Title: Six Teacher Approaches to Physics Labs Legend: [stage instructions] (voiceover)

All: Good Morning. [Pause for 20 seconds for Mr.P and transition to Zeller.]

Mr.p: [Good Morning.] Today we are going to be sharing different teacher approaches on how best to have students learn from classroom physics labs. Mrs. Zeller, please get us started. [pause 5 seconds for transition.]

Zeller: [11-12 second pause between "Good morning" and] Sure Mr.P. In my physics classes we have 2 types of labs. (We have inquiry, pre-learning labs that occur at the beginning of the unit that we use to build the knowledge and connect to throughout the unit. The other type are application/confirmation labs where students have already learned the material and are now applying their knowledge

to figure out a challenge or confirm something they know. Labs have varied amounts of instruction based on the student population that is in the class. … Our goal is to get to a more self-run lab style where the kids come up with the procedure and explore, but will most likely only get there with AP. We are also trying to figure out how to improve the students' science communication skills and have them write lab reports throughout their years of science.) [turn and look at…] Mr.p, now it's your turn. [5 second pause for transition.]

Mr.p: [pause 5 seconds for transition.] Thanks Mrs. Zeller. Labs in my physics classes slowly decrease the amount of instruction to move the students away from what I call 'Cook Book Labs' where they are given step-by-step instructions

… to labs where they are given almost no instruction. (For example, in the first lab I tell them exactly what the procedure is, what to measure and walk them through the entire process. By the end, I provide them with the lab materials and tell them what they are trying to prove. They determine their own procedure, what to measure and why. Also, we use labs as a way to prove the laws of physics. This shows these aren't just random equations we are manipulating, but rather equations which describe the physical world around them. Also, I consider the basic understanding of how to use a spreadsheet program very important for physics. So, in most of our labs, we Harness the Power of Excel!) [turn and look at…] Mr. Thomas, you are up. [5 second pause for

transition.]

Thomas: [5 second pause for transition.] Thanks, Mr.P. I have been working in a small school with limited lab supplies and measuring devices. (So our labs/lab type investigations have been about half using computer simulations and half hands on measurements. Or labs focus more on learning how to develop good questioning skills, analyzing the factors involved, and recognizing the nature of the physics laws in what is being studied as it is about performing the lab. At first I am much more involved in guiding the students with studying the scenarios, and as the course progresses the students take more of a lead on asking the questions and drawing conclusions. The labs are being used to think more

deeply at the underlying actions behind everyday occurances to understand why the world works as it does.) [Turn and look at…] Mr. Segal, the camera is yours. [5 second pause for transition]

Segal: [5 second pause for transition.] Thank you Mr. Thomas. I don't always do inquiry-based labs, but when I do, I prefer to use what I learned at a Modeling workshop in Tempe, AZ, taught by Jeff Steinert in 2013. (I present a preselected set of lab materials and demonstrate something they can do. For example, the materials might include a fan-unit cart, a track, and a motion detector. I ask the students "What do you observe" and write responses on the board. In another column I write "What can we measure / quantify?" and

record the quantities they name. Then in the third column I write "What experiment(s) can we do?" and the stem: "To determine the graphical and mathematical relationship between..." In effect, this final question is a request for an independent and a dependent variable, with the reminder that we're hoping to make a data table, a graph, and a mathematical relationship describing the variable. There may be multiple doable experiments named, and I generally let groups do whichever experiment they prefer.) [Turn and look at. . .] Mrs. Morey, I believe it is your turn now. [5 second pause for transition.]

Mrs. Morey: [5 second pause for transition.] In my AP Physics 1 class, my physics lab approach is to have students design

as many of the procedures themselves as possible and receive feedback from their peers. (I generally have student groups design a lab procedure, do some initial testing, present their methods to the class, and then have a class discussion about similarities and differences between the lab procedures. We then talk about whether the differences are likely to affect their results. Groups are then able to make changes to their procedure if they desire before collecting all of their data.) [Turn and look at…] Now we move on to Mr. Sourvelis. [5 second pause for transition.]

Sourvelis: [5 second pause for transition.] I have incorporated an inquiry approach to physics labs. Typical lesson: Discussion, Lab, Content/lecture, Practice, Test. Lab: Step 1:

present common misconception through prompt/writing, and/or small group discussion. Step 2: guide groups toward designing an experiment to test different ideas. Step 3: do lab, collect data, linearize graph, y = mx + b. Step 4: derive the physical significance.) [turn and look at…] Mr.P, I think we are back to you for the wrap up.

Mr.p: [5 seconds for transition] As you can see, we all have very different approaches to physics labs in the classroom. No one approach is the "correct" approach, however, I will say there was a common theme of pushing students to design their own experiments. I hope this video has been helpful tool to help you, as the teacher, to determine what works best for your students and you. Thank you to all of

you for sharing your insights.

All: [10 second pause for transition] You're welcome. [10 second pause for transition]

Mr.p: And thank you for learning with me today, I enjoyed learning with you.