Sample Statement of Teaching Philosophy: Physical Science

As an educator, I aspire to change my students' mindset towards their education. To nurture lasting habits of perseverance and curiosity, my teaching consists of a heavy emphasis on building critical thinking and problem-solving skills. Not only are these two skills crucial for success in the physical sciences, they are also important transferable skills. I also aspire to reinforce to students that education is not merely a collection of facts to be memorized and recited, but rather a mechanism to train and sharpen their skills. I view education as the means to provide students with the proper tools to help them tackle unknown problems that they will encounter in their lives and careers.

I believe that both lectures and evaluations should be structured to optimize long-term knowledge retention. Although reinforcing critical thinking and problem-solving during lectures is important, assessments can also be used as a learning tool to help foster these skills. Evaluations requiring students to draw from their conceptual understanding of the material rather than enumerating stored knowledge encourages students to reflect on their approach to learning. Such evaluations reveal to students that true understanding is more than the ability to recount information on a test—it is the ability to take one's knowledge and use it to solve previously unknown problems. As such, assessments designed to be similar to problems students have seen previously potentially hinder their ability to see how the course material connects to concepts beyond the course.

Long-term retention is also reinforced through story-based lectures, providing an overarching narrative throughout the course that helps flesh out the connections between major units, and the natural progression between lecture topics. One of my past students explained that this style of teaching feels a bit like watching a murder mystery movie where the audience is made aware of crucial clues throughout the movie, and their significance is made known at the end through a story that explains how all the clues are related. This is a fitting analogy as the course material is new information that is likely out of context for students, and a clearstory that explains how all the new ideas connect helps with understanding and long-term retention.

In addition to narrative-based teaching, I often rely on problem-based learning, PBL, to provide a framework to demonstrate how new concepts build on prior knowledge. PBL provides real-life examples that show students how and why the new material is useful. Beginning my lectures with a thought-provoking task that students attempt to solve in groups creates a lively classroom atmosphere with interesting and enthusiastic discussions. I select interactive tasks carefully, ensuring that they relate to the lecture's topic and set the stage for the more advanced topics.

I also believe that students need to be intrinsically motivated to learn to achieve a deep understanding of the material. Students often describe having a math and/or physics phobia, claiming that the material is too difficult and the concepts too abstract to understand. A large part of my role as a teacher is to get students

intrinsically motivated in the material and, in turn, eradicate this phobia. Many concepts in introductory math and physics have concrete real-world applications that the average person would have experienced. Framing course material around tangible scenarios helps students overcome the phobia of abstractness, allowing them to touch, see, and feel the course material come to life. This is in part achieved through PBL during the lectures, but also achieved through active learning in the classroom. Through structured peer-to-peer interactions in the class and tutorials, leading questions can be prompted to struggling students. Often, it is the case that students are overwhelmed by the complex sentence structure in many word problems, however, if prompted to think about what would happen if they were to carry out the scenario in real life, the conceptual answer is usually easy to deduce. This deduction not only helps to build their confidence but also helps to overcome the math and physics phobia.

Personalized feedback is also crucial to foster self-confidence and intrinsic motivation. Personalized feedback encourages incremental improvements, even if small, promoting intrinsic motivation while acknowledging efforts to learn. Every student has strengths and weaknesses, meaning that what constitutes an accomplishment for one student may be something trivial for another. I found that providing personalized feedback on assessments de-emphasizes quantitative feedback measures, such as grades, and helps to put a focus on the efforts and the developing strengths of the students. In the sciences, I have found that personalized feedback is most helpful when applied to lab reports, where students are expected to convey concise scientific information through written communication and creative ways of presenting data.

One of my goals as an educator is to have my students outgrow me. It is impossible to expose my students to every facet of the course's material, and every possible application they might see in their lives. What I strive to do during the course is to not only give students the tools they need to help themselves after the duration of the course but actively communicate that this is what I'm pushing them towards. I often remind students of online resources, telling them that this will be not only useful throughout this course but to have as a bookmark for future use. When students ask simple questions, I often politely respond by asking them what they would do if I wasn't there to immediately help them. This is a gentle reminder that I'm trying to help train them to be life-long independent learners and problem-solvers. Another way I reinforce this point to students is to structure assessments in such a way that there are no questions "similar" to ones they've seen in lecture. I remind students that being able to problem solve is not regurgitating what you know, but knowing how to use the tools you've been given to solve the problem at hand.

I believe students should be actively involved in their education, and that students are more invested in their learning when there is a dialogue between students and instructors - rather than the traditional one-way flow of content from instructor to students. I need to know about the prior knowledge students bring to class, as well as where they are getting stuck as we continue through the course. This diagnostic feedback can be obtained through student self-assessments, tickets out the door, and anonymous polling of the class (students work independently on a problem at the end of the lecture and submit their solutions). It is my experience that students are often their own hardest critics when asked to gauge their ability in the course material. If I

am able to see improvements in the students that they aren't able to see in themselves, it is important for me, as their teacher, to point out these successes – building confidence and motivation.

I believe that equity plays a paramount role in education. Equity within the classroom takes many forms, from accommodating different learning styles, and identified needs to the structure of the evaluations. It is no secret that students often form study groups and/or online group chats to help support one another in the course, which introduces a social factor to student success. These social benefits can extend to studying for tests and completing assignments (either dividing up the workload or searching solutions online). In addition to maintaining equity associated with identified learning needs, I also strive to achieve equity in these other aspects of my teaching. This includes providing an equitable learning environment for introverts and extroverts alike, reducing extra costs associated with education—such as expensive textbooks, iClickers, or additional software. In an effort to promote equitable education, I also remake all assignments, quizzes, and tests each year with fresh questions to help prevent predictable and searchable solutions. Most importantly, I believe in promoting an inclusive learning community where students help each other. While going through my education with dyslexia, I came to appreciate first-hand the importance of designing questions that are accessible by a broad audience. Cultural, language and socioeconomic barriers remain pervasive issues in higher education that I strive to address through my outreach activities.

Lastly, teaching is a skill analogous to playing an instrument. It takes practice, continual reflection and feedback (from students and peers alike), and engagement with teaching and learning communities. As I explore new approaches and ideas, I leverage formative feedback from my students and colleagues through discussions, presentations or workshops. I have also found involvement with high school science educators to be an invaluable experience. This allows me to provide continuity in education for incoming university students, ensuring there is minimal disjoint between curricula. I have also found that my involvement with physics and math teaching communities helpful for professional development, allowing me to keep up to date with new ideas and to get feedback on my ideas.