

SIUE Faculty Fellows Innovate, Integrate and Invigorate STEM Education

by Megan Weiser
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EDWARDSVILLE - The Southern Illinois University Edwardsville Center for Science, Technology, Engineering and Mathematics (STEM) Research, Education and Outreach has announced its FY20 Faculty Research Fellows.

The competitive fellowship is granted to outstanding faculty with proposals aimed at innovating ways to engage students in STEM and improve undergraduate STEM learning. The FY20 fellows are Nima Lotfi, PhD, and Kathleen Vongsathorn, PhD.

Lotfi is an assistant professor in the School of Engineering's (SOE) Department of Mechanical and Mechatronics Engineering. As a research fellow, he will study the implications of using open-source hardware and software platforms for Control Systems education. Vongsathorn is an assistant professor in the College of Arts and Sciences' (CAS) Department of Historical Studies. Her research centers on integrating STEM and history in undergraduate curriculum.

"The 2019 Faculty Fellows and their projects illustrate the types of creative partnerships we aim to develop through the program, said Sharon Locke, PhD, SIUE STEM Center director. "By connecting our Center's STEM education researchers with engineering and history scholars, we are at the leading edge of new approaches to undergraduate STEM education."

"Both fellows will study how learning STEM in practical and real-world settings brings personal relevance to learning, and supports broader participation in STEM education and careers," she added. "I'm thrilled to be collaborating with these outstanding educators over the next year."

Lotfi emphasizes that control systems have been the cornerstone of many global technological advancements since the early 20th century, as well as the foundation of mechatronics and robotics engineering (MRE), a newly-developed degree program in the SIUE SOE that is experiencing tremendous enrollment growth.

"Control systems play a fundamental role in industrial automation, transportation, energy industry and other emerging areas such as robotics, manufacturing, Internet of Things (IoT) applications and cyberphysical systems," Lotfi explained. "Control engineers are shaping the world by designing smart and autonomous systems and processes that will improve human life and welfare. My goal as a STEM Research Fellow is to increase awareness and familiarity with the use of open-source software and hardware packages in controls and MRE education, and practice toward accelerating their adoption."

Lotfi will investigate the integration of open-source hardware and software platforms in various control and MRE courses, aiming at familiarizing students with the implementation of real-time and advanced control algorithms.

"The open-source software platforms can be augmented to other STEM-related courses at SIUE to help foster a computational mindset among students," Lotfi said. "With

recent advancements in the computational power of computers, some of the traditional mathematical concepts are being replaced by powerful numerical methods which are rarely covered in STEM courses.”

Additionally, Lotfi is promoting the value of control systems training for industry professionals and the public, as well as the cost-effectiveness of open-source platforms.

“Open-source platforms are the perfect solutions in underserved communities and K-12 institutions in which there is a serious lack of financial support and technical expertise,” Lotfi explained. “I hope this project will lead to identifying educational outreach opportunities among the general public, and facilitate resources and education to a broader array of constituents. Community members stand to benefit greatly from understanding the scope and possibilities associated with open-source platforms. Such exposure can allow people to engage in home, farm or office automation projects, and therefore, utilize the numerous advantages of automated systems at a reduced cost compared to commercial alternatives.”

Vongsathorn adds an extra ‘m’ for medicine in her use of the STEM acronym. With scholarly expertise and training in the history of science, medicine and technology, she is interested in the intersection between history and STEMM.

“My goal as a STEM Research Fellow is to determine what model for the integration of STEMM and history curriculum will be most effective in improving learning outcomes for SIUE undergraduates,” Vongsathorn said.

Vongsathorn started at SIUE in fall 2018, and is eager to build a relationship with the SIUE STEM Center to support her scholarly interests and focus on interdisciplinary teaching and research.

“It’s been exciting to start exploring avenues for integrating STEMM and history,” she explained. “One avenue will be through a travel study to London which has been approved for July 2020. The travel study “Science, Medicine and Technology in the History of Britain and its Empire” will integrate historical and STEMM content through site visits and museums. My aim is that this opportunity will be appealing and constructive for STEM students.”

She describes this interdisciplinary exploration as an intriguing puzzle that she is determined to solve by productively connecting the pieces.

“Beyond my scholarly interests, I firmly believe, and research suggests, that incorporating humanities into STEMM curriculum can create better scientists,” Vongsathorn said. “There is also some evidence to indicate that integrated curriculum

improves retention and grade point averages for women and underrepresented minorities in STEM.”

“Growing up as I did in a family of women scientists, this is important to me,” she added. “I was fortunate to do my graduate study in a department where almost everyone was focused on health in Asia and Africa. This, and my research in Uganda, gave me a real appreciation and understanding of the role that people around the world have played in the development of scientific knowledge, which has often gone unnoticed. I’m keen to bring some of that awareness to SIUE students.”

The STEM Faculty Research Fellowship program provides funds that free up a portion of faculty time for testing classroom innovations, and gives access to the Center’s educational researchers to help assess student outcomes. STEM Center educational researchers also collaborate with the fellows to prepare proposals to external funding agencies for additional research and institutionalization of effective STEM education practices.

The Southern Illinois University Edwardsville Center for STEM Research, Education and Outreach comprises an independent group of researchers and educators, innovating ways to engage students and the public in science, technology, engineering and math (STEM). Within the SIUE Graduate School, the Center brings together research faculty, graduate students and practitioners to conduct education research. The Center contributes educational expertise to SIUE undergraduate classes and provides professional development for K-12 teachers. The Center boasts a significant library of equipment and resources, which are available for loan at no cost to campus and regional instructors. For more information, visit <https://www.siue.edu/stem/about.shtml> or contact STEM Center Director Sharon Locke at (618) 650-3065 or stemcenter@siue.edu.