¾
4. Equivalent Fractions: fractions that have the same value
    a. ½ = 5/10
5. Complex Fractions: the numerator and/or denominator contains a fraction:
    a. $\frac{12}{\frac{3}{4}}$
    b. $\frac{2}{6}$

Teacher Background Knowledge

When teaching math, I don't believe in using a lot of worksheets, but I do believe in using manipulatives. This unit uses a variety of manipulatives, and the SMARTboard that is in my classroom. Although there are more concepts to be taught when teaching fractions (estimating fractions, comparing and ordering fractions, adding and subtracting fractions with like denominators, equivalent fractions, and simplifying fractions) this unit is meant to continue to build a concrete understanding of what fractions are.

Classroom Strategies

Lesson One: Reviewing Fractions

Because fractions seem very abstract, it is important for students to understand what a fraction is. We discuss that a fraction is a part over a whole. The part is the "top" number or the numerator and the whole is the "bottom" number or the denominator. We create definitions of fractions: 1. a piece broken off, 2. a number that is not a whole number, 3. a portion of something, 4. a part of a larger whole or group. To give students an example, we count the number of students in the class and we use this number as our denominator. Then we discuss how our numerator can change. I ask the students to stand up and sit down depending on what we are looking for. We find the fraction of students who are: girls, boys, wearing glasses, have braids in their hair, wearing a certain color, etc. We write these fractions on chart paper and continue to discuss the concept of a part over a whole. Then the students and I go on a Fraction Hunt. We walk around the school and write down all of the places where we see fractions. This continues on for homework, where the students find fractions around their home.

Lesson 2: Practicing with Fractions-Fraction Dodge ball

Take the students outside. You will need a Dodge ball or other playground ball. Review with the students the rules for Dodge ball (see http://www.dodgeballusa.com/rules.html for official Dodge

ball rules). Explain to students they will be playing Dodge ball for math purposes. Play Dodge ball for about two minutes. Pause the game and stop to create fractions- what is the fraction of the students who are out? What is the fraction of students who are still in? What is the fraction of girls still in? What is the fraction of boys still in? What is the fraction of girls out? What is the fraction of boys out? Resume the game, and pause again in another two minutes.

After the students have created fractions, come inside to practice drawing fractions. Students practice drawing thirds (draw a circle, find the center and put a dot. Then draw a Y and you have thirds). Tell the students that this fraction is created to represent thirds. Ask the students what other fractions can be made from thirds. Connect this to the dodge ball game they just played. There are three people playing in the dodge ball game so our circle represents these three people (put one person in each section). If one of these people gets "out" what is the fraction of people in the game, versus the fraction of students out of the game. Students continue to break apart the picture fraction into more parts (sixths, ninths, and so on). Continue making references when creating other fractions to the dodge ball game they just played. Having the students physically put "people" into the sections helps the students to create a more concrete visual of what you are expecting them to do. Students then practice drawing their own fractions. Students are given a variety of rectangles and they must create halves, fourths, eighths, and tenths as well as label them. Students can also create word problems based on the fractions they drew. For example a word problem could sound as such: "my nine friends are I were playing dodge ball at recess. After one minute of playing three people got out. What is the fraction of my friends still in the game? What is the fraction of my friends not in the game?" As the teacher, you can collect these word problems and redistribute them to the students in the class for practice.

Lesson 3: Sports and Fractions

Continual practice of working with fractions is what makes students have more concrete understanding of fractions. To keep students engaged, we connect fractions to their interests. The students in my class love sports, so why not incorporate this into fractions. Let's be honest, there's nothing funnier than sports bloopers, so to begin this lesson we watch Casey at the Bat (Disney 1946)[iv]
http://www.youtube.com/watch?v=erfSed2MUsA&feature=related.
Together we keep track of how many times the team is at bat and make fractions out of how many outs and how many on bases the team gets. We also discuss the fraction of players on the field (both teams included). Ask the students: what is the fraction of the players on both teams? Literacy link: We then observe Casey at bat. We record the fraction of Casey's at bat, and then we move onto his effort in the game. Ask the students: Why do you think Casey chose not to hit the ball? The students then write a continuation of this story. Give them the prompt that they are a news reporter and must write a newscast on what happened in the second game. They are to use fractions to represent how many outs and how many on bases the team gets. As well as the fraction of players on the field (both teams included).

Now the students try this on their own. Show the YouTube video-
http://www.youtube.com/watch?v= eeEy060qrA. In this video there are multiple laterals. Be sure the students understand the sequence in which a game works. At some point in the video, stop and create a fraction of what has occurred. Students must use a tally chart or other method to keep track of events in the video. The students can also turn this into a news report piece as well.

Lesson 4: Cooking with Fractions

Give students the materials and recipe for making their own personal pizza:

¾ cup pizza sauce

½ cup of mozzarella cheese

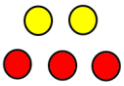
¼ cup of pepperoni

Allow the students to only use the ¼ measuring cup. After they have made their pizza, bake them (if the cafeteria allows, if not, the pizza will be fine to have "raw"). With your assistance, have all the students cut their pizza into halves. Then have each different groups of students cut their pizzas a different way-group 1 cut their pizzas into fourths, group 2 cut their pizzas into eighths, group 3 cut their pizzas into sixths, and group 4 cut their pizzas into twelfths. Let the students eat their pizza. After a minute or so, tell the students to stop eating. Ask the students: what is the fraction of the pizza that you have eaten? And what is the fraction of the pizza that is left?

Students then create their own non-food recipes of themselves to make a class recipe book. For example (and this is really good to do around the time of Mother's Day) they can make a Recipe for a Mother- keeping in mind that the end result must equal 1-: 2/8 kindness, 4/8 love and understanding, 1/8 laughter, 1/8 seriousness.

Lesson 5: Fraction Models

There are three models students must know:

1. Fraction of a unit or area 
2. Fraction of a part of a group 
3. Fraction of a measurement 

Teach the students examples of measurement. Give the students a fraction, for example ¾. You create 4 line segments (because 4 is the whole) and color in 3 segments (because the numerator says the part is 3). Students then draw each model for the fractions of: 1/3, 2/3, 4/5, ¾, 6/7, ¼.

Lesson 6: Fractional parts of a Whole/ Fractions of a Group

This is a very difficult concept for students to understand. There are two ways the students can solve these kinds of problems: 1. Draw it, and 2. Create a number sentence. I use the

SMARTboard lesson: http://exchange.smarttech.com/details.html?id=e99c812c-838f-49b3-ba42-2b5576cd280e

Following the SMARTboard lesson, I continue to model this method for the students. This SMARTboard lesson is great for teaching this concept as it goes step-by-step through the process with examples such as:

1. For the CMAs a designer must design shoes for 12 celebrities. ¾ of them must be sparkly heels. How many shoes will be sparkly heels?
2. The NFL is creating special limited t-shirts for the Super bowl. There will be 32 of them total. ¾ of these t-shirts have the (enter NFL team here). How many shirts total will be made for said NFL team?

To bring the students to the next level of blooms taxonomy, the students should create their own word problems to give to their classmates to solve finding fractional parts of a whole.

Lesson 7-9: Fractional Parts with Tangrams

This three-day lesson works great if your classroom (like mine) works in a lot of cooperative learning center groups. I naturally have my students in groups in the classroom. I level my students (high, medium, low) for reading to help differentiate their reading levels. For math however, I believe that heterogeneous groups tend to work the best. The students in math already know who is in their group, and I have assigned each student with a partner. The partners tend to be a high student with a medium student, and a medium-low student with a low student. This creates a natural peer tutoring within their groups. I believe that students can learn a great deal through this peer tutoring. This set up is for our "whole group" class time. Our school schedule is set up so there are two days a week (for one hour) "Family Flex time" where the students are broken up based on their ability level in math. These groups are differentiated based on where the students' needs are (addition, subtraction, multiplication, division, word problems, data analysis, geometry, fractions, etc).

These ideas come with worksheets from the book *Geometry and Fractions with Tangrams*.[v] Before these activities start, allow the students some "play time" with the tangram pieces. I think it's important for the students to have "free play" with them to see where their thinking and creativity is at. After about 5 minutes, bring the class together to discuss tangram pieces with the students. Each large triangle = ¼, each small triangle = 1/16, medium triangle = 1/8, square = 1/8, parallelogram = 1/8.[vi]

1. Tangram parts- Students get 7 tangrams pieces (2 large triangles, 1 medium triangle, 2 small triangles, 1 square, and 1 parallelogram). Students manipulate these pieces to find the fractional part of each piece. They must label each piece (for students who are higher level thinkers, they can add these fractional parts together). Students then find the fractional part of: two large triangles, whole puzzle, a triangle, etc.
2. Using worksheet labeled page 45, students use the small triangle (1/16) to find the fractional value of each shape. Challenge for the higher level thinkers make a number sentence and solve.

3. Using the worksheet labeled page 46, students find the fractional value of shapes using the large triangle (1/4). Student "place and trace" tangram pieces on each shape.
4. Tangram Art- (there is a literacy link in this activity) Students get fourteen tangram pieces (2 sets)/ Students create their own picture made of tangrams. The students must trace each piece and tell the fractional value of each piece. When the picture is complete, students must write a story to match their picture.

Lessons 10-12: Mixed Numbers and Improper Fractions

Using this wonderful SMARTboard lesson http://exchange.smarttech.com/details.html?id=179f0ee9-bb05-4937-b0e7-bb6b7fa8cc9a, the students go through a step-by-step process for understanding mixed number and improper fractions. After the students have some practice with creating mixed numbers and improper fractions, the students can make their own Memory Game. Give the students twenty index cards. The students on one card will write the mixed number and on an opposite card write the matching improper fraction. They will have ten sets of matches. For students who need some extra help in math, give them ten mixed numbers, and have them create their improper fraction match. The students can play two ways. They can play on their own where they mix up the cards and make matches, and then switch cards with another student in the class. Or they can play in partners, and put all of the cards together (so forty cards, twenty sets of matches). Each match they get is one point.

Lessons 12-14: Adding and Subtracting Fractions with LIKE Denominators

When teaching about adding and subtracting fractions with like denominators it is always important to tell them that the denominator ALWAYS stays the same. In beginning to teach this lesson, if the problem is ¼ +2/4= _____ I always have my students go ahead and write the 4 for the denominator in the answer. Of course this changes when you get into adding and subtracting fractions with unlike denominators, but we won't worry about that for now.

Using the SMARTboard (you can also just write this on chart paper or whiteboard) students look at two rectangles. Roll the dice (again you don't need a SMARTboard to do this, you can use a regular six-sided dice) to determine the denominator. Break the top rectangle and bottom rectangle into said number. Roll the dice again to determine the top rectangles numerator and shade in this number. Roll the dice one more time to determine the bottom rectangles numerator and shade in this number. Write the fraction amount. Add the shaded pieces together and keep the denominator the same. Do this a couple of times for practice with the students. You can do this same game with subtracting fractions. Roll the dice to determine the denominator. Break the top rectangle and bottom rectangle into said number. Roll the dice again to determine the numerator and shade this number in this number. Write the fraction about. Roll the dice one more time to determine the next numerator and shade in this number. It's important to note here, that because of the probability of what the dice will roll, it is possible that the first fraction they create will be smaller than the second fraction. Because in fourth grade we do not work with negative numbers, I always am sure to tell my students the bigger fraction will always come first. The students then subtract the fractions.

Due to the nature of the fourth grade end of grade testing in math, I like the students to relate the numbers into word problems. Eighty percent of this test is word problems, so the more students work with word problems, and create their own word problems, the better. My students love movies, and they are especially fond of Harry Potter. To make a connection, and to make word problems more enjoyable to read, I have created five addition and subtraction fraction word problems that involve Harry Potter:[vii] The nature of these word problems involve with fractions in time. So it is important to review with students the fractions on a clock: ¼ hour= 15 minutes, ½ hour= 30 minutes, ¾ hour= 45 minutes, 1 hour=60 minutes. Also when talking about word problems, it is important to review with students how to read a word problem:

1. Read the problem two times. Underline the clue words that tell you what the problem is asking you to solve. (*note we always refer back to our word wall with word problem clue words-ex. Add= in all, altogether, etc.)
2. Re-read the problem. Determine the numbers you need and don't need. Circle the ones you need, cross out the information you don't need.
3. Solve the problem. Use any strategy you are comfortable using solving the problem (for example, if it is a multiplication problem, some students draw pictures, some use an algorithm, some break apart numbers).
4. Reflect: does the answer to your problem make sense? Did you answer the question?
5. Check your work.

Here are some word problems for practice:

1. Harry Potter practiced ½ hour of magic in the morning and ¼ hours of magic in the afternoon. How long did he practice altogether?

2. Harry Potter and his best friend Ron Wesley were practicing for their Quidditch match against Slytherin. They spent ¾ of an hour in the morning practicing dodging bludgers, Harry Potter spent ¼ of an hour finding the Golden Snitch, and Ron spent ½ of an hour practicing in the goal. How much time did they spend practicing?

3. Hermione Granger was in the library studying for her classes. She spent ½ hour studying for Potions, 2 ½ hours studying for Defense Against the Dark Arts, and 1 ¾ hours studying for Herbology. How much time did she spend studying?

4. Ron, Hermione, and Harry Potter had 12 hours to find the last Horcrux that Lord Voldemort hid. They already spent ¾ of an hour arguing on where to start looking, 3 ¼ hours travelling, and 5 hours dueling with various enemies. How much time do they have left to find the Horcrux?

5. Dumbledore decided to have another Tri-Wizard Tournament. The five athletes had 2 hours to get the Golden Egg from the untamed dragons. It took Harry Potter ¼ of an hour to walk out on to the battle field, and ½ hour running away from the dragon. How long does he have left?

I think that it is important once the students have practice solving given word problems, they create their own.

Lesson 14-15: Creating your own number system for fractions

To go along with the history of fractions, why not have the students pretend they are Ancient Babylonians or Ancient Romans and create their own number system for fractions. This also creates a fun way to solve addition and subtraction problems, as well as give them another visual that when they add and subtract fractions with like denominators, the denominator always stays the same. On the first day, model for the students your expectations. As a class create symbols to represent the numbers 0-12. It could look like:

0= square 1= triangle, 2- circle, 3=heart, 4= star, 5= diamond, 6= smiley face, 7= sad face, 8= flower, 9= rainbow, 10= triangle + square, 11= triangle + triangle, 12= triangle + circle.

Give students various problems to solve keeping in mind that the denominator throughout the problem never changes. The next day the students create their own symbols to represent each number. They create a key and at least ten problems. Collect all the students' work samples and redistribute the work. Another fun activity to do, would partner up with another class. Each class creates their own number system and posts it. Create class problems with number systems and trade. It will be fun to see the kids solve various problems.

Lesson 16-18 Culminating Activities:

Activity #1: Fraction Fun Class Newspaper

Put the students into equal groups (if possible). Each group will be assigned a task to create a classroom fraction newspaper. I recommend using the Microsoft template for newspapers. It's important to set the standards for what you are expecting. Each student should be assigned a role in the group in order to prevent conflict. I believe these groups should be created based on interest and talent. The students will create a column on the following:

1. Arts and Entertainment- This can be done one of two ways, or both depending on the demand of students interested in this column. The students in this group should be broken into two groups within the group. One group of students should be the artists and the other group should be the reviewers. This column is a variation of "color by number". If you have students like mine who are very talented artists, they can create their own picture template for coloring by fractions. The students would have to draw a picture break it up into various section sizes. Based on these sizes, the students would have to assign fractions to each section (the sections would have to be about the same size). In fourth grade we work with a lot of "benchmark fractions" (fractions that you can judge/compare other numbers with) which include: 1/4, 1/2, 3/4, 1/3, 2/3 and often 1/10 (because of its importance in decimals). I would limit the fractions the students use to create their picture to these fractions. They are also familiar with them as well. If this idea is too difficult for the students, the students can be given a "color by fraction" picture already designed for them to color. You can take a basic color by number picture, and substitute the basic numbers with fractions. Make sure to include a key in which each fraction is represented by which color. Once the artists have completed this colorful picture, it will be the art reviewers' job to review the picture. The reviewers must use

fraction words in their review. The review must be at least 3 paragraphs long (in fourth grade we make the rule that a paragraph is 5-7 detailed sentences), and have correct grammar and punctuation.

2. Sports Page- this assignment would have to be given in advance, and to students who are allowed to watch full football games. The students would have to watch a full football game and keep track of the bloopers they see. For example, they could keep a tally of how many passes a certain quarterback makes, and how many were incomplete. Since they have done an activity like this in a previous lesson, they should understand the concept of it. The students could even do more than one blooper. One student could do incomplete passes, another student could do fraction of fumbles, or watch a certain player and create the fraction of tackles he gets over how many total carries he has. The students must then turn their data into a review. I always tell the students, that bloopers are funny, so your report should be fairly funny as well. The students must use fractions in their report. Since most sports pages include more than one sport, if there are many students who want to complete this task, they could do another sport-like hockey for example.

3. Health Section- reporting on a "restaurant" aka- cafeteria food! What student doesn't like to critique school food! In fourth grade, one of our big science units is Nutrition. The students learn about the five food groups, the key nutrient in each group, and the health benefit of each food group. They also learn recommended serving sizes for each group, as well as how to read the new and old food guide pyramid and portion plate. Over time cafeteria has become a lot healthier, but how much healthier? The recent food guide pyramid says we need to have (per day) 6 servings of the grain group, 5 servings of the vegetable group, 3 servings of the fruit group, 3 servings of the milk group, and 2 servings of the meat group. The students could track the cafeteria lunch options for a week. They create a daily report about which fractional part of their served lunch is from each of the food groups. They draw a conclusion about whether or not school lunches are healthy. Another variation of this article is one group could research and report about school lunches, and another group could interview other fourth grade students about what they eat daily for each meal, and create a review of what fraction of students interviewed are "healthy" (follow the food guide pyramid).

4. Cooking Section- the students are given a "Fraction Chips" recipe from the book *Eat Your Math Homework.*[viii] The students write up the article including the answers to things such as: how many ways can you serve ¾ of a tortilla? Can you make equal shares with the fraction chips you have? (How else can you make a ¾ serving?) What are the ways you can make a ½ serving size? How about a 2/3 serving size?

5. Blogging Fractions- in every newspaper there is an Editorials section. Here people can write their opinions of fractions. Why not have the students write a blog about their opinion of fractions? Students can create a blog on www.blogspot.com and create a week long blog where people can respond to their thoughts. They turn these opinions into an article.

6. Comics- through researching about fractions in pop culture, I have found a lot of funny comic strips about fractions- for example:

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Activity #2: Prezi Presentation

Students are expected to learn "21st Century Skills". This incorporates technology and their use of technology into their daily education. Since worksheets for many students aren't the most valuable learning tools for students, why not have the students use technology to create a presentation about what they learned. Using www.prezi.com, the students can create a study guide to show to the class about what they have learned about fractions.

Lesson 19-20 Fraction Review

Again, using modern technology in the form of our SMARTboard, I have created (using the Jeopardy template on SMARTtools), Jeopardy game that reviews all concepts of fractions taught. Since our math time is only 90 minutes per day, this game is played over two days. The students are split into two heterogeneous teams. Students "buzz" in when they know the answer. The game keeps all students engaged. If you do not have a SMARTboard in your classroom, putting questions on index cards works just as well.

Lesson 21- Fraction test

This test is not included in this unit, as it is a common assessment created by the entire fourth grade team.

Resources

Chartier, Tim . Interview by author. Email interview. Email, November 8, 2011.

" nrich.maths.org :: Mathematics Enrichment :: History of Fractions ." nrich.maths.org :: Mathematics Enrichment :: November 2011 Front Page . http://nrich.maths.org/2515 (accessed November 26, 2011).

"Delta Scape: Fractions." Delta Scape. http://deltascape.blogspot.com/search/label/Fractions (accessed November 26, 2011).

"Fraction Chips." In *Eat Your Math Homework*. Charlesbridge: Charlesbridge Pub Inc, 2011. 12-17.

Geometry and Fractions with Tangrams. Lincolnshire, Ill.: Learning Resources, inc., 1995.

Chicago does not offer any guidelines for citing a photograph in a bibliography.

"iss.schoolwires." iss.schoolwires. http://iss.schoolwires.com/cms/lib4/NC01000579/Centricity/Domain/2862/Peanuts_Fractions_Cartoon.jpg (accessed November 26, 2011).

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Appendix: Implementing District Standards

4.N.1 Understand the value of whole numbers and decimal representations from 0.01 to 100,000

4.N.1.1 Represent whole numbers and decimals using models, words and numbers (symbolic).

4.N.3 Understand the concept of equivalence with models as it applies to fractions, improper fractions, mixed numbers and decimals.

4.N.3.1 Identify equivalent fractions (using halves, fourths, eights; thirds, sixths, twelfths and fifths, tenths, hundredths)

4.N.3.2 Compare fractions, decimals and mixed numbers using models, benchmarks and reasoning

4.N.3.3 Represent mixed numbers as improper fractions and improper fractions as mixed numbers.

4.N.4 Use models to represent addition and subtraction of fractions and decimals.

4.N.4.1 Illustrate addition and subtraction of fractions, with like denominators, using area and length models.

Synopsis

This unit is designed to help make this abstract concept of fractions a little more clearly. This unit can be used for grade levels 3-5 as this is where fractions is most heavily taught in elementary school. This unit begins with a basic review of what is a fraction, how do you create fractions. It then moves into different aspects of fractions such as: fractional parts of a whole, improper fractions and mixed numbers, and adding and subtracting fractions. The unit culminates with a project that brings together all areas of fractions.

This unit is aligned with the North Carolina Standard Course of Study for Mathematics in fourth grade.

Endnotes

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[i] "nrich.maths.org :: Mathematics Enrichment :: History of Fractions ." nrich.maths.org :: Mathematics Enrichment :: November 2011 Front Page . http://nrich.maths.org/2515 (accessed November 26, 2011).

[ii] "nrich.maths.org :: Mathematics Enrichment :: History of Fractions ." nrich.maths.org :: Mathematics Enrichment :: November 2011 Front Page . http://nrich.maths.org/2515 (accessed November 26, 2011).

[iii] nrich.maths.org :: Mathematics Enrichment :: History of Fractions ." nrich.maths.org :: Mathematics Enrichment :: November 2011 Front Page . http://nrich.maths.org/2515 (accessed November 26, 2011).

[iv] Chartier, Tim . Interview by author. Email interview. Email, November 8, 2011.

[v] *Geometry and Fractions with Tangrams*. Lincolnshire, Ill.: Learning Resources, inc., 1995.

[vi] *Geometry and Fractions with Tangrams*. Lincolnshire, Ill.: Learning Resources, inc., 1995.

[vii] "Delta Scape: Fractions." Delta Scape. http://deltascape.blogspot.com/search/label/Fractions (accessed November 26, 2011).

[viii] "Fraction Chips." In *Eat Your Math Homework*. Charlesbridge: Charlesbridge Pub Inc, 2011. 12-17.

[ix] "iss.schoolwires." iss.schoolwires. http://iss.schoolwires.com/cms/lib4/NC01000579/Centricity/Domain/2862/Peanuts_Fractions_Cartoon.jpg (accessed November 26, 2011).