

Designing, assigning and assessing projects in the classroom

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Abstract: This workshop presented the construction and assessment of projects in the Liberal Arts Mathematics or Quantitative Literacy classroom. The workshop also covered group projects: how to assign groups and how to assess group projects. There were many opportunities for participant discussion and sharing.

- I. Started with a brief background of myself and my institution, Triton College, River Grove, IL.
- II. Topics covered in Liberal Arts Mathematics
 - Set Theory
 - Logic
 - Consumer math- buying a house, a car
 - Basic statistics with graphing calculator
- III. Topics covered in Quantitative Literacy
 - Voting Theory
 - Graph Theory
 - Fibonacci numbers and the Golden Rectangle
 - Symmetry
 - Normal curve
- IV. Interviews- why use projects?

Interview with Dr. O'Connell, mathematics department chair at Triton College, River Grove, IL

Q: When did you start doing projects in your Liberal Arts mathematics classroom?

A: 15 years ago

Q: Why do you do projects?

A: The students I was teaching were not math inclined. I wanted to create an experience in which they could see how math is used in everyday life, in which they could challenge themselves to think more clearly and in which they could do college-level work they could be proud of.

Q: What benefits do the students derive from doing projects?

A: They use every day life skills like writing a resume, researching a mortgage, using the internet, writing a convincing argument and analyzing statistics presented in a newspaper.

Q: What challenges have you experienced in assigning projects?

A: It has been a challenge to get the students to submit quality work on time. As a result I am brutal in grading the first project. Most students get C's D's and F's. I then give them one chance to resubmit the work (within 2-3 days). I regret it and give them the second grade. I tell the students that they should be really proud of the work they hand in.

- Me
- My (Cynthia Harris') answers

Q: When did you start doing projects in your Liberal Arts mathematics classroom?

A: I began assigning projects when I began teaching quantitative literacy five years ago. The instructor's manual told me to assign projects but after a thorough search, I found out that no projects were provided. In math for elementary teachers, I wanted at least a small part of the course to cover methods.

Q: Why do you do projects/what are the benefits?

- A:
1. To engage the students.
 2. To give them something with a real-world context.
 3. To apply what they have learned to a new situation, thus developing higher-order thinking skills.
 4. As an alternate form of assessment for students who do not test well.
 5. To learn to work with others.
 6. To teach them to carefully read and follow directions.

Q: What challenges have you experienced in assigning projects?

A: It has been a challenge to clearly state the directions for projects, to fairly grade projects, to assign groups and monitor how they work together and on some projects, to guard against plagiarism.

- V. Pass out Projects packet
- Original projects- If you would like a copy of the Sample Projects Packet, e-mail me at charri32@triton.edu and I will mail you one.
 - Discuss four of the projects in the packet in terms of successes and challenges
- VI. Brainstorm topics on which to do a project
- Write on whiteboard
 - Vote
 - Pick top 3
 - Divide into groups based on top three
 - Design a project around your topic
 - Pass out instructions

Directions for Group Work “Designing a Project”

1. Count off 1-5 or 1-4 so each person has a number.
2. Select a recorder. If no one volunteers, #2 is the Recorder.
3. Select a facilitator. If no one volunteers, #3 is the Facilitator.
4. Have a brief discussion about what would be taught under your given topic.
5. Brainstorm ideas for activities that would apply what the students have learned in class to a new situation. The Facilitator should facilitate, the Recorder should record.
6. Select one idea.
7. Write it up and refine it as much as time permits.
8. Copy it onto an overhead sheet(s). Write big. (#1, 4 or 5 should do this)
 - You have 35 minutes

VII. Look at the completed projects

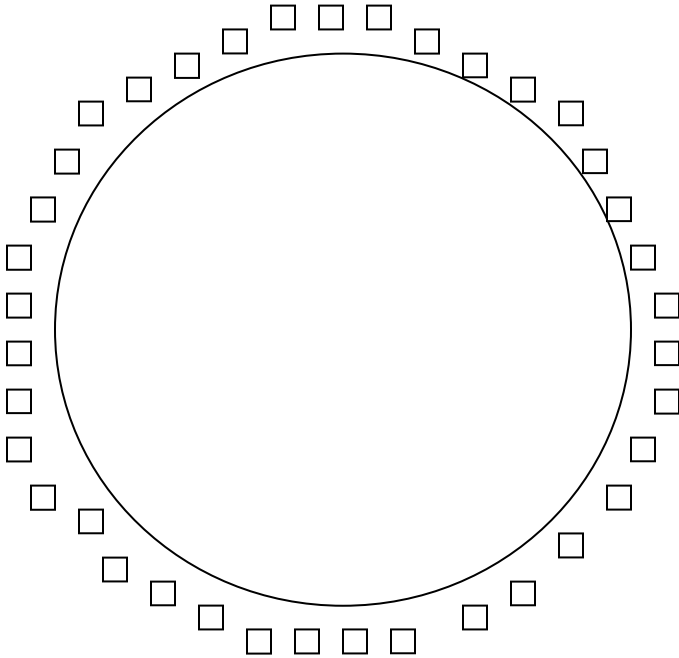
Note: bear in mind that this was 35 minute group exercise. Although the results are excellent, they are not finished products. I transposed them from overheads, making as few changes as possible.

Probability Project - Roulette

You are going to spend an evening at Harrah’s Casino. You have \$100 to bet on roulette.

1. From a website, determine the odds for each type of bet.
2. Convert these odds to probabilities.
3. Design a simulated roulette wheel. (Fill in the numbers 00, 0 and 1-36 on the diagram on the next page.)
4. Make 10 bets of \$10 each.
5. Record the amount of money you have left.
6. Is it more or less than you expected?
7. What is the expected value of your \$100?

8. What does it mean to the casino?



Logic Project 1- arguments

1. Find an argument from each of the following sources:
 - a. Print (magazine, newspaper)
 - b. TV/radio
 - c. Internet
 - d. Personal Experience (conversation)
2. Translate the arguments into formal English statements. Use the format given in the text.
3. Translate the arguments into symbolic form.
4. Make a Truth Table for each argument.
5. Determine whether the argument is valid or not valid.
6. Write an explanation to the original author discussing your conclusion.
7. Document your sources.

Logic Project 2- home buying

Logic- Home Buying Criteria Project

9. Get a “homes for sale” or real estate newspaper classified ads.

10. Select 20 homes that clearly can be labeled with each of the following criteria:
 - Cost ($\leq \$200,000$ or $\geq \$200,000$)
 - Bedrooms (≤ 3 bedrooms or > 3 bedrooms)
 - Bathrooms (1 or ≥ 2)
 - New or previously owned
11. Make a table of the data and label each characteristic with a letter.
12. Let p be > 3 bedrooms, q be ≥ 2 baths, r be new construction. Determine which home satisfies $p \wedge q \wedge r$.
13. Select the top three criteria important to you and write a logic statement representing this type of home.
14. Go to the website of a realtor to see how logic is used to determine “your home”.

Consumer Math Project- buying a car

[Dealer Ad Attached]

15. Go to three different lenders and find their interest rates for a 5-year new car loan.
(from #3, I assume we are looking for lenders that offer “cash back”)
16. Taking the dealer’s offer of 0% financing for 5 years, what is the total cost of the car? *(I assume the ad offers 0% interest.)*
17. Assuming simple interest for five years, compute the total cost of the car for each lender (taking the cash back).
18. Assuming interest is compounded monthly, repeat part 3.
19. Compare your results from #3 and #4. Which option is better?
20. Assuming simple interest for 5 years, determine the *(an)* interest rate *(and cash back amount)* from a lender that would yield a total cost equal to that in #2.
21. Repeat #6 using compound interest.
22. How does compounding affect the rate *(payment/total amount paid)*?

Statistics Project -M&M’s

Note: this project is loosely based on an older edition of “Modern Mathematics” by Wheeler. Many other writers, including M & M Mars have adopted the idea of using M&M’s™ to obtain data.

Distribute an unopened snack pack of M&M’s™ to each person.

1. Guess the number of M&M’s in your package.
2. Open the package and count the number of M&M’s, then count and record the number of each color.
3. For each color, calculate the mean, median, mode, standard deviation for the class.
4. Do the same for the data of how many in a package.
5. Create a bar graph for the data in #4. Can you manipulate the bar graph to look like a normal curve?

Discuss the normal curve in terms of standard deviation and the 68-95-99.5 rule.

6. Use a box-and-whiskers graph to show the data.

As you can see, the possibilities of how to represent and analyze the data are extensive!

VIII. Selecting Groups in the classroom

- Assign geographically
- Count off
- Self Select
- OTHER IDEAS- by birthdays, by seating, using a deck of cards

IX. Grading Projects

- Hand out Rubric Packet- look at rubrics in the packet
- 20-30% of final grade
- General Rubric form

Template for Analytic Rubrics					
	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score
Criteria #1	Description reflecting beginning level of performance	Description reflecting movement toward mastery level of performance	Description reflecting achievement of mastery level of performance	Description reflecting highest level of performance	
Criteria #2	Description reflecting beginning	Description reflecting movement toward	Description reflecting achievement of	Description reflecting highest level	

	level of performance	mastery level of performance	mastery level of performance	of performance	
Criteria #3	Description reflecting beginning level of performance	Description reflecting movement toward mastery level of performance	Description reflecting achievement of mastery level of performance	Description reflecting highest level of performance	
Criteria #4	Description reflecting beginning level of performance	Description reflecting movement toward mastery level of performance	Description reflecting achievement of mastery level of performance	Description reflecting highest level of performance	

Simpler form

Chapter 5 Project- Scoring Rubric

This project is worth 50 points.

Created a problem which requires an Euler path or circuit to solve (10)	_____
Drew a graph to represent the problem (10)	_____
Named the vertices, edges, loops, bridges and degree of each vertex correctly (10)	_____
Correctly analyzed the existence of an Euler path or circuit (10)	_____
Solved the problem by showing an E.P., E.C. or Eulerizing to find an optimal path (10)	_____
Creativity (+5)	_____
Total	_____

Pros and cons of “chart” form versus simpler form

X. If you have any questions about any of the information you have read here, please e-mail me at charri32@triton.edu