Mar 23rd, 9:30 AM - 9:50 AM

A flipped large Calculus 1 class; first observations and conclusions

Piotr Mikusinski
University of Central Florida, piotr.mikusinski@ucf.edu

Follow this and additional works at: https://digitalcommons.georgiasouthern.edu/stem

Recommended Citation
Mikusinski, Piotr, "A flipped large Calculus 1 class; first observations and conclusions" (2019). Interdisciplinary STEM Teaching & Learning Conference. 35.

This event is brought to you for free and open access by the Conferences & Events at Digital Commons@Georgia Southern. It has been accepted for inclusion in Interdisciplinary STEM Teaching & Learning Conference by an authorized administrator of Digital Commons@Georgia Southern. For more information, please contact digitalcommons@georgiasouthern.edu.
A flipped large Calculus 1 class; first observations and conclusions

Piotr Mikusinski, University of Central Florida

Interdisciplinary STEM Teaching & Learning Conference, Savannah, GA, March 21-23, 2019
Some information about the class

- Enrollment: 230 students (all FTICs)
- The class was offered as part of our EXCEL program
- The class met for 80 minutes on Tuesdays and Thursdays in a large classroom
- On Fridays students met in 80-minute recitation sections taught by TAs (up to 50 students per section)
- Initially, all students had to spend three hours per week in the EXCEL lab.
Some information about the class

Students are selected into the EXCEL program by the following criteria:

- Must meet the university criteria to be in Calculus 1.
- Declared a calculus based STEM major (a major that requires at least Calculus 1).
- Minimally qualified to enter in College Algebra and the highest math placement they can have is Calculus 3.
Course organization

Before coming to class:
- Read the assigned section in the textbook
- Read the summary in webcourses
- Complete the online pre-homework in WEBASSIGN

In class:
- Take a wake-up quiz (a problem from the pre-homework)
- Work on problems posted in class
- Discuss the posted problems and solutions with classmates, LAs, and TAs
- Listen carefully to the explanations by the instructor
- Take quizzes that check understanding of the discussed material
Course organization

After class:

- Complete the online homework in WEBASSIGN
- Discuss problems with classmates in Piazza
- Study in the EXCEL LAB
- **Participate** in the recitations
  - Work on the assigned problems in small groups
  - Present and discuss solutions
  - Take the weekly quiz
## Grading Policy

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>WebAssign Homework</td>
<td>5%</td>
</tr>
<tr>
<td>In-class iclicker questions</td>
<td>3%</td>
</tr>
<tr>
<td>Recitation participation</td>
<td>3%</td>
</tr>
<tr>
<td>EXCEL/COMPASS Lab participation</td>
<td>3%</td>
</tr>
<tr>
<td>Piazza activity</td>
<td>1%</td>
</tr>
<tr>
<td>Recitation Quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Mid-Term Exam Average (3 mid-term exams)</td>
<td>45%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
</tbody>
</table>
Resources

- Textbook
- Summaries
- Videos
- Online homework
- LAs
- TA
- Other students taking this class
- Recitations
- LAB
- Reviews
- Piazza
- My office hours
A typical class
Find the derivative of $f(x) = (x^4 + 5x^2 - 3)^6$.

A $f'(x) = (24x^3 + 60x)(x^4 + 5x^2 - 3)^5$

B $f'(x) = 6(4x^3 + 10x)^5$

C $f'(x) = (4x^3 + 10x)^6$

D $f'(x) = 6(x^4 + 5x^2 - 3)^5$

E None of the above.
The Chain Rule:

\[ (f(g(x)))' = f'(g(x))g'(x) \]

\[ \frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx} \]

\[ (f(\Box))' = f'(\Box)(\Box)' \]
Find the derivative of $f(x) = (2x + 7)^4$. 
Problem 2

Derive a formula for the derivative of $f(g(h(x)))$. 
Problem 3

Find the derivative of $f(x) = \sin \left( e^{\sqrt{x^2+1}} \right)$. 
If $f$ and $g$ are both differentiable and $h = f \circ g$, then $h'(2)$ equals

A $f'(2) \circ g'(2)$

B $f'(2)g'(2)$

C $f'(g(2))g'(2)$

D $f'(g(x))g'(2)$

E Not enough information.
Problem 4

Find the derivative of $f(x) = \sqrt{\frac{1+\cos^2 x}{1+e^{x^2}}}$. 
Find $h'(3)$ if $h(x) = f(g(x))$ and

<table>
<thead>
<tr>
<th>$x$</th>
<th>$f(x)$</th>
<th>$g(x)$</th>
<th>$f'(x)$</th>
<th>$g'(x)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>2</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>1</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>
The area of a circle $A = \pi r^2$ changes as its radius changes. If the radius changes with respect to time, the change in area with respect to time is

A. $\frac{dA}{dr} = 2\pi r$

B. $\frac{dA}{dt} = 2\pi r + \frac{dr}{dt}$

C. $\frac{dA}{dt} = \pi r^2$

D. $\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$

E. Not enough information.
Problem 6

Find the derivative of \( f(x) = \sqrt{x + \sqrt{x + \sqrt{x}}} \).
Problem 7

Find the derivative of \( f(x) = \frac{2^{3x}}{32x} \).
I Am done!

I think I am done, But I am not sure.

I am Confused. Please help me!

I just starteD.
Students’ performance

Total semester percentages

- [3, 16]: 10
- [16, 29]: 10
- [29, 42]: 10
- [42, 55]: 20
- [55, 68]: 20
- [68, 81]: 50
- [81, 94]: 80
- [94, 107]: 10
The professor kept the class interesting and pretty active.
I really enjoyed how Professor Mikusinski incorporated a sense of community in this class.
He always made the class enjoyable and we actually wanted to participate. It never felt forceful.
I liked the utilization of iclickers to encourage participation in the course. Professor Mikusinski made it so that the majority of the iclicker questions were used for participation and arriving at a correct solution would add points. I thought this was a great set up for the iclicker as it didn’t punish students who were still learning concepts, but still encouraged them to participate and do well. I thought Professor Mikusinski’s teaching style was very helpful as I learn concepts more easily by working problems.
Students comments: What did you like best about the course and/or how the instructor taught it?

- Allowing students to work together to solve problems and discuss concepts.
- I greatly enjoyed how interactive the course was with the iClicker questions. The reversed classroom style was greatly more interactive.
- I liked how we were able to collaborate with the people sitting next to us.
- Funny, and very engaging.
- I liked the course summaries provided the most because it helped give me a good idea of what the professor expected.
- What I liked best about this course was that we had our 6 LAs.
- I liked how he explained some topics in class and didn’t leave instruction solely to the textbook.
Please, please, just **actually teach**.

I did not enjoy having to learn the material before the class by myself.

There needs to be **more teaching**. People often times don’t understand the homework and then they’re expected to know it all? No. Some things just need to be taught.

**Start by teaching** the lesson.

This class was awful for me personally. The professor was very unreliable and I’ve been relying on myself and prior knowledge to learn. The class is **not engaging and does not stimulate learning** for me at all.
Students comments: What suggestions do you have for improving the course and/or how the instructor taught it?

- Reverse classroom is **ineffective** as the material is never clearly explained.
- Not teaching it reverse classroom but **having an actual lecture**, myself personally is able to retain knowledge and understand it significantly better if it is taught the traditional way.
- We **didn’t learn much during the class**, just did practice problems.
- **Actually teaching the concepts** instead of trying to teach us through problem based learning.
- I **don’t feel like ”active learning” style courses are beneficial** to students, especially with a challenging math course such as calculus.
Student Perception of Instruction

Effectiveness organizing the course

- Excellent
- Very good
- Good
- Fair
- Poor
Effectiveness communicating ideas and/or information

- Excellent
- Very good
- Good
- Fair
- Poor
Student Perception of Instruction

Effectiveness stimulating interest in the course

- Excellent
- Very good
- Good
- Fair
- Poor
Effectiveness creating an environment that helps students learn

- Excellent
- Very good
- Good
- Fair
- Poor
Student Perception of Instruction

Overall effectiveness of the instructor

- Excellent
- Very good
- Good
- Fair
- Poor
Conclusions

- An active learning class can be an effective way to teach calculus in large classes.
- LAs are essential.

What would I like to change or improve?
- Include a short review at the beginning of every class.
- Better “marketing” of the class format to students.
- Expand the online component.
- Provide an adaptive tool to help students with their deficiencies.
Thank you!