Improving Student Engagement in Mathematics Classes through Active Learning Strategies

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Why Active learning in Mathematics and Statistics?

Role of Mathematics and Statistics is Changing:
- More fields require more mathematics (e.g. data science, bioinformatics, finance)
- Most of the business and government decision-making require data analysis

Technology has Changed the Way Mathematics and Statistics are Done:
- Python, MATLAB, Mathematica, Excel, statistical software, etc.
- Data source is growing and we need skillset to analyze those data
- Business and industry run on technology

Students are Changing:
- Expect to see how mathematics is related to their field of interest. Expect to use technology
- Don’t learn well in passive lectures
To Enable Students to Use Their Mathematics in Other Settings

- **Mathematics** needs to be taught showing its connections to other fields
  - Otherwise students think of it as unrelated and not useful

- Problems are needed that probe student conceptual understanding
  - Otherwise some students only memorize

This is true for any subject. However, math is special in this aspect.....✿

Why we need to approach mathematics learning this way?
We would like to go from this
Life skills through mathematics

To this.

Why these skills are important?

Asking Questions

Collaborating as a team

Communicating the findings/report to general audience
Currently, most of the students are not realizing the importance of the General Education courses and its connection to their respective majors.

Instead they treat these courses as one of the GE checklist. For example, Math 1040 (Intro. to Stat).

Most of the students in Math 1040 are nursing, criminal justice, exercise science, and psychology majors.

It is critical that these majors understand statistics by applying the classroom knowledge to their future careers.
How do we change this attitude within the student population?
Last Fall, I was experimenting an semester long project to encourage students to do statistics in Math 1040 class through hands-on activities by stressing conceptual understanding rather than memorization of procedures.

This project stressed the importance of the Math 1040 (GE course) and made students to understand the connection to their major study.
Students picked a data set (based on their passion or major study) from StatCrunch (https://www.statcrunch.com/).

Students gave a brief description of the data set and sample methods, and why they chose specific methods for their topic.

Depending on the data set, students used skills from the lecture to either display the data, gave an analysis or both.
After students analyze the data set, they should write a short summary describing the analysis of the data set. Specifically, what their Display/Quantitative analysis describe about the sample (descriptive statistics).

Students should at least once, after finishing the paper, meet with the writing tutor.
Sample Data Sets/Projects

- Nutritional Data for Fast Food 2017
- Shark Attacks Worldwide
- Dental Hygiene
- Cancer Survival
- Super Heroes
- NBA Salary 2017
- Movie Budgets and Box Office Earnings
### Grading Rubric Math 1040 Part 1

*Data set, analysis, and conclusion*

*Due Date: ***********

<table>
<thead>
<tr>
<th>Grading Criteria</th>
<th>Possible Points</th>
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<tbody>
<tr>
<td>Pick a Data Set (Explain why you chose this particular data set)</td>
<td>15</td>
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<tr>
<td>Survey methodology (describing the data - at least 5 qualitative/5 quantitative)</td>
<td>20</td>
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<tr>
<td>Display/Quantitative analysis of the data set</td>
<td>25</td>
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<tr>
<td>Summary of the survey</td>
<td>30</td>
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<tr>
<td>Meeting with the writing tutor</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>100</strong></td>
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Statistic Poster Showcase

https://youtu.be/WDsmutfsc
Feedback from the students:

➢ The project was pretty fun. I liked it more than a regular class with regular class work. It did take a lot of time and effort, but it was worth it. I was fairly nervous for the first judge but after getting to practice the second judge was easier. The project overall was a good idea only commentary would be to do it earlier in the semester.

➢ I enjoyed the poster presentation because it was a good rather than doing the homework. It was good to be able to apply statistics to real life. **It might be good to do a group project so that if one student is lacking knowledge on one subject another can help them.**

➢ I thought the poster was a great experience having students present is typically something only found in upper division classes. It always increases learning when students must teach, giving us a long-term goal to accomplish was also very pragmatic.

https://youtu.be/W12Dsmutfsc
Feedback from the students:

- The project was useful to me because it helped me put everything that we learned all semester into a real-life scenario, and I was glad we got to choose our data sets because I was really interested in my data set, so it helped my motivation to do it. I think although it took a ton of time and was frustrating at some points, it was a good experience.

- I didn’t expect to do the presentation when I signed up for this class. When I found out that it was required, I didn’t want to do it, but I feel that in doing self-motivated research and application of ideas. I learned better than simply doing assignments.

- The presentation of projects has helped me understand how statistics work in real life situations especially with in my major.

- I will admit, at first, I did not get too excited about the project. But at the day of presentation, my perspective changed. I realized how cool it was. I enjoyed talking about my data and the findings I made. It was fun! It was much better than studying another unit for a test. Thank you, Vino! Fun project!
Acknowledgement

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Any Questions?
Thanks!

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