Statement of Teaching Philosophy

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I have had the opportunity to observe many different teaching styles in different countries as an undergraduate at the University of Moratuwa, Sri Lanka, a graduate student at Saga University, Japan, and a postdoctoral research fellow at the Johns Hopkins University, USA. After securing a faculty position at the University of Moratuwa, Sri Lanka in 2003, where the top 0.2% of the students who sit for the GCE (A/L) examination secure admission, I have gradually developed my own teaching style with three major objectives: (1) to ignite a passion for the scope of the subject, (2) to internalize the fundamental concepts and make the students thirsty to look for more excitement and knowledge by themselves, and (3) to make students appreciate the essential professional standards one should follow in order to become a productive professional. Therefore, constant evaluation of the conversation in the class room is of paramount importance to me.

Few simple but vital set of strategies I adopted helped to grow the demand for my courses by nearly 400% from year 2003 to 2007. First, I take a considerable amount of time to make the big picture, the opportunities, and the purpose of the subject clear to the students. For instance, before teaching kinematics of a robot manipulator, I take few examples where a good knowledge of the kinematics of rigid body chains have saved human lives, or changed the fate of a project. These examples can range from robotic tele-surgery, robot manipulator at the international space station, prosthetics, etc. A good passion for the subject and an appreciation of the goals of studying a particular subject has always lead to a healthy conversation between me and the students. Second, I slow down to explain the physical meaning of fundamental mathematical concepts as much as possible. For instance, the meaning of Eigen vectors in terms of characterizing how a matrix rotates and scales vectors, or Laplace operator in terms of characterizing the decay and oscillation of the response of a dynamical system to a stimulus, etc. I make sure to do a number of simulations with simple Matlab codes and let the students experiment with these mathematical concepts. This makes it easier to train the students to effectively use Mathematics to analyze physical phenomena. Wherever possible, I take examples from Nature to demonstrate concepts that may sound complex at first. For instance, the tiny brain of an ant is a good example to demonstrate that we do not need extremely large computational power to orchestrate a multitude of complex skills such as dexterous coordination of many legs, powerful taste and smell processing capability, ability to collaborate with other ants to accomplish complex tasks, implement a variety of defensive behaviors, etc. Visuals has helped me a lot to communicate the physical meaning of these examples. Third, I make sure to stimulate their imagination, habit of reading, investigating, and discovering things on their own. I do this by giving them questions and practical design and fabrication projects that require them to think, read, and use computers and tools to design and fabricate a solution. Even a very simple project like designing a single motor system to make somebody touch and feel torques ranging from

0.1Nm – 5Nm, where the user can change the torque with a knob, touch a pulley to feel the torque, and see the value of the torque on a display, has made a significant impact on the practical understanding of torques and forces, interfacing electro-mechanical systems to microcontrollers, computers, etc., and to improve a product through observing how a stranger interacts with it. Fourth, I invite representatives from the industry to sit in my classes and give feedback from time to time. It has not only improved subtle areas of my teaching strategy, but also helped to improve the demand for my students.

Curriculum development:

I was in charge of curriculum revisions in the Department of Mechanical Engineering of the University of Moratuwa under a World Bank grant for Improvement of Relevance and Quality of Undergraduate Education (IRQUE), where I introduced new courses in Mechatronics and introduced significant improvements to the taught courses in Automation & Robotics, and Control Systems and Instrumentation. Apart from the undergraduate education, the Government of Sri Lanka appointed me as the chairman of the National steering committee to design a high school curriculum on design and technology that integrated concepts from Mechanical Engineering, Electrical Engineering, Electronics Engineering, and Civil Engineering with a high priority given to design methodology.

Teaching experience:

ES100 – Senior design project, **School of Engineering and Applied Sciences, Harvard University**
I started to supervise two students to design legged robotic systems to navigate on soft terrain conditions.

Faculty of Engineering of the University of Moratuwa, Sri Lanka
Undergraduate courses:
(i) ME428 - Automation and Robotics (2004, 2005, 2006), (ii) ME301 - Control Systems & Instrumentation (2004, 2005, 2006), (iii) EE222 - Electrical Measurements (2003, 2004), (iv) CS323 - Intelligent Systems (2003, 2004), and (vi) ME430 - Energy Conservation (Two lectures in 2004, 2005, 2006).

Postgraduate courses:
(i) EE5061 - State Space Design, (ii) ME5144 – Mechatronics and Robotics, and (iii) ME5202 - Advanced Engineering Mathematics for Controls (iv) PME/MSE304 - Mechatronics and Robotics.

Future areas of teaching interests

In addition to the above areas where I have four years of experience, I wish to explore the possibility of integrating neurological aspects of human motor control with mechatronics to train engineers in bio-robotics. I also wish to explore the possibility of integrating evolutionary computation techniques with distributed processing to train engineers to the emerging field of system of systems engineering where heterogeneous and independent systems will be optimized by making them work in a loosely unified system. In addition to core Engineering subjects, I am eagerly looking forward to teach a course to train engineers to be change agents, technology diplomats, and opportunity creators in the industry and the society.