

Recent national reports have elevated learning how to do physics to the same level of importance as learning the concepts of physics. The elevation of “scientific practices” is designed to shift the focus of physics education to a student’s ability to do science in addition to their content knowledge. Assessing these practices is important to determining if teaching methods are facilitating students learning to engage in the process of science. Recently, a group of researchers released the Three-Dimensional Learning Assessment Protocol (3D-LAP), part of which can code as aligning with scientific practices. I am investigating how we can assess a student’s ability to engage in scientific practices, in particular, the practice of Developing and Using Models. The 3D-LAP represents one of the most promising ways to assess scientific practices, but currently it is unknown if questions written with the 3D-LAP actually give us evidence that students are engaging in a specific scientific practice. To investigate this, I created a set of questions that align with Developing and Using Models as defined by the 3D-LAP. Having students work through this task through a think-aloud interview will provide a better look at the student’s engagement. To do so, I developed a think-aloud protocol and used it to run a couple of trial interviews where students completed the test. These interviews provided me with insights that prompted revisions in the test, such as common confusion in phrasing and wording, and revisions in my protocol, questionnaire, and consent form.

To further my investigation, I need to be able to ‘grade’ the problems for correctness and determine if a student has ‘engaged in the practice’. Using a definition, developed this semester for Developing and Using Models, I looked at the key elements of what defines this particular scientific practice. These key elements break down into three major parts. Students’ ability to make assumptions and simplifications to move from real world to model world. Students’ ability to use scientific principles to develop models, and using a model to create mathematical formulas. Lastly, the students’ ability to apply reasoning to answer the question, and to explain real world phenomena. The initial interviews gave me an idea of how I can determine if students engage in the practice, such as presentation of the student’s body language, what they write, when they write certain elements, what is vocalized, and other general habits. I wrote a new question that may provide a wider range of models for the students to engage in as well. At the beginning of next semester, I will conduct and record several interviews and begin the process of analyzing my data. Ultimately, this research allows for a better understanding of how to use test questions to engage and assess students’ abilities to engage in scientific practices.