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Teaching Statement

As a postdoctoral researcher, my teaching experience largely revolves around teaching-assistant work at Johns Hopkins University during my graduate studies. This included directing introductory physics labs and running problem sessions for the physics major oriented introductory classes as well as grading homework assignments and exams. However, I have always considered helping new students through their first introductions to the classwork and inspiring promising young physicists in basic research opportunities the most rewarding aspects of the field. Physics tends to be one of the more intimidating subjects for new students but also one of the most closely associated with real world success. This is because the skills learned in the classroom revolve around analytical problem solving. Although the problems in introductory classes are typically contrived and not directly applicable, the problem solving skills are of paramount importance to any career. The challenge of a good introductory teacher is to impress this upon the students.

The hallmark of a successful teaching style is student engagement. I have found that much of the problem solving skill development occurs during group oriented practice sessions. This requires the students to be engaged and allows them to address confusion of the material among peers in an informal and unintimidating environment, which in a unique advantage over an individual oriented session. I have knowledge of how to successfully incorporate this type of learning through my graduate teaching experience. During my work running problem solving sessions, we have attempted a multiple teaching formats, but what I have found to promote student engagement and interest was a cooperative problem solving system where a rotating group “transcriber” would write the problem solution using a group whiteboard while the other members would hypothesize potential solutions. Then, a successful group could then display the solution to the class. This introduces each student to methods of physical intuition and inherently requires a high level of participation.

One of the most important times in a young high energy physicists career is the first introduction to experimental research. This is a tumultuous time because is poses a very different type of problem than is encountered in class. There are many ways to make this transition, but it is essential to have a dedicated advisor to teach skills in addressing the open ended and nebulous problems encountered in physics research. A good introduction to research can usually be accomplished by a basic detector characterization. This allows the student to design the full apparatus of scientific research in a manageable scope. My introduction to research at James Madison University was the testing of PMTs for Jefferson Lab, specifically the measurement of dark current and gain variance of different modules. This specifically offered an opportunity to fully characterize a physics problem from the physical design of the testing apparatus to the data analysis which serves additionally as a real world programming introduction. The other possibility is a real world physics analysis, which is now a real option for a young researcher. However, this also requires a more careful oversight to make sure the student is able to develop the a diverse skill set due to the safety net of legacy software packages can lead the student to not fully appreciate each step in the analysis chain. During my postdoctoral research career, I have had the opportunity to guide undergraduates through their very first CMS analyses, which provides a head start on the programming and data analysis skills essential to success in a graduate career.

A current challenge for the field is how to cultivate diversity. A diverse physics community is objectively beneficial, but it is a pervasive problem that does not seem to have an novel solution. The true solution lies only at a societal level and can be influenced insofar as we can guide the long arc of cultural norms in the direction of equality. However, we can incrementally improve the situation by inspiring underrepresented young people. In my graduate career I participated in outreach programs designed to inspire the next generation of physicists. Part of this effort was to deliver a basic overview of LHC high energy physics research to Baltimore-area high schools and participate in physics demonstrations that can seed inspiration for the sciences. Additionally, these outreach experiences have given me the experience necessary to break down complicated topics into a simple and intuitive description.

An essential part of a physics course plan is malleability. An effective learning strategy is something that if formed over years of experience and only if the instructor can correlate teaching strategy with subject comprehension. Therefore, I plan to constantly update my teaching strategy with class feedback and incorporating techniques from professional educators. Additionally, I plan to encourage students to seek individual help from both myself and more senior students and to actively participate in class discussions or ask questions when a topic is confusing. There exists an apprehension in asking for help, but in physics it can be unavoidable, so therefore I will strive to encourage an environment that is free of this stigma.