FLIPPING CALCULUS AT CAL STATE LA

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The Calculus Flippers



Lusine Kopusyan
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Sui Man
Emma Lopez

Calculus Instructors

Silvia Heubach
Faculty Learning
Community Coordinator



FitW Grant Effectiveness Study

- In-depth study for Calculus I over two semesters
- At Cal State LA, 4 instructors taught 2 sections of Calculus I, one in flipped, and one in regular mode
- Number of students in flipped sections: 77
- Number of students in non-flipped sections: 102
- Students were told about flipped or non-flipped mode of instruction on the first day of class (to avoid selection bias)

Study Design

- Math Diagnostic Testing Protocol (MDTP) pre-test was given to all 8 sections
- Post-test and survey on effectiveness was given to all sections at the end of the semester
- Students will be followed to see how well they do in subsequent classes
- In Fall 2018, the study will be repeated with 4 instructors teaching paired sections of Calculus I

Common Course Structure

- Common syllabus
- Pre-reading assignments from textbook
- Videos on definitions and concepts
- Lesson plans
- In-class activities
- Common final (for all flipped and non-flipped sections)

Common Challenges

- Several students wanted to switch sections after finding out about flipped mode of instruction
- After three weeks, most students adjusted to flipped mode, but several still had resentment
- Intervention: We created a presentation on reasons for flipped approach and visited all four flipped sections (around week four)
- Moral: Next semester will visit classes much earlier with this presentation – Student buy-in is crucial!

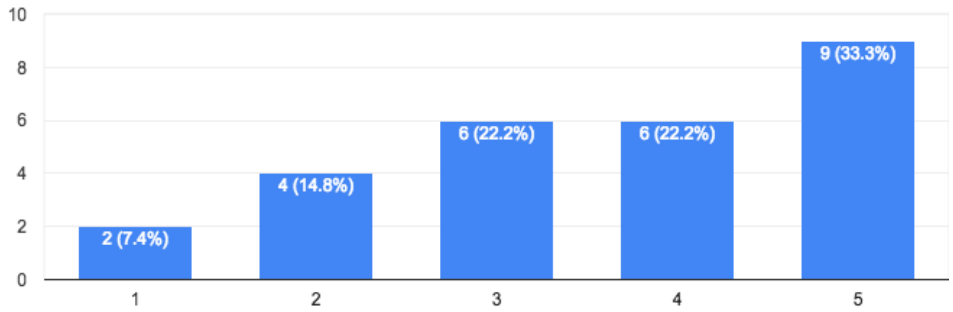
Mid-Semester Evaluation

- All students were given an anonymous Google survey controlled by the coordinator.
- Students were free to give their name to receive some participation points
- Response rate: 35% (flipped) and 75% (non-flip)
- Comments for flipped sections ranged from “I hate it, don’t’ do it” to specific comments for improvement and a few “likes”

The Good

Working in pairs and groups really help me understand the materials by discussing, working out the problems, and completing the task together.

27 responses



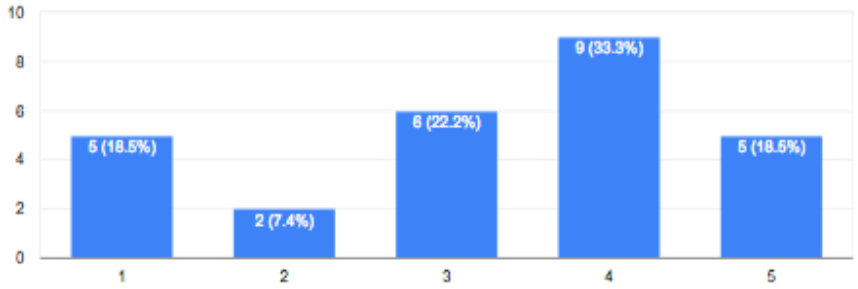
1 = Strongly disagree

5 = strongly agree

While students ranked the active learning strategies as positive

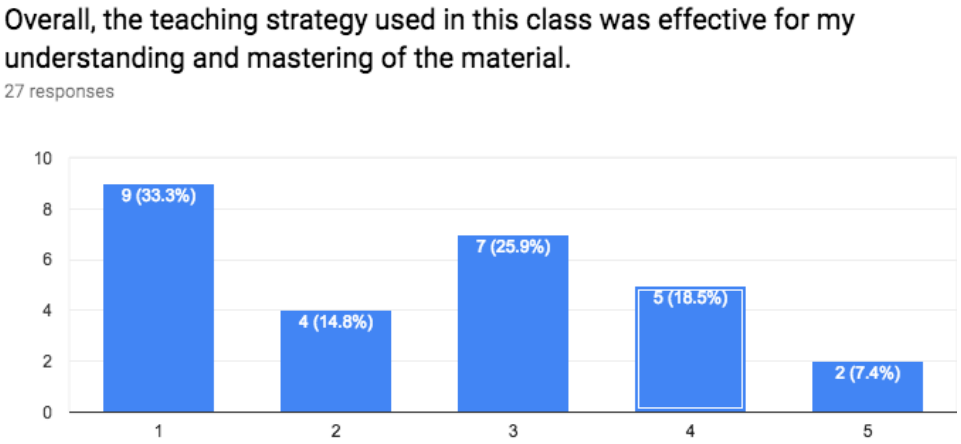
The in-class active learning strategies contribute to my understanding of the course materials before leaving the classroom. I am making significant contributions in my group learning activities that enhances my understanding.

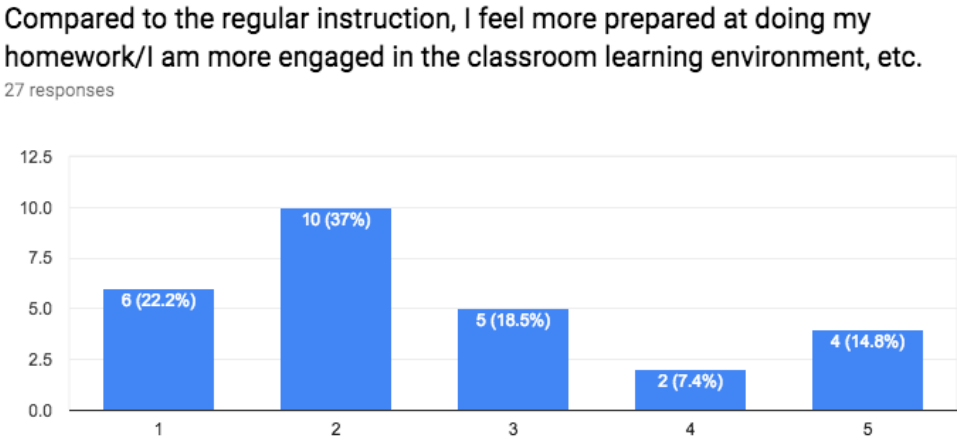
27 responses



The Bad

This did not translate to their overall perception of the course

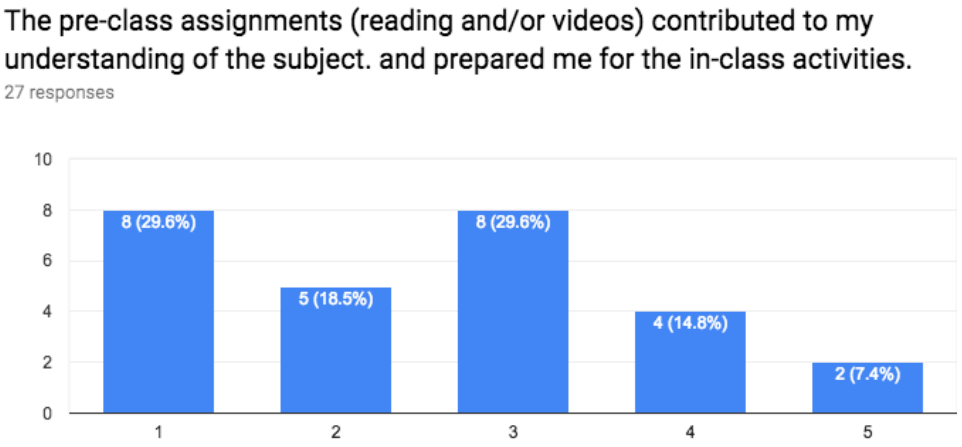




1 = Strongly disagree

5 = strongly agree

The Ugly



1 = Strongly disagree

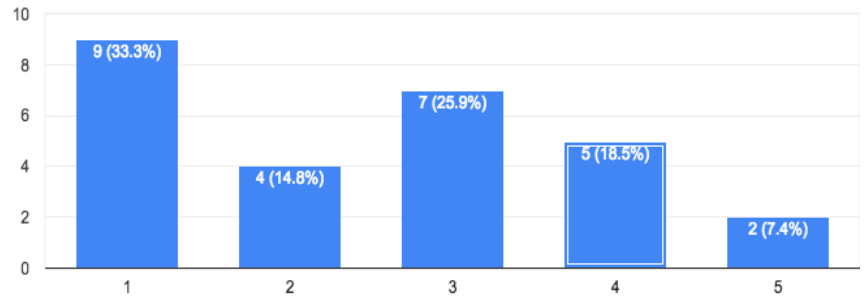
5 = strongly agree

Flipped vs Non-Flipped

Flipped

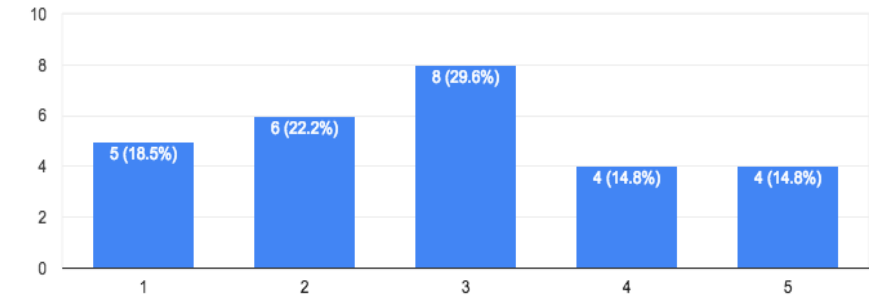
Overall, the teaching strategy used in this class was effective for my understanding and mastering of the material.

27 responses



The course contributed to my intellectual growth and/or helped me develop useful skills.

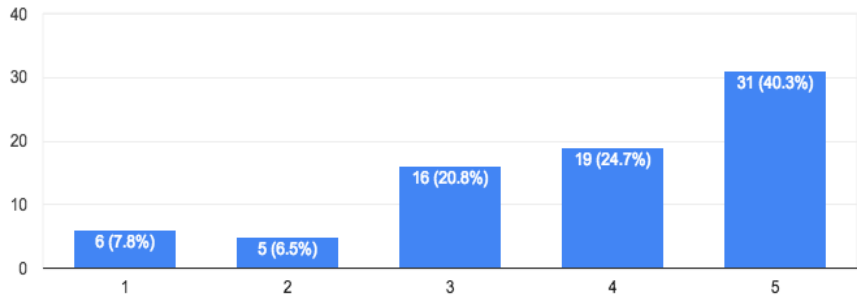
27 responses



Non-flipped

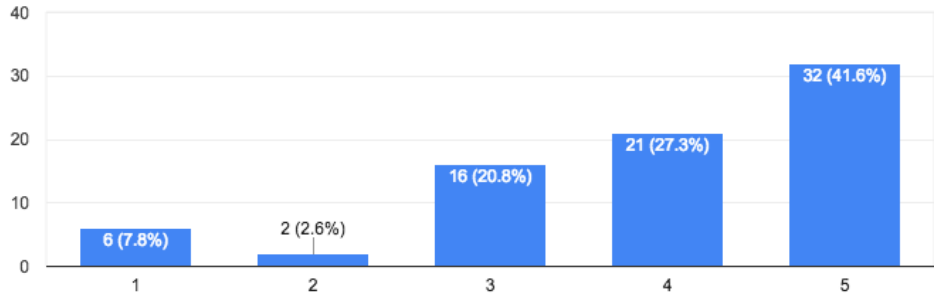
Overall, the teaching strategy used in this class was effective for my understanding and mastering of the material.

77 responses



The course contributed to my intellectual growth and/or helped me develop useful skills.

77 responses



Sui Wing Man – Course Logistics

- Gave knowledge quizzes about the guided practices
- Tried some active learning strategies, but students would not follow through, so they were given some time to do the work on their own.
- Had students collaborate on finishing the problem on the board together.



Sui Wing Man - Challenges

- Enrollment: Dropped from 15 enrolled students to 8 by the end of the second week.
- Incomplete teaching materials: Only a quarter of the lesson plans and materials were fully developed when the semester started.
- Underprepared students: MDTP pretest results showed students came in underprepared.
- Attendance: Most of the time only half the students attended

Sui Wing Man - Successes

Success 1: Better test results

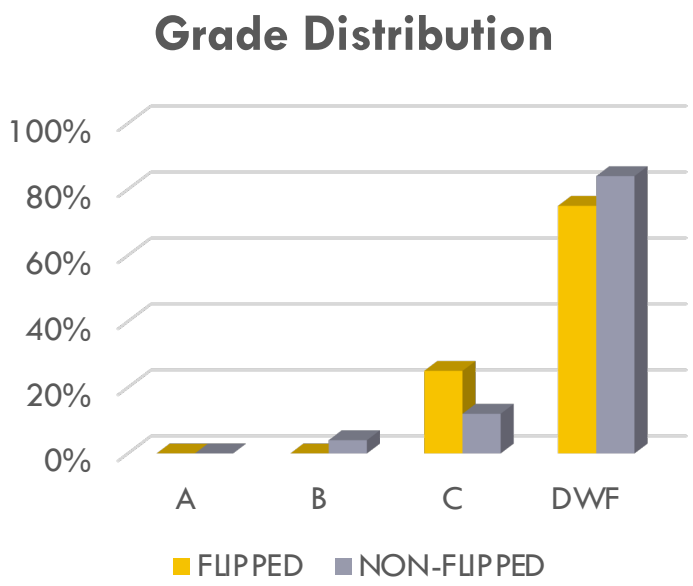
The flipped class scored better in every test, but the sample size (non-flip: 18, flip: 3) is so tiny that the data is probably irrelevant.

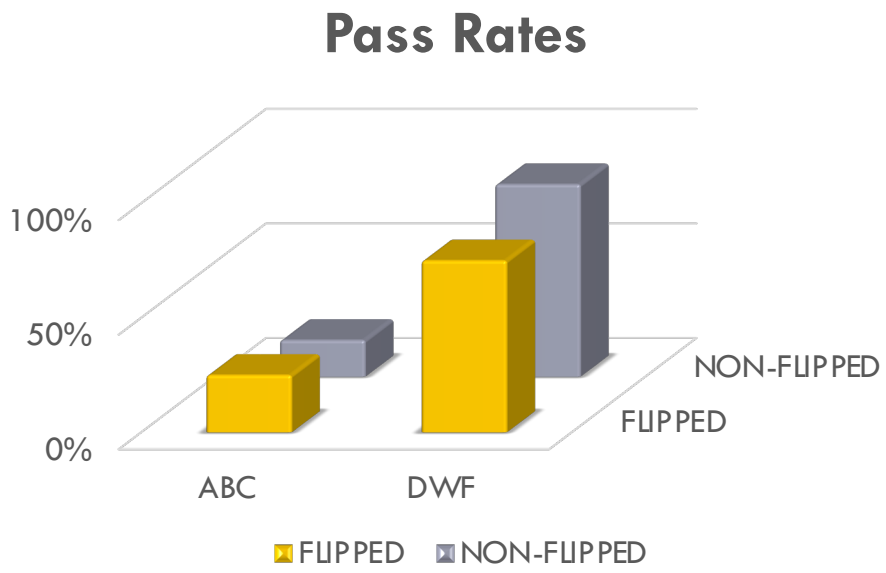
Final average: flip—59.6, non-flip—38.7

Success 2: More resiliency

The flip students almost always stayed for the whole test, while half of the non-flip students would give up during the half-way mark.

Sui Wing Man – Overall Grades

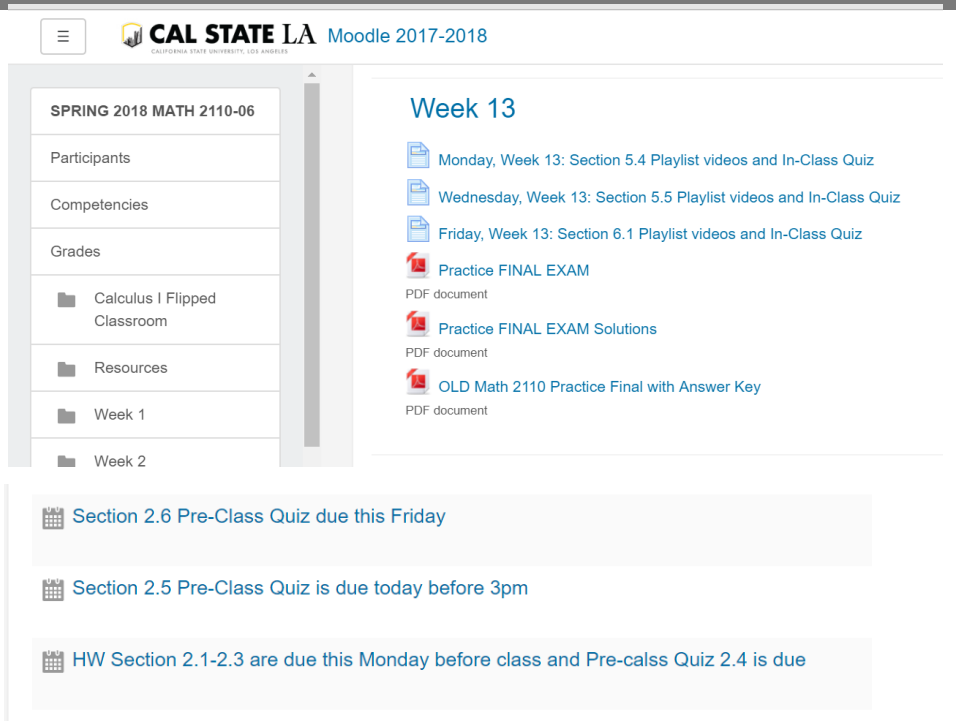


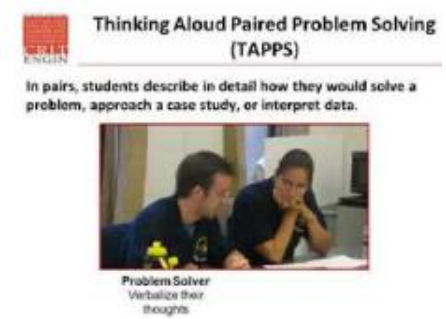


	Flipped	Non-Flipped
Pass	25%	16%
Non-pass	75%	84%

Fendi He – Course Logistics

- I used the LMS to send out an email reminder two days before the pre-class reading assignments and pre-class videos were due.
- Students' understanding of the reading and videos assignments was assessed using an in-class quiz.





- I used various active learning strategies from my CETL training
- Favorite one: Thinking Aloud Paired Problem Solving: have them work in pairs and explain their solution to each other.

Fendi He - Challenges

- Students do not like to do the pre-class assignments and videos. They feel that it is the instructor's responsibility to teach them in class.
- Some students feel that they have too much homework. They feel overwhelmed.





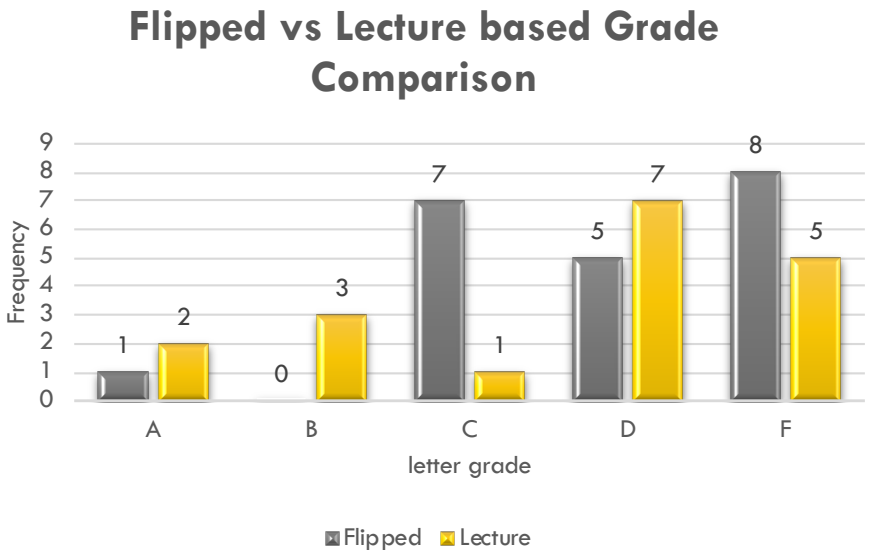
- Introverted students who do not like to participate in the in-class activities.
- Students' lack of pre-calculus skills.

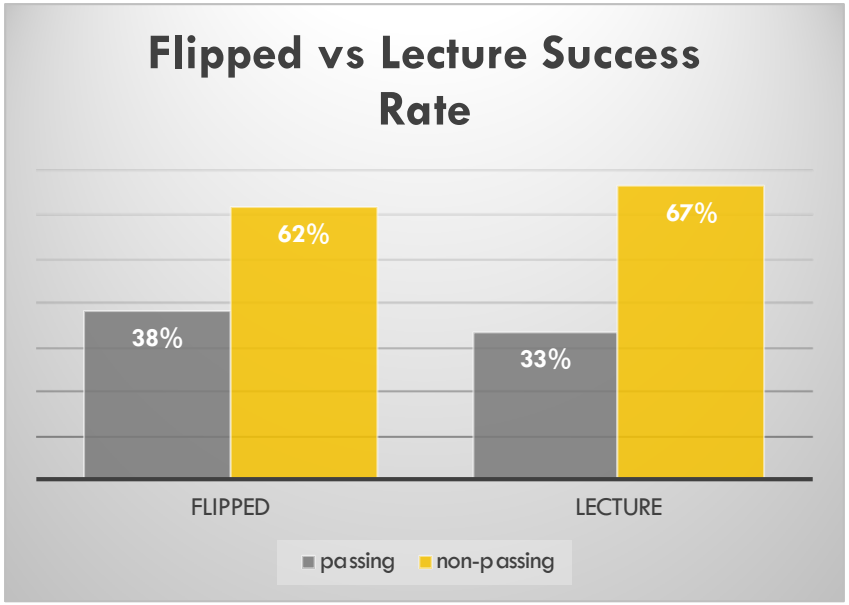
Student comments from my flipped class:

- *The way the course is set up is great. This isn't my first time taking Calculus and seeing the difference from a lecturer class is amazing. I learned a lot from doing assignments before class and going over them in class.*

- *I learned a lot in this class because I actually had to invest a lot of time. If I didn't invest the time to learn the materials, I would not have learned a thing because it is not a lecture class.*

Fendi He - Success Rate





	Flipped	Lecture
A	1	2
B	0	3
C	7	1
D	5	7
F	8	5

	Flipped	Lecture
passing	38%	33%
non-passing	62%	67%

Lusine Kopushyan - Course Logistics

- Pre-class assignments are posted on Moodle weekly.
- Email reminders are sent about pre-reading and watching videos.
- Students are asked to come up to the board and write down the formulas from the section.
- Definition quizzes are given in the first 5-10 minutes.

Lusine Kopushyan

Challenges

- Students don't like the idea of "self-teaching".
- Students complain about the structure of the course and resist to prepare before class.





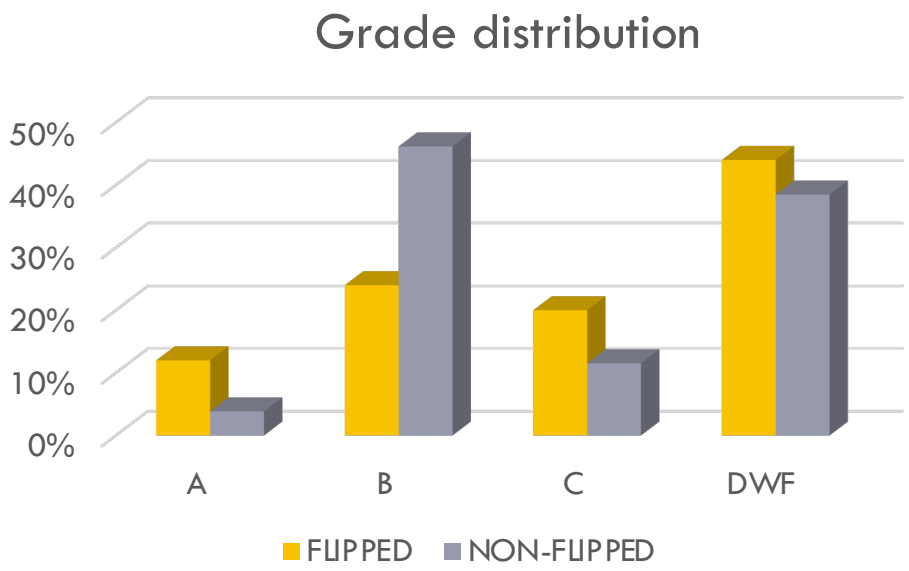
Successes

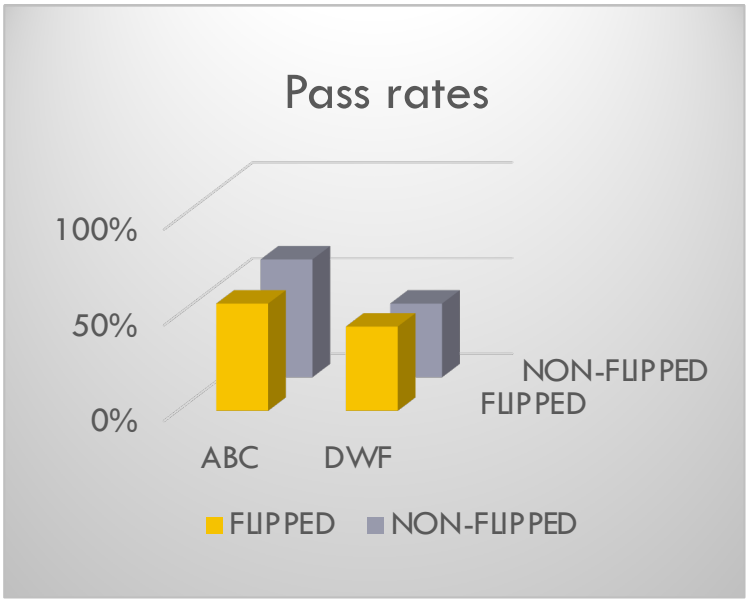
Several students got motivated and engaged, and one even inquired about flipped Calculus II

Student Comments Mid Semester Survey

Besides the fact that this was a flipped calculus class Professor Kopushyan did the best that she could to make sure we understood the topics taught. I definitely do not think flipped calculus courses should continue to be taught this way as I found it harder to understand the topics.

Lusine Kopushyan - Success Rate





	Flipped	Non-flipped
Pass	56%	61.5%
Non-pass	44%	38.5%

Emma Lopez - Course Logistics

- All activities and assignments where posted on Moodle (LMS) by section.
- Students were emailed ahead of due dates to remind them of their pre-class reading, video assignments, and in-class activities.
- There were on-line quizzes to assess prep work and in-class quizzes to assess the more advanced SLOs based on work done in class.

Emma Lopez – In-Class Activities



In-class activities consisted of Think Aloud, Pair Share, Stations, and Working in groups, applying my training from CETL.

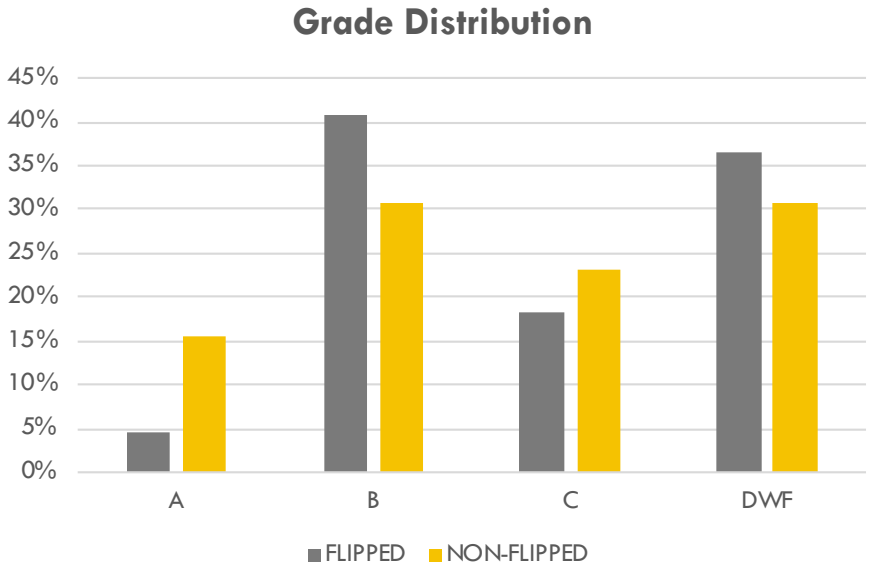
To foster a friendly class environment, I would bring coffee and snacks to motivate students to work during days where they had workshops.



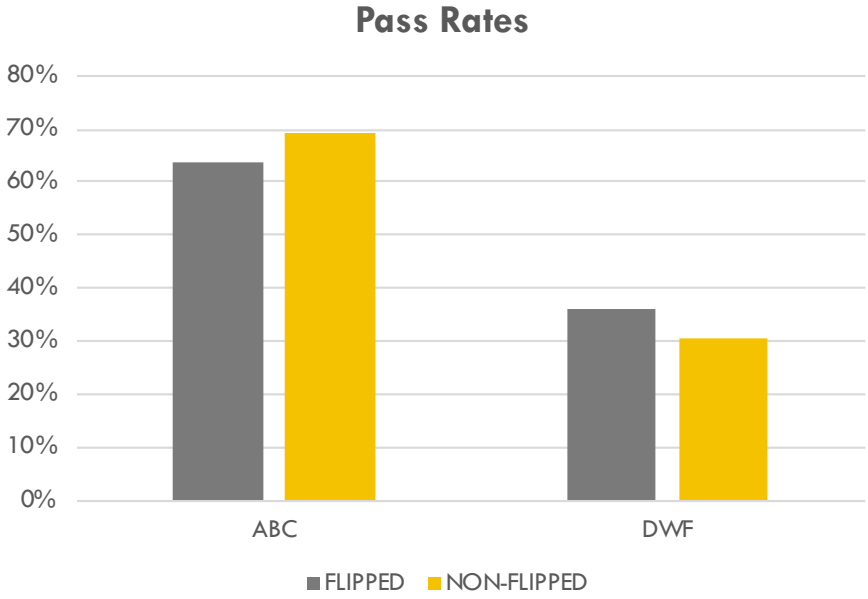
Emma Lopez – Challenges

- Motivating myself in being less skeptical in using FLIP as a teaching technique.
- Motivating students to read the section and watch the videos on a daily basis.
- Getting students to interact with their peers during the in-class activities.
- Increasing morale during in-class work assignments.
- Convincing students to take the surveys and pre/post assessments for the program.

Emma Lopez – Success Rate



	Flipped	Non-Flipped
Pass	64%	69%
Non-pass	36%	31%

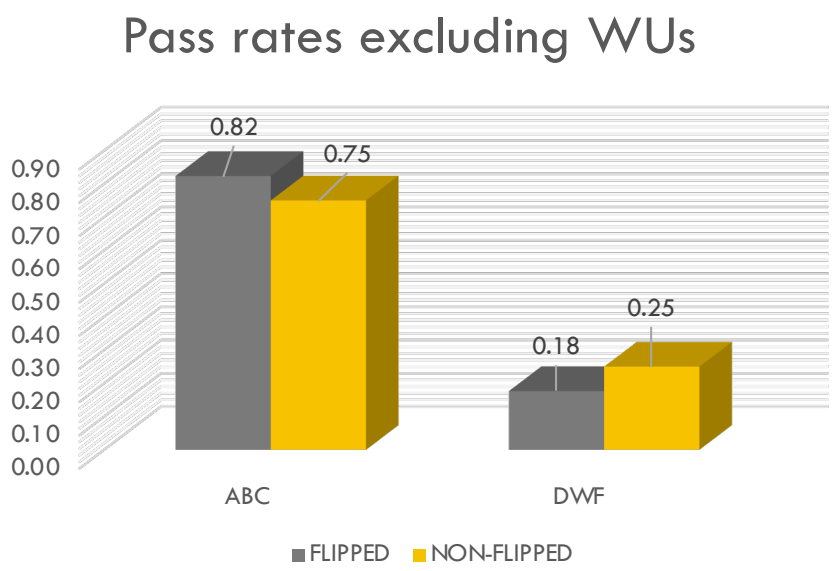


Emma Lopez - Conclusion

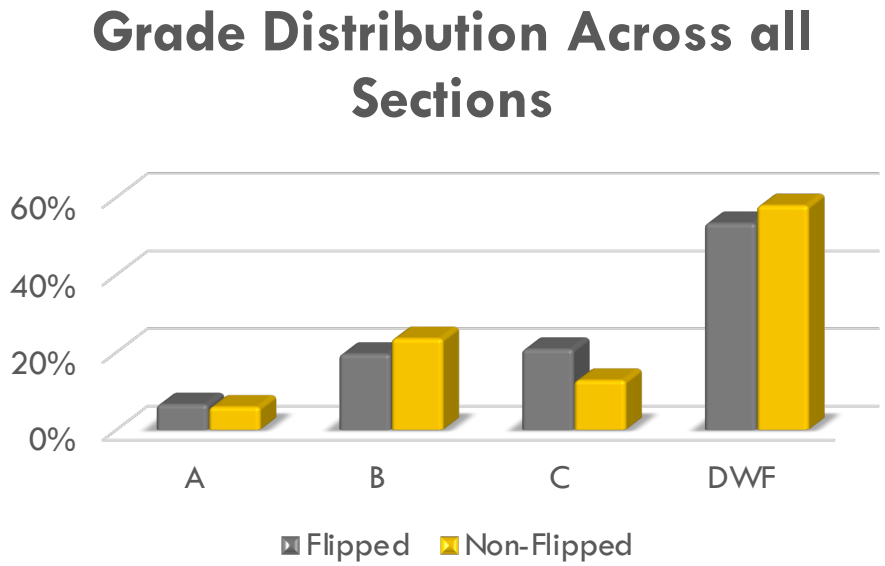
For me, FLIP is a Success!

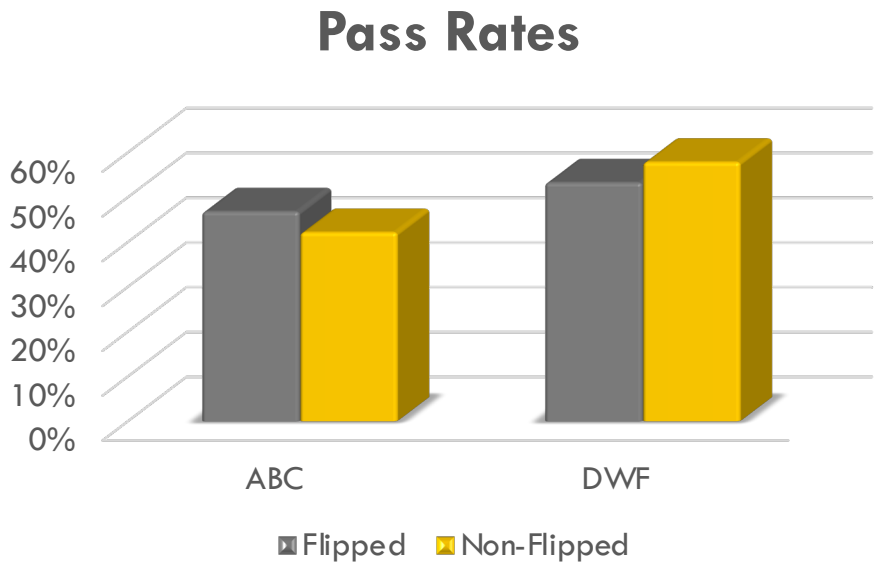
- I saw students transform from not wanting to work in groups to actively seeking out opportunities to work on problems and build a community outside of class

- Several students just disappeared in my classes (Flip 5, Non-Flip 2). Taking those WU students out of the data, the picture regarding FLIP was different



Results Across all Sections





	Flipped	Non-Flipped
Pass	47%	42%
Non-Pass	53%	58%

Overall, a slightly better result for the flipped classes, but more stats evaluation needs to be done – Shandy Hauck and her team will do that.

Improvements for Fall 2018

- Add videos with worked examples to prep-work
- Add videos to address the pre-calculus gaps
- Cut down on the number of homework assignments
- Modify daily quizzes to reduce anxiety
- Give mini-lecture just to make sure everybody can follow the rest of the class
- Earlier motivational talk
- Let students know it is a flipped class when they sign up ????

Thank you for Listening!



Any Questions?

Any experiences you want to share?