

CTL Fellows Final Report
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Title: Flipping the Classroom in Math 332: Analysis on Manifolds

Abstract: The standard method of instruction in most college level mathematics courses is the lecture format. This method affords for clear and concise presentation of content, yet provides little opportunity for students to engage with the material during class meetings. Math 332: Analysis on Manifolds met Spring 2017 and was one of the most advanced mathematics course offered at Trinity this semester. There were two students in the class, both very strong senior mathematics majors. The goal of this project was to introduce a flipped classroom model in this course, requiring the students to study the course material before class and allowing for discussion and student led presentation of the material during class meetings. The project was very successful, and students developed many important skills: reading and learning from a mathematics text, communicating mathematics via oral presentations, and engaging in a collaborative learning experience.

This course was modeled on the seminar style of the Oxford tutorial. Students were required to read a chapter of the text and complete problems before coming to class. During class meetings the students would lead presentations of the material and related problems. Class sessions were therefore based on discussion, as opposed to instructor led lecture, allowing for students to engage with each other and the course material. The instructor guided the discussion of the material, only intervening at those points where students found themselves without proper direction. In this format students gained a responsibility not only for their own learning, but also for the learning of their classmates.

I had not previously taught in this format and the CTL seminar proved instrumental in my teaching of this course. I was able to workshop my ideas with interested colleagues in an environment where our mission was to explore innovation in teaching. Various fellows, for whom Analysis on Manifolds sounded terribly intimidating, were able to provide feedback and guidance on the issues of a discussion based course and student presentations. Three fellows were able to visit and observe my course during the semester and provided ideas and feedback on how to improve the structure and flow of the course. It was the collaborative effort to innovation in teaching that made the CTL Fellows program such an enriching and successful experience.

The inspiration for this project came from my undergraduate experience at Swarthmore where all upper-level mathematics courses are taught in this seminar style. The deep bonds I formed with the mathematics faculty and majors during these seminars were the most transformative aspect of my undergraduate education and I wanted to bring these experiences to Trinity. Beyond the two

students who took this course Spring 2017 there were many other people who were able to experience this course. The entire CTL fellowship heard about my ideas and outcomes during our seminar meetings. The three fellows who visiting my course got first hand exposure to the flipped classroom. And maybe the biggest success of my participation in this program is that two of my mathematics colleagues became interested in my flipped classroom techniques and have been selected to participate in the CTL program this coming year. I plan to help them implement their project of flipping the introductory calculus courses using video based instruction and group focused class sessions. It therefore appears as though future cohorts of Trinity students to come will benefit from my participation in this CTL program.