

Design Education Across the Curriculum for the Future of Design

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EXTENDED ABSTRACT

The future of computer-aided process design hinges on continued recruitment, training, and retention of the next generations of engineers. Many elementary and secondary school programs focused on engineering have made substantial impacts in informing children about careers in science, technology, engineering, and mathematics (STEM). A report by the National Academies established three general principles for pre-college engineering education, the first of which is that elementary and secondary engineering education should emphasize engineering design¹. Curricula focused on teaching the engineering design process have been developed for K-12 students and educators^{2,3}. These materials often emphasize engineering design as an engaging process with iterative prototype testing and a supportive process where learning from failure is encouraged in a positive way. However, these engineering design process concepts have not necessarily been communicated to university-level engineering faculty (in contrast to the scientific method). This is a problem when college students only see design as a high-stakes, time-intensive senior capstone project or as highly specialized content siloed in upper-division courses with design explicitly in the name such as Plant Design, Process Design, or Product Design.

Despite upward trends for exposure to engineering design in pre-college settings and for students majoring in engineering more broadly, particularly computer science, a concerning trend is the decline in chemical engineering enrollments⁴. Computer-aided process design presents the opportunity to integrate design into engineering education at the pre-college and undergraduate levels while also leveraging strong interests in computational sciences and data-oriented careers. This presentation will focus on surveying several design project activities from the author and others⁵⁻⁹ aimed at high

school and early college students to teach chemical engineering principles and attract them to and retain them in chemical engineering. Recommendations for integrating design across the curriculum through hands-on and computational activities will be also discussed to support the future of computer-aided process design.

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