

April 8, 2013

Helen,

Thank you for inviting me into your 9th grade physics class at Tech Boston Academy on March 28. The lesson was an introduction to thinking about momentum, and you began with an interesting and provocative Do Now.

The task was to compare the momentums of two people in differing speed/mass scenarios. The question for the students to consider was, “which one would be harder to stop?” You, Jim, and I talked about this, and I think your choice of this particular phrasing was very interesting and ultimately productive; more on that later. After the students were given some time to think about the four situations, and to the “harder to stop” questions, you handed around folded pieces of paper that had A, B, and A-B on them. You created “pseudo clickers!” I really appreciate that you are trying moves like this, and I thought it worked quite well with the students. Except for a couple students, when you asked about their thoughts on each of the scenarios, you got a nice sampling of where the group was with their thinking. This structure allowed you to get a sense of the thinking of the whole group, and it is a form of *formative assessment* that jives with the ideas in Coffey et al. (2011) that we read for ED 121. Whole-class conversations are good practice for articulating responses and argumentation, but they are hard from the standpoint of knowing where everyone is with their thinking and reasoning. Both the “clickers” and conversation offer you different insights into student thinking, and I think variation in sampling seems smart. One thing to consider is when the group has what seems like a split - 50/50 for A and B, for example. A great move here is to have folks turn to their table partner to chat, aptly called a “turn and talk.” After this, you ask folks to re-vote (to see if opinions have changed), and then ask for explanations of both A and B. This makes less sense when there is consensus, because you have fewer people to defend the minority answer, but sometimes you may want to do that depending on whether defense of the minority gets you anything. In all cases, practice arguing for different explanations is what we want students doing, and you had a system in place to allow for that.

The first three scenarios of the Do Now went as expected, however, some students seemed to think that larger speed played a bigger role in overall momentum than mass. I do wonder if the “harder to stop” phrase cued this response. However, in talking with you it seemed like this was in place before that idea was introduced. Regardless, you were aware of this and paying attention. The fourth scenario sparked a nice conversation - big person moving slow vs. small person moving fast. This sort of dilemma, which forces a reconciliation of speed vs. mass is a great topic for deliberation. Furthermore, the lead into this fourth scenarios using the other three scenarios allowed students to begin slowly unpacking their thinking. Evidence of the success of this final scenario came in the fact that you re-pollled them after conversation, and more said they were confused - this is great! In part because the confusion lead them to talk about the two components of the normative model - mass and velocity.

In attempting to reconcile this big/slow vs. small/fast comparison, all sorts of great ideas came out. Anthony offered something that was tough to understand, but you used a nice move in

asking another student to “restate” what he said. Another student glommed onto the “harder to stop” idea by asking whether you were doing the stopping, or whether Mr. Evans was doing the stopping. This student-generated comparison was great, and it’s something you should think about carrying through to other conversations - they invented this thing, if it works, stick with it! Toward the end of this conversation, it seemed like the majority of those contributing ideas were attending to mass and speed - this is where we want them, grappling with the dimensions of the model. We can ditch the harder to stop thing pretty easily, because that’s wedded to this particular scenario. So, my ultimate assessment of “harder to stop” is that it had wonderfully productive messiness. Sure, it’s a hard idea (involving energy, impulse, etc.), but it allows students to tap their intuitions in productive ways, and because it’s messy there is opportunity for real inquiry. If you feel as though you’ve worked the physics out better at the end of these conversations, and the students have shown progress, I think that’s encouraging. In the future, you will know how this scenario can play out - which I think was Jim’s concern, what if the students become too focused on the non-momentum physics as a result of thinking about this? However, I would hope that you, as a skilled teacher, can focus the conversation on momentum by how you select lines of conversation and what problems you introduce.

After the Do Now came a transition into a worksheet, and that was a little rough. We talked about it, so there isn’t a great need to rehash the transition here. However, your explanation of the worksheet was long and wordy, and you lost some good momentum with the class (pun intended!) at this point. It was taken up by many students as “we’re stopping having the interesting, contentious conversation and complying with what Ms. Harlan wants us to do.” We talked about this, and I think you have ways of going from their articulation of mass and speed as the things we care about into the model, even just saying that in physics, momentum is defined as the product of these quantities. Can they explain why it’s a product, and not a quotient? Those are questions I’d want them to grapple with.

The worksheet asks students to take up some rather big, somewhat amorphous questions before getting into problems with specific numbers. The questions were interesting, but I saw a lot of students skip to the problems with numbers. Look, numbers can help people make sense of the math sometimes! What we need to look out for is a pattern of “plug and chug,” which I know you are aware of. I wonder, though, if the bigger idea questions could come after they’ve had a little bit of time playing with numbers, as some of them really wanted to do this. The bottom question on the worksheet asked them to assign numbers to the scenarios that sparked good conversation during the Do Now. I liked this task as it got them back into the scenarios they had thought about. Perhaps you could leave this off the worksheet (because by the time folks got to it, they were confused), and you could introduce the task when you think using numbers might help them unpack the conceptual ideas, leading to a better sense of the normative model.

At the end of the lesson, you handed out a second worksheet with more problems. I couldn’t help but think: “less is more.” Until you had some evidence to suggest they were grappling in meaningful ways about the model - $p=mv$ - I’m not sure how more problems was going to help them. You also had the scenarios they had not yet assigned numbers to, that could have been their homework. Things to consider!

One last point: I notice that you are really good and seem to enjoy working one-on-one with the students. Sometimes these conversations have a tendency to become Q&A sessions,

where you probe the students toward correctness. I think that's fine, but you should keep that in mind as you move around the room. When do I push on their thinking? When do I scaffold for them so they get to a new place or understanding? Treating these times that you enjoy as further opportunities to explore student thinking broadens your collection of attending and responding devices.

Helen, things are coming along nicely! Keep listening to those students, and once you're feeling good about that we can begin moving toward what to do with all the great ideas on the table! Thanks again.

Sincerely,

Brian