Lesson Plan 1

Supermarket Unit: An Applied Academic Project

appropriate for Grades 6-9

As presented by:

Susan Mercer and Ricard Doty
Spurgeon Intermediate School
Santa Ana, California
Abstract/Personal Reflection

In the “Supermarket Unit,” students create their own “supermarkets,” make shopping lists for different budgets, and write their own mathematics problems. A primary objective of this unit is to allow students to solve problems in the context of a situation that students find familiar, relevant and interesting.

This unit provides a context in which students develop number and operation sense, learn to organize information in different forms and utilize the calculator as a tool that helps them solve complex problems. Furthermore, the unit serves as a vehicle for practicing estimation skills, working with decimals, fractions, and ratios, and is a precursor for a unit on data collection.

Students work in groups to create their supermarkets and to answer the group test, but during the rest of the assignments students may choose to work in groups or individually. Calculators are available at all times to ensure that students can achieve the precision needed to successfully complete all the activities.

The Supermarket Unit was created to address the needs of students who believe they cannot “do” math and feel that math is dull, boring and irrelevant. This hands-on project, provides them with opportunities to explore and solve problems, using prior knowledge and/or acquiring new knowledge. It gives them an understanding of mathematics based on a familiar situation students experience daily. The unit allows students to discover that mathematics is relevant, interesting and useful. It also helps students develop the idea that they can be good at mathematics and something at which they can get better.

Materials:

- Newsprint paper
- Markers
- Scissors, rulers and glue
- Graph paper
- Calculators
- Lots of supermarket advertisements (at least one per student)
- Student Assignment handouts (see Lesson Plans and Activities)

Time Line

Each lesson takes a different amount of time. See Lesson Plans and Activities for details.

Expected Outcomes

The concepts embedded in this lesson are based on the National Council of Teachers of Mathematics (NCTM) Standards. Students will:

- understand, represent and use numbers – whole, fractions and decimals – in a variety of forms in real-world and mathematical problem situations;
- develop number sense and relationships of whole numbers, fractions and decimals;
- understand and apply ratios and proportions;
- understand and appreciate the need for numbers beyond whole numbers and comprehend how basic arithmetic operations are related to each other;
- systematically collect, organize and describe data using tables, Venn diagrams and graphs;
- develop an informal understanding of the different types of measures of central tendency (median, mode, and mean).

Prerequisites: Teachers & Students

This unit is not meant to be an introductory lesson on graphs, ratios, fractions, decimals, etc. Instead, it was designed as a seventh-grade opening unit to review and practice general math skills taught in earlier grades.

Assessment

An assessment rubric is provided at the end of the lesson.
Lesson 1

Lesson Plans and Activities

A student assignment sheet is provided at the end of each lesson in this unit for teachers to copy and distribute to their class. It is important to give students their own assignment page for them to use as a guide and to help them work at their own pace within the time frame of the lesson.

Note: These assignments were originally in English and Spanish to address the needs of this particular school's large Hispanic population. Dual language assignment pages are available upon request to Susan Mercer.

Lesson 1: Creating a Supermarket

Time: 2 class periods

Activities:

In groups, students are asked to create their own "supermarkets" from store advertisements. Every supermarket must include the following categories: dairy products, meat, fruit and vegetables, cleaning products, paper products, groceries, beverages and miscellaneous. Each category has to include at least five products, and each group has to give its store an original name. Products may not be repeated within each supermarket and each product must have a picture, name and price. All finished supermarkets are displayed around the classroom. If a group finishes early, the students may include another category or two.

Student Assignment Sheet 1

(1 of 8 to be handed out to students)

Using store ads, each group will create its own supermarket.

1. Each supermarket will have to include the following categories:
   1. dairy products
   2. meats
   3. fruits
   4. vegetables
   5. paper products
   6. beverages
   7. cleaning products
   8. groceries
   9. miscellaneous

2. Each category must have at least five different products. Display the picture, the name and the price of each product.

3. Give your supermarket an original name.
Lesson 2: Shopping Lists 1

Time: 2 class periods

Activities:

A. Students are to make a table that contains the following headings listed in Student Assignment Sheet #2.

Using only their own group’s supermarket, students are asked to record on their tables two products from each category and find the total. This table constitutes the student’s first shopping list. (The teacher needs to model what the first table should look like and explicitly link shopping lists to the table form.)

B. Students are asked to make a new table with the same headings as in Part A. Using all the supermarkets posted around the room, students are asked to generate a shopping list with at least six products that totals between $100 and $105. Next, students are to prepare a list where the total is between $200 and $202. For this activity, students move around the classroom, “visiting” the different supermarkets and recording their shopping lists. If students finish early, as extra credit they may make an additional list with a total between $300 and $301.

Student Assignment Sheet 2

Shopping Lists 1

Using the group supermarkets, you will create different shopping lists.

1. Prepare a shopping list that contains two products from each category and total the costs of your products.
2. Prepare a shopping list that totals between $100 and $105.
3. Prepare a shopping list that totals between $200 and $202.

Each shopping list must include:

- Supermarket’s name
- Product’s name
- Unit price
- Number of products purchased
- Total cost of the product
- Total spent
Lesson 3

Lesson 3: Shopping Lists #2

Time: 3 class periods

Activities:

A. Students are to make tables that contain the following headings: product, price per pound, number of pounds of each product bought and total cost. They then “buy” at least 15 different products in various quantities, and add up the amounts and costs to arrive at a total. Students are told that the number of pounds bought has to be different for each product.

Note: Some students use successive addition to calculate the total price. This is a great opportunity to show individual students that the answer obtained from using successive addition is the same as the one they will get when using multiplication.

B. Students are told to calculate the price of one-half, one-third and one-fourth of a pound of a specific product. They are to do this for five different products. This is a good review of fractions and rounding. (Depending on the students’ math skills, the fractions can be changed to make the problem more difficult.)

C. Students are to find five different ratios and calculate the unit price for each one. For example: 5 oranges for $1; unit price 20 cents. This is a good review of ratios and rounding.

Student Assignment Sheet #3

Shopping Lists #2

1. Prepare a table that contains the following headings: product, price per pound, number of pounds purchased and total price.

2. Complete the table by buying different products and different number of pounds. A minimum of 15 products must be bought.

3. Find five different products and buy 1/2, 1/3 and 1/4 pound of each. Show clearly, in a table, the price per pound, the price for a 1/2 pound; the price for 1/3 pound and the price for 1/4 pound. Explain clearly how you obtained each value.

4. Find five different ratios. For each one, find the unit price of the product. Explain clearly what each ratio means and how you obtained the unit price.
Lesson 4: Venn Diagrams and Double Entry Tables

**Time:** 3 class periods

**Activities:**

A. Using all the supermarkets in the room, students create and complete Venn diagrams. As an example, students are asked to find products that cost 99 cents and products that are red in color. Students create their own Venn diagrams.

B. Using all the supermarkets in the room, students create and complete double entry tables. As an example, students are asked to find products that cost 99 cents, $1.99, and are fruits or vegetables. Students create their own double entry tables.

C. Using graph paper, students create a number line from $0 to $10 using increments of $1. (Recommendation: use four squares to represent one dollar. In this way, it is easier for students to find quarters.) Students complete the number line by placing, proportionally, two products in each interval of a dollar.

Lesson 5: Group Test

**Time:** 2 class periods

**Activities:**

In groups, students will generate a shopping list for a BBQ party with a budget of $30. They must specify the number of friends invited to the party, what they want to buy, how much they will buy, and how much they will spend.

Lesson 6: Graphing

**Time:** 3 class periods

**Activities:**

A. Using the classroom supermarkets, students look for the price of strawberries in at least six different supermarkets. (Any product may be used as long as it is shown in at least six supermarkets.)

---

**Student Assignment Sheet 4**

Venn Diagrams and Double Entry Tables

1. Using the supermarkets in the room, create and complete a Venn diagram for products that cost 99 cents and are red in color.

2. Using the supermarkets, create and complete a Venn diagram for products that cost $1.99, are paper products and are white in color.

3. Create and complete your own Venn diagram.

4. Using the supermarkets in the room, create and complete a Double Entry Table for products that cost 99 cents, $1.99, are fruits and are vegetables.

5. Create and complete your own double entry table.

6. On graph paper create a number line from 0 to 10.

7. Using the supermarkets, complete the number line by placing two products in each interval.
Lesson 6

Students graph the information, find the range, median, mode and mean of the price of the product in the different supermarkets. It is best to provide the definition of range, median, mode and mean as it relates to the price of strawberries. For example: range, the difference between the cheapest and the most expensive strawberries; median, the middle price — half the stores will sell at a higher price and half will sell at a lower price; mode, the price that occurs most often; mean, the “average” price. This activity provides the students with the use of new mathematical terms in the context of a situation to which they can relate.

Student Assignment Sheet 5: Group Test

With your group, plan a party with a budget of $30.

Your group answer must include:

1. The number of friends you are going to invite to the party and what are you going to serve.
2. A list of what you will need for the party and in what amounts.
3. A table to show which products you are going to buy, in which supermarket, how many of each and total cost. The total cost has to be as near to $30 as possible.

You will write your response on construction paper. Only this will be graded. This is a group test and you will be graded as a team, but individual grades will be given for participation.

Student Assignment Sheet 6: Graphing

You will create different graphs based on the price of different products.

Requirements

1. Find the price of strawberries in six different supermarkets.
2. Graph the information.
3. Find the range. What does the range tell you about the strawberries sold in the different supermarkets?
4. Find the median, mode, and mean of the price of strawberries. What do these specific averages tell you about the strawberries sold in the different supermarkets?
5. Select a product and do steps 1 to 3 for that specific product.
Lesson 7: Writing Math Questions

Time: one week as homework assignment

Activities:

As homework (although this can be done in class), students write and answer five original mathematical problems that can be solved with products and prices from one or more supermarkets around the room. Students’ problems must include: a) buying more than one pound of fruit and meat; b) using coupons; c) and creating Venn diagrams. When solving their problems, students must show all their work and explain their solutions clearly so that another person can understand what they have done.

The questions must be different. Different means that if one question reads “I buy 10 pounds of grapes at 69 cents per pound, how much did I spend?,” the next questions cannot refer to buying 10 pounds of fruit or meat. Students need to include at least two math operations in each of their questions (add, subtract, multiply, divide). For example, a student wrote: “Sally went to the store with only $5 to buy fruit. She decided to buy watermelon since she was going to make drinks with watermelon. Each watermelon cost 59 cents per pound. So she bought five pounds. How much did she spend? How much did she have left over?” To solve this problem, the student had to multiply and then subtract.

It is a good idea for the teacher to provide a couple of good examples of questions before they do their homework. If not, they mix the question with the answer or forget to ask the question and just state facts. It is a good idea to provide a couple of good

Student Assignment Sheet 7

Homework Assignment

Write five questions that have to do with supermarkets and answer them. One or more questions have to include:

a) buying more than one pound of fruit;

b) buying more than one pound of meat;

c) using coupons;

d) Venn diagrams.

The questions must be different, original and creative. Use at least two math operations (add, subtract, multiply, divide) when solving each question, except the one with the Venn diagram. When graded, each question/answer will be worth 10 points. (If a student wants extra credit he/she may write a sixth question.)

The questions will be graded according to the following criteria:

a) depth of the question (how complicated the question is);

b) originality and creativity;

c) correct answer;

d) math concepts applied and used (math operations used); and

e) presentation and neatness.
examples in. This is a very important activity because it helps students understand how math questions are developed and the various parts of a math question. Students realize they have to provide the information first and then ask the question.

At the beginning, students write questions where information is missing such as “I want to buy 10 pounds of meat. How much did I spend?” Or they may omit the question, as in, “I bought 10 pounds of grapes and I spent $3.49.” Having students write their own questions allows all students to perform the task regardless of their previous experience or math skills. The advanced students get creative and move beyond the buying per pound; on the other hand, the students who normally cannot answer word problems, create their own questions, keeping them simple and within what they can master. Most important is that every student writes his or her own questions and answers them correctly.

Lesson 8: Portfolio

Time: 3 class periods

Activities:

As a culminating activity, students produce portfolios using the assignments done during the supermarket unit. Students put all their assignments together and redo one assignment that they think they could improve. In addition, students write a letter to their parents explaining what they will find in their portfolios. As homework, students share their portfolios with their parents and a written evaluation or response is expected from the parents.

Student Assignment Sheet 8

Name: ___________________________ Per: ______ Date:_______________

Supermarket Unit Portfolio

During the next three days you will be developing your Supermarket Unit portfolio based on all the math assignments you have done during this unit. Your portfolio will be graded based on your explanations, creativity, completeness and neatness.

Your portfolio must include:

1) all the assignments you have done: a) tables and shopping lists b) buying per pound, fractions and ratios c) Venn diagrams and number lines d) graphs e) supermarket questions you have written (homework assignment)

2) the one assignment that does not reflect your best work which you have chosen to do over again.

3) a letter to your parents explaining what they will find in your portfolio and what you have learned. (This letter must be at least one page in length.)

4) a cover page with your name, unit name, period, date and teacher’s name.

5) a written response from your parents that shows you have shared your portfolio with them.
Assessment

Even though much of the work is done in groups, each student is responsible for completing each assignment. The only group grade is the group test.

Students are graded based on the following:

1. Each assignment includes more than one table or graph. Each table or graph is scored individually using a 4-point rubric.

   **4 points:** all requirements are present, table is complete, clear and neat, calculations are accurate (equivalent to an A).
   **3 points:** a requirement is missing or there is a miscalculation (equivalent to a B+).
   **2 points:** the student has attempted to do the assignment but some parts are missing. For example: student did not calculate the total (equivalent to a C).
   **1 point:** table or graph is incomplete; clearly, the student is off-track with the assignment (equivalent to a D).
   **0 points:** no work is done or only a minimal amount is completed (equivalent to an F).

In order to keep all the work together and organized, all the tables or graphs of a specific assignment are stapled together with the assignment page as the cover page. The rubric scores of each table or graph are added together and the total of the scores is the student’s grade for that specific assignment.

2. Before ending the project, it is recommended that students write self-evaluations. Students are asked three questions:

   - What letter grade do you think you deserve for the supermarket unit?
   - Why?
   - What did you learn?

   Students reflect about what they felt they have learned, what they liked about the project, and what they felt could be improved. The importance of having students reflect on their work cannot be emphasized enough. Self-reflection gives students an opportunity to think about what they have gained from the project, to see how their work might connect to other topics or to their real-world activities, and to feel ownership of the work they have done. (It also provides the teacher with important feedback that can be used to plan subsequent units and to revise the unit for future students.)

3) Students are assigned a grade for their finished portfolios. They can get an A only if they have shared their work with their parents.

Extensions and/or Modifications

Depending on time, available resources, and students’ math skills, the following extensions and/or modifications may be implemented:

1. An electronic spreadsheet can be used to input the shopping list and calculate totals. Students enjoy doing this, but it is time-consuming. Using the electronic spreadsheet reinforces the students’ technology skills.

2. Tax can be calculated on non-consumable goods.

3. Different fractions can be used, such as 2/5, 7/10, 4/7 etc., instead of 1/2, 1/3 and 1/4.

4. Students can make shopping lists in which specific products are discounted and they have to calculate the savings.

This unit has been used as an introduction to the data collection/graphing unit that it precedes. Data collection and graphing can be extended by having students graph pie charts, bar graphs and line graphs and compare them and by asking students to explain which one represents the information the best.