

April 24, 2019

Professor Maribel Vazquez
Department of Biomedical Engineering
Rutgers, The State University of New Jersey
599 Taylor Road
Piscataway, NJ 08854

Re: Teaching Observation for Professor Maribel Vazquez

Dear Maribel,

This letter summarizes the peer observation of your *Biomedical Transport Phenomena* class (14:125:303) that I conducted along with Dr. Bifulco from CTAAR on Monday, April 16th, 2019. This is a challenging and highly-technical Junior level core course that involves application of fundamental mathematical and scientific principles to biomedical problems. This semester, the class has approximately 60 registered students, all biomedical engineering majors. In advance of visiting the class, we noted that the syllabus is well-organized and complete, containing learning goals, a course schedule with specific topics, assessments, and readings for each individual class session. Other materials (lecture slides, homework questions, etc.) are detailed, and well organized. The expectations for students are clear.

The class began with an individual 20-minute quiz to test student understanding of concepts recently covered in the course. Relevant formulae were provided, placing an emphasis on principles and application rather than memorization. We noted that the quiz was originally scheduled for the class before the observation, but you adjusted the schedule to fit students' knowledge and understanding of the concepts, which is to be commended. After the quiz, you used PowerPoint slides to work through solutions to the quiz as well as alternate solutions of the quiz. All students were engaged during this period, perhaps because the quiz was so fresh in their minds. You encouraged students to focus on reviewing how and why they took a particular approach to solve the questions, not just whether they "got the points". This was a very lively part of the class with many internal discussions going on between groups of students. You not only easily identified areas of confusion but also demonstrated a strong mastery of the material which contributed to a healthy level of respect from students.

The mutual respect between you and the students was fully evident. The classroom was completely full throughout the class period, indicating excellent attendance. We observed almost no instances of cell phone or laptop use for non-course-related activities. The strong rapport between you and the class was demonstrated by your knowledge of the student's names and their individual tendencies. You did a particularly good job of encouraging questions and discussions during class. We noted that you pause effectively to allow students to process the information and formulate questions. A large percentage of the students within the class answered and asked questions. You were comfortable within your position to acknowledge your uncertainty about an answer to a question posed by a student and announced that you would look into the question more fully and report back. While students clearly felt comfortable asking questions at any time, one minor suggestion is to allow students a little more time to formulate their question before beginning to answer.

Another strength that we noticed was the use of advanced questioning techniques throughout the class period. For instance, the review of the quiz solutions included additional formative questions that

required students to consider how the problem would be different if an input was altered. These higher order questions provided an opportunity for students to engage in learning that clearly supported the objectives and ABET outcomes outlined on the course syllabus. Transfer and flexibility in using content knowledge is a difficult goal for students to obtain and it was great to see teaching strategies supporting this skill.

Another component of the class was a review of recent concepts in which you made use of clear, well-organized PowerPoint slides to visually and mathematically present key ideas. This part of the course worked through fundamental principles and highlighted real-world examples for application such as bladder catheterization and dental treatment. While some students were following this review portion of the class closely, we noticed that others appeared detached and may have found it more mundane. Students' attention was not harnessed to the same high level observed throughout the rest of the class. As this portion of the class was administered in lecture style, we thought you may consider utilizing the interactive questioning techniques that you used so well in other parts of the class.

The final part of the class was a group work activity where students used "clicker" devices to submit answers to multiple choice questions. This segment of the course was also very lively with good discussions both before and after problem solutions were revealed. We appreciated that this active learning strategy engaged students by providing time for students to discuss problems amongst themselves. You remained actively involved in the discussion by circulating around the classroom to answer questions and prompt students to continue considering the problems. While collaboration was encouraged, you permitted those who were uncomfortable working in groups to work on their own; which is a good inclusive teaching strategy.

As you acknowledged in our pre-observation meeting, one challenge for teaching this class is that students have not always mastered the prior knowledge required for this course. It can be extremely difficult for students to move ahead with course content if they lack foundational knowledge. In addition to the review and re-teaching strategies you already use, you might consider developing pre-quizzes and support modules in the Learning Management System (Sakai / Canvas). These pre-quizzes could assess the prior knowledge essential for each module of the course and provide an opportunity for students to self-evaluate and preemptively take action when additional review is needed.

Overall, we were very impressed by the learning environment observed in this class. Mixing multiple teaching approaches within the 80-minute period proved to effectively maintain engagement with this relatively dry subject matter. The coverage of course material was efficiently paced, and you even remained after class to patiently discuss concepts with some students who had follow-up questions. We are impressed that you have created a classroom environment where so many students were actively engaged in (heated) discussions on convection in biomedical systems!

Sincerely,



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