Presidential Award Winners

Take "Stock" in the Market: Connecting Fractions, Decimals, and Percents

By Anita Dobbs

Mathematics is such an integral part of everyday life that it is extremely important that students see connections with real-life situations and other subject areas. My role as a math teacher is to aid students in developing problem-solving and critical thinking skills. I believe that this can be implemented by innovative and creative methods that capture students' interests.

In twenty-three years of classroom teaching, I have developed a style of teaching that incorporates knowledge of the students' developmental stages and motivational techniques. Experience in middle school situations has led me to an understanding of the personalities of seventh graders. Adolescence is a time of great change. Interests apart from academics sometimes take priority. I try to keep the students' minds occupied with mathematics. Problem-solving and critical thinking activities are designed to help students see the value of mathematics in everyday life.

My vision for mathematics education is that students develop a love for mathematics. I want to instill that love for math because if students love something, they are more willing to put time and effort into it. Research has clearly shown that students learn best when they have a passion to know. Too many times students see math as drudgery. They feel that there is too much drill and

practice and not enough of a connection to their lives. Therefore, I strive to keep the classroom lively and interesting. One way I achieve this goal is through the use of humor. Throughout the entire class period, I keep students thinking by telling puns, jokes, or riddles that relate to the math concept that day. They anxiously listen in order to understand the meaning of the pun or joke. Usually the pun is tied to the lesson; for example, "Fractions are a PART of life," "Decimals are easy if you get the POINT," or "PerCENTS make SENSE." This builds an open community in my classroom where students tend to participate more and even throw a pun my way. This use of humor also allows me to give students catchy ways to remember methods that might otherwise be forgotten. According to the *Alabama Course of Study: Mathematics*, students should be "actively involved in meaningful activities in which the goal is conceptual understanding" (7). These methods, involving the use of humor, have aided in that. I have had students come back to me years later to tell me that they remembered some of the puns that helped them in their classes. For these reasons I tell my students that I hope they will like, if not love, math more. In each lesson, I show my students, by example, my own love of mathematics.

From this philosophical standpoint on teaching mathematics, I developed a unit on fractions, decimals, and percents. Middle school students have difficulties connecting these three concepts. Therefore, I feel that any practical applications that can reinforce and make these concepts come alive is extremely beneficial to them. According to the *2000 Principles & Standards for School Mathematics* from the National Council of Teachers of Mathematics (NCTM), the students should have "accurate and efficient strategies" for computing among these concepts.

In order to help improve the conceptual understanding of fractions, decimals, and percents, the students participate in a unit on the stock market. The goal of this unit is to help students see connections, not only among the three concepts, but also between mathematics problem-solving and real-life applications. The students work with the stock market in the economics section in social studies. The stock market unit that I developed takes that knowledge and builds on it to expand into mathematics. I feel that this real world application sparks interest in students, of all ability levels, in the investigation of fractions, decimals, and percents; and therefore, leads toward that love of mathematics.

When we start the stock market unit, I lead the students in a discussion designed to assess background knowledge that they have about the market. Each class shares a variety of ideas. Students ask questions ranging from "How do we know how much each share

is?" to "What happens when a stock splits?" Most of the students have seen or heard about the stock market in the news but have never taken an in-depth look at how the market works. After assessing what the students' needs are, based on their inquiries, I ask a speaker to come to talk with the students about the business aspects of the stock market and answer any further questions. The speaker discusses how the price of a stock is determined, what types of stocks are sold, and how the economy affects the market.

Once the students have the background knowledge of the stock market, I feel that it is time to direct the students toward their own investigation of the market. I ask them to research what stocks they would like to "buy." They may make their decisions based on personal reasons, but they must write their rationale for choosing each stock. This is an important language arts connection. Students may use outside sources and are encouraged to seek help from family members who invest.

In the beginning of the stock market unit, students are given the materials necessary to document the stocks that are bought. I base the materials on a spreadsheet-type arrangement that I designed. The students are asked to monitor the four stocks that they "buy" for a period of two weeks. During that time, students are expected to keep a record of the close and the change (+/-) of each stock each day. The students may keep records as either fractions or decimals so that they can see how the fractions translate into decimal notation. I encourage the use of internet sources and finance or money sections from the newspaper, and have both readily available for the students in my classroom. Both sources show the change in stock as not only a "+/- ," but also as a percent of change. At the end of the two-week period, students analyze each stock using the materials provided.

The problem-solving process for this unit takes shape when the students take the opening date and the closing dates to compute the differences for a gain or a loss in their overall portfolio. They must take the decimal or fractional equivalents and subtract the amounts. "The content knowledge," as stated in the *2000 Principles & Standards for NCTM* for problem-solving, "is required for students to solve challenging problems." Once the students solve these problem situations with the stocks, they become more curious and interested in exploring other situations and, therefore, become more effective critical thinkers in the process. Throughout the mathematics methods course that I taught at the University of Alabama at Birmingham, I stressed to the teachers the importance of having students become problem-solvers. Real-world applications, such as the stock market unit, help the students to see the importance of mathematics.

Name Drew Period 4th

Directions for stock market portfolios:

(1) Choose four stocks for companies in which you want to invest.
(2) Keep track of the stocks starting at the close of the day on Friday, 1/14 to Friday, 1/28. You may use the internet or the newspaper. Newspapers will be available here at school.
(3) Write a sentence that gives the rationale for choosing that particular stock.
(4) At the end of the two weeks, the stocks will be evaluated for gain or loss.
(5) A line or bar graph that shows the gains or losses of one stock will be required. Graph paper will be provided for this.

Companies (Rationale for choosing each):

1) AOL - has combined with Time Warner to create an increase

2) Abercrombie & Fitch (ANF) - it's a hot item right now

3) Gap (GPS) - my dad has stock and says it's doing well

4) Wal-Mart (WMT) - a big selection of items for different types of people.

Stock Market Portfolio

Name Drew
Period 4th

Company	Ticker	F close	T	+/-	W	+/-
AOL	AOL	63 1/4	60 11/16	-3 7/16	64 1/2	+3 13/16
Ab & Fitch	ANF	23 11/16	23 1/2	-3/16	21 7/16	-2 1/16
Gap	GPS	47 13/16	47 13/16	-	48	+3/16
Wal-Mart	WMT	64 9/16	65 9/16	+1	64 3/16	-1 3/8

Ticker	T	+/-	F	+/-
AOL	64 3/16	-5/16	65	+13/16
ANF	20 5/16	-1 1/8	20 3/16	-1/8
GPS	46 3/4	-1 1/4	45 1/4	-1 1/2
WMT	63 7/8	-13/16	62 1/2	-7/8

Ticker	M	+/-	T	+/-	W	+/-
AOL	61 15/16	-3 1/16	61 5/16	-5/8	60	-1 5/16
ANF	20 3/16	-	21 1/8	+15/16	22 15/16	+1 13/16
GPS	42 9/16	-2 11/16	44 5/16	+1 3/4	45 1/8	+13/16
WMT	58 13/16	-3 11/16	60 3/4	+1 15/16	61 15/16	+1 3/16

Ticker	T	+/-	F	+/-
AOL	61 3/4	+1 3/4	58 15/16	-2 13/16
ANF	22 1/16	-7/8	22 1/4	+3/16
GPS	45	-1/8	43 1/2	-1 1/2
WMT	59 3/8	-2 9/16	54 9/16	-4 13/16

(1) What was the best stock investment you made? What company was it and how much profit did you make?
Abercrombie was my best investment, but I didn't have a profit. I lost $14.38

(2) What was the worst stock investment you made? What company was it and how much did you lose?
Wal-Mart was the investment that lost $100 and was my worst.

(3) Show each stock with its profit or loss for the two weeks.

	Price/Share			
Company:	F	F	Gain/Loss	x10 shares
AOL	63 1/4	58 15/16	-4 5/16	-$43.12
Ab & Fitch	23 11/16	22 1/4	-1 7/16	-$14.38
Gap	47 13/16	43 1/2	-4 5/16	-$43.12
Wal-Mart	64 9/16	54 9/16	-10	-$100.00
		Total	Gain/Loss	-$200.62

This year during the stock market unit, I had very positive comments from students. All of them said that keeping up with the stocks was fun and interesting. Many could not wait to get to the internet or to the paper to see the daily changes. The spreadsheet made it easy for students to keep track of each stock on a daily basis. During group discussions, the students shared their ideas and speculated as to why their stock had a gain or a loss. I was ecstatic to see that even though some students "lost" money, this did not dampen their attitudes toward the unit. In fact, it made things quite interesting from the standpoint of finding, within each class, what company had the highest gain or loss. The genuine interest from all levels of students in, not only, the stock market itself, but also in the connections among fractions, decimals, and percents, fostered a better understanding and love of mathematics.

This past year, I followed up the beginning investigations by entering teams in the Stock Market Simulation, sponsored by the Alabama Council on Economic Education. I did this to further challenge the students' problem-solving abilities and continue the excitement generated by the two-week unit. Since the Stock Market Simulation incorporates the use of fractions, decimals, and percents, all students benefited from this fun and exciting experience. Students on each team bought, via the internet, stocks totaling up to $100,000. Cooperation among team members was necessary in order to come to a consensus on which stocks to buy. Throughout a ten-week period, each group followed the stocks and made decisions on buying or selling. Besides watching the stocks and computing with fractions and decimals, the students had to add a $25 commission on each trade. Therefore, many problem-solving and critical thinking skills were used in order to decide if it would be worthwhile to buy or sell, due to the commission. The team rankings, generated by the internet, gave the students feedback that kept them interested and motivated to continue doing research for the betterment of their group.

In order to meet the needs of the diverse student population at our middle school, I divided the teams for the games by classes. The two honors classes had four teams in each class. The students on these teams worked relatively independently of me and did all computations with only minimal guidance. My general classes had one team per class. I felt that this was necessary because these students need more step-by-step guidance to go through the ten-week period. I facilitate by guiding them through the computations. Nevertheless, all students help make choices for the stocks. Since our work involves the use of percents, fractions, and decimals, and the relationships among them; I am able to teach these relationships within the context of the simulation.

This simulation, along with the unit on the stock market, has already proven how innovative approaches aid student learning. I have already seen the positive side of entering the game. Two years ago, I had a student in my inclusion class who had attention deficit disorder. Tom was on medication to help him concentrate. When we worked with fractions and decimals, just within the context of the chapter, he had severe difficulties understanding and grasping the concepts. However, when we discussed the stock market, I saw a spark of light within him. It was unbelievable the difference in his attitude in class. Tom came to me several times a day to discuss stocks. It touched me when he said that he had discussed stocks with his "granny." His grandmother suggested stocks and told him information about each company. He then went to the internet and entered the stocks he wanted in the personal finance section of the site. Every day he gave me a printout of his stocks and the changes (+/-). The information was in fraction form. He looked at that printout and could tell me exactly what each stock had done. Tom was reading fractions and could tell me what they meant. He understood the connection with percents also.

Portfolio Print: davids

Symbol	Shares	Last/NAV	Change	Pur. Price	Gain/Loss	Value
AHO	1	23 1/8	-5/16	23.00	+0.125	23.12
BBY	1	57 1/4	+2 1/4	50.00	+7.25	57.25
BMY	1	63 3/4	-1/2	65.00	-1.25	63.75
CHINA	1	88 1/2	+3 15/16	80.00	+8.50	88.50
CSCO	1	125 13/16	+5/8	113.00	+12.81	125.81
DIS	1	37 9/16	-7/16	38.00	-0.437	37.56
IBM	1	118 13/16	+4 11/16	114.00	+4.81	118.81
MSFT	1	109 15/16	+3 5/16	100.00	+9.93	109.93
QCOM	1	139 1/16	+5 5/8	142.00	-2.93	139.06
YHOO	1	373 1/8	+19 1/8	350.00	+23.12	373.12

From the beginning, I felt that this type of activity was exactly what Tom and others needed. A student from my honors class asked me about a company that I knew Tom was researching. I directed the student to Tom and saw the pleasure that he derived from an honor student asking HIM about a company. He was proud that he was able to help this student when, usually, it has been the other way around. Rewards I find in teaching come from these inspirational moments. As a result, I continue to implement innovative and inventive methods that capture and hold students' interests. Consequently, I hope that my students will make connections that will engender, within themselves, a love of mathematics.

Assessment of Student Learning

In order to be attuned to the mathematical needs of my students, I must constantly assess student learning. Since I teach students at various ability levels, I have multiple purposes for assessment. I must not only assess what the students learn, but also what they know prior to the lesson and how they are learning the concepts. This overall assessment of student learning helps me to monitor how the students are progressing, make decisions in preparing for classes, and. therefore, evaluate the mathematics program.

For the past few years, I have bean concerned that, after format assessment through testing, my students would still be unable to relate these three concepts to real-life situations. I also saw frustration in some students who wanted to give up instead of work through a difficult problem. I did not want the students to lose their interest in mathematics. I knew that fractions, decimals, percents, and their connections, were necessary throughout the rest of mathematics and life. Therefore, I decided to assess student leaning by using a performance assessment. As stated in the *Alabama Course of Study: Mathematics,* this type of assessment "requires students to integrate several concepts and skills and apply them to real-life situations to provide an in-depth view of learning" (7), I felt that in developing the stock market unit, I would be able to integrate many concepts and apply them to real life.

Two years ago, I began using the stock market unit as an assessment tool. The first step, in presenting the unit to the students, was to assess what the students already knew about the market. In each class we began by using the chapter project from the textbook as a springboard. A picture of the trading floor for the New York Sock Exchange was shown. I asked students if they had ever seen this on television or elsewhere. Most said that they had seen it on the news or in a movie. The discussion progressed and students asked a multitude of questions. It was through this student inquiry that I evaluated prior knowledge and knew which direction the unit should take.

Through an internet connection, I went on-line during class to check stock prices of twelve popular stocks listed in the textbook. Students were amazed at how some of the prices had changed. The stock that had the most dramatic change that year was Sony Corporation. The stock had risen from about $99 a share, at the time the book was published, to $272. When I told the students the new price, I could tell that the news had captured their attention. What impressed me was the conjecture the students made about why Sony had risen so much. Without realizing it, they had already

done research by finding out that *Playstation 2,* a new product, was coming out during that summer. They told me about all of its compatibilities with other technology. It was at that moment I saw their interest sparked and realized that they were ready for movement to the next step in the assessment process.

Since I had evaluated where the students were in their understanding of the stock market, I needed to steer them toward the performance assessment of the stock market portfolio. I designed a spreadsheet-type table where students would keep track of four stocks for a two-week period. Directions for the portfolio were included. Students were asked to give a rationale for buying each of their four stocks. They were told that at the end of two weeks, the stocks would be evaluated for a gain/loss. By reading the rationales, I was able to assess what factual knowledge the students had about the corporations and what reasoning they had used. The rationales ranged from: "Exxon Mobil - gas prices are high and everyone has to fill up the car," to "Hershey - Valentine's Day is coming soon."

In order for me to assess the students' computational skills and procedural knowledge, I had the students keep track of the day-to-day trades of each stock. They based the dollar amounts per share on the close of the market. The internet and the newspaper were offered in my classroom so that the information was readily available. This year I incorporated the use of the *Macintosh iBook* computer which has wireless internet capabilities. My teammates and I helped write the grant for the ten *iBooks* so that students would have ready access to the internet through many computers. The internet also showed the percent of change from the previous day. If the students alternated between the use of the newspaper and internet, they had to convert between representation formats in order to find the daily change (+/-). This connection between fractions and decimals is stressed in the standards set forth by the NCTM. The *2000 Principles and Standards* says that students should become "fluent and flexible" in understanding the relationship between the two. Therefore, I assessed their procedural knowledge by checking their daily computations for each stock. Because the students had to perform various computations in order to calculate the change in their stocks, they sharpened their computational skills and were forced to understand and appreciate the real-life applications of these skills.

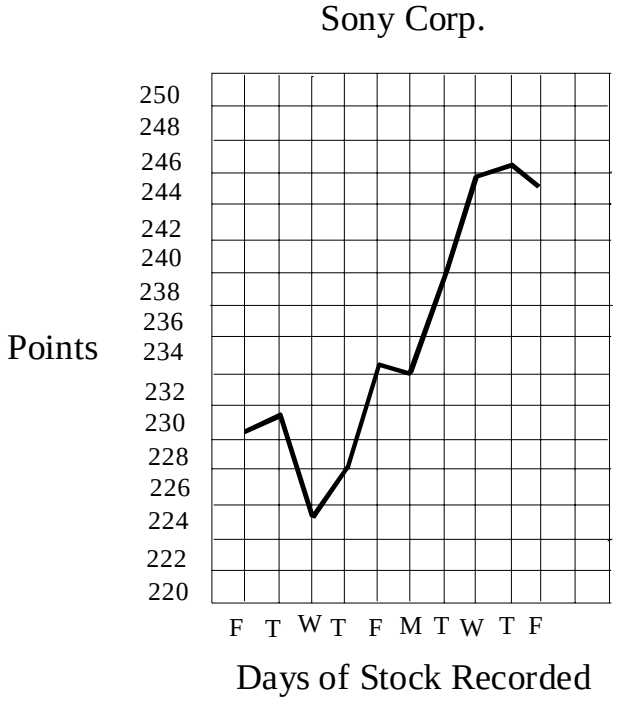
Since I assessed what the students knew initially from the preliminary inquiry, and evaluated how they were learning from their rationales, it remained for me to assess what the students learned from the two-week portfolio. First, I checked the accuracy of the day-to-day recording of each stock's price by spot-checking quotes

from an internet site. Second, I checked the students' computations. These two areas gave me a good idea of what skills and procedural knowledge the students had learned. At the conclusion of the portfolio, the students showed each stock and its price per share at the beginning and the end of the period. When the students subtracted to find their gain or loss, they sometimes had to change fractions to decimals. This was the main connection between the two concepts that was reinforced in this unit. After finding the difference, the students multiplied by ten, since they had bought ten shares. This expanded to more procedural knowledge and skills assessment with multiplication of decimals. I found that, in asking the students to find the total gain or loss, they were also getting practice with rational numbers. As time went on, I found that each task in this portfolio built on another skill already used and that each concept was connected. I was pleased with student performance and was able to adjust, as necessary, to further meet the needs of individual students after assessing what skills required further development.

The last day of the stock market unit was one of the most beneficial. I wanted students to share their portfolios in the classroom. I asked them to discuss, in groups, how their stocks had done. In doing so, I further assessed what the students had learned, because I moved from group to group to listen. I was ecstatic about the enthusiasm in the room. The students eagerly shared with one another, finding it hard to wait for a turn to speak. They wanted to know not only if anyone had made money, but also what stocks their classmates had chosen. We then shared the group conversations with the whole class. The love for mathematics that I try to promote was felt in the classroom that day. The students' conversations did not center around the work of keeping up day-to-day or having to "do the math," but rather around the connections that they had made to the real world. They had nothing but positive comments about working with the stock market. I knew then that this unit was worthwhile and necessary in my classroom.

Their final assignment was to draw a line or bar graph to represent the changes in one of their stocks over the two-week period. This connected another necessary concept to the unit - statistics. Graphs helped to further assess what the students had learned. I displayed these graphs in the room so that everyone could see them and further discuss the stock market.

After evaluating the stock market unit, in light of student interest and achievement, I will continue to incorporate it in our study of fractions, decimals, and percents. All of these different representations brought forth in this one unit fulfilled the NCTM



standard that stresses connections among the concepts for middle school students. Each year I will build on the previous year's successes and then reassess. I will need to make changes, additions, and deletions, where necessary. I now realize that the unit can be expanded to perhaps be followed throughout the year since it includes rational numbers and graphing. This year I am following the unit with participation in the Stock Market Simulation. Next year, I want to work more closely with the social studies teacher in our team to take an interdisciplinary approach.

Throughout the stock market unit, assessment is the key to learning what mathematical needs my students have. It is in becoming aware of these needs that I can help students build a strong mathematics background and therefore, continue to foster a love for mathematics.

Hewitt-Trussville Middle School
301 Parkway Drive
Trussville, AL 35173

zcvbzcvb