



A Financial Lesson

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1. Overview

This unit is an approximately 5-8 class period lesson for discussion and explanation as well as occasional short (5 minutes) sessions throughout the duration of the project. The duration is ideally 12 weeks, but can be shortened to 6 or less if needed. During this project, students choose an occupation, determine a family and household, setup a monthly budget, pay monthly bills, and file taxes at the end of the project.

2. Purpose

This project had several purposes

Finance is an application of mathematics that is relevant to every student, without exception. Moreover, most assessments of financial options require only basic math skills. Thus we wanted to provide important financial education using the math skills that should be mastered by middle school students.

This project is fairly complex with lots of instructions that need to be followed and parts that need to be put together in order to efficiently and correctly complete it. We felt that such a project would be a good test of skills at the end of the year.

If we manage to have students really buy into this project and they see the result of their financial decisions and spending habits, there is a chance that they will think about some of these tendencies and keep this in mind when they become adults.

Since there is repetition in this project when they pay bills every week (for as many weeks as the project is run), students will have a chance to do similar calculations each week and thus correct mistakes. In this way they are continually being drilled on basic math skills and in some sense told to do it over again, however, it is in a progressive fashion since each time it is done, it is another month and the situation has changed some.

A common theme to teach children is the finiteness of resources. In science class the students learn about fossil fuels and other energy sources. In this lesson they learn that money, as a resource, also has its limits. This may seem obvious, but in working with some of these students, they do not really get it.

3. Objectives

The objectives for this project were to:

- Teach students about finances
- Provide students with a complex activity that is comprised of many smaller parts
- Create a project that promotes student self reflection and assessment
- Create a project that repeatedly drills basic math skills, but in a progressive fashion
- Instill an appreciation for the finiteness of resources, in this case money

4. Indiana Standards Met

4.1. Math

4.1.1. Standard 2 - Computation

Students compute with rational numbers expressed in a variety of forms. They solve problems involving ratios, proportions, and percentages.*

8.2.1 Add, subtract, multiply, and divide rational numbers (integers*, fractions, and terminating decimals) in multi-step problems.

Example: $-3.4 + 2.8 \times 5.75 = ?$, $1\frac{4}{5} + -\frac{3}{8} \times 2\frac{2}{9} = ?$, $81.04 \div 17.4 - 2.79 = ?$.

8.2.3 Use estimation techniques to decide whether answers to computations on a calculator are reasonable.

Example: Your friend uses his calculator to find 15% of \$25 and gets \$375. Without solving, explain why you think the answer is wrong.

4.1.2. Standard 6 - Data Analysis and Probability

Students collect, organize, represent, and interpret relationships in data sets that have one or more variables. They determine probabilities and use them to make predictions about events.

8.6.1 Identify claims based on statistical data and, in simple cases, evaluate the reasonableness of the claims. Design a study to investigate the claim.

Example: A study shows that teenagers who use a certain brand of toothpaste have fewer cavities than those using other brands. Describe how you can test this claim in your school.

8.6.2 Identify different methods of selecting samples, analyzing the strengths and weaknesses of each method, and the possible bias in a sample or display.

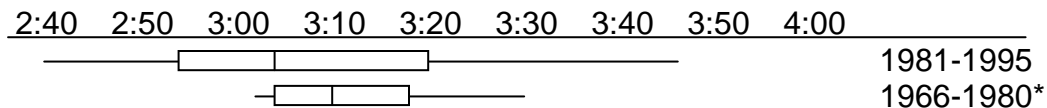
Example: Describe possible bias in the following survey: A local television station has a daily call-in poll. Viewers of the morning and noon newscasts are asked to call one telephone number to answer “yes” and a different telephone number to answer “no.” The results are reported on the six-o’clock newscast.

8.6.3 Understand the meaning of, and be able to identify or compute the minimum value, the lower quartile*, the median*, the upper quartile*, the interquartile range, and the maximum value of a data set.

Example: Arrange a set of test scores in increasing order and find the lowest and highest scores, the median, and the upper and lower quartiles.

8.6.4 Analyze, interpret, and display single- and two-variable data in appropriate bar, line, and circle graphs; stem-and-leaf plots*; and box-and-whisker plots* and explain which types of display are appropriate for various data sets.

Example: The box-and-whisker plots below show winning times (hours:minutes) for the Indianapolis 500 race in selected years:



*Except 1967, 1973, 1975, and 1976.

In the years from 1951-1965, the slowest time was 3 h 57 min. Explain how the slowest time changed through the years 1951-1995. How did winning times change during that period? How did the median times change in the same period?

- 8.6.5 Represent two-variable data with a scatterplot* on the coordinate plane and describe how the data points are distributed. If the pattern appears to be linear, draw a line that appears to best fit the data and write the equation of that line.
Example: Survey some of the students at each grade level in your school, asking them how much time they spend on homework. Plot the grade level and time of each student as a point (grade, time) on a scatter diagram. Describe and justify any relationship between grade and time spent on homework.

4.1.3. Standard 7 - Problem Solving

Students make decisions about how to approach problems and communicate their ideas.

- 8.7.1 Analyze problems by identifying relationships, telling relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
Example: Solve the problem: “For computers, binary numbers are great because they are simple to work with and they use just two values of voltage, magnetism, or other signal. This makes hardware easier to design and more noise resistant. Binary numbers let you represent any amount you want using just two digits: 0 and 1. The number you get when you count ten objects is written 1010. In expanded notation, this is $1 \leq 2^3 + 0 \leq 2^2 + 1 \leq 2^1 + 0 \leq 2^0$. Write the number for thirteen in the binary (base 2) system.” Decide to make an organized list.
- 8.7.2 Make and justify mathematical conjectures based on a general description of a mathematical question or problem.
Example: In the first example, if you have only two symbols, 0 and 1, then one object: 1, two objects: 10, three objects: 11, four objects: 100. Predict the symbol for five objects.
- 8.7.3 Decide when and how to divide a problem into simpler parts.
Example: In the first example, write expanded notation for the number five in base 2; begin with the fact that $5 = 4 + 1$.

Students use strategies, skills, and concepts in finding and communicating solutions to problems.

- 8.7.4 Apply strategies and results from simpler problems to solve more complex problems.
Example: In the first example, write the first five numbers in base 2 notation and look for a pattern.
- 8.7.5 Make and test conjectures using inductive reasoning.
Example: In the first example, predict the base 2 notation for six objects, then use expanded notation to test your prediction.
- 8.7.6 Express solutions clearly and logically using the appropriate mathematical terms and notation. Support solutions with evidence in both verbal and symbolic work.

Example: In the first example, explain how you will find the base two notation for thirteen objects.

- 8.7.7 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
Example: Measure the length and width of a basketball court. Use the Pythagorean Theorem to calculate the length of a diagonal. How accurately should you give your answer?
- 8.7.8 Select and apply appropriate methods for estimating results of rational-number computations.
Example: Use a calculator to find the cube of 15. Check your answer by finding the cubes of 10 and 20.
- 8.7.9 Use graphing to estimate solutions and check the estimates with analytic approaches.
Example: Use a graphing calculator to draw the straight line $x + y = 10$. Use this to estimate solutions of the inequality $x + y > 10$ by testing points on each side of the line.
- 8.7.10 Make precise calculations and check the validity of the results in the context of the problem.
Example: In the first example, list the first thirteen numbers in base 2 notation. Use patterns or expanded notation to confirm your list.

Students determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.

- 8.7.11 Decide whether a solution is reasonable in the context of the original situation.
Example: In the basketball court example, does the accuracy of your answer depend on your initial measuring?
- 8.7.12 Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems.
Example: In the first example, use your list of base 2 numbers to add numbers in base 2.
Explain exactly how your addition process works.

5. Methods

5.1. Materials & Resources

The materials required for this activity are:

- Computer with MS Excel

5.2. Procedures

5.2.1. Preparation

An excel file is created for each student to track how they spend their money and an excel file is created for random events that is linked to each students file (see section 7)

5.2.2. Finding your dream job (1-2 period)

This part of the activity is for the students to choose an occupation. They work through a worksheet that ascertains their like/dislikes in regards to classes and hobbies, desired education level, and ideal job description (see section 7). They then go to the website [HTTP://WWW.BLS.GOV/K12](http://www.bls.gov/k12) and find a suitable job. They need to summarize the duties that need to be performed for this job, and record the annual salary. This was done over a two periods in science class.

5.2.3. The spouse, the kids, and where you live (1-2 periods)

The next activity is for the students to decide their family, monthly income, type of house, type of car, and calculate their set monthly bills. Set monthly bills are the bills that need to be paid to maintain their basic lifestyle like where they live and what they drive. This is all calculated with a worksheet (see section 7). This was one of the most enjoyable parts of this project for the students.

To decide family, a playing card was given to each student. A table was then drawn on the board that determined spouse, spouse's salary, and number of children.

Hearts	Diamonds	Clubs	Spades		# of kids	# of kids
Married	Married	Single	Single		Hearts/Clubs	Diamonds/Spades
				A	0	3
Spouse Income:	Spouse Income:			K	0	3
A = yours	A = yours			Q	1	2
				J	1	2
Otherwise	Otherwise			10	2	1
½ yours	0			9	2	1
				8	3	0

The table was filled in step by step to create some suspense. This was exciting for the students.

The next step was computing monthly income using the annual salary that was done in 5.2.2. Remind them that the annual salary is not just theirs, but the sum of theirs and their spouses. This is not difficult for students; however, some do have trouble rounding to the nearest cent, which I require for tracking their expenses later on.

Now that family and monthly income has been determined, the students can decide what kind of house they want to live in and what kind of car they want to drive. They have three options for each, which is explained in a handout (see section 7). Urge them to keep in mind how much money they make and how many family members they have. After these have been chosen, the set monthly bills can be computed.

This can be done in 1 period. However if it is done in two, it gives students a chance to try a few options and be comfortable with their choices.

5.2.4. Optional monthly bills (2 periods)

The next step is to explain what optional bills the students may choose to pay. These include cable, phone, insurance, and entertainment. All of the information is contained on a handout (see section 7). This is confusing to students at first, so we took our time explaining it to them. However, the main point of these two class periods was not to just explain how to fill out the bill sheet, but to have discussions about the different bills. In particular, the cost of food was a big shock to most students. Also, how credit cards work was not known by most students. They understood that borrowed money needed to be paid back, but they did not know that interest was charged. They were also unfamiliar with a minimal payment and the penalties that can be charged for not paying the minimal payment.

5.2.5. Paying monthly bills and random events (12 weeks)

Now the students are ready to go. Each week represents a month. The students turn in a bill sheet and this constitutes paying the bills for that month. Here is how some situations are handled:

- Overpayment of a bill results in lost money, no credit is given.
- Underpayment of a bill results in a late charge of the money plus 10%.
- Overspending for total monthly expenses (above what is in checking account) results in a credit card charge.

Although we have discussed the importance of having insurance, a student may still wonder why is paying for insurance important in this project. This is actually a really good question. If there is no benefit during the project, why pay for it, regardless of how it is in real life. To add such importance for things like insurance into this project, there are random events. Two random events happen every week (every month in the project world). One event benefits students, the other costs them money. The students that will be affected by these events are determined by the playing card that was dealt to them at the beginning of the project.

During these weeks, the students are also given a handout for tracking their checking and savings accounts (see section 7).

5.2.6. Tax time (1-2 periods)

At the end of the 12 weeks the students need to fill out a tax form and pay taxes if they are owed. Otherwise they get a refund. The tax form is a modified version of a 1040EZ form (see section 7).

At the time of this writing, this part has not yet been completed.

5.3. Tracking the students data

An Excel file is created for each student. This file has several tabs.

The first tab holds the data obtained from *Set Monthly Bills* worksheet (see section 7). All that needs to be entered is the name of student, occupation, annual salary, and playing card. The rest is then calculated using formulas in Excel.

The next twelve tabs are the months were bills are paid. Only the data that corresponds to the bill sheet that they turn in is entered, the rest is calculated in Excel. Overpayment of a bill is highlighted in blue and underpayment is highlighted in red. Thus for grading, I simply circle the incorrect answer and put a plus for overpayment and minus for underpayment. The credit card balance, minimal amount due, and late charges are written on the student's bill sheet for the next month and handed back to them.

The next two tabs are the midyear and end of the year summaries that give a complete breakdown of how the students spent their money. This will be used for discussions, presentations, and for them filing their taxes.

The next tab is the tax form. Data is entered from the sheet that students turn in, and it will display the errors.

6. Scope

We have 5-8 class periods of explanation and discussion and a period of 12 weeks where short sessions of 5 minutes or so are needed to turn in bills sheets, decide the random events and who they will affect, and answer any questions that arise. It may be good to add some discussion days throughout. For example you may find students are putting money into a savings account that has an interest rate of 1%/month, while having credit card debt that is accruing interest at 1.7%/month. There could be a good discussion about paying off high interest debt before saving money. Even though saving money is a good thing, sometimes it is not always the best option. It is this kind of financial sense that I am striving for with this project. The 12 weeks can be shortened to any number of weeks that fits your schedule. We only did this for 6 weeks. We just told the students that they were starting their job in the middle of year.

7. Activities, worksheets, and templates

The following MS Word worksheets are available for use in this lesson:



Your Dream Job

The following MS Excel spreadsheets are available for use in this lesson:



Set Monthly Bills



Home & Car



Finance Pay Sheet
Instructions



Finance Pay Sheet



Checking and
Savings



KRS 2EZ Tax Sheet



Student File



Random Events

8. Evaluation

This project will be treated as a test grade. All worksheets turned in will be graded. However, since this project is in progress, we are unsure about the assessment at the end. This may very well be in the form of a presentation for each student.