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I have always enjoyed teaching and mentoring. Early in life this led me to be a coach and a tutor. In fact, it was other students that recognized my passion for teaching and mentoring that encouraged me to become a professor. When I first started as a professor, I thought my primary mission as a researcher was to come up with innovative solutions that would solve the problems of the world. I still have this as a major goal of my research program but I now recognize that my primary mission is to teach the next generation of researchers how to develop those innovative solutions. To develop these skills, students must be able to identify problems, propose logical solutions, and communicate them to their peers and the general public. While it would be nice to have a single approach that tells professors how to teach and mentor students, everyone has unique goals, ambitions, and motivating factors. Therefore, whether it is in the classroom or lab, it is important to recognize and embrace these differences so that you can provide each student with the tools and opportunities to build on their strengths and improve their weaknesses. These differences require patience from an advisor, especially when the goals, ambitions, motivating factors, or approach to solving a problem may differ from your own. While each student requires a unique approach, there are some general themes that are important to all students.

Establish a holistic learning experience: An important aspect of mentoring is to identify what motivates and inspires each student. From the beginning, I alter their graduate experience to prepare them for their long-term goals. If their goal is an academic position, I have them focus on hypothesis-driven research, I get them to help write proposals, and I provide additional opportunities for them to teach in the classroom. For those that seek an appointment at national labs, I encourage them to do an internship or use the national facilities in their research. For those that seek careers in industry, I focus more on improving their leadership and entrepreneurial skills. It is also important to communicate regularly with them to see if their long-term goals have changed so that you can provide different opportunities.

Providing a unique environment requires preparation and flexibility. Even though the end objective of each student may differ, I encourage a holistic learning environment that develops both technical skills directed towards their long-term goals and soft skills that are important in any future position. I focus on the importance of conveying difficult material in a concise and clear manner and adapting that message for the current audience. At group meetings, all students are encouraged to participate in active discussions and ask challenging questions. This teaches students how to offer critical assessments without being personal and those presenting learn how to anticipate the mindset of the audience and how to address constructive feedback. Because the students feel the freedom to express their opinions, they are more inquisitive and genuinely want to learn more about what their fellow lab mates are doing. We often brainstorm together, finding unique solutions to complex problems. This commitment to communication skills has been successful and my students often win major awards at conferences.

Provide a nurturing environment: The demands of graduate school are high and students who are excited and enjoy their time in the lab are the ones that will be committed and productive. I believe the most important role of a mentor is to push students to excel; to make them realize that they can achieve much more than they ever thought they could. When students have trouble understanding concepts or solving a problem, I don't simply answer their questions – I ask them questions that help lead them to the answer. This requires more time from me, but students truly learn the material and can explain rather than recite what they have learned. This process of questioning also helps them to understand the logic used to understand material or identify problems. I also encourage independent thinking by creating an open atmosphere where students are welcome to express their opinions and ideas. I treat students as peers throughout this

process. When they find an innovative approach that might work, I encourage them to try it. When they choose paths doomed to failure, I ask questions that make them realize the error in logic rather than quickly brushing it off. When they find a potential solution with uncertain promise, I encourage them to read more to decide if it is a worthy path to pursue. This process helps students to identify problems and propose logical and practical solutions.

Provide a safe environment: It is important to recognize that students have activities and problems outside of academia. I strive to provide an environment where students can talk to me about anything. To help establish this environment, I will often ask about their activities outside of the lab or share my own. Observing their behaviors during casual talk is important for recognizing when students may be struggling and unwilling to share what is troubling them, whether it is in or out of the lab. While students naturally tend to be more reserved with the information they share with their advisors, I always share my related experiences and tell them both what has and has not worked for me in similar situations. After they graduate, my former students immediately feel open to discuss all aspects of life. Many of my former students could be considered some of my best friends.

Empower leaders: If graduate students learn to lead their project, they can appreciate the accomplishments of their work and explain it to others. I start by ensuring that students understand how to design experiments to answer specific questions. These skills ensure students are capable of problem analysis and solutions through self-discovery. Students must appreciate the assumptions made to analyze problems and learn to analyze data with a heightened degree of scrutiny. In the laboratory, students must learn how to formulate their problems, properly analyze their data, and discover the solutions through their own process. Once students have gained self-confidence in their research and planning skills, I encourage students to move their project to what excites them (within the confines of our research funding). At this point, they are in control of their learning experience, and I am more of their guide that keeps them motivated and encourages them to persevere as they encounter setbacks.

Mentoring Success

Since I joined UF in the Fall of 2005, I have been honored to supervise the research of 68 graduate students. I have chaired or co-chaired 19 PhD graduates, chaired 3 MS graduates, and served as research advisor for another 49 MSNT students. My research group currently consists of 3 PhD and 2 MSNT students. I also enjoyed mentoring PhD and master's students with their curriculum and career choices during my time as Associate Chair for Graduate Studies.

My graduate students publish in high impact journals and receive good citations. Over my career, I have had 7 (out of 21) students win 12 awards for presentations at conferences. These awards include the best presentations at very large conferences that often have thousands of attendees, including AIChE, MRS, and ACS. My graduate students have also been highly successful in their careers after graduating. Out of the 21 students I have graduated thus far, five of my students have taken positions as professors, another student has an adjunct professor position, and the others have taken positions at leading industries, such as Intel, Apple, Applied Materials, and ASM International. My first student was a recipient of the prestigious Outstanding Young Alumnus Award from UF, which is highest honor given to alumni within 10 years of their graduation. However, the most fulfilling evidence of mentorship success has been the continual interaction that I have been able to maintain with my students after they graduate. Many of them continue to engage with our group after graduation – not for the sake of completing work that they were conducting but to ensure that the next generation of students is successful. I have also embraced my role as a lifetime mentor to my former students. I often talk with them about the challenges that they are facing at their current position and what steps I would likely take in a similar situation.