Method assesses instructor performance in 'freeform classroom'

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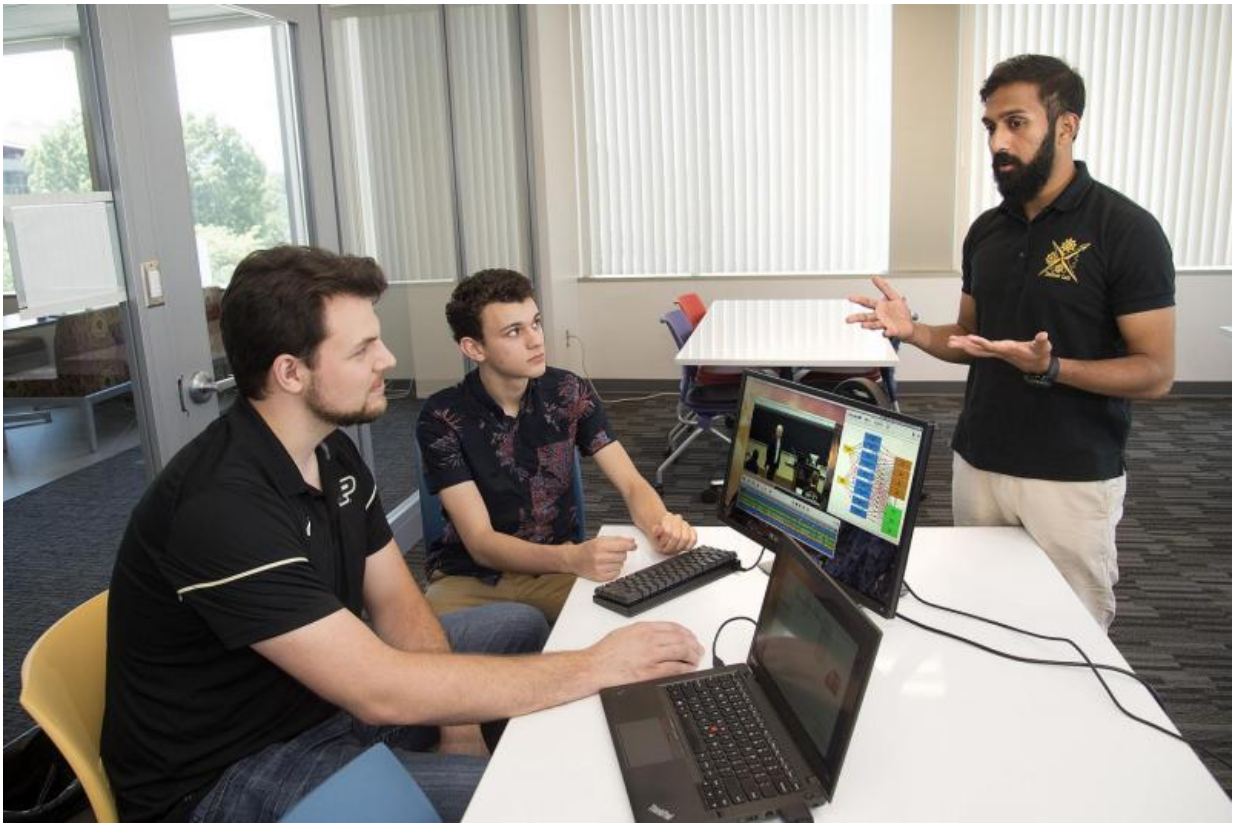

Graduate students (from left) David Evenhouse, Austin Zadoks and Rohit Kandakatla discuss research involving the Freeform Classroom at Purdue University. Credit: University photo/Mark Simons

Engineering education researchers have developed a method to assess

the effectiveness of instructors who are using an innovative teaching approach that could play a role in boosting the number and quality of engineering graduates.

The Purdue Mechanics Freeform Classroom allows students in challenging engineering courses to access hundreds of instructional videos and animations while encouraging interaction with each other and faculty online. The approach is helping sophomore-level students overcome daunting challenges in core engineering courses.

However, engineering education researchers need a scientific method to assess how well instructors are using the Freeform Classroom. A new assessment method is detailed in a research paper being presented during the American Society for Engineering Education's 124th Annual Conference & Exposition, June 25 – 28 in Columbus, Ohio. The paper, entitled "What Does a Class Meeting Entail?" won the ASEE Mechanics Division Best Paper Award.

"The goal of this work is to understand what actually happens in class by examining instructor actions," said Edward Berger, a Purdue University associate professor of engineering education and mechanical engineering. "The big picture is to understand the relationship between what the instructor does and how the students perform."

Work to measure the effectiveness of the Freeform Classroom is being led by Jennifer DeBoer, an assistant professor of engineering education, and a team of engineering education and mechanical engineering researchers. The work is part of a project funded over four years with a $1.4 million grant from the National Science Foundation.

The assessment method is organized around "active, blended and collaborative," or ABC learning, in which students talk to each other or to the instructor either face-to-face or on a course blog and use various

online materials while collaborating to solve problems.

"The ABC framework is a lynchpin for Freeform, and this paper is our first attempt to characterize instructor actions in the classroom, paying particular attention to these ABC elements," DeBoer said.

The Freeform Classroom approach has been used since 2009 to teach a sophomore-level dynamics course and was pioneered by Charles Krousgrill, a Purdue professor of mechanical engineering. He and mechanical engineering professor Jeffrey Rhoads have expanded and led efforts to refine and implement the Freeform Classroom for dynamics, a key introductory course focusing on engineering systems in motion.

The assessment method analyzes video recordings of each class meeting, focusing on an instructor's actions and decisions.

"We interpret the instructor's intentions in terms of the number of students they are trying to engage: some, all or none," Berger said. "If I am just lecturing, I am not engaging with anyone, and that's totally passive. If I am encouraging students to work together to solve a problem, that is active."

The paper is the first of three studies assessing instructors who use Freeform. The two other papers will be presented during upcoming conferences.

"The first paper concentrates on comparing veteran instructors and establishing a baseline for instructional time allocation in an undergraduate STEM classroom," DeBoer said. "The other two papers will delve into technical details about how the assessment method works and differences in instructional strategies over the entire semester."

The researchers developed a coding structure to categorize and analyze

instructor actions in class and to classify them as active, blended and collaborative. The research findings will allow them to provide feedback and guidance to instructors.

"We could say, 'You didn't do that much active learning in class. What if we gave you a little workshop on how to do active learning?'" Berger said. "So, it has a professional development application."

The overall goal is to improve the success rate for students in engineering.

"If we want Freeform to be adopted by other people either at other universities to teach dynamics, or people here at Purdue who want to apply Freeform to a different class besides dynamics, then we need to give them guidance," DeBoer said. "That's where the in-class assessment is important."

DeBoer and Krousgrill also have introduced Freeform to educators at Universidad del Norte in Colombia and will discuss the collaboration during a panel discussion at the ASEE conference. Freeform was used for a course on solid mechanics, in a collaboration through the Colombia-Purdue Institute, which is designed to enhance the scientific and entrepreneurial workforce in the South American nation.

"This has been a really productive collaboration, and it's the first Freeform course to be implemented beyond dynamics and in a different cultural environment," DeBoer said.

Provided by Purdue University

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