

# Enhancing Undergraduate Education: A Graduate Student Instructor's Journey

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## Abstract

The journey of me being a Graduate Student Instructor (GSI) at UC Berkeley unfolds, revealing the complex interplay of challenges and rewards in undergraduate education. Amidst the responsibilities of teaching, I navigate the dichotomy of worth and sacrifice, reflecting on the impact of teaching on academic pursuits and work-life balance. Despite the challenges, my commitment to excellence and innovation shines through in my pedagogical approach, combining meticulous preparation with interactive teaching methods to engage students and foster critical thinking. Through dedication and perseverance, I empower students to grasp complex concepts, integrate innovative research, and cultivate a passion for scientific inquiry. As the journey continues, I transition to a Research Scientist role at Gladstone Institute of Virology, where they continue to inspire and mentor undergraduate students, shaping the future of scientific discovery.

**Keywords:** Graduate Student Instructor; Teaching; Teaching Assistant; UC Berkeley; Graduate Student; Undergraduate Teaching

**Abbreviation:** GSI: Graduate Student Instructor

## Introduction

"But was it worth it?" was the response of a professor of mine during a lunch in 2017, when I told them that I won the Outstanding Graduate Student Instructor Award due to my outstanding performance in the previous year working as a Graduate Student Instructor (another name for Teaching Assistant at UC Berkeley) for the course of MCB102 (Principles of Biochemistry and Molecular Biology).

I did not answer at the time, as I was thinking: "Well, it depends."

If "worth it" means making money, then it is not. At the time

being a Graduate Student Instructor, I earned well within the poverty line of California.

If "worth it" means academic success, then it is not. Because of the teaching activities, I delayed my research projects by half a year.

If "worth it" means work-life-balance, then it is not. The officially paid time for Graduate Student Instructor was 20 hours a week, but I was working >40 hours a week solely on teaching, plus >20 hours on research activities.

The professor asked me this question knew these. They were a parental-like figure while I was at UC Berkeley. They were caring about my well-being physically, mentally, and academically.

Now, seven years after I was asked that question, I could finally answer it. Yes, it was worth it. It was worth it despite all the above reasons of not-worth-it. It was worth it because I did my best for what I liked, when the opportunity presented itself.

UC Berkeley, as with the other research-oriented universities I know of across the country, heavily depends on graduate students to fulfill the teaching obligations for undergraduate students. We as Graduate Student Instructors held teaching sections to review each lecture given by the professors, designed and correct quizzes, organized and marking exams, and held office hours.

At the time, being a non-native English speaker international graduate student, even at such a diverse place like UC Berkeley, I was a minority. I was worrying how to best instruct my students, over one hundred of them, to make them lucky to have me as their Graduate Student Instructor.

I led two discussion sections for the course MCB 102 (Principles of Biochemistry and Molecular Biology). I believe that students in this Upper Division course should both understand the concepts and more importantly be able to apply them in a realistic research scenario. However, upon talking to previous students, the most complaints were about the lecture materials requiring memorization in the textbook and the lectures, which were based on "classic" knowledge generated decades ago. Thus, helping the students understand the concepts while at the same time expose them to the latest research and use it to organize an inclusive discussion became an urgent challenge. To solve this problem, I structured my teaching materials in a tiered manner to generalize the knowledge and integrate them with the latest research for each discussion.

To achieve this goal, I combined the usage of three powerful tools: handouts, slides, and emails. Before each discussion, I prepared a single-spaced, double-sided handout based on the last three lectures and distributed it at the beginning of each section. The handout covered all the major concepts in bullet points, sometimes in fill-in-the-blank format, and always noted with the relevant pages in the textbook.

During the discussion, aided by my own slides, I used 1/3 of the time to review the knowledge in a general manner such as comparing the different pathways of DNA repair, 1/3 of the time to discuss interactive questions like what would happen if we delete some components of the DNA repair pathways, and the other 1/3 of the time to introduce the latest researches related to the course materials. For example, I used a latest Nature paper about transcription initiation impairing DNA repair to discuss what could be the possible interfering mechanisms between transcription

and DNA repair and how to evaluate them. I always gave the students enough time to think about each discussion question, paid attention to evenly call out different students, let them provide their answers before revealing mine, encouraged their different opinions, and led them to the better ones through comparison and further discussion.

Finally, my sections never ended within the classroom. The common wisdom among Graduate Student Instructors was that we should refrain from answering the students' emails, and instead encourage them to ask questions in the discussion sections. But I found that, due to the generous size of the class, there were always students who did not get a chance to ask their questions in the section. As a result, I encouraged students to send me emails with all levels of questions. In this way, I identified their common weak points, and discussed them in the next section, while at the same time filled in the various knowledge holes for each student, either within or outside my sections.

These were no easy tasks. Preparing high-quality handouts and discussion slides required me to read the textbook thoroughly, listen to each lecture carefully, pay attention to the students' reactions and take detailed notes about the important and confusing points in each lecture. And sometimes I replied to emails for hours in row.

But these efforts paid off wonderfully. The handouts served as useful and assuring study guides and prodded the students to read the textbook. Since the fourth week, more of the students started to ask me questions from uncovered parts of the textbook. The slides I used in the discussions and sent to the students afterwards were immensely helpful in clarifying confusing topics, as other sections' students started to audit in my sections and ask for the slides. More important, integrating latest research in the discussions honed the students' ability to use the concepts to solve new scientific questions: They did better over time in experimental questions in the exams and discussions. Besides the overwhelmingly positive comments in the evaluations, the most valuable reward for me came after the last section before the final exam: three students approached me to discuss their ideas about the latest papers they found by themselves in scientific journals. It was then I realized, to energize a new generation of scientists - this was where all my strength and enthusiasm for teaching came from.

Doing my best on what I like, when the opportunity is present, is what I learnt from this experience. Now I am a Research Scientist in the Gladstone Institute of Virology at San Francisco. Gladstone offers a great platform for me to teach undergraduate students the basic concept of bioscience, lab skills, and scientific thinking methods. So far, I have extensively trained four undergraduate students

at Gladstone, two of them co-authored papers with me and then went to the top medical schools. The lab-based teaching at Gladstone is another quite different but equally fun experience as the classroom-based teaching at UC Berkeley.

I appreciate the invitation from JRVAV for this opportunity of sharing my experience, and I hope I will have more chances to share more of my teaching and researching experience with the readers in the future.