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Engineering Education Statement of Purpose

With growing tensions in high schools due to political changes, rules, and curriculum being determined by individuals that rarely enter a classroom, and teachers being expected to "do more" with fewer materials, the reason I got into teaching in the first place can often get clouded: to inspire students to chase the thrill of discovery. I was fortunate enough to have this desire to chase this thrill from a very young age, and it has been my life-long mission to help others feel this same inspiration. From being a camp counselor, to helping with countless outreach events, and teaching technology and engineering courses to both secondary and college-level students, my pursuit of discovery turned into a career focused on helping others learn and enjoy learning. To continue my personal exploration, and to hopefully help educators around the world, my next goal is to pursue a PhD in Engineering Education. I want to further help and study how we as a society can better support our primal desire to learn more about the world and universe around us, and how we can make it better.

My primary interest in Engineering Education is at the secondary level, focusing on how to ensure that the knowledge and critical thinking skills that were developed in high school can bridge the gap to college, the workforce, the military, or whatever path the student decides to pursue. I received my Master's degree in teaching with a concentration in science education from Piedmont College (now Piedmont University) through the Woodrow Wilson Teaching Fellowship (now Citizens and Scholars). Through this fellowship, I taught engineering and mechatronics in Barrow County, Georgia. Due to the high poverty rate in the area, it was not uncommon for students to have to skip school to go to work to help provide for their family. This put additional pressure on me as an educator to ensure that the content I was providing to students is meaningful and practical enough where it is known to the student that it is worth being in school that day instead of making some extra cash. While my task at hand is complex, the situation the student is in can be described as impossible; take the immediate return and provide food for the family, or go for the long journey and hope to learn something to better the chances in the future. Fortunately with teaching engineering and mechatronics, most of my students found coming to class enjoyable and useful, but I needed to find ways to have the class provide nearly immediate benefit for some of the students so they felt it was worth coming to class instead of going to work while still meeting the curriculum standards.

This need for immediate return caused me to develop a program which was almost exclusively about problem-based learning, where students would find and solve small problems in their life that could be accomplished with the help of technology and engineering. The timeline with many of these challenges were usually no more than one or two weeks; this allowed us to go over different concepts and approaches which then would steer which direction the students would take to solve a problem they had in mind. This led to students designing and making an interactive nightlight for their siblings, creating computer (CAD) models of houses' floor plans to ensure everyone in the household could have some of their own personal space, and even programming debt and loan calculators to help parents see and manage their personal finances. These little projects often got brought back up in different concepts. The loan calculator got a graphical user interface (GUI) and e-mail notifications for bill payments, the nightlight turned into an alarm clock with FM radio, and the house floor plan turned into a full three-dimensional model, appliances and furniture included! All of these projects and solutions did more than just teach how to use CAD software, basic electronics, or some programming; they helped build that joy of discovery, and push students to learn more to make improvements and better solutions. It is this mindset that will help the students in whatever path they choose after they graduate from high school. Some students had to go right into the workforce to provide for their family, but were able to move up the ladder quickly due to their problem-solving skills. Other students went to the local technical college or completed a certificate program, and are currently making more than I did as a school teacher just after a few years, and others went on to college to pursue further opportunities right away. My favorite part, regardless of the path the students took after they graduated, is that many of them are still tinkering and problem solving. I still get contacted from former students about projects they are working on and what they are learning. Finding ways to ensure everyone has the opportunity for whatever path they choose is incredibly important to

me, and I am always looking for better and more meaningful ways to help others achieve their personal educational goals.

While teaching high school in Georgia, I also taught night and summer classes in mechatronics at Lanier Technical College, primarily AC theory and Industrial Instrumentation. The majority of the college students that I was teaching there were taking the courses out of necessity to provide for their families, but were fortunately able to work and go to school at the same time, a luxury many of my high school students did not have. The college students took their studies very seriously, and most only saw it as a means to make more money, but I wanted to try to get the students to actually enjoy learning as well. While I did keep most concepts focused on industry for the college students, I also managed to work in personal projects and experiences that were able to bring the concepts closer to home and more meaningful for the students, like scaling down an industrial heater to a home oven. Building and assembly line automation turned into home automation and autonomous gardening. This led to more tinkering again, and personal projects that students were eager to show me – another favorite experience that never gets old. On multiple occasions, I had students thank me for "helping them enjoy learning again," or that they wished they had these experiences in high school. While I am humbled by these statements, it raises the question of "why have these students not felt this joy of learning until now?" To answer: the students have felt this joy of learning before, otherwise they wouldn't know what they are missing, but now we need to ensure it stays with them.

Since June of 2021, I have been an instructional lab coordinator at Purdue University in the Elmore Family School of Electrical and Computer Engineering (ECE), focusing primarily on leading and coordinating ECE20007, our introductory electronics course for the department. One of the first things that I learned about this course is that nearly half of the students that take ECE20007 are not actually studying ECE. While it is clear that this course should primarily cater to ECE students and ensure the students are prepared for their future ECE courses, it also needs to hold practicality and effectiveness for the nearly 700 other students that take this course over the academic year. This has led to running experimental sections early on in my career here at Purdue, and developing and adjusting labs to have practical and meaningful applications that can be seen across science and engineering disciplines. In my time here at Purdue, I have already met with nearly 100 different individuals regarding ECE20007, including graduate and undergraduate teaching assistants, ECE20007 students, and faculty and staff from multiple colleges and departments from around the university. When these meetings occur in my office, it is always fun to see students get excited when they see my 3D printers, lab bench and personal projects. After our discussion about the course, the topic often changes with the student asking how to get involved with 3D printing, or animatronics, or just wanting to learn more about electronics. This happens regardless of discipline and the students often state they haven't had the opportunity or desire to do more personal projects until they had that conversation with me. It is always exciting to see the student get excited about learning again, but we need to make sure this thrill of discovery happens at every level of education, and is encouraged in classes and individual time.

I wish to pursue a PhD in Engineering Education to further study how we as educators, educational institutions, and a society can better practice, engage, inspire students and ourselves to seek the thrill of discovery no matter the level of education, and ensure that students wish to seek knowledge and experience from an early age. Not only should everyone be excited to learn early on, but should continue to want to learn throughout their careers and lives. Engineering has a unique position in our schools and society where we can address nearly every subject including the social sciences and technical writing, and finding ways to develop well-rounded scientists and engineers will allow us as a society to flourish and prosper.