Designing for Student Motivation and Success: Translation of Engineering Education Research into Practice in a Materials and Energy Balances Course

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This talk describes an ongoing project focused on curricular and pedagogical changes in a second-year materials and energy balances course at Purdue University, *CHE 20500: Chemical Engineering Calculations*. In this work, we have focused on ways to not only improve students' academic performance but also their motivation. Motivation is essential for individuals to find energy, mobilize effort, and persist toward a particular goal. This psychological factor is important for student learning and engagement in university classrooms and has been linked to student success and persistence in STEM degrees.

The course redesign substantially decreased the failure and withdrawal rate in the course, and this effect persisted in subsequent course offerings. Students also had increased motivation, which positively predicted higher academic success. During the COVID-19 pandemic and switch to online learning affected students, we continued to collect motivation and student success data. We found lower motivation and higher stress levels were related to differences in performance, especially for women. Ongoing efforts include the development of course resources to support self-regulated learning. These ongoing efforts are based on larger engineering-wide research efforts on student success and the translation of those research efforts into effective classroom practices. Lessons learned from these efforts can provide ways to consider not only the curricular content of courses but also how implementation support student outcomes.

Bio

Allison Godwin, Ph.D. is an Associate Professor of Engineering Education and of Chemical Engineering at Purdue University. She is also the Engineering Workforce Development Director for CISTAR, the Center for Innovative and Strategic Transformation of Alkane Resources, a National Science Foundation Engineering Research Center. Her research focuses on how identity, among other affective factors, influences diverse students to choose engineering and persist in engineering. She also studies how different experiences within the practice and culture of engineering foster or hinder belongingness and identity development. Dr. Godwin graduated from Clemson University with a B.S. in Chemical Engineering and Ph.D. in Engineering and Science Education. Her research earned her a National Science Foundation CAREER Award focused on characterizing latent diversity, which includes diverse attitudes, mindsets, and approaches to learning to understand engineering students' identity development. Dr. Godwin currently serves as the Chair of the American Society for Engineering Education Educational Research (ASEE ERM) and Methods Division and an Assistant Editor for *Chemical Engineering Education*. She has won several awards for her research including the 2017 the IEEE Frontiers in Education Benjamin J. Dasher Award and the

2020 ASEE ERM Best Diversity Paper Award. In the classroom, Dr. Godwin has also been honored with awards for teaching including being invited as a participant in to the 2016 National Academy of Engineering Frontiers of Engineering Education Symposium and being awarded the 2018 Purdue University College of Engineering Exceptional Early Career Teaching Award.