To: Husni Almoubayyed, Ph.D. Student in Physics

From: Jessica Harrell, Senior Graduate Teaching Fellow

Date: November 1, 2016

Subject: Observation of 33-121 “Physics I for Science Students”

Thank you for inviting me to observe your 50-minute recitation for 33-121 “Physics I for Science Students” on October 11, 2016.

You are the TA for 2 recitation sections, each of which has approximately 25 undergraduate students enrolled. Many students are first-year physics majors while third and fourth-year students from other science, math, and technology majors are also enrolled. For the 11:30 section I observed, 19 students were in attendance.

In this section, you ran a computer lab. On the day I observed you were trying out a new method for walking students through a group activity. For this activity, you planned to use Interactive Python Notebook to project the steps in the activity while students tried it out on their own. During the activity, students worked in 8 groups of 2-4 at computers around the edges of the room.

In what follows, I discuss feedback from my visit to your recitation, which is aimed at helping you recognize effective strategies you are currently using as well as providing you with input into new or different strategies to try in future teaching.

Strategy 1: Modeling Expert Problem Solving

Before beginning the computer lab activity, you returned a graded exam to the students. You gave students time to review their grade and any incorrect answers during the first 5 minutes of class. Once students had looked over their work, you spent another 4 minutes reviewing “common problems.” During this brief review you also asked students 2 questions: “If there is a string attached, what other forces are there?” and “Can someone explain the buoyant force?”

Though brief, this review session modeled problem-solving skills for the students and asked students to participate. Articulating your approach to solving each problem can be challenging when you are an expert in the material and can solve problems easily. However, students who are learning new material often cannot identify the most important or relevant concepts on their own. In the review I observed, working through common problems from the exam gave students the opportunity to see how they should approach these problems in the future.

Modeling expert problem solving effectively helps students learn because you are explicitly identifying which material is relevant to a problem as well as how to apply this material. One of

the features of expertise is that experts can process information in their discipline very quickly, while novices take longer. When teaching novices, it's important to provide time for students to absorb and make sense of new information. When you asked questions during this review, you gave students an opportunity to participate in the problem-solving process. In future teaching, consider taking even more time for reviewing, asking students additional questions, or even having students work the problems. This would ensure they had adequate time to process information and ask their own questions.

Strategy 2: Guiding Students through a Group Activity

During the remaining 40 minutes of the recitation I observed, students worked in groups to complete a 5-part computer lab. You told me before the observation that you would be trying out a new method for walking students through each part of the lab. This method involved you guiding students through the process by showing them one part at a time on the projector using Jupyter Notebook then giving students time to work on that part alone before proceeding to the next part. You explained this process to students at the start of class.

The method you used provided students with guidance on their lab but also gave students ample opportunity for active learning. Working in small groups on the lab is an example of students applying course concepts with the help of an expert who was there to answer questions. While students worked on the lab in their groups, you checked in with each of the 8 groups at least once. You also had the help of an undergraduate TA who typically checked in with groups on the opposite side of the room from you.

This approach allows students to learn the material at their own speed, receive more personalized feedback, and practice in class. This approach also focused recitation time on higher cognitive tasks under the guidance of the TA. Studies show that students learn more deeply when they are actively and thoughtfully engaged with the material and receiving immediate and constructive feedback. The best feedback explicitly focuses on aspects of students' performance relative to specific goals related to their learning in the course and provides students with information on their progress.

While you previewed the lab procedures and remained available for questions, in future teaching you might consider situating the lab more clearly in relationship to the course content to integrate more effective feedback. This could be as simple as providing students with an advance organizer that explains how the lab activity fits into the other course lectures and learning objectives. Another way to situate the activity in the larger course is to highlight a set of questions the activity should help them answer and provide associated feedback. Research shows that students learn and retain more if they have a conceptual framework for situating new knowledge. Providing such an advance organizer would offer this framework and would help students understand how the lab activity might help them meet course objectives.

Strategy 3: Building Rapport with All Students

The classroom climate includes the intellectual, social, emotional, and physical environments in which students learn. A variety of factors such as the class demographics, the physical set-up of the classroom, or the interactions between the TA and the student can impact such a climate. Creating a classroom climate that invites all students to participate in learning activities is necessary for activating learning and heightening retention. One way to create a positive classroom climate is to build rapport with students.

You built rapport with your students when you chatted informally with the front row at the start of class. You also interacted personally with every group at least once during the lab portion of the class, answering questions or checking in on how they were doing. When you were guiding students through the parts of the lab and using the blackboard, however, you primarily faced the left side of the classroom. Most of the students who asked or answered questions while you were modeling the activity were sitting on this side of the classroom.

There are several things you can do to build rapport with all students in ways that preserve your standing as the authority in the classroom and promote a sense of trust and respect for all students. When the room is set up in a way that makes it easier to face one side of the classroom over the other, you may have to be intentional about pausing to turn and visually check in with the whole class after writing on the board. Calling students by name, sharing your passion for the discipline, displaying a generally positive and enthusiastic attitude toward the material and the course, and creating a supportive and inclusive space are some additional examples of rapport-building behaviors.

If students feel that their contributions are valued and encouraged, if they feel included in the discipline and its discourse, and if they feel comfortable taking risks and asking questions, this facilitates learning and retention. In general, the greater the student's perception of the instructor's interest and approachability, the more effectively ideas can be shared, and the more likely students are to learn. Overall, research shows that when students perceive instructors as genuinely interested in them and in their learning, they are more likely to seek help when needed and less likely to engage in problematic behavior.

Concluding thoughts

We have already met to discuss the feedback summarized in this memo, and this observation will count toward the requirements for the Future Faculty Program. If you would like to discuss this feedback further—or any other aspect of teaching and learning—please get in touch!