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Framing Design Projects in Engineering: Constructing an Effective Problem Statement

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Abstract:

Design projects are very important for engineering education because they give students the opportunity to practice and develop the skills needed to effectively address open-ended problems. The use of these projects in classroom contexts is supported by learning theories such as experiential learning and constructivism. Many research studies provide empirical evidence that demonstrates the positive impact of such projects on students' learning. Nonetheless, designing and implementing these projects within the boundaries of an engineering course is challenging, especially when the goal is to engage student teams in collaboratively solving a real-life problem by applying course concepts.

This workshop aims to facilitate the exchange of frameworks, strategies and tools that can support the participants in setting up design projects in a way that fosters effective, collaborative learning of course content, using human-centered design approaches. Specifically, the workshop will focus on assisting participants in constructing problem statements for design projects in engineering courses. These statements will intentionally encourage students' collaboration and will guide students through the problem-solving process without presuming specific solutions.

Members of the Siebel Center for Design at the University of Illinois at Urbana-Champaign will lead this collaborative workshop. Participants will be provided access to a Miro Board to facilitate collaboration during and after the workshop. Experience with Miro is not required. After providing the necessary background and introduction, the facilitators will foster an open forum to explore the participants' approaches to creating and setting up design projects in engineering courses. Building on the participants' contributions, the facilitators will lead discussions around the characteristics of effective problem statements in design projects. Next, the facilitators will share their methodology for constructing problem statements that can foster students' collaborative learning of the engineering concepts using human-centered design approaches. This methodology asks instructors to identify the intended learning outcomes for the design project, then work backwards to find realistic scenarios in which the knowledge, skills, abilities of the course are relevant in this design context. This is accomplished through a series of questions which promote the systematic consideration of the design space and associated design practices. Additionally, this methodology urges instructors to identify instances when students need to build joint problem spaces to co-construct knowledge and embed explicit prompts in the problem statement to encourage students to participate in these collaborative practices as they work on the project. The facilitators will engage participants in small-group activities to promote first-hand experience and reflection on this methodology. By the end of this workshop, participants should have an informed, systematic approach to properly construct a problem statement for a design project that encourages and fosters collaboration among students while providing a sense of guidance to the problem-solving process.