Understanding Number Sense for Fraction Success

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Overview: This unit will be designed to reinforce the standards based curriculum, Math in Context, with a hands-on approach to attain the main focus of a deeper knowledge of number sense. Students will use "draw a picture", "notice patterns" and "make a list" as art-like strategies as well as have flexible grouping to create images and reference points to better grasp fraction/ratio relationships. Students that are below grade level in reading more often than not are below grade level for mathematics. These students have compensated for their low reading by excelling with auditory instructions and giving verbal feedback. These students may not be able to articulate with written words their understanding and method for getting the answer. Draw a picture, make a list and recognizing patterns are designed to allow these students to participate in discussions and make connections using problem-solving skills without relying on words. This unit will craft an increase in numbers sense by using images and graphics.

This unit's design will allow students that do not have number sense to elicit a base understanding using models and manipulatives to comprehend the part/whole relationship of fractions as taught in whole group and flexible guided math groups. The intended audience for this lesson is low-income high poverty sixth grade students that are below grade level in literacy and mathematics in a self-contained classroom in a low performing school. Students will be able to reach a level of procedural understanding as well as a functional proficiency within the realm of ratios and fractions by the end of the sixth grade.

The unit's overall goals are to give students coming into sixth grade a basic understanding of what numbers are, the relationship between numbers and the magnitude numbers represent for the use of ratios and fraction work. Students with an immature understanding of numbers sense will be in flexible groups using strategies that develop their number sense to an appropriate age level. This unit will also allow those students that have mastered number sense to move forward with flexible grouping work that will challenge them. The dual deficiency the students have in Literacy and mathematics will

be overcome with student access to creating images and handling manipulatives to create mathematic art work that not only answers the question but gives the student better understanding and grade appropriate knowledge.

Number sense is lacking in the students of low-income high poverty demographics across grade levels within the school district. Low performing schools make it a priority to focus on test taking strategies to achieve annual yearly progress for the School District of Philadelphia. The basic math skills that could be taught or reinforced are being glossed over or are being delayed to achieve test mastery.
This delay is not made up as the year progresses, the students that are behind, stay behind. This deficit creates sixth grade students that need to direct modeling a problem by using tally marks to regroup instead of relying on counting strategies to aid them in division, multiplication, addition or subtraction of numbers and ultimately fractions.

Regardless of the school's adequate yearly progress, the Core Curriculum is a fast paced model that teaches many concepts in a short amount of time. The learning through problem solving and worthwhile mathematical tasks are lacking to aid students in successful understanding of math content. Students have adapted to this pace by understanding certain pieces of many concepts, without fully understanding the concept or skill taught. To aid students in learning, relational and instrumental understanding is two ways of teaching and learning this unit will focus on.

The relational understanding is knowing what to do and why you do it. Students will be able to grasp understanding of fractions and ratios, how to add/subtract/multiply/divide fractions and ratios by being immersed with hands-on strategies. This method will give students a real working grasp of number sense. They will understand connections between denominators and ratios by creating 3-D images of them and combining those models together.

The instrumental type of learning is knowing the rule that is associated with the problem but not why the rule is use. This is the most prevalent learning students of low-income high poverty have at their disposal. Their background knowledge is shaky at best, then when paired with information that is at grade level to their comprehension which is below grade level, instrumental learning becomes normal. To avoid this problem, students will create their own rule to add to the accepted mathematic rule. Student will become comfortable with using their own words to build concrete definitions. This will allow for genuine relational learning to occur.

One example of widespread instrumental learning is within a subtraction problem that requires borrowing with two digit integers. A student may know to "borrow" a number to complete the subtraction problem but not understanding the place value of the integers. The student may not understand they have changed value on the numbers. They just proceed with the borrowing to achieve an answer. The student has realized functional

understanding of subtraction without a conceptual understanding of what occurred between the numbers. This lack of relational learning in borrowing with common integers affects learning with ratios and fractions. Relational teaching is allowing students to fully understand a concept or skill and it's rules through the use of manipulatives, worksheets, guided math groups, whole class instruction and peer instruction. The instrumental way of teaching is giving students a hasty look at a concept or skill with focus on the rules to achieve an answer. The current curriculum does not on allow students to create their own efficient procedures to solve mathematical problems.

Rationale:
The unit's goal is to use flexible guided math groups and table groups to move children that have an instrumental understanding of number sense to a relational understanding. Students currently have a vague notion of the composition of numbers and the basic math operations needed to decompose numbers. The guided groups will allow students to invent personal working definitions and rules as well as use manipulatives to aid in relational learning of basic math operations as well as the composing and decomposing of numbers. The guided group will give the teacher chance to alter misconceptions of very low level learners. When student become familiar with certain concepts, the group dynamic can change, creating a new "low level." Working within table groups will give students of varied degrees of understanding opportunity to aid each other with definitions and strategies. Students teaching each other will build student confidence as well as relational knowledge.

The School District of Philadelphia's Math in Context Curriculum has classrooms moving at a rapid pace. The workbooks showcase a lot of math within story form or written problems. There are limited sections where students can practice the concept or skill being addressed. Using Guided Math groups, will allow a teacher to address the various learning skills in the classroom and identify what level of math practice is needed. Teachers will need to supplement the Math in Context Curriculum by using practice problems and worksheets.

The students' will be able to understand the concept of ratio (part of a uniform set to whole uniform set) by using manipulative, the practice sheets as well as each other. Student will showcase understanding of ratios by creating their own with/out use of manipulatives. Students will demonstrate understanding of ratio, by proving to each other or the teacher what a ratio is using the supplies on hand. If the student can defend and answer questions correctly, they will prove their ratio true.

Once students have master ratio, understanding that fractions are under the term ratio, and have own vocabulary, the meaning of that vocabulary will be less of struggle for them to grasp. Students will also understand the relationship between numerator and denominator (part of uniform set to whole uniform set). Students will express numbers in a ratio as a fraction with success building upon their ratio success.

Students will use manipulatives, draw a picture/make a list or other strategy to show understanding of the whole/part relationship of the fraction or ratio. They will build understanding of equivalent fractions and showcase relational understanding by simplifying the fractions. Students will then become able to showcase relational understanding of factors and multiples required to add/subtract fraction and recognize landmark or benchmark fractions

Mathematical Background:
The theme of this background focus is on Howard Gardener's Theory of Multiple Intelligences, specifically Visual-Spatial or the Spatial Intelligence. Visual-spatial learners are "picture smart" individuals who think in images rather than in words. The learning takes place all at once with large pieces of information grasped in innate leaps rather than in the gradual buildup of isolated facts gained through practice. The Art and Craft of Problem Solving aids this unit in a variety of ways. Allowing a math student to see the art behind the math, the patterns within the work and the freedom to express their person strategies will aid this learner within a linguistic and logical-mathematical intelligence education system.

These learners can learn all of the multiplication facts as a related set in a chart much easier and faster than memorizing each fact independently. They do not learn from repetition and drill. They are whole-part learners who need to see the big picture first before they learn the details. These learners think in terms of physical space in a similar manner as architects. They like to draw and read maps. They can be taught through drawings, verbal and physical imagery.

Tools that aid the visual spatial learners include models, graphics, charts, photographs, drawings, 3-D modeling as well as texts with pictures/charts/graphs. Visual media help students acquire concrete concepts, such as object identification, spatial relationship, or motor skills where words alone are inefficient. When working with whole class lessons the chance for students to have reflective time (question-write-pair-share) and brainstorming sessions will give meaningful processing time. Pictures facilitate learning for poor readers who benefit more from speaking than from writing because they understand spoken words. The pair-share conversations will allow the students themselves as well as their peers to fine tune understanding.

The one of the over-arching goals of this unit is to connect art with mathematics. Students using manipulatives or draw a picture strategy to relate their understanding to the class and teacher at large. Within this parameter, the first goal is to communicate number relationships to all learners. This population of learners is below grade level in Literacy and Mathematics. These students rely on pictures and images to connect the missing text pieces. If the text lacks images or graphs, the students lose the connection.

Teachers may use the whole class instruction time discussing what to do without much diagramming or illustrating what students are being asked to complete. By pairing illustration with words, teachers can reach the below level learners.

Learning can be the building up of the skill set within one intelligence classification by means of utilizing other skills learned in one or several other intelligence classifications. By highlighting the students that struggle with reading and the written word and presenting mathematical concepts to them with pictures, conversation and lists, their numbers sense will become tangible for them.
There are several ways of learning that are separate from and related to intelligence. Although the personal basis for the ability to learn is by utilizing a cross-section of the intelligences and their respective skills, this is not the sole factor. The external factors for learning are varied for the task to be learned and are utilized as means to communicate the skills to be learned by means of the various intelligences. Skills are acquired by the successful targeting of the external skills to the intelligence. One student that is proficient with operational math might misunderstand formulaic math because of the presentation of the lesson. Teachers need to be mindful to incorporate the various types of learner within the classroom as the lesson is being prepared.

Using the over-arching goals of connecting art with mathematics, the second goal is to use the visual spatial intelligence to garner students in understanding the denominator and numerator have a part-whole relationship. The whole number on the bottom (denominator) is being compared to the whole number of the top (numerator). Visual-spatial students will be able to grasp this concept by drawing pictures of the whole set then segregating the part. With pictures, students will be able to comprehend there is a whole grouping and part of that grouping is being looked at or separated. When students draw the whole, then draw the whole again without the denominator portion, it will become clear to the students part of the whole. Understanding that drawing a picture is a tool and a workable skill set will aid students with understanding the fraction relationships.

The third goal with the overarching goal is to demonstrate that fractions can be reduced or increased without changing the original ratio using images to represent the original fraction and newly created fraction. This maybe the hardest goal because of the concept, ¾ is equal to 75% or .75. Teachers are challenging the students' understanding of numbers by stating ¾ are equal, which up to now students understand 3 pieces of pizza do not equal 4 pieces of pizza. Student groups will use manipulative as well as drawing a picture to increase the understanding of the ratio partnership. With each fraction-students will need to demonstrate one increased ratio by an illustration or manipulatives. The school district recommends using graphs and charts. If the student is unclear on the connection between the numerator and denominator, charts will not ensure success. Using specific charts in isolation, a ratio table used just for ratios will not be user friendly to the students. Students achieve success when a there is an understanding of the

denominator/numerator relationship. With continued practice, drawing and use of manipulatives, they will achieve mastery. To aide their understanding and recognition, teachers have employed ratio tables or charts that are infrequently used and just as confusing as the ratios themselves. Students will have greater mastery of adding or subtraction fractions with draw a picture or make a list strategies

Some students have an instrumental understanding of how to "do" math. They remember that there are rules to follow but they do not understand why the rules work. This type of learning creates a lack of understanding within number relationships.
To achieve the highest student success, the concept of understanding numbers gets scaffolded as the student progresses through school. By allowing students to learn through their intelligence, their success rate of retention and understanding of mathematics concepts will increase.

These lesson plans are implemented and created to enhance the math standards while giving students practical knowledge of fractions, ratios and Guided math groups will allow a teacher to provide work for mastery for each concept. This additional work provides the active learning the students need.

Objectives:
The objective within this unit is for students to understand number sense in relation to ratios and fractions. Students will need to define what a ratio is and where we find ratios in real life. Ways to achieve this objective can be tied to Science: Foss Kits Environment by planting seeds, observing planted seeds to sprouted seeds. Students will be able to visually understand the concept of total seeds planted and seeds that sprouted. Another way students can understand ratios can research for commercials or print ads that highlight a ratio, for example four out of five dentists in Philadelphia, for instance that support certain toothpaste. Student will be able to grasp the notion of 5 total dentists were polled and 4 of them chose a certain brand toothpaste and one did not choose that toothpaste brand. Student groups can demonstrate how they would illustrate four out of five dentists agreeing with one dentist disagreeing for each group of 5 dentists up to the total amount of dentists for Philadelphia. Students will understand that the wording of a ratio or the numeric expression of a ratio is important to understanding ratio. Students will be able to connect the ratio of 4/5 dentists with the ratio of their test scores to number of stars given on movie ratings to the number of seeds that were planted to the number of seeds that sprouted.

The students will learn that there are a few various ways to write ratios such as a/b, a:b and/or a to b, to tie into the first objective's of a ratio's definition. Students will discuss the images to set a ratio and practice writing the ratio out numerically. Students will create their own images to exchange with their peers in table groups.

The second objective within this unit is for students and table groups to discuss what we use ratio for and why do we use ratios? Using the Science and dentist ratios, students will learn that ratios compare partial amounts to whole amounts. Using the dentists ratio, students will be able to articulate four dentists believe one thing out of five total dentists, which leaves one dentist not agreeing with the other four. And in reverse-there were four dentists that agreed with each other out of five dentists that were questioned. The discussions and table group work will aid students in understanding ratio helps quantify a set. Students will be able to set groups of five dentists aside and notice that more than half of the dentists in a group of twenty five dentists, twenty of them recommend a brand.

To aid in students understanding of number sense by increasing and decreasing the ratio without changing proportion, the students will use a ratio table. This table is organized in columns, allowing students to multiple the number of columns with the ratio. This table allows students to see the first ratio increased in sections. The table can enhance the illustration students created for the first ratio that was introduced to the class (four out of five dentists). The first column would be 4:5 (four dentists agreeing/one disagreeing), the second column 8:10 (eight dentists agreeing/2 disagreeing), the third column 12:15 (12 dentists agreeing/3 dentist disagreeing). Students will be challenged to acknowledge any patterns they notice after each increase of the original fraction 4/5. These patterns will help illuminate the relationship between the numbers and the numbers within the ratio.

Within this unit, students will be able to understand that fractions fall under the term ratio which can be noted as part:whole or part/whole. Students will discuss their understanding of ratio having a part to part relationship (4 dentists agree/1 disagrees, 3 parts of four are shaded in/1 part is not), whole to part (23 students in the classroom/14 students are girls) and part to whole (4 dentists agree on a toothpast/5 dentists were polled, 5 questions were correct/35 questions on the test). A fraction is a ratio because it compares a part to a whole, for example ¾ is three parts of four, ¼ is one part of four or 4/5 is four parts of five. Students will discuss the definition of a fraction is the part to whole relationships of a number set. Students will set this definition for themselves with examples. Students will come to the understanding that fractions are limited to the part/whole relationship.

Students as they explore the part/whole relationship of fractions, they will be able to understand the function of a fraction and are notated as part/whole. Fractions highlight relationships between numbers. The fraction 3/8 is informing the student there are three parts out of eight that are being highlighted. The student with practice and understanding will comprehend why the three is being showcased. Students will create various meaning using draw a picture for certain fractions as a test for mastery of the relationship between the two numbers.

Students will work within groups to interpret and use fractions in different contexts with different labels (seed germination/batting averages/movie rating) to show the relative sizes of two quantities as well as demonstrating understanding of the part/whole relationship. Groups will need to explain the stated ratio for example 4/5 as well as the implied ratio 1/5. They will be demonstrating that their understanding that the relationship of the numbers (numerator or denominator) within fractions and ratios stay the same while the labels change. For the stated fractions of 4/5, it could mean four dentists agreeing out of five total dentists or four correct answers out of five total questions. The implied fraction of 1/5 therefore could mean one dentist disagreed out of a total of five dentists or one question was answer incorrectly out of give total questions. The goal is to challenge the students to see that the labels do not change the number relationship. Students will articulate that the labels will determine what part and what whole are being compared.

Things You Might Encounter
With flexible grouping a teacher could encounter poor grouping where students are talkative and off task. Another group could be mismatched with students that grasp a concept easily or with difficulty. A group could have one student is teaching others without adding to their understanding or learning.

Flexible grouping when the group climate is balanced is very beneficial, students learn tolerance, how to work cooperatively and most importantly, students take ownership of their own thinking/learning. Students will be less inhibited by teacher led discussions to share their strategies within the comforts of the student group.

Within the groups students will learn there is a relationship between numbers by using manipulatives of base ten cubes, strips and one hundred sets as well as scrap paper to draw a picture or guess and check. Students will share their results within the groups then whole groups.

Students will work on a variety of word problems using the base ten manipulatives, paper and each other to describe/achieve the answer. Students will enforce the correct understanding and offer new strategies to those students that have misconceptions. To show mastery of the ratio, fraction and number relationships, students will create word problems using variety of base ten blocks.

The flexible grouping a strategy that allows students to voice their concerns and misconceptions without the weight of being wrong in front of the teacher and their peers. The teacher check-ins with each group and group share outs will ensure that the correct understandings are being reinforced.

Strategies: Students are not coming into middle school with a concrete understanding of number sense. The School District of Philadelphia does not allow a teacher to re-teach a

math skill or elaborate on a hard to understand skill. With the use of guided math groups and whole class instruction, students will use Guess and Check strategy as well as Make a Picture strategy while using manipulatives to achieve a better understanding of fractions and ratios thereby gaining a relational understanding of numbers.

One strategy that works within the classroom setting is flexible grouping strategies. The group often employs several organizational patterns for instruction. Students are grouped and regrouped according to specific goals, activities, and individual needs.

When making grouping decisions, the dynamics and advantages inherent in each type of group must be considered. Both teacher-led and student-led groups can contribute to learning. Careful grouping will allow all students to learn at a successful rate.

The groups will be based on the student's understanding of number sense. Having work previously with these students, the teacher will be able to assess the ability to regroup numbers, a sense of the number's magnitude as well as mental math and estimation. The students that are struggle with those concepts will be seen in guided math groups daily and the students that have a higher level of number sense can be seen in guided math groups a few days during the school week.

The whole class will have work based on the day's objective while the flexible grouping allows the teacher to reinforce the previous day's lesson with the current objective or just work on the day's objective. This guided math group gives the teacher an opportunity to understand where each child is and their grasp of mathematical concepts.

Another strategy is to draw a picture to work out various math problems. Students will be able to use images to help elicit understanding of a whole set of data as well as the part of the data that is being analyzed. The Draw a Picture strategy allows students that are struggling with words to participate in class and in the problems.

Another strategy is called Guess and Check. This is a problem solving strategy allows students to guess the answer then check the guess to see if it fits the condition of the problem. This strategy allows all types of learners to get the answer because of the flexibility of how the student arrives to the answer. The student learns how to analyze their guesses and the results. This maybe the first strategy that is taught and made explicit to the students and students will want to be careful that this useful tool might not work for all problems. Students should be advised that Guess and Check can start them off to work through many problems yet may not solve all word problems.

Students using Guess and Check will be able to look at the data set of guesses to obtain a pattern that will aide in answering the question. The students will become familiar with interpreting patterns which will increase their success in understanding the relationship between the conditions of a problem and the answer. Guess and Check strategy will give

students without a solid number sense a chance to connect the word problem to a numerical problem which they can then answer.

The use of a combination of Guess and Check and base ten blocks manipulatives, students will be able to analyze, interpret and explain this unit's word problems. Students' full understanding will be based on the exploration of word problem and their strategy for getting the answer.

Another strategy is to Draw a Picture of the condition of the word problem which can aide students that lack a clear image or understanding of what word problem is asking. When students can draw out the parameters of the word problem, there is a clear connection and understanding.

Students will be able to draw out the problem to create concrete images to aid in their exploration of the number set and the part of that set that is being compared. Students will understand part/ whole relationship using the draw a picture strategy to highlight the part in a certain way (color, shape) and the whole in another way (different color, different image). The flexible groups will reinforce the concept of isolating a part of a whole group to determine the stated fraction as well as the implied fraction (stated fraction: dentists that agreed with each other/out of total dentist, implied fraction: dentists that disagree/out of total dentists).

Guess and Check strategy will allow students complete ratio word problems using manipulatives increase or decrease the stated fraction. Using T-charts to aid students in organizing their guesses and the outcomes. The t-chart will also allow students to write explanation of computation and strategy of how they got to the correct "guess".

Classroom Activities: Day 1: Part 1

Objectives: Students will understand the term ratio. Students will understand the terms of numerator and denominator in ratio. Students will be proficient increasing and decreasing ratios. Push students to record and communicate their solution strategies and challenge students to become proficient with rational numbers. Provide many opportunities for students to self assess their competency.

Warm Up:
Students will have a worksheet to start off the idea of ratios.

Write your answer in the space provided.
1) How many triangles are there out of all the shapes?
2) How many circles are there out of all the shapes?
3) How many squares are there out of the shapes?

After answering the questions: discuss in your group-could you write triangle to shapes without words that mean the same thing? Could you write circles to shapes without words that mean the same thing? Could you write squares to shapes without words that mean the same thing? Where else have you seen one part of a whole being isolated?

Whole class discussion using inquiry based learning:
Talk about the triangles, circles and squares were singled out of all of the shapes. Why? What was the purpose? After this discussion, ratio definition can be introduced and ways to represent ratios. Highlighting: Definition: A relationship between two quantities, normally expressed as the quotient of one divided by the other. (The bottom number is the whole and the top number is the part you are discussing. Another definition is the relation which one quantity or magnitude has to another of the same kind. There are different ways to represent a ratio using ":"(semi colon), " / " or in words using "to" as in "four to twelve".

Individual practice/guided math practice:
Students will design a ratio for boys to classroom, girls to classroom, teacher to classroom. Using images and numeric expression, what would happen if the total number of students in the classroom doubled, what would have to happen to the numerator? Students should practice increasing the numerator and denominator while keeping the ratio the same-as high as they can compute. Students can use the following strategies: Draw a Picture, Ratio Table or Guess and Check.

Whole class check-in/Wrap up:
Highlighting the definition of ratio and how to write it. Students will have opportunity of share out their ratios and possible ways to double the ratio. Students can share their strategies. This is place to correct misconception/mistakes on ratio. Highlighting how the students know what the whole number is and what the part being looked at is.

Day 1: Part 2

Objectives:
Students will understand the term ratio. Students will understand the terms of numerator and denominator in ratio. Students will be proficient increasing and decreasing ratios. Push students to record and communicate their solution strategies and challenge students to become proficient with rational numbers. Provide many opportunities for students to self assess their competency

Discuss /Group work:
With table group will students discuss the terms for the two numbers in the ratio: Numerator and Denominator. Students can share out their prior knowledge of what numerator and denominator. The bottom number is the total number of items being

looked at or analyzed. The top number is the part of the items being looked at. Refer to their individual work as well as the wrap up, asking them to label the numerator and denominator.

With table group students will brainstorm why the "whole" number goes on the bottom (denominator) and the "part" number goes on the top (numerator).
Discuss/Group:
Come back together to discuss how to write ratios. Show that students can write ratio putting part on the left side and denominator on the right, using semi colon (;) or a slash (/). Noting to students that each symbol still shows the part of a whole.

Warm up:
Worksheet-Students will have numeric ratios that they need to pair with images. When the images are paired with correct ratios, students will label the numerator and denominator. Students will fill in semi-colon or slash in correct location of numeric numbers.

Table group will check the worksheet before sharing out as class. Highlighting the whole number is the denominator and the part being analyzed or singled out is the numerator.

Individual practice/guided math practice:
Worksheet-find the ratio using Guess and Check strategy. Students will be able to guess the second ratio based on the first ratio. For example: 64 meters in 1 second = _____ meters in 2 seconds. Students will work in table groups to complete worksheet.
As students finish, they can put the an answer on an overhead or Promethean board. Students will explain their strategies to their classmates.

Whole class check-in/Wrap up
Come back as whole group, to share out strategies on how students achieved ratios. Students will have opportunities to showcase their understanding. This is the time to correct misconception of how to write ratios.

Day 2: Part 1

Objectives:
Challenge students to understand the base ten system and how numbers can be related to each other in relation to base ten. Using the base ten blocks manipulatives, students will use the single blocks and one hundred column blocks to demonstrate various ratios. Push students to record and communicate their solution strategies and challenge students to become proficient with rational numbers. Provide many opportunities for students to self assess their competency.

Warm up:

Students will have six set ratios and using Guess and Check strategy to double the given ratio. Students can work in pairs or table groups to reach the answer without using a calculator.

Discuss /Group work:

Discuss with students base 10 numbers. Our current number system is a base-ten system. We have single digits for the numbers zero through nine. We do not have a single-digit numeral for the number ten. The two digit number ten is written as "10", it stands for one ten and zero ones. To introduce 10 base cube pieces. Discussing that each block represents ten items. The column of ten blocks stacked up represents 100 items. Discuss with students how to reduce/increase the ratio.

Within table group, students use the strategy Draw a Picture to create new ratios using the base ten system. Students can use an assortment of 10 cube pieces demonstrating the denominator and numerator and how to write ratio correctly. Students will also show how the ratio can be increased and decreased by increasing or decreasing the base ten blocks.

Individual practice/guided math practice:
Students will showcase their ratios using the manipulatives, explaining how the numerator and denominator are related as well as

Whole class check-in/Wrap up
This is the time to highlight interesting strategies that students have used or share out successes the students achieved that day. Students will have time to discuss any change in their misconceptions and their current understanding.

Day 2 Part 2

Objective:
Using http://www.census.gov/schools/. Students can choose their state and discuss what the ratio might be for 2008 in a certain age category and gender. For example in Pennsylvania 2008 there were 147,570 ten year olds. From that number there were 71,975 ten year old girls. The class would begin brainstorming questions that come from knowing there are 71, 975 ten year old girls in Pennsylvania. Some questions that might get the conversation started are: What does that ratio look like? Could the class reduce the ratio? Could the class estimate the ratio to an easier set of number then continue reducing? What is the school data for 10 year old girls? What might the state data versus the school data look like?

Warm up:
In groups using Guess and Check, students will create a ratio of girls to total students and predict how many ten year old girls are in their school. Then using the same strategy, how many ten year old boys are in their school.

Discuss /Group work:

In groups, students would research the amount of girls in relation to total students in within their homerooms. Using this data and the Guess and Check strategy, could the students predict how many homerooms are in the state of Pennsylvania using the 71, 975 ten year old girls as the answer? Students will note they are creating ratio problems with having answer, not solving word problems to achieve the answer.

Come back to whole class and share out new ratios. Asking students if they recognize familiar number combinations. Put the ratios in "order" least to greatest based on the denominator amount. Discuss if the higher ratios are reduce, would the reduced ratio be their original ratio of girls in class to total class students?

Whole class check-in/Wrap up
Class will discuss the reverse way they work on problem, having an answer then creating the steps to get the answer. Students will have a chance to share strategies that got them their answers, way they reduced the ratios to get the original ratio as well as any cleared up misconceptions.

Annotated Bibliography/Resources

Journals

Hiebert et al. *Making Sense: Teaching and Learning Mathematics with Understanding Chapter 5 Mathematical Tools as Learning Supports* Portsmouth, ME Heinemann 1997

Skemp, *Relational Understanding and Instrumental Understandings* Arithmetic Teacher Nov. 1978 pps 9-15

Carpenter, T.P, Fennema, E., Franke, M.L., Empson, S.B. Children's Mathematics: Cognitively Guided Instruction, Chicago 1999 pps 1-12

Web sites:

dese.mo.gov/divimprove/curriculum/frameworks/supplement/.../3-4.pdf

macmillanmh.com/FL/mathconnects_econsultant/.../dec09grade3_fl.pdf

http://www.thomasarmstrong.com/multiple_intelligences.htm

http://www.studygs.net/visual.htm

www.philly-connect.com/index.php?option=com_content&task=view&id=334&Itemid=35

http://www.sci.tamucc.edu/txcetp/cr/math/rf/RatioFraction.pdf

http://www.purplemath.com/modules/numbbase.htm

http://www.edhelper.com/ratios.htm

www.teachervision.fen.com/math/problem-solving/48896.html

Appendices:

Interactive website for lower learners

http://www.learningbox.com/Base10/BaseTen.html

http://www.ixl.com/math/practice/grade-5-determine-the-ratio

http://www.edhelper.com/ratios.htm

http://www.sci.tamucc.edu/txcept/cr/math/rf/RatioFraction.pdf

State Standards:

• Recognize fractions, decimals and percents that are equivalent	2.2B
• Write ratios in fraction form	2.2 C
• Apply knowledge of fractions and decimals to represent ratios and percents	2.1 D
• Compare quantities and magnitudes of numbers	2.4 A
• Use properties of numbers to assist in computation	2.1 E