

Fractions CAN Be Fun: Making Fractions Come Alive through the Arts

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Introduction

One recurring concept I have found that many of my students have approached with trepidation in math is fractions. Typically, they are able to grasp the basic concept of fractions as being parts of a whole. They can usually even add and subtract fractions with common denominators, but once I give them problems with unlike denominators, ask them to compare fractions, and express equivalent fractions; they get overwhelmed and perplexed. Throw in teaching about mixed numbers and they are staring into space and baffled. If they are in fact able to do all of these things with fractions, I can't help but to wonder about the depth of their understanding.

Purpose

Through this unit I am striving to take my students' knowledge of fractions further; to a whole new level. The National Research Council has reported that "rational numbers are more complex than whole numbers, in part because they are represented in several ways...and used in many ways..."¹ This is something I have certainly found to be true, and in creating this unit I am seeking to make fractions fun, relevant, and easier to understand. Traditionally, math textbooks are criticized for confusing students with concepts related to fractions.² I want my students to truly grasp what they are doing rather than just learning tricks or following directions to get answers, so I plan to go beyond sole textbook instruction.

After using a variety of math textbooks that provided a vast amount of practice with fractions, but lacked in providing adequate explanations and real world connections to fractions, we sought to find more meaningful math instruction with the Singapore Math curriculum. In addition to using Singapore Math materials, which aim to help develop strong understanding in math, I will expose my students to learning about fractions through learning opportunities that incorporate art, music, and movement. I find it essential to embrace some textbook practice in teaching fractions so my students can make connections between both their active learning experiences about fractions and in written form. The National Research Council suggests using math textbooks to help students create a strong understanding for learning about parts of a whole, equivalent fractions, using models and number lines, flexibility and ease with using various operations with fractions, knowledge of understanding the size of fractions, fluency with comparing fractions, and making relevant connections between fractions and their daily

lives.³ I am excited to provide learning opportunities that will apply what they have learned in their textbooks in innovative ways.

Students learn best through various models and teaching strategies. Many math teachers conclude that the use of manipulatives is a crucial part of understanding and learning about fractions at the elementary level before they are able to think abstractly.⁴ I find this primarily important in teaching fractions, especially to such young students (highly gifted K and 1st graders). After pouring my heart and soul into helping them understand fractions, I found that some students would have the concepts solid and then have trouble retaining what was taught by the next day. I don't want them to live with this fear of fractions that will only get more traumatic over time; instead I want them to have a strong foundation of the ideas so that as the subject matter and content progressively increases in complexity, they will be able to make connections to what they already firmly grasp. The NCTM (National Council of Teachers of Mathematics) indicates that elementary aged children learn best about fractions when using informal knowledge, real life experiences, and language.⁵ This in turn, will help to make learning about fractions more relevant to their daily lives as they are increasingly able to make strong connections that they can relate to.

The fear of fractions I have seen in my students over the years is something I want to rectify as I allow my students to explore fractions as they have never done so before; with the arts. In creating this unit, I want to breathe new life into teaching fractions and make them come alive in new ways. I want my students to have valuable auditory, visual, and kinesthetic opportunities to figure out what makes fractions relevant to them and to help make the concepts make sense. Concurrently, they will be exposed to the arts and make connections among other subject areas. This will help them to see how interrelated math can be to art, music, drama, literature, history, and science.

I predict that this unit will last for approximately a month although that will vary according to each child's pace, fluency, and understanding. Since my math instruction is self paced in correlation with each child's needs, I will modify instruction accordingly. Throughout this unit my students will use multiple intelligences as they create an assortment of products to reflect their understanding. The learning activities written for this unit will include opportunities for collaboration at times, nurturing social interaction among my small number of students; as well as independent tasks that will strengthen my students' individual knowledge of fractions.

Background

Barringer Academic Center is a partial TD magnet elementary school located in the west part of Charlotte, NC. Barringer is very unique in that it is home to four distinctive programs; including an Academy for students living in the geographic area near the school (grades K-5), a Learning Immersion program for grades K-2, a Talent

Development program for certified students (grades 3-5), and the Horizons program for the identified highly gifted (grades K-5).

Barringer's population is diverse and sets us apart from other schools, as our differences unite us and we learn from each other. Within Barringer, all teachers serving certified gifted students either already have their gifted certification or are in the process of earning it, showing our staff's dedication to providing meaningful instruction aligned with the needs of the students we serve. Our team of facilitators (TD, math, and literacy) are an asset to our school's varied programs, providing guidance and resources to meet all of our students' needs effectively. Our approximately 644 students come from a multitude of areas in Charlotte. Many magnet and Horizons families drive a distance to keep their children challenged. Together a strong partnership between Barringer staff and parents of our students, are supportive and many readily give their time and talent to help all students benefit from the best learning opportunities that can be provided.

I am one of five Horizons teachers at my school and like my Horizons colleagues; I am responsible for teaching my students at a minimum of two grade levels above in all subject areas and keeping them challenged. Further, my kindergarteners work at a minimum of a 2nd grade level in all subject areas, and my 1st graders work at a minimum of a 3rd grade level in all subject areas. The students that will be participating in this unit of study are part of the Horizons program for the highly gifted at the elementary level. Barringer houses the elementary Horizons program for all of Mecklenburg County. In order to qualify for this rigorous program, students must work consistently at a minimum of two grade levels above in all subject areas. The admission in itself is rigorous. Candidates must submit certain test results and a portfolio of work samples highlighting their writing, math, and reading abilities. If the test results and portfolio samples satisfy specific criteria, students must also then go through an interview with a Horizons teacher at their grade level to determine their most appropriate placement.

Within my classroom, math instruction is planned individually for each student and students work at their own pace which takes a great deal of time, attention, and consideration. Concepts are typically presented whole-group before students are given individualized tasks based on their learning needs and interests. Students demonstrate their understanding through diagnostic assessments, teacher observations, anecdotal notes, as well as varied formal assessments and culminating projects of topics covered. Since each child works at their own pace, it is crucial to have some math time devoted to hands-on investigations of what they are individually studying and also to have the chance to create, using what they have learned.

In teaching math to gifted students, instruction must be modified to meet their unique needs. There is a common misconception that gifted students find all math simple and that teachers do not need to do anything different since they will simply understand anything you give them. Conversely, "their needs dictate curriculum that is deeper,

broader, and faster than what is delivered to other students” and the teacher must focus on teaching strategies that will accomplish these goals effectively.⁶ In following these considerations, I am choosing to pre-assess my students to understand their prior knowledge about fractions, investigate the curiosities they have about fractions, and learn what concepts need additional emphasis for each child. Some specific ways in which gifted students vary from their peers are “pace at which they learn, depth of their understanding, and interests that they hold.”⁷ Through learning more about fractions through this unit, my students will gain a stronger understanding for what fractions are and how they can integrate what they have learned in math to music and art. They will be able to work at their own pace; will be provided with experiences to deepen their understanding of the content presented; while concurrently engaging and challenging them. In providing high quality instruction to my gifted students in accordance to these needs, I will devise assignments that encourage them to figure out multiple methods in finding solutions, incorporate higher level thinking questions to correspond with the topics being investigated, go beyond the common core curriculum standards, and have high expectations for the products created.⁸

By incorporating music into teaching math, fractions will come to life in a whole new way. Creating music is beneficial in children’s social development. It is also effective in improving cognitive performance, especially spatial-temporal reasoning (“the ability to visualize spatial patterns and transform them mentally over time in the absence of a physical model”).⁹ Spatial-temporal reasoning gets the child to “form a mental image and then transform it...in real time.”¹⁰ I chose to incorporate music in teaching fractions because studies have shown the positive correlation with young students studying music and improved spatial-temporal reasoning.¹¹ Over time, research has shown that learning music helps to advance skills and abilities in new ways. This is especially true in children younger than age 7.¹² By incorporating music into math instruction, the teacher is introducing an appealing method of encouraging a stronger understanding of fraction reasoning.¹³ At the same time, since a growing number of schools are cutting the arts programs, this is a way to use music practically as it helps students with the academic area of math, keeping music in the classroom.¹⁴ Beyond these findings, the enjoyment my students get out of music was one of the greatest determining factors in incorporating it into this unit. I have loved music from an early age. I even earned my minor in music, in hopes of integrating the arts into my classroom as much as possible to make learning fun!

Learning Objectives

North Carolina is one of many states to recently adopt the Common Core standards. In the content area of fractions in math, the common core standards for 2nd grade math (my kindergarteners follow these standards and beyond) expect these students to recognize equal parts of whole shapes and to refer to these parts as halves, thirds, and fourths. The third grade common core standards for math (used by my 1st grade students) expect these students to develop understanding for fractions as numbers.

In addition to what is required by the common core standards, my students go beyond and explore various concepts within the unit of fractions found in the Singapore Math curriculum. Concepts found in Singapore Math that my students will be working with are: recognizing parts of a whole (halves and quarters), writing fractions in numerator-denominator form, ordering and comparing fractions, learning about fractions as part of a set, adding and subtracting fractions, as well as exploring equivalent fractions and mixed numbers.

The Singapore Math program was first introduced in the 1980s to students in Singapore in an effort to improve math performance. Since that time, Singaporean students have ranked “first in the Trends in international Mathematics and Science Study four times since 1995.”¹⁵ It encompasses the common core standards, and allows my gifted learners to go beyond the required curriculum. Traditional American textbooks teach math out of sequence, teach arithmetic concepts with repetition, but not effectively.¹⁶ The basic idea behind Singapore Math is to introduce vital concepts strongly, eliminating the need to re-teach later on.¹⁷ This in turn, helps children build a stronger foundation for understanding that can be referred back upon as the content becomes more complex.

Since implementing Singapore Math in my classroom, I have seen a new level of engagement in math instruction on behalf of my students. I also have noticed an increase in their understanding of key concepts with fewer holes. This is especially crucial as these students get older and math concepts grow in complexity; to have a solid understanding to refer back to in making connections. Before implementing Singapore Math, I felt that most of my students could perform what I asked of them in math, but their *understanding* was lacking. I was constantly seeking many resources to support math instruction and now I feel less pressure to reinvent the wheel. With Singapore Math my students are able to follow through with their math assignments *and* explain their thinking as well as being able to explain *what* they are doing and *why*.

In teaching this unit, my students will be presented with vocabulary pertaining to fractions as well as musical note and rest values. They will understand how to write fractions and draw shapes with various fractions shaded or un-shaded. Models and art will aid in demonstrating the ideas of numerators and denominators. Students will learn to refer to equal parts as halves, thirds, fourths, etc... They will learn musical note values of whole, quarter, and eighth notes as well as whole, quarter, and eighth rests. They will learn how to relate that information to fractions, which will be emphasized through playing music on the keyboard. Art activities will be incorporated in comparing fractions and learning about the equivalence of fractions. They will acquire strategies to compare fractions further, by making connections to what they have learned with music, art, and their ties to fractions. Individual learning styles and multiple intelligences will be used to modify instruction individually for students.

Teaching Strategies

My students will have the opportunity to take a hands-on approach to not only learn about fractions through this unit, but ultimately to develop a strong understanding for fractions and what they are doing with them in the context of their textbook assignments and beyond.

Since the structure of our class is unique, during this unit of study I will present a concept whole-group at first. Next I will break off into smaller groups as I work with individual students on the concepts they are ready to learn. The activities I have planned will be modified according to each student so they are appropriate for their distinctive needs.

Making connections to musical note values, students will explore fractions as parts of a beat in music. They will learn about quarter notes, half notes, eighth notes, and whole notes. These fractions in music form will be played on the class keyboard and on sound blocks in the classroom. Students must deeply understand what they are doing in relation to the music as they create visual representations to correlate their knowledge of fractions applied to musical note values. They will be assessed on their understanding of the note values and of the fractions that correlate.

Students will create foldables to incorporate all of the musical note value knowledge as well as the vocabulary on fractions recorded in each child's math journal. Foldables are 3 dimensional graphic organizers made by students out of paper. They present an interactive way to get students to organize and retain information they are learning about. The foldables will help them maintain what they have learned and give them information to discuss with their peers as they work on other project based learning activities collaboratively. This will help to build their strong foundation in fractions. Their journals and foldables will not be limited solely to definitions; they will include relevant examples and drawings as well.

Students will analyze music played and discover fractions of beats played. This will make fractions relevant to the world around them and open their eyes to other ways they see fractions in their daily lives, rather than just in their math textbooks.

Students will create tangible models to reflect understanding of operations with fractions, equivalent fractions, and mixed numbers. (Specific examples can be found within the classroom activities section of this unit.) I will conduct group discussions to informally assess everyone's understanding for adding and subtracting fractions, equivalence of fractions, and mixed numbers; as well as through formal assessments done in class. I will use hands-on models for them to actually see what they are doing while collaborating with their peers. I believe this will also help as they learn about mixed

numbers and try to figure out common denominators. In finding equivalent fractions, they will make connections to musical note values, to art, and even through movement. Students will have the flexibility to do what works best for their unique learning style.

All of the concepts learned throughout this unit will be used to make connections, as my students are given multi-step word problems involving fractions. They will use response journals to document their understanding, connections, and vocabulary learned throughout the unit. Students will become mathematician conductors, as they use their knowledge of note values and fractions to conduct the class on sound blocks.

Math Background

Vocabulary

Throughout this unit my kindergarteners and first graders, working at a minimum of two grade levels above, will acquire an abundance of vocabulary as they learn about fractions. Throughout the unit, they will keep track of the vocabulary learned in their math response journals. They will use their math response journals to record their definitions, to make extra notes, and to record examples to show their understanding. Vocabulary will be recorded within their response journals. These journals will be readily available for students to record connections they make to math, music, and art connections they make throughout this unit of study. They will have flexibility and freedom to record additional vocabulary and symbols as they discover it through the learning opportunities offered.

*Math Vocabulary*¹⁸

- Fraction - A number that shows parts of a whole or of a set.
- Denominator - The number below the line, which tells into how many parts the whole has been divided.
- Numerator - The number above the line, which indicates the number of those equal parts being considered.
- Equivalent Fraction - Fractions that have the same value or name the same amount of a whole.
- Common Denominator- A common multiple of the denominators of two or more fractions.
- Mixed Number - A number that has both a whole number part and a fractional part, such as $2 \frac{1}{3}$. Mixed numbers represent values greater than 1.

*Music Vocabulary*¹⁹

- Eighth Note/Rest - A note that lasts $\frac{1}{8}$ the duration of a whole note. An eighth rest is silence equal to an eighth note.

- Half Note/Rest - A note that lasts $\frac{1}{2}$ the duration of a whole note. A half rest is silence equal to a half note.
- Quarter Note/Rest- A note that lasts $\frac{1}{4}$ the duration of a whole note. A quarter rest is silence equal to a quarter note.
- Whole Note/Rest- A musical note that lasts an entire measure in $\frac{4}{4}$ time. A whole rest is silence equal to a whole note.

Activities

The following activities will commence with introducing the basic understanding of what fractions are and how they are relevant in daily life, while allowing my students to include their prior knowledge of fractions. I will then go on to teach my students about how to express fractions in written form, in models, on number lines, as well in the context of music and art. I am laying out this unit in terms of sequentially teaching the concepts being emphasized, rather than numbered lessons. This will allow for more flexibility as I differentiate for each child. The number of days spent on each activity will vary according to the needs of my individual students.

Learning about Identifying Fractions

I will inquire, through informal discussion, to receive feedback pertaining to my students' prior knowledge and discuss the meaning of fractions. I will provide examples of what we will be doing within the fraction unit by reading the book "Eating Fractions" by Bruce McMillan. I will bring in bananas to cut and model parts of a whole. I will guide discussion in small groups for each child to brainstorm connections they can make to other subject areas, in an effort to make fractions more relevant to their daily lives. When each group has had sufficient time to discuss, we will do interactive writing through Microsoft Word on the SMART board to evaluate and synthesize our groups' responses.

Afterwards, on our SMART board, I will access <http://www.visualfractions.com/> to show students other variations of how fractions look, such as within shapes and on number lines. In an effort to differentiate for individual students' needs, I will then provide time for my students to complete a pre-assessment from their Singapore Math assessment book to get a grasp for what they already know about fractions. Next, I will conduct an interest inventory to understand what will provide intrigue during this unit. They will have time to work independently on the visual fractions website. In accordance with the documented level of understanding shown through the pre-assessment, if students need more information to grasp understanding of fractions they will be guided to the "Investigate Page" to be given explicit directions to understand how fractions are presented through this site. If their level of understanding shows that they need more rigor, they will be guided to playing games through the visual fractions site and/or to the "Fraction Designer Pages" where they will be able to create their very own unique fraction creations.

Response Journals

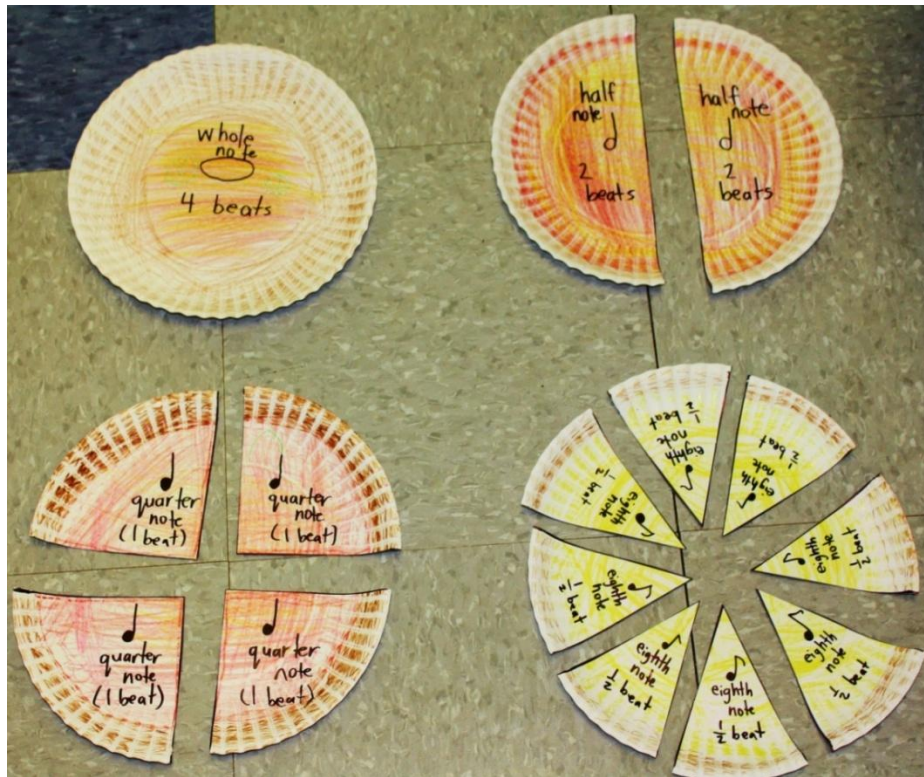
Upon completion, my students will be given their response journals to be used throughout this unit. They will be given directions to include a student developed glossary within their journal and to organize the knowledge they receive while learning about fractions. Words and drawings reflecting understanding will be added gradually, as terms are introduced within instruction. Topics will not be limited to what we write about and discuss in class, so my students are able to extend their knowledge and connections while staying engaged and excited about our study of fractions. Student response journals will be easily accessible so they can be used throughout each child's unit of study.

Learning How to Write Fractions

In addition to whole group learning, collaborative and independent learning opportunities; my students will be given individual assignments in their Singapore Math textbooks and workbooks according to their needs. The goal will be that each child understands how to identify and write fractions effectively. I will also strive to help my students develop a connection between learning about fractions through music. They will be introduced to time signatures and note values through a short Brain Pop video found at <http://www.brainpopjr.com/artsandtechnology/music/timesignatureandnotevalues/>.

Rhythm Pizzas

In an effort to connect teaching musical note and rest values to teaching fractions, we will create a model tangible rhythm pizza. I discovered the inspiration for this idea through: <http://www.susanparadis.com/catalog.php?ID=SP754> As I teach my students about the various note values explored, I will play their corresponding note values on the keyboard in our classroom so they can have the visual and auditory connections to what they are learning. My students will use these tangible models to see and appreciate equivalence of fractions and of musical note values:



- 1 whole note = 4 beats = 1 whole pizza
- 1 half note = 2 beats; 2 beats + 2 beats = 1 whole note (4 beats); 2 half notes = $\frac{1}{2}$ pizza + $\frac{1}{2}$ pizza = 1 whole pizza = 4 beats
- 1 quarter note = 1 beat; 4 quarter notes = 1 whole note (4 beats); $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} = 1$ whole pizza
- 1 eighth note = $\frac{1}{2}$ beat; 2 eighth notes = 1 quarter note; $\frac{1}{8} + \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$;
 $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = 2$ beats = $\frac{4}{8} = 1$ half note = 2 quarter notes;
 $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{8}{8} = 1$ whole note = 1 pizza
 = 4 quarter notes = 2 half notes

I will give my class the opportunity to create their own rhythm pizzas, given materials and directions. They will be given permission to take turns playing the keyboard to show their understanding for the connections I have presented. The creation of the rhythm pizzas will help generate relevant discussions bridging connections between music and fraction based on what we have created, moving away from preconceived notions that music and math are isolated topics.

Hearing What You Learned

In linking what was just taught about musical note values, my students will be given the opportunity to move and apply what they learned about rhythm to a familiar song. They

will stomp, stomp, clap to 2 quarter notes and one half note in the background. I will play Queen's *We Will Rock You* on the SMART Board, after showing them the rhythm: <https://www.youtube.com/watch?v=qGaOlfmX8rQ> I will inquire about the fractional parts that make up that 4 beat measure and they will be prompted to show their understanding using the rhythm pizzas to illustrate how 2 quarter notes (2 beats) + 1 half note (2 beats) = 1 measure of 4 beats.

Learning about Fractions of a Set

Most of my students in the past have had minimal difficulty discerning numerators from denominators, although often there would be some confusion when I asked them what the terms meant and why. This showed me that they did not have a firm understanding of the reasoning behind the terminology of numerators and denominators. In teaching my students about fractions of a set, I will teach them the meanings of numerators and denominators and they will create art reflecting their understanding. I will discuss how numerators which means number of, is derived from the Latin verb enumerate which means to count. They will brainstorm ways to show understanding that numerators are parts of the fractions that are counted and I will give them examples presented visually on our Smart Board.

I will give them information about the meaning of denominators, given the meaning of denominate being to name. I will share examples of naming such as: NOMINATING (or naming) political party candidates, religious denominations being identified by their names, and denominators of money as names of the coins and bills they use to buy things. They may use my examples or think of additional examples to create a foldable of our discussion of the meanings of numerators and denominators, and in turn applying this knowledge to fractions. They will also have the opportunity to tell me their denominators (names)!

Numerator
Denominator

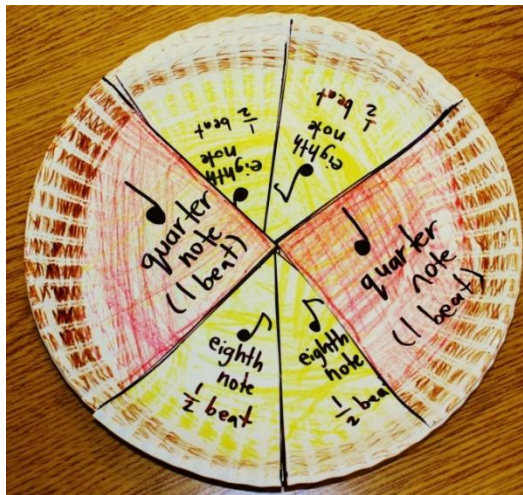
We will take this a step further and I will project various fractions on the Smart Board. Starting with $\frac{2}{4}$, we will examine the numerator and denominator, giving my students the opportunity to explain how they know the numerator and denominator and making connections to musical note and rest values in the process.

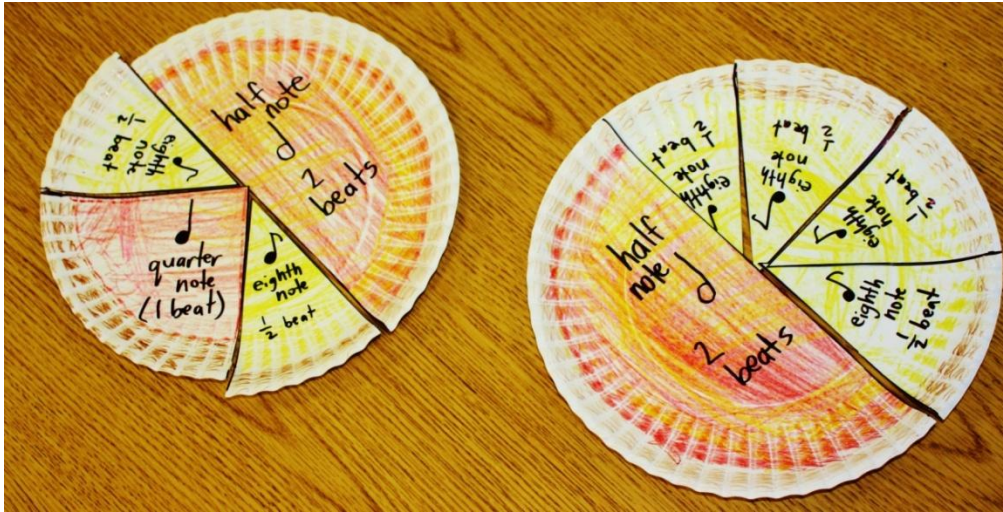
Learning about Equivalent Fractions

In addressing the concept of equivalent fractions, my students will be given questions to complete using their rhythm pizzas in groups. Students will express their answers in words and pictures, ensuring understanding beyond the superficial level. I will go from group to group asking them to give me specific evidence, using their rhythm pizzas to support their answers.

1. How many fourths are in one whole?
2. How many sixteenths are in one half?
3. 1 half is equal to how many fourths?
4. How many eighths are equal to one fourth?
5. How many quarter notes are in a whole note?
6. How many eighth notes are in half note?
7. How many eighths are equal to one half?
8. How many eighth notes are in one quarter note?

They will be given time to investigate how to create a whole pizza using various parts of their rhythm pizzas.

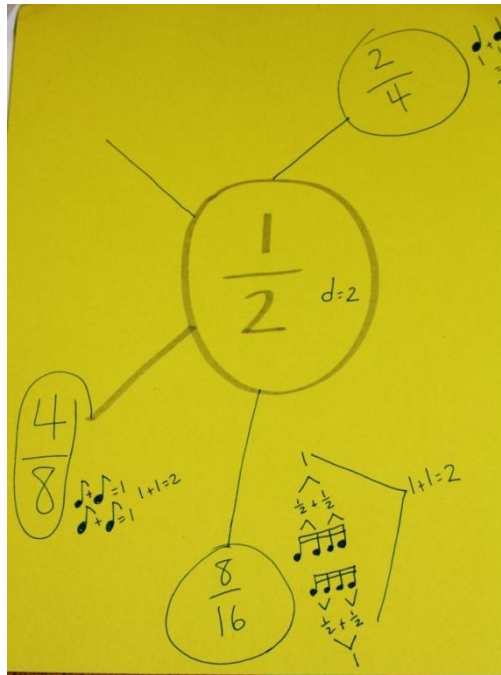




As I see and hear that my students understand equivalent fractions, and that they are able to convey their understanding, they will be given individual assignments to complete within their Singapore Math books.

Webs of Equivalence

Upon completion, students will be individually responsible for creating equivalent fraction webs. They will be given these fractions: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{5}$, and $\frac{1}{8}$. They will create a graphic representation of a web with lines feeding to fractions equivalent to the one in the center. (See figure of projected expectation). In addition to fractions, students will be able to include musical note and rest values to correspond to their knowledge of equivalence. They will be able to use their response journals, as they add more about equivalent fractions. Magazines will be available for students to find things to cut out that could be incorporated in their webs of equivalence. The end product of these webs will result in a mural of equivalent fractions to display on a bulletin board, so others may make connections to the art created by my students. In bringing my students' level understanding higher, they will be asked to tell their parents, other teachers/staff, and their peers on various grade levels about their discoveries in creating their equivalent fraction webs as the mural becomes a focal point.



Student Composers

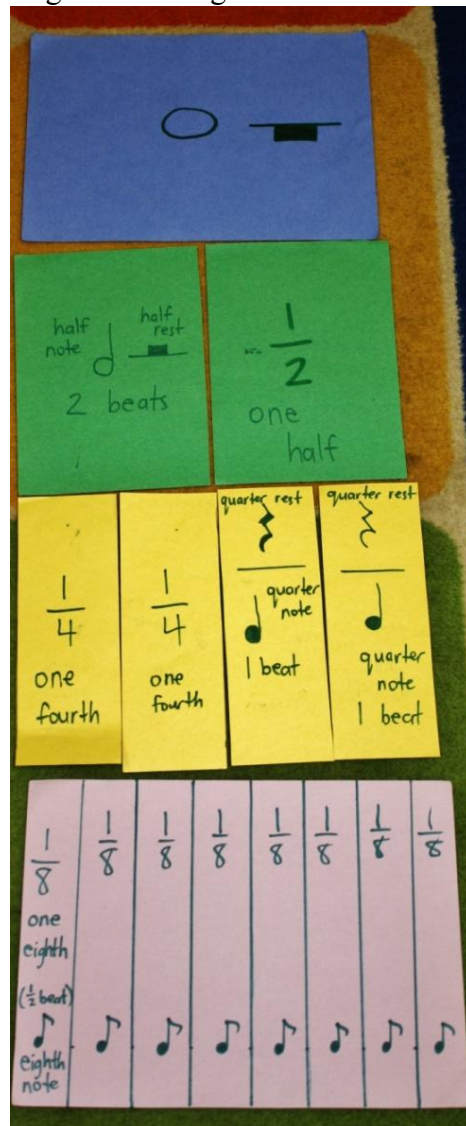
My students will see how many different combinations of notes can be used to create a measure of music, given blank 4/4 time signatures (containing 4 beats). They will be able to use rhythm blocks to play their rhythms once everyone is finished.

Learning to Add and Subtract Fractions

Students will be introduced to adding and subtracting fractions through independent reading and work guided through their Singapore Math resources, appropriate to their level of understanding. Once I see that they have had adequate practice with addition and subtraction of fractions with common denominators, and unlike denominators, I will provide them with a tangible way to reinforce their understanding while integrating music.

I will start by distributing 4 sheets of construction paper for each child. The blue sheet will stay intact and will be labeled as 1 whole. The green sheet will be divided in half (using a ruler-integrating measurement skills) and each half will be labeled as $\frac{1}{2}$ (one half). The yellow sheet will be divided into four equal parts (using a ruler) and each equal part will be labeled as $\frac{1}{4}$ (one fourth). The violet paper will be divided (using a ruler) into eight equal parts and each part will be labeled $\frac{1}{8}$ (one eighth). All pieces of paper will be placed in one pile, emphasizing that $1/1 = 1$; $\frac{1}{2} + \frac{1}{2} = 2/2 = 1$; $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = 4/4 = 1$; $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = 8/8 = 1$. This is important for my

students not only to see this math, but to feel in order to understand. My students will be then be asked to cut the pieces of paper into the equal parts as designated with the initial lines drawn. They will be responsible for recording the corresponding musical note and rest values on the back side using their response journals. Following these directions, the blue sheet should be labeled with a whole note and whole rest; the green sheet will be labeled with 2 half notes/ half rests- one on each of 2 equal parts; the yellow sheet will be labeled with 4 quarter notes/quarter rests- one on each of 4 equal parts; and the violet sheet will be labeled with 8 eighth notes/eighth rests- one on each of 8 equal parts.



Using Notebook software, I will write addition and subtraction problems on our SMART board, using fractions related to the fraction bars my students now hold in front of them. They will use the fraction bars to add and subtract, recording their answers in their response journals. They will be encouraged to show their answers in writing

fractions in standard form, word form, and drawing musical note/rest values. In solving these problems, my students will have to implement their understanding of adding and subtracting with and without common denominators. For example, when asked to add $\frac{1}{4} + \frac{3}{8}$, they will have to think about how many eighths are in a fourth, trading in 2 eighths for the one fourth, and then adding those $\frac{2}{8}$ to the $\frac{3}{8}$ giving a final answer of $\frac{5}{8}$. The construction paper fraction bars will be helpful for them to place on top of fractions they are trying to solve as they work through finding the common denominator.

- One half + one fourth = _____
- One fourth + one eighth = _____
- Two fourths + one fourth = _____
- One half + two eighths = _____
- Four eighths + one half = _____
- One fourth + three eighths = _____
- One whole – one half = _____
- One half – two eighths = _____
- One fourth – one eighth = _____

(I will create additional problems as needed, pertaining to my students' areas of weaknesses.)

Learning about Comparing Fractions

Comparing fractions is one part of teaching fractions that generally confuses many of my students. I will start by ensuring an established understanding for all of the concepts my students have covered up to this point. This will be done through informal discussions, classwork, and assessments using Singapore Math. That way I know everyone is ready for the challenges that lie ahead. I will assess their understanding of writing, reading, showing equivalence of fractions, as well as adding and subtracting fractions through an informal assessment using problem solving. The problems given will encompass cumulative of what has been taught, and prior to moving on in the unit, students must show a high level of understanding in pictures, words, and explanations. Introducing comparing fractions, I will pass around measuring cups: $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$ and have my students decide how to order them from least to greatest. I will provide them with water to measure and compare the amounts as they pour the water into bowls to make active discoveries about ordering and comparing fractions.

I also want to make sure that they are getting the connection between music and art so I will have them compare musical note and rest values to illustrate their understanding. I will play the corresponding durations of the notes or clap out the durations of the rests, and my students will be asked to respond with recognition of which note or rest values or longer or shorter, depending on my questions.

Using Notebook software on the Smartboard, I will arrange these fractions in a line: $\frac{4}{9}$; $\frac{1}{2}$; $\frac{2}{6}$; $\frac{9}{10}$. My students will be responsible for ordering them from least to greatest and have them explain and order them in their math response journals.

Magic Fractions

Upon completion and showing evidence of strong understanding of fractions; we will play the Magic Fraction Game. (http://www.ehow.com/print/how_8222426_teach-math-creative-drama.html) Before class, I will take note cards and cut them into equal parts. I will write one fraction on each card in glitter pen to play up the magic of the game. We will speak in hushed tones, be in low lighting, and have instrumental music playing in the background to get the kids in the spirit of magic. As I take a magic wand, I will instruct my students to go around the room. I will tell them that their magic number can turn into a whole number if they can find the other equal parts to equal the whole. For example, if one student has $\frac{2}{3}$ on their card and another has $\frac{1}{3}$, these students must find each other. Once everyone has found their match/matches, I will turn the lights on and the groups will explain to the class, how their magic numbers fit together to equal one whole number. In successfully completing this activity, they must successfully compare and add fractions.

Fraction War

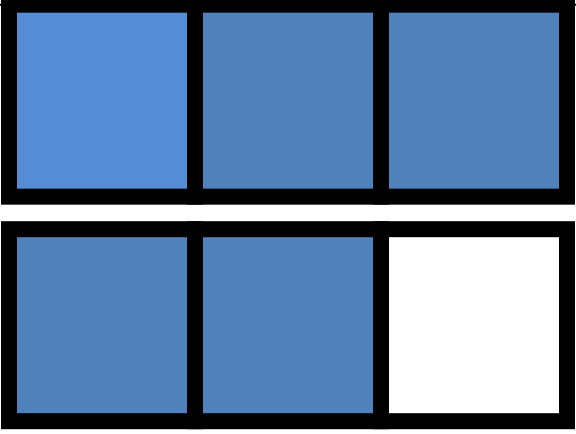
My students will create index cards bearing various fractions. In the same way they would be accustomed to playing war with cards, the higher point value card gets to keep the cards, the game will be adjusted to emphasize their understanding of comparing fractions. Students will be invited to take half of the deck of cards, playing with a partner. They will each put one card down simultaneously and decide which fraction is greater. The player who put down the greater fraction can keep the cards. If they reach equivalent fractions, they will place two cards face down and the third card will determine the fraction that is greater, giving all of the cards to the person with the largest fraction. The game could be modified in following games to decide which fraction is smallest. Students will be asked to communicate with their partners, sharing feedback as to why they believe the fraction in question is indeed greater.

Learning about Mixed Numbers

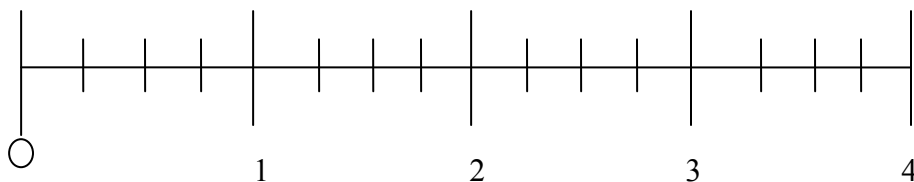
Traditionally, math textbooks teach how to convert improper fractions to mixed numbers and vice versa using formulas. In introducing my students to these concepts, I want them to see and appreciate what they are doing rather than just memorizing steps and not knowing why. I chose to incorporate art in teaching this concept so they could see what they are doing as they make connections between improper fractions and mixed numbers.

I will begin with an art activity with my students to help them connect improper fractions to mixed numbers. My students will have the opportunity to record the definitions and their thoughts on both improper fractions and mixed numbers in their response journals as we work through this lesson. I will make a chart on the board to model two columns: one labeled at the top for improper fractions and the other labeled at

the top for mixed numbers. I will model the first example for them, writing $5/3$ as the improper fraction. I will make two bars and shade five-thirds on the mixed number column and ask my students to tell me the mixed number illustrated through the drawing: 1 whole shape and $2/3$ so they will record $1 \frac{2}{3}$ next to the drawing on the mixed number column. When I see that my students understand the concept I am emphasizing, they will be responsible to independently complete their charts using some improper fractions and some mixed numbers I give them. Some examples are: $12/5$, $1 \frac{3}{8}$, $9/4$, $3 \frac{1}{2}$...

Mixed Number	Improper Fraction
	$5/3$ (five-thirds)

Next, my students will use number lines to represent these fractions: five-halves; six-thirds, and seven-fourths.



In culminating these activities, my students will draw models of fractions given to decide which fractions are greater than 3. They will circle the fractions that they can prove are larger than 3 with their drawings. The fractions I will present to evaluate are:

$11/5$; $7/3$; $5/8$; $14/4$; $1/2$; $8/2$

My students will evaluate their work with the activities they participated in throughout this unit upon completion. They will make conclusions about the concepts learned in their response journals. Continuing to draw on knowledge gained, they will use what they learned about fractions in problem solving and as they find ways to make connections to music and art with math.

Bibliography for Teachers

Alajmi, Amal. "How do elementary textbooks address fractions? A review of mathematics textbooks in the USA, Japan, and Kuwait." *Educational Studies in Mathematics* 79, no. 2 (2012): 239-261.

This article helped me analyze various math textbook from around the world in regards to their approaches to fractions.

Ashley, Jennie. "How to Teach Math With Creative Drama | eHow.com." eHow | How to Videos, Articles & More - Discover the expert in you. | eHow.com. http://www.ehow.com/how_8222426_teach-math-creative-drama.html (accessed September 20, 2012).

Tanya Chartier brought this article to class and provided me with inspiration to use the magic number activity.

Berman, Alanna. "Math, Singapore Style | San Diego Jewish Journal." San Diego Jewish Journal. <http://sdjewishjournal.com/site/3193/math-singapore-style/> (accessed October 25, 2012).

I was able to learn why Singapore Math was created through this article, and how another school has implemented this program.

"Classics for Kids." Classics for Kids.

<http://www.classicsforkids.com/terms/categories.asp?id=Notes%20and%20sheet%20music> (accessed October 25, 2012).

I found kid friendly vocabulary and music theory information on this site.

Courey, Susan, Endre Balogh, Jody Siker, and Jae Paik. "Academic music: music instruction to engage third-grade students in learning basic fraction concepts." *Educational Studies in Mathematics* 81, no. 2 (2012): 251-278.

I found great inspiration from the research findings of this study. It helped to support my hopes about teaching music to help teaching fractions.

Fitzgerald, Theresa. *Math dictionary for kids: the essential guide to math terms, strategies, and tables*. Waco, Tex.: Prufrock Press, 2006.

This is a great resource for fraction related vocabulary, and math vocabulary in general. I found the definitions for the words in our response journals in this book.

"Getting in rhythm helps children grasp fractions, study finds - SF State News - San Francisco State University." San Francisco State University.
<http://www.sfsu.edu/~news/prsrelea/fy12/031.html> (accessed October 23, 2012).
I found inspiration from the Academic Music study. A chart found by accessing this link motivated me to create meaningful learning experiences in this unit.

Graham, Kristen. "Singapore Math Makes a Difference." *Philadelphia Inquirer*, December 9, 2008. http://www.dfsme.net/philly.com_article_12.09.08.doc (accessed October 23, 2012).
This article helped me to reflect on how I could change the way I was used to teaching fractions, by increasing understanding positively with Singapore Math.

Johnson, D.. " Teaching Mathematics to Gifted Students in a Mixed-Ability Classroom." Profoundly Gifted Children Services and Programs by the Davidson Institute. http://www.davidsongifted.org/db/Articles_id_10515.aspx (accessed October 23, 2012).
In order to reach my specific highly gifted student population effectively, I need to remember strategies to impact each student's math instruction.

Christopher Scapturak Jennifer Suh, and Greg Mahaffey. "Masterpieces to Mathematics Using Art to Teach Fraction, Decimal, and Percent Equivalents." *Mathematics Teaching in the Middle School* 13, no. 1 (2007): 24-28.
This article encouraged me to be patient as my students work to understand the complex topic of fractions. It gave me inspiration to incorporate the arts as well.

Paradis, Susan. "Susan Paradis." Susan Paradis Piano Teacher Resources.
<http://www.susanparadis.com/catalog.php?ID=SP754> (accessed October 10, 2012).
This website gave me the idea behind creating rhythm pizzas.

Rauscher, Frances , and Sean Hinton. "Music Instruction and its Diverse Extra-Musical Benefits." *Music Perception* 29, no. 2 (2011): 215-226.
While I already knew that integrating music into math instruction was beneficial, this article explained why music education is so crucial especially at a young age.

Reading List for Students

McMillan, Bruce. *Eating Fractions*. New York: Scholastic, 1991.
This is a great book that gives visual examples of fractions to make connections to as students learn about parts of a whole.

List of Materials for Classroom Use

Response journals; pencils; Smartboard; Notebook software; Microsoft Word; bananas; Singapore Math textbooks, workbooks, and assessment books corresponding to appropriate level of each student; crayons; markers; paper plates; keyboard; wood blocks; construction paper in four different colors; bulletin board for display of mural showing equivalent fraction mural; blank measures of music; chart with musical note and rest values; rulers; glitter; and index cards.

Notes

¹ (Christopher Scapturak Jennifer Suh, and Greg Mahaffey 2007) P.24

² (Alajmi 2012) P.240

³ (Alajmi 2012) P.240

⁴ (Alajmi 2012) P.241

⁵ (Courey, Susan, Endre Balogh, Jody Siker, and Jae Paik 2012) P.252

⁶ (Johnson 2000)

⁷ (Johnson 2000)

⁸ (Johnson 2000)

⁹ (Frances H. Rauscher and Sean C. Hinton 2011)P.215

¹⁰ (Frances H. Rauscher and Sean C. Hinton 2011)P.215

¹¹ (Frances H. Rauscher and Sean C. Hinton 2011)P.215

¹² (Frances H. Rauscher and Sean C. Hinton 2011)P.215

¹³ (Courey, Susan, Endre Balogh, Jody Siker, and Jae Paik 2012) P.252

¹⁴ (Courey, Susan, Endre Balogh, Jody Siker, and Jae Paik 2012)

¹⁵ (Berman 2012)

¹⁶ (Graham 2008)

¹⁷ (Berman 2012)

¹⁸ (Fitzgerald 2006)

¹⁹<http://www.classicsforkids.com/terms/categories.asp?id=Notes%20and%20sheet%20music>