MEANINGFUL FRACTIONS

Mark McGrath and Mike Valenti
INTRODUCTION

This curriculum is an interdisciplinary mathematics lesson designed for 6th grade students. The schedule calls for one class period of 5 minutes per day, over the course of 5 days. The lesson will incorporate writing and social dialogue into a traditional fractions lesson. It will focus on applications that have meaning to the student, and that inherently encourage the students to participate out of genuine interest. We seek to provide a curriculum that appeals to the interests of the students, and that succeeds in helping students think about how the material truly applies to the real world, and not just the page placed in front of them. Students will develop a more positive attitude towards the material through their ability to connect with it. Furthermore, we will help to build a connection between fractions and percentages by clearing any confusion about the representations’ relationship – and we will work to ensure that all students understand the connection. Another important aspect of the schedule is the extensive inclusion of group work. The cooperative learning employed looks to promote total inclusion of all students and ideas, and will foster an environment that encourages active participation and peer teaching/learning.

OBJECTIVES

We have five main objectives through this lesson: two developed with this lesson and the other three based off of the Connecticut Standard for mathematics guidelines. [1 - Create an environment that fosters cooperative learning through group activities. 2 - Develop a lesson that includes all students, and that encourages participation through use of meaningful examples. 3 -
Use numbers and their properties to compute flexibly and fluently and to reasonably estimate measures and quantities (CTS 2.2). 4 - Students will use fractions to help them interpret statistics (CTS 3.1). 5 - Engage students in mathematical competition to enrich activities” (CTS 1.2).] The main theme for all our objectives was to make sure that students were able to grasp Fractional concepts and be able to apply them to their everyday lives. Fractions and being able to compute them into percentages can be a tough lesson to teach to sixth grade students. As teachers designing this fractional curriculum, we really wanted students to understand fractions, but at the same time be interested and enjoy doing it. One of the major advantages in being able to understand and calculate fractions is to be able to apply them to statistics. Like Fractions, statistics can be boring, so we strived to find two scenarios that would interest the students. The first scenario that we implemented in our curriculum was sports statistics. Sports statistics is a great foundation to allow students to break down their favorite athletes’ stats, and in doing so use the mathematical concept of first creating a fraction, and second converting that fraction into a percentage. For example, Tom Brady completed 12 of 25 passes, what was his completion percentage? This example will allow students to create a fraction of Tom Brady’s passes attempted and completed, and then be able to find his completion percentage through the use of the fraction. The students are learning how to take numbers from stats and convert them into mathematical concepts that will allow them to understand and enjoy their favorite athletes and how well their stats match up to other players in professional sports. The second scenario that we applied was social demographics. We wanted the students to be able to interpret the statistics that come out of taxation, income, poverty, and unemployment. Since we are addressing an urban public school, students would then be able to compare their cities’ demographics to other cities around the country. This would give them a realization of what the world is really like and find
ways to improve upon these fractions and statistics. One of our main objectives was to create an environment that fostered cooperative learning through student engagement with one another. Instead of having the teacher instruct the class for most of the day, we believed that we would create more stimuli in breaking the class up into groups and have them work on fractional activities. These beliefs are contrived by the theorist John Dewey, stating “To engage students in meaningful activities where they had to work with others on problems, purposeful activity was the key to genuine learning” (Dewey 56). To make sure the students weren’t slacking off in their composed groups, the teacher should walk around and provide the guidelines and ask questions to the students so that they stay on top of their assignment. “The teacher’s task in all this was to provide conditions that stimulate thinking, the teacher had to participate in a common experience with the learner” (Dewey 57). We wanted to emphasize cooperative learning to its fullest by implementing the jigsaw method on all the groups. Each group after learning about fractions and how to use them to interpret statistics, would construct a worksheet using fractions through their lesson on sports statistics and social demographics. There would be four questions on the worksheet designated to each member of the group. Groups would then trade off their worksheets and try to answer the questions using their knowledge from the prior days’ lessons. Their grade would illustrate how well they were able to grasp fractions and statistics, and how well they improved initially from the first lesson. The jigsaw method would hold each student in the groups accountable for making up their own questions and be able to answer the other group’s questions, ultimately allowing them to be attentive in being able to grasp the concepts of fractions and statistics.

LESSON SCHEDULE
The first day of our lesson will consist of an overview on fractions, going over the basics of how to interpret a fraction – what is the numerator? what is the denominator? We will then incorporate examples of how fractions are used in everyday situations to broaden the students’ horizons that fractions have a profound effect on everyday life, and are not just confined to a classroom mathematics lesson. The lesson will also entail converting fractions into percentages by teaching the students how to reduce and provide them with a fraction table to show them percentages correlated with fractions. For example, 2/5 is equal to 40%, ½ is equal to 50%, etc. All students will be given a basic calculator and shown how to use it, in order to calculate their percentages. We will use two scenarios that will provide easy relation and understanding to using fractions and percentages, these are sports and social demographics. We will briefly touch upon the significance of these two categories, how fractions and percentages pertain to them, and how we will address fractions from the perspectives of those two concepts later on in the week. This will take about 20 minutes of the class time. The second aspect of class will be breaking the students into 4 different groups containing six students each. These groups will be detracked, allowing for a variety of students with different academic abilities to interact and help each other on a worksheet that will be handed out testing the students on the overview of fractions and percentages. After their 20 minutes of working on the review sheet, the teacher will provide the right answers to the students and at this time correct the problems that were committed to all of the groups. This will make up the final ten minutes of class.
The lesson for this day will include utilizing the first scenario on how to interpret statistics and calculate fractions and percentages in sports. The teacher will provide examples from the three main sports, basketball, baseball, and football to show how fractions are used. Examples will be given on how to breakdown statistics and convert them into fractions. As an example, Ladanian Tomlinson ran the ball 14 times for 135 yards – what fraction does this represent? Can it be simplified? The teacher will walk the students through the steps of how to take the numbers from the stats, to create a fraction. The number of times Ladanian ran the ball will be the numerator, while the total yards, 135 will be the denominator. The students will then divide the denominator by the numerator, and will be able to find how many yards Ladanian Tomlinson averaged per carry. This will take up 10 minutes of class time. The second phase of class will be getting the students into groups of four on personal interest of the three sports provided. Their task will be to brainstorm all the possible ways fractions can be used in sports to interpret statistics such as free throw percentages, batting averages, pass completions, etc. This will allow students to make a connection to sports and fractions and to become immersed in understanding the statistics of sports. This should only take students 10 minutes to complete. The final 30 minutes of class will involve a class-wide activity/game to see if the groups know how to convert statistics into fractions. The teacher will provide sport statistics from the 3 main sports on the board, and each group will have to break down the statistics by using fractions to answer the question. [See the Ladanian Tomlinson example as mentioned in the beginning of the lesson, as an example of a question provided on the board.] If a group answers their sports question correctly they will move on to answer another question, if they get the question incorrect then they will be eliminated. The last group standing will be provided five extra credit points on a future quiz. This class activity will push the students to want to answer the question correctly so they can
gain the five bonus points, while winning the game and not letting down their teammates. It allows the student to be actively engaged in learning about fractions and how they relate to statistics and percentages.

(Day 3)

Day three is an important day because we involve some social commentary, and some discussions of issues that impact all of the students. We hope to create a lesson that successfully teaches fractions while also encouraging thoughtful consideration of social demographic statistics. For example, the teacher will cite the Hartford Connecticut Census and Demographic Information statistics and discuss statistics like: “What fraction and percentage of Hartford residents were born in foreign countries? What fraction and percentage of Hartford residents are unemployed? What fraction and percentage of the average west Hartford income is the average Hartford income?” The teacher will follow such math problem questions with a discussion about how the students feel about these statistics, how they impact their environment and opportunity, and how it affects their attitude towards school. Next in the lesson for the day, is the class will be broken up into groups that are equal in ability. These groups will work together to complete a worksheet that solves fraction/percentage questions that exist within social demographic statistics. The group work will encourage usually alienated students to offer their ideas, and the most capable students to teach the struggling students. This fosters a positive environment of learning within the classroom. After the group work, the class will then review the sheets and be assigned their homework. This homework is to ask their parent/guardian where they see fractions
in their everyday lives. Examples will be documented from responses the parents give about fraction of their salary they spend on different things like food, gasoline, utilities, rent, etc.

(Day 4)

Today will begin with a class forum and discussion about the homework findings from the students’ parents. The students will solve the fractions documented together at the board, and will simultaneously grow to understand that fractions truly occur in everyday life, and that their parents are aware of their importance. This sentiment will cement the importance of the lesson into the minds of the students. Students will see how many different things require money and consideration by parents. It will allow students to learn fractions, understand that the world is filled with mathematics, while also gaining a greater respect and closer relationship to their parents. This homework activity was also a good opportunity for the parent to become involved with the students learning. After the discussion of the findings is complete, the students will work on an individual assignment, which asks them all to write a journal entry about where they see fractions in their everyday lives. They will be better prepared for this activity at this time because they can see how the teacher and their parents find fractions in their lives. Students are encouraged to be as creative as possible with this activity. Once the entries are complete students will be encouraged to read their findings to the class. This peer instruction will help struggling students to understand how the class’ most successful students have thought about fractions in their lives. This peer learning will be very effective because the thought process can be easily related to amongst all the students. The day will be complete after the journal entries have been worked on and their has been a following class-wide fraction review.
The final day of the week is very important because it represents a culmination of all the lessons and activities throughout the week. The day seeks to provide an environment that is new and fun, therefore a more attractive lesson for the student to participate in. At the start of the lesson we will randomly break the class into two halves. Each of the two groups will work together to create a worksheet that includes thoughtful examples of sports statistics fractions and social demographics fractions. After this activity is complete the teacher will take the sheets, ensure that they are correct and appropriate, and then switch them between groups. Now, the groups are tasked with solving the questions formulated by the other group. This will be a new exciting way for students to impact the lesson, and to feel more involved and included by the classroom and with the material. Once this activity is done, the class will then be subject to a traditional wrap up review of the fraction topic, again going through the subject from the very basics to the applications discussed throughout the week. Once this final review has been accomplished, the students will be given an individual worksheet to complete in an effort to chart their progress.

EVALUATION

The evaluation process here will be on that is not traditional in most aspects. The grading system takes into greater account the learning methods of the student, as well as the effort and cooperation of the students. This is not considered only to encourage individual student participation and effort, but is promoted because that participation is beneficial to the class as a whole. The group worksheet and individual worksheet will also be consulted to assign a grade
based on the students’ understanding of the weeks’ material. The total breakdown of the evaluation process can be seen below in the evaluation rubric grid, and takes into account participation, homework, material understanding, quality of journal entry, and group worksheet.

It is a rubric that assesses the whole effort of the student and not just a narrowly defined definition of material acquisition through memorization.

<table>
<thead>
<tr>
<th>Score</th>
<th>Participation (Homework + involvement)</th>
<th>Understanding of Material (overall work + final worksheet)</th>
<th>Journal Entry</th>
<th>Group Worksheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No homework, no participation</td>
<td>No understanding and no effort</td>
<td>Did not attempt assignment</td>
<td>No group cooperation</td>
</tr>
<tr>
<td>2</td>
<td>Little effort at homework, little participation</td>
<td>Little understanding via little effort</td>
<td>Thoughtless work on entry</td>
<td>Little cooperation or effort</td>
</tr>
<tr>
<td>3</td>
<td>Some homework done, some participation</td>
<td>Decent effort, but student needs more work on subject</td>
<td>Decent journal entry</td>
<td>Decent cooperation, decent effort</td>
</tr>
<tr>
<td>4</td>
<td>Acceptable homework, acceptable participation</td>
<td>Acceptable understanding of material</td>
<td>Acceptable entry</td>
<td>Acceptable cooperation, acceptable effort</td>
</tr>
<tr>
<td>5</td>
<td>Good effort on homework, active participation</td>
<td>Good understanding of material</td>
<td>Good, thoughtful, journal entry</td>
<td>Good worksheet creation and cooperation</td>
</tr>
</tbody>
</table>

**OVERVIEW**

Ultimately, the lesson will serve as an effective curriculum that will leave students prepared for the current reality of standardized testing in schools. What it does in addition, however, is prepare the students to apply their learning to the real world, to think thoughtfully and critically about their surroundings, to see and recognize examples of fractions in sports thereby
encouraging participation. Students will also hopefully gain a greater appreciation for what their parents have to deal with on a daily basis, while allowing the parents a window into the education of their child. The curriculum is interdisciplinary and seeks to encourage the inclusion of writing into the learning, while promoting group activities and total class-wide involvement.