Brett Kippley A/S abstract

To develop future scientists, engineers, and critical thinkers, we must help our students learn how to solve inquiry-based problems by gaining both the knowledge and the skills required to be creative problem solvers. Combinations of knowledge and skill to solve inquiry-based problems are known as scientific practices. As science and technology become a larger part of everyone's lives, it becomes increasingly important that everyone be able to engage in scientific practices, whether it's to evaluate medical studies, determine the validity of articles in popular media, or constructing evidence-based arguments to inform their own decisions. Scientific practices are a fundamental piece of the Next Generation Science Standards, which have so far been adopted or adapted by 26 states and Washington D.C., highlighting the promising future scientific practices have in science education more broadly, or physics education in particular. Currently, there is a need to accurately assess if students can engage in scientific practices. So, how can we, as educators, determine if a student can engage in scientific practices?

I am focusing on how we can assess the scientific practice of "developing and using models". First, I developed a definition for modeling in physics, informed by the literature, which has four steps: there is an observation or question about the real world, then you make a model of the real world by creating a representation (Diagram, math, etc.), then you make a prediction using the model, and finally you compare the model's prediction to the real world to check the correctness of the model. From this I looked for what evidence could be collected as part of an assessment involving modeling. Examples of this evidence would be things such as real-life scenarios, assumptions being made, or representations. I then defined what these observables would look like in an assessment. Some of these observables can be part of the question (e.g. real life scenario) while most are asked of the student (e.g. prediction). An example of this would be if a question gave a student a representation it would be labeled as Question Provided Representation as compared to if the question asked the student to construct a representation it would then be labeled as a Student Provided Representation. Currently, I am developing an assessment to see if students can engage in the scientific practice of developing and using models by assessing students on modeling process by looking for the observables. I will see if they can do each step in the modeling process individually and then also in a combination to see if there is any step that students are more successful or unsuccessful at. This process can be used to design assessments for other scientific practices an