Lesson Reflection

In response to the brainstorming prompt, my 10 Honors Physics students came up with a long list of terms. These ranged from scientific, “mass times acceleration”, to pop culture references, “lightsabers and ‘May the force be with you’”. After completing the list, we went back through and, as a group, decided which terms were scientific and which were not. Based on those decisions, I asked them to come up with a definition for force. I made it clear that this was just an intuitive definition; we were describing the ideas of force that they already had. The list of definitions is as follows:

- “Something exerting energy onto another object”
- “The push or pull on an object”
- “Amount of energy acting on an object”
- “Something that changes the direction of something else”

These responses are similar to responses I received in previous years. Given this data, I decided it was a good idea to focus equally on the history of force and science and on Newton’s First law. My students had ideas about force that would be easy to build on, though I would have to caution them about the words they chose. For example, “energy” has a very specific meaning in physics, and it’s not part of the definition of force. I thought it would be unlikely that discussing the development of our scientific understanding of force along with the development of science would confuse my students or mislead them.

After I talked about Aristotle, Galileo and their respective scientific methods and views on motion, we changed our focus to Newton’s First Law and defining inertia. I did two demonstrations. I had to use some leading questions to help them with the cart and mass demo, as well as watching a clip of Dr. Feynman explaining the situation, but afterwards a couple of students quickly extended the explanation from the first demo to the block and the dowel demo. The other students then asked questions or restated what the first two students had said in their own words. At this point, I gave them the assignment to come up with 3 different examples of where we can observe inertia in real life.

I collected a copy of everyone’s examples, then asked each person to share and explain their examples. Based on the discussion, I would say all but one student had a good understanding of inertia. That one student’s examples were all about applying a force to move or keep from moving an object. However, based on what they had originally written, I would say that most students had a limited view of inertia. Two of their examples would be very similar, and the third would be an example of an applied force. I believe that during the discussion of the examples, they tweaked what they had written because they realized their examples could use improvement. This shows that their understanding of inertia was growing through discussing a large variety of examples. In order to continue that growth, I found 3 more videos of inertia demos for us to watch and discuss the next day.

The final assessment for this lesson was a worksheet that asked a variety of questions about the main topics in the lesson. Using information from all of the assessments, it is clear that I did not change students' ideas about force, but there was a clear development in their understanding of inertia. The assessments were not designed to assess Wiske's methods and processes dimensions, but I believe I could rank each student in the knowledge and forms dimensions using the assessments on inertia. As a group, my students are on the line between novice and apprentice rankings in knowledge. Some see many connections between inertia and a variety of situations and concepts, while others are still limited in how they apply their understanding. Some students have to be prompted by an assessment to apply what they know. Others will spontaneously make statements in class that connect inertia to an experience they had or a topic we've already studied. Unfortunately, my students are clearly novices in the forms dimension. They try to describe a situation fully, but they fail to use the appropriate scientific vocabulary, even if the proper terms are not new to them. In future lessons, we will have to discuss how to write an analysis in a scientific manner.

These rounds of assessment have given me a much clearer view of how students' understanding of inertia developed throughout the lesson. I could adjust and add to the lesson to address misunderstandings as they developed, and I could see the scope to which my students understood. At that point, I could make a decision on whether we needed to extend the lesson or move on to related topics in order to widen that scope. Having the proper data to make that decision prevents me from moving on too early or too late, both of which have detrimental effects on my students' understanding.

In future lessons, I need to do far less talking. I need my students to do the discussing and the active work in deepening their understanding. That gives me more time to make a better analysis of the data I get from their discussions. My goal is to put two rounds of Gallagher's assessment spiral in all of my lessons from here on out, though in reality it may only be two lessons each week. Future assessments also need to have stronger connections to the real life reasons for understanding the material and methods of developing that understanding, so that I can assess those dimensions as well.