

Title: Group Multiple Representation Algebra Project

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Purpose for Project: We each taught different levels of algebra but still wanted to help students to understand and connect the different representations; equations, graphs, and tables. The students also needed to understand the advantages and disadvantages of each representation.

Desired Goals: 1.) be able to convert from one representation to another,
2.) understand when one representation is the best choice,
3.) enjoy using data they found that was relevant to their area of study.

Indicators of Success: For each goal in order:

- 1.) The students started the project with data they found (in table form) and were asked to convert into graphs and equations. This was graded.
- 2.) As part of each assignment, the students were asked how to find particular information once they graphed the data and found the equations. This was graded.
- 3.) In the final questionnaire about the project the students were asked about the requirement to provide their data. This was not graded.

Project Description: The algebra project was generally in three parts. The first part asked the students to get into groups of no more than four people that had similar areas of study. They then were to find data, in table form, which explored a question of interest. Depending upon the level of the algebra course the data may have had a requirement such as being linear. The Parts of the project were given out as the semester progressed and the groups were given plenty of time to complete the work. If possible, time was given in class for the group members to coordinate among themselves occasionally. A last note, we did allow students to work alone if they felt very strongly against working in groups.

Questions in Part I asked the groups to explain where the data came from, why they chose it, why they believed it was a good data set (coming from a website was not good enough). Besides providing ten data points, the students needed to determine what the dependent and independent variables were and why. We asked many “why” questions. We did provide possible websites for the students to find data, such as the CDC, NSF, Census Bureau, etc.

Questions in Part II asked the groups to graph the data, labeling the graph appropriately. Next they were to pick any two interesting points on the graph and explain what the point means in terms of the problem, not the math. Depending upon the level of the algebra, the groups could be asked to compare their graph with the different families of graphs (linear, quadratic, logistic, etc.) and determine which their graph fits most closely. In addition the groups are asked to discuss the y- and x-intercepts in terms of the problem, not the math. Also, the groups were asked to make predictions from the data and to determine if it was a valid predication. Besides the normal line graph we usually see in mathematics, the students are asked to decide which other types of graphs (bar graph, pie chart, etc.) would give additional information about the data and to show it.

Part III was mainly the evaluation for the project. It asked the students about their experience with the project, and asked for suggestions for improving. Also, it had a peer evaluation portion where the students could grade each member of their group for effort and cooperation.

Project Results: There were many pros and cons.

On the pro side:

- students saw a relationship between the textbook mathematics and real-life,
- students were able to choose data they were interested in,
- majority of students enjoy group work, it reduces some anxiety
- as instructors we noticed “misconceptions” prior to exams that we could correct.
- students realized that data is not “neat and orderly” in real-life.
- some students said the projects helped them to understand elements like “slope” better.

On the con side:

- limit where the students can get data; some were overwhelmed with the choices and did not know where to start or what a good data set was.
- at times the project was a bit ahead of the lecture material.
- writing skills were weak, therefore the “why” questions proved to be difficult for students to give complete answers without using mathematics.
- working in groups was difficult because most students work and only see each other in class.

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In the future:

- take class time to walk the students through one completed project from the beginning with finding the data and through many projected questions that will need to be answered.
- would limit the types of functions that the college algebra class used so the project would not be ahead of lecture.
- one of us (had a college algebra class) did make this an individual assignment but would use groups in the future.
- another of us (had a beginning algebra class) would use one data set for the whole class and have each student work on it individually. She felt the beginning algebra class did not have enough math background or confidence to do this project without direct guidance and therefore groups would not be needed.
- Provide a set amount of time (10 – 20 minutes) each week or so in class for the students in each group to meet.
- one suggestion for the college algebra level would be to break the project down into different data sets (provided by instructor) that represent each family of functions, essentially several mini-projects.
- collect data as early as possible in the semester.
- in-class presentations would be nice if there is time.

Yes, each of us will do this again. Going through it once showed the great potential this type of project has and how easily it can be customized for any class at any level. It is an opportunity to not only connect different representations within algebra but to connect mathematics and writing.

Evaluation Method: Each Part of the project was graded and a questionnaire was given at the end of the semester. Also, each Part was reviewed in detail in class when returned graded. The project counted as 5% of the course grade. This was enough to encourage the students to take it seriously but not enough to hurt a student's grade if the project had serious flaws.