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Alumnus' Engineering Research Begins with Basic Math Principles Learned at Gardner-Webb

BY OFFICE OF UNIVERSITY COMMUNICATIONS ON NOVEMBER 4, 2021

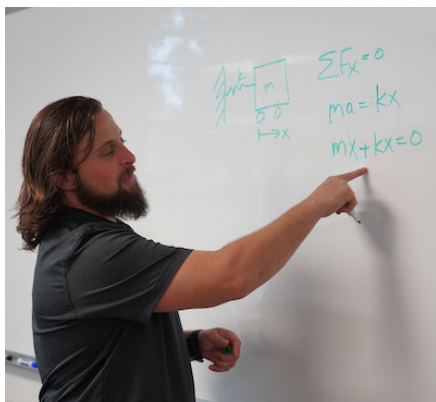


Dr. Timothy Kernicky, '09, Helps Develop Methodologies for Inspecting Infrastructure

To our readers: November 8 is National STEM/STEAM (Science, Technology, Engineering, Art and Math) Day. According to the U.S. Census Bureau, STEM occupations account for nearly 7 percent of all U.S. occupations and STEM workers play an important role in America's innovative capacity and global competitiveness. They are engineers (like Dr. Timothy Kernicky), medical scientists, sociologists and informational security analysts. National STEM Day is celebrated every year to encourage kids to explore their interests in the fields of science, technology, engineering, art, and math. In 2019, there were nearly 10.8 million workers in STEM occupations, according to Census Bureau estimates.

While studying calculus, statistics, data analysis, matrices, and other topics in the Department of Mathematical Sciences at Gardner-Webb University, Timothy Kernicky thought to himself, "I'll never use math in my career." However, he soon discovered that these mathematical principles would be central to his graduate studies and his research.

After graduating with honors from GWU in 2009 with his Bachelor of Science in mathematics, Kernicky earned a Master of Science in structural engineering in 2013 from the University of North Carolina at Charlotte and a Ph.D. in Infrastructure and Environmental Systems in 2018 from UNC-Charlotte.



Kernicky served as an adjunct instructor after receiving his Ph.D. and is now a research assistant professor in the UNC-Charlotte Energy Production & Infrastructure Center. Over the past decade, he has been heavily involved in experimental structural engineering research. The goal is to develop new methodologies to directly address failing infrastructure and to help mitigate failures before they occur by tracking the onset and progression of deterioration and damage.

Kernicky recently visited the Gardner-Webb Department of Mathematical Sciences to give students and faculty members an overview of his research and examples of the mathematical principles he uses every day.

He acknowledged that his research, along with 14 publications or presentations he has either authored or co-authored are the result of learning basic math principles in his undergraduate classes at Gardner-Webb.

His current projects include, “Development of a Low-Cost, Portable, and Rapid Nondestructive Inspection Tool for Timber Distribution Poles” and “Exploring Digital Twin Technologies for Advanced Nuclear Construction.” The goal is to provide practical, cost-effective solutions for the industry.

“We are developing a system or a process for rapid testing of timber distribution poles (for power lines, cable lines, etc.),” he expounded. “We have been trying to develop an algorithm or a way at instrumenting a pole with an accelerometer and collecting vibrations.”

He described the current method for testing timber distribution poles, which occurs once every 12 years. “The lineman goes up and he hits it with a hammer and he listens to it; it’s called a sounding,” Kernicky said. “If it sounds good, they climb it and check the top. If it doesn’t sound good, we need to dig around the base, excavate it a little bit, but that is an expensive process.”

The research at UNC-Charlotte is sponsored by Duke Energy and it is aimed at supplementing the process with a device that can be strapped onto the pole. “They can still perform the impact and listen to it, but we can get quantifiable damage through something called model updating or model calibration where we can determine if there is sub-surface decay without having to excavate,” Kernicky

related. “UNC-Charlotte and Duke Energy have a joint patent. We are in the verification phase. It will be several years before we can take this to market.”

Gardner-Webb University is North Carolina’s recognized leader in private, Christian higher education. A Carnegie-Classified Doctoral/Professional University, GWU is home to six professional schools, 14 academic departments, more than 80 undergraduate and graduate majors, and a world-class faculty. Located on a beautiful 225-acre campus in Boiling Springs, N.C., Gardner-Webb prepares graduates to impact their chosen professions, equips them with the skills to advance the frontiers of knowledge, and inspires them to make a positive and lasting difference in the lives of others. Ignite your future at Gardner-Webb.edu.