Statement of Teaching

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Philosophy

My teaching philosophy is that students from all backgrounds deserve an opportunity to study science. This is critically important since reports show that many sciences, technology, engineering, and mathematics (STEM) college students fail to complete or even start their bachelor's degree (1). Women and minority students particularly struggle in completing their STEM degrees in addition to being underrepresented despite their growing presence in the American population (1, 2). My teaching efforts, therefore, aim to increase retention of college STEM students, especially in the field of biology.

I teach to give all my students the **opportunity to be successful scientists and independent thinkers**. My teaching strategy focuses on building confidence and motivation among students by inspiring them to learn science and creating opportunities that make them feel like scientists. First, I minimize the amount of time students spend passively listening to lectures and increase active learning activities to encourage students to interact with the information throughout the lessons. Second, I contextualize lecture material and scientific research to explicitly highlight the relevance of information to the students' lives. This is particularly meaningful as I believe that the scientific thought process can be applied to individual socioeconomic circumstances. Finally, I consider my students as scientific peers, so I challenge them with real data from primary literature and expect them to synthesize the information and communicate it effectively to others, just as any professional scientist would.

Teaching Methods and Experience with Active Learning

I believe that active learning is an invaluable tool in classrooms to encourage students how to think, create, and/or solve problems based on the learning materials. A previous study showed that active learning increases retention and performance while decreasing failure rates in STEM classes (3). Since I **received over 100 hours of training in incorporating active learning strategies in the classrooms with the Pedagogical Fellows Program** under the Division of Teaching Excellence and Innovation at the University of California, Irvine as a graduate student, I have been successfully implementing active learning in my courses as an **instructional assistant professor at Chapman University.**

For general and medical microbiology at Chapman University, my goal is to incorporate active learning strategies for my students to stay engaged. I use "backward design" principles in my lesson planning to define the student learning objectives (SLOs) and then plan my assessment strategies. Weekly lecture videos incorporate short quiz questions throughout the lecture to encourage students' interaction with the materials. This also helps me evaluate students' understanding of the lesson and ensure that students achieve the weekly SLOs. I then encourage the students to complete "You're the Professor!" activity on the discussion board in which each student posts two questions about the lecture and answers one question from another student. I then design questions based on some students' own questions and on experimental data from scientific literature to create bi-weekly formative assessments.

My laboratory course for microbiology includes methods to collect, interpret, and discuss data through writing lab reports and to critically read, analyze, and evaluate primary scientific literature. I also use the social reader application "Perusall" to engage students in scientific readings by collectively annotating readings in threads, responding to each other's comments, and interacting. Much of my pedagogical training as an instructor focuses on the importance of stimulating students' interest in biology to increase their engagement.

Exposure to Authentic Science

As an undergraduate student, I started each quarter in my biological courses with a high level of excitement, but I was ultimately disappointed. I did not feel like I was solving problems like a scientist. I was taught biology without integrating the critical thinking skills and broader impacts that make biological sciences engaging. Based on my experience, I now aim to teach by **exposing students to authentic science**.

When I redesigned the course for experimental microbiology laboratory at UCI with Dr. Rachael Barry, my goal was to develop SLOs, lectures, and exams centered around the use of critical thinking to solve scientific problems. I emphasized on understanding concepts and eliminated the need to memorize by always allowing the use of notes and the internet. I also grouped the students into learning communities to encourage knowledge sharing and group collaboration to work on active learning activities during lecture. I then gave the students a few days to analyze experimental data as a group and let them speculate on potential exam questions (4). On the day of the exam, I revealed the short answer questions on the previous experimental data and tested the students individually on their ability to critically articulate logical conclusions from the results. This examination format made the students feel less anxious and more confident answering the questions while developing critical thinking skills and maintaining grades comparably to traditional memorizing exams (5). This course engaged students in a way that I did not engage with my course materials as a student. Thus, I now aim to integrate student learning communities and data interpretation in future courses that I will teach.

Science Communication

I recognize that there is a lack of simple and effective scientific communication between scientists and non-scientists. One contributor to the disconnect between the scientific and non-scientific community is the impression that science is complicated, complex, and inaccessible, which causes untrustworthy feelings among some groups. Therefore, I believe that **exposing my students to primary literature** bridges the gap toward understanding scientific discoveries. Since primary literature is the main formal interaction of scientists, making my students comfortable with it should increase their sense of belonging within the scientific community. For introductory students, I want them to be able to read and summarize primary literature. For advanced students, the goal is to analyze and critique experimental design and conclusions in the primary literature. My reading assignments come with a guide that includes specific questions to break down each part of the paper or figure. This ensures that students understand thoroughly scientific literature.

In addition to reading, analyzing, and critiquing the primary literature, I aim to **prepare my students for scientific writing** by fostering intellectual engagement with the course material, requiring students to seek out information from primary literature, and allowing them to exercise independence and creativity. I found that students perform best at scientific writing when they have clear instructions and specific structure examples on each section of their writing. I therefore always give my students a writing guideline with examples and improve it after each draft they turn in. Finally, I provide additional office hours, spending at least 20 minutes per student, before final drafts are submitted to help and ensure that students write their best possible scientific writing.

Conclusion

I believe that our roles as professors are to inspire, engage, and teach students authentic science and effective communication to become future leaders in STEM. I am eager to continue developing my pedagogical skills and developing coursework that take the students' diversity and socioeconomic circumstances into consideration. I am confident and motivated to enact my vision of science education and inclusive courses at the University of California, Riverside.

References

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