Statement on Mentoring of PhD Students

Frank L. Lewis **Tuesday, January 26, 2010**

Without students there is no university. Without students there are no professors. Sometimes, when we get busy in our daily jobs, we might forget the reason all of us are here but I have realized for the past 29 years that the only way to be successful is to first and foremost make my students successful.

I consider myself privileged to write this essay on my mentoring philosophy. I'll try to keep it short though I am excited about the topic.

I have had 36 PhD students, and I normally advise about 5-8 PhD students at any time. They come from around the world and from all walks of life. I make it a point to meet each one of them individually once a week to consult on their progress and talk about their research projects. Each student knows that the expectations are high, thus works hard and advances quickly as we develop new scientific ideas together. After about a year, each one writes the first journal paper. I am quite tough on my students at the beginning to promote a fast pace of scientific discovery. But after they get the first journal paper accepted, I insist that we go to first-name basis. This has a fine effect in surprising my students, further motivating them, and making them realize that hard work, creativity, and diligence are the key to success and recognition on all fronts. It is particularly gratifying to go to work at the Automation & Robotics Research Institute on weekends and see all my students there working as well!

I view it as a personal challenge to make each student excel professionally, and to produce as many creative works as possible by the time they leave me. This is one main way I get my own fulfillment. The development of each of my PhD students is like a chess game for me, I'm always thinking how to make them the best they can be. Each one needs to be treated differently. As one tactic, I have sent students to Singapore or Hong Kong to collaborate with my colleagues there for a few months, and this has stimulated them to create papers, books, and patents. During their PhD studies all of my students end up publishing 3-5 papers in the top scientific journals, plus several conference papers. Many of my students have had their dissertations published as books. It is extremely exciting to see in final form a finished book, with all the ideas we worked on so hard for so many years fashioned into a beautiful tapestry with all its dependencies, relationships, and intricate flow of ideas. In fact, for us writing a book is like creating a painting in thoughts and ideas. Everything has to be balanced and in proportion.

No matter what is happening in my professional life, the advance of my PhD students is always my first priority. I try to create an environment of excitement, discovery, and interchange of ideas at ARRI. I am available personally or on email 24 hours a day for my students. I go through their draft papers and give feedback within one day. It is exciting to see the ideas develop as we work on projects together, in the weekly one-on-one meetings and also online working on publications together. I also run a weekly PhD Forum where all students meet together and we discuss ideas, with some students giving presentations about their work each week. This makes for an exciting interchange of ideas and gives them practice for presentations. I make it a point to send each student to a couple of conferences to present their papers in front of expert audiences.

It is important for PhD students to learn teaching skills. Therefore, I sometimes have my students teach lectures in my classes to hone their thinking and discourse styles. In fact, I organized for my recent PhD student Draguna Vrabie to teach as listed instructor-of-record the undergraduate control systems course EE 4314. I did the same for Murad Abu-Khalaf, Jyotirmay Gadewadikar and Jose Mireles some years ago. Murad now works as a design engineer at Mathworks, Inc., Jyotirmay is now a professor at Alcorn State University, Mississippi and Jose Mireles is now a professor at both Univ. Texas El Paso and UA Ciudad Juarez in Mexico.

Diversity has always been a tangible thing for me. I have worked hard to recruit women PhD students into engineering. My PhD student Cecilia Temponi is now faculty at Texas State University, Asma Al-Tamimi is a professor at Hashemite University in Jordan, and Draguna Vrabie has just finished her PhD. She is now a Research Assistant Professor working at ARRI with me on a textbook. I had an NSF Graduate Research Traineeships (GRT) grant some years ago. I worked hard to recruit students into the UTA graduate program from UT Brownsville and Grambling University. I have had award winning students from those efforts, with Margaret Hoffman, Antoine Langston, and Antonio Quevedo going on to top jobs or further graduate school at top universities.

Six of my former students have patents based on their PhD research work. Three of my entrepreneurial students Javier Campos (Venezuela), Scot Ikenaga (Hawaii), and Andy Lowe were hired to start the DFW office of Montavista Software. Now it is a successful enterprise in the regional southwest USA area.

Many of my students have won top national and international awards. Rafael Fierro won the top PhD dissertation award from the NSF in Ecuador, Hsiang-Hsi Huang in Taiwan, and Jonqlan Lin in Taiwan. Hsiang-Hsi has served as Chair of his Department at National Pingtung University and is now visiting me (many years later!) as a Visiting Research Scientist at ARRI. Almost all of my PhD students have been recognized in some fashion, either nationally, internationally, or through local UTA/IEEE awards, or by having their dissertations selected for publication as books.

Three of my students are NSF Career Awardees - Darren Dawson, Rafael Fierro, and S. Jagannathan. Darren is now an endowed chair professor and Department Chair at Clemson, Rafael a professor at Univ. New Mexico, and Jag an endowed chair at Missouri Inst. Science and Technology. Jyotirmay Gadewadikar won the Dept. of Homeland Security "Early Career Faculty Scientific Leadership Award". Two of my students' students are now NSF Awardees! It is an amazing feeling to see my own enthusiasm passed down from my students to theirs!

On another note, I believe that once a student has learned to write papers and do creative thought, it is my obligation to give them the important service of…. Developing their sense of humor! Though it may sound odd, this definitely correlates to their productive scientific capabilities and feelings about life in general….

I work with students that come highly recommended by my colleagues from around the world. I had a Croatian PhD student, Stjepan Bogdan, working with me under the Fulbright Program. I was expecting another student from Serbia, Rastko Selmic. When he arrived at the airport I had Stjepan meet him and help get him settled in his apartment. I recall later they told me how they had reacted to this in a rather surprised manner. They became fast friends and wrote several papers together. They were both top students, with Rastko now a professor at Louisiana Tech University and Stjepan a professor at University of Zagreb.

It is gratifying and exciting to see my students advance beyond me. My 3rd PhD student Chaouki Abdallah is Chairman of ECE at University of New Mexico and was General Chair of the top controls conference CDC 2008. My second PhD student Kadri Ozcaldiran is now President of Bogazici University in Istanbul, one of the top institutions in Turkey. My 10th PhD student, Vassilis Syrmos from Athens, is now Associate Vice Chancellor for Research at University of Hawaii at Manoa, and served as Scientific Adviser for the Chairman of the Senate Committee on Appropriations, Senator Inouye from Hawaii.

Two years ago, I noticed two top USA undergraduates in the UTA CSE Department, Chris McMurrough and Matt Middleton. Although they did not know it then, I set my sights on getting them into the UTA PhD program. I paid them to work at ARRI on their team project of building a robot for a regional IEEE competition and simply let them play with their ideas. After a year, they decided to stay for the master's degrees with me at UTA! Then Chris received a summer scholarship to work at Wright Paterson AFB with my colleague Dr Siva Banda, chief scientist for control systems in the Air Force, and Matt was invited to work at US Army TARDEC, Michigan for a few weeks by Greg Hudas and Grant Gerhart, a Senior Scientist in the Army. Now they are both my PhD students. So it seems my plan worked, and UTA now has 2 more top PhD students!

As a final word, I want to say that our discipline of Feedback Control Systems has a long and embedded history within the historical development of engineered systems, starting with the Egyptians, Greeks, and Arabs, going through the Industrial Revolution, the Communication Revolution of the railroads of 1870s and the telephone longlines of 1907, and into the present day. My goal is to motivate students to think deeply and broadly and in a highly committed manner within society. For me it is important to make my students realize how the ideas they are working on relate within the broader context of Systems Theory, and thence to Natural Philosophy and the History of Mankind.

As Khalil Gibran said: "Our students are as arrows shot from our bows. We can mold then and fashion them, but once loosed they follow their own trajectory and we can only watch gladdened at their free and straight flight."

As the ancient Chinese Sage said: "Without students, we inherit the wind."