Teaching Statement

"Not failure, but low aim is sin."- *Benjamin E. Mays*

The goal of engineering education is to turn students into creative critical thinkers that will develop technologies that help humanity advance. To succeed in educating students, it is important to:

Promote a positive learning environment: Students should feel: (1) comfortable sharing their problem-solving methodologies, (2) safe mutually analyzing/criticizing each other's approaches, and (3) motivated to learn and explore new ideas. To promote this kind of environment, I am transparent with students about learning objectives, motivate them to learn, and treat them with respect. I discuss the 'broader' objectives of the class with my students, provide them with a grading scale that encourages learning, ask them for feedback regarding how they believe the class should be conducted and, within reason, change class specifics to respond to their suggestions. I learn their names, ask them how they feel about various assignments, communicate to them how they will benefit from the activities, and tell them stories about my own learning.

Emphasize the significance of the course material during course sessions: To do this, I will tend to follow my version of the Kolb cycle. Briefly, when applying the Kolb cycle, the instructor: (1) introduces the material they are about to explain by answering the question 'why?'; (2) expounds the actual material, thus answering the 'what'; (3) illustrates the material's usefulness through an example, thus answering the 'how'; and (4) finally further reinforces the new knowledge by discussing the 'what if?'. I will successfully implement this cycle by: (1) showing a visual of the physical phenomena that will be studied during the lecture and explaining some of the history and/or context of how such discoveries were made, (2) 'teaching' the big idea of the material that needs to be internalized by lecturing, (3) asking the students questions about the material and providing them with time to answer alone, discuss with peers, and re-answer the questions, and (4) exploring weaknesses in the idea or discussing how it can be used in more applied settings. My modification to the Kolb cycle is that after step (3), I plan to go back to step (2) and reteach the material in order to clear up any misinterpretations that appear during the group activities.

Tailor the assignments to develop both student's problem-solving and critical thinking skills: *To develop problem-solving skills*, my assignments have three kinds of exercises: one-step, guided-multi-step, and multi-step exercises. One-step exercises involve identifying key variables in a word problem and applying a formula and are designed to help students become comfortable with the notation. Guided-multi-step exercises start with a multi-step question followed by a series of one-step questions, which lead the students to answer the multi-step question. These exercises are designed to give students an example of how to approach more 'open-ended problems'. Multi-step exercises have the same types of questions as the guided multi-step ones; however, a strategy is not provided. *To develop their critical thinking skills,* I typically ask questions like, is there a more effective way to solve the multi-step word problem and why it is more effective. Furthermore, I will have them work through a guided multi-step problem using two different approaches and have them compare the two approaches to the solution. For class projects, I give them assignments in which there is clearly more than one correct way to arrive at a solution and have them write about why they chose their specific approach.

Ensure that student assessment encourages students to continue learning: Engineering students are highly heterogeneous, that is, individual students enter with different preferred learning styles with any number of extracurricular responsibilities, different amounts of background knowledge of the subject, and at various stages of intellectual development. Ideally, students would study a given material until a prescribed aptitude is achieved and then move on to the next subject. However, because of time constraints, a grade that represents how much of the material was mastered must be given at the end of the term, and unfortunately, in our culture, a person's grade is mistakenly equated with his/her talent. As a result, gifted engineering students are often quick to quit or end up with a diminished self-image following their education. To avoid this, I constantly remind students that the final grade measures readiness for future classes and not necessarily ability. I also use student performance during assignments to determine which topics need to be further discussed in class.

Independent of their stage of intellectual development, students ought to be challenged by their education. As a professor, I want to 'teach' students to embrace that challenge so that they can find the will to overcome obstacles in their learning. When they leave my class, they will ideally internalize the quote on the top of this passage and ultimately become creative critical engineers.