Statement of Teaching Philosophy

The vast majority of my teaching experience, and observing the resulting learning experience of others, comes from leading small and mid-sized organizations within the US Navy, and industry. The instruction style I have used to greatest effect is results-oriented, with an emphasis on best-practices, knowing fundamental processes and principles, and continuous improvement. I have personally observed that my teaching effectiveness is highly dependent upon my motivation, clear presentation of the material and expectations, and appropriate learning assessment. It is also dependent upon the motivation and preparedness of the student. I believe that the methods for teaching and learning effectively within these environments are applicable, and can be even more effective, within the traditional academic environment due to the added resources and time available.

Enthusiasm and motivation. Enthusiasm begets enthusiasm. My passion and enthusiasm for a principle or a subject can be infectious. It can provide the initial ``spark" that grabs the student's attention, and ignites their own natural curiosity. I believe that the motivations of the individual play a significant role in learning. The most effective learning occurs when the student is fully engaged in the process, taking personal responsibility for being focused, prepared, present, and, in a group setting, communicative with the other group members. I believe my responsibility is to make the experience interesting, valid, and relevant, and to encourage critical thinking. By keeping the learning experience valid and relevant, it promotes a sense of authenticity, which provides renewed impetus for the student to remain actively engaged in learning. It keeps the students motivated by helping to answer such questions as ``What's in it for me? Why should I care?" I have been able to keep course material relevant and interesting to students by using real, and sometimes dramatic, examples of the current topic.

Developing engineering intuition. Engineering is the place where scientific theory and mathematical modeling meet the physical world. I believe it is important for students to develop a personal, intuitive understanding of the relationship between the mathematical models (the tools) and the physical processes that they represent. I help facilitate this by using analogies and simpler models to describe more complex concepts. Pictures, and real physical examples are used to show that many of these complex physical processes actually exist; it makes the concepts tangible. These physical examples are compared with the results of mathematical simulations. This helps validate the entire learning experience, reinforcing its value to the student. We utilized this integrated teaching method for training junior nuclear submarine reactor plant operators. Operators were required to predict reactor plant behavior under various conditions utilizing a system of fluid dynamics and reactor core dynamics equations. Real-time plant behavior was modeled through a simulator, in order for students to get a physical sense of the time scales involved. Reactor plant drills and theory-to-practice exercises were routinely performed to reinforce the operators' theoretical knowledge and practical skill. Formal critiques of the drill session provide feedback for the operators, and our training team, which often helped us develop better training sessions. Submarine training team members are always members of the crew, and this training/learning process infused the culture

with a sense of continuous improvement, and learning how to learn. The continuous improvement applied to all members of the exercise; as a trainer, I'm sure I learned as much from each experience as the trainees did. This immediate feedback of the theory-to-practice helps the student cement the relationship between the two.

Foundation in the fundamentals. I think its import to spend at least as much time on mathematical and physics fundamentals as it is on how to use the full set of equations. These are the building blocks from which creative engineering solutions flow. I don't assume that the student has a strong foundation in all of the fundamentals. Students that do have a relatively strong foundation in the fundamentals can always benefit from seeing the material again from a different perspective, and they can contribute greatly to the classroom dynamic, sharing their knowledge and perspective. This also helps prevent the presented material from becoming too formulaic, where the student only knows how to apply the material to a limited set of circumstances. I am aware that there is a different foundation upon which to build for undergraduate, beginning graduate, and advanced graduate students. The experience level of my audience may affect the level of complexity of the equations we investigate. However, students of all experience levels can benefit from learning more about the fundamentals.

Diversity as a strength. The people I have had the pleasure of serving with in the military and industry came from very diverse backgrounds by age, race, experience, culture, socioeconomic level, and gender. Two things that we all valued were a desire to succeed as a team, and good, experienced co-workers. There was an inherent understanding that ``we were all in this together'', and our diversity needed to be utilized as a strength; when we were in the brain-storming or group-learning environment, we could draw upon a much greater pool of knowledge. The diversity within the traditional class environment also includes diverse learning styles. I create a learning environment that is attractive to people of diverse backgrounds and learning styles in a variety of ways: leading the class in taking the time to establish professional norms in how we will interact with and treat each other; utilizing large-group, small-group, and individual discussions; team projects; and getting to know each person's background and motivations through interviews and assistance during office hours.

Professional ethics. Engineers help solve problems, and develop new processes and products, that can have a significant impact upon people. I believe it is important for engineers to learn to accept responsibility for the quality of their work, due to the impact it may have on individuals, and society. I believe that the traditional classroom environment can be a part of promoting solid professional practices and ethics by focusing on fundamentals, taking advantage of a diverse social environment, and developing an engineering intuition, and understanding why each of these issues is important for their professional development. Getting the individual student to the point where they feel empowered to continuously improve themselves in all of these areas is the ultimate goal.