USF Academy of Distinguished Engineering Educators (ADE^2)
USF Department of Mechanical Engineering
SEMINAR SERIES

Reflection, Metacognition, and COVID-19: Could They Be Related?

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Dual Audience: ENB109 and MS Teams

Yes, if studies involving them happen to be funded under the same NSF RIEF grant! In 2018, my colleague Dr. Sam Dickerson and I received an NSF Research Initiation (RIEF) grant to study reflection and metacognition in the electrical and computer engineering classroom using SPICE simulation software. As Director of Assessment for the Engineering Education Research Center at the University of Pittsburgh and Research Assistant Professor focused on engineering education research, I have served as Dr. Dickerson's mentor for this RIEF grant. Interestingly, we were asked last summer to conduct a secondary study on the impact of COVID-19 on engineering students under a supplemental award. I will be presenting results from both studies, both of which are important for engineering educators.

Reflection, or thinking about what one is doing, is essential in developing metacognition or the ability to regulate one's progress towards a goal. Self-regulation includes planning, monitoring, evaluating, and controlling one's work. This self-regulation is critical in developing lifelong learning skills, which is so essential for engineering professionals. We have learned numerous lessons from our work with reflection and metacognition. The first is that "reflection fatigue" may be possible, perhaps similar to "Zoom fatigue." A second lesson learned was that our students were (in general) inexperienced with reflection and did not have an in-depth view of it, including the benefits it can afford. However, this should not be surprising, as the literature indicates that structured, systematic reflection is generally not part of the engineering curriculum. A third lesson learned was that assessing students' reflections for depth and content is complex, even for two "Ph.D. level" analysts using an established rubric from the assessment literature. At USF, we expect to advance reflection in the engineering curriculum

through an NSF-funded, three-year project underway between Professors Guldiken and Kaw and me. This project will introduce structured, systematic reflection to Dr. Guldiken's Fluid Mechanics course this fall by embedding reflective activities directly into the coursework. We plan to use many of the above "lessons learned" for a strong project at USF.

On a somewhat "unrelated" note, I have been able to study the impact of the **pandemic** through this same RIEF grant. Our study focused on engineering students' academic **motivation, perceived stress, and valuation** of the university experience. In fall 2020, several months into the pandemic, a large subset of all undergraduate engineering students at the University of Pittsburgh (*n*=1,141) responded to a survey-based study, with a response rate of 41.6%. Follow-up focus groups were held. Stark percentages were uncovered via survey, including 78% who said their motivation was less or much less compared to before remote instruction. Based on the Perceived Stress Scale (PSS-10), students experienced a higher perceived stress level (*median* = 22) several months into the pandemic versus other undergraduates before the switch to remote instruction and at the pandemic's outset. The most frequent top stressor was *academic*-related, as reported by 61% of survey respondents. *Remote coursework* was a primary de-motivator reported most often by students. Related to these, the valued experience cited most often was *campus-based instruction with peers*. In all focus groups, low or decreased motivation was mentioned by students. These and other interesting results from this COVID study will also be presented.

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