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Connecting Chemical Engineering Principles and Sustainable Development for Curriculum Integration: A Delphi Study

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ABSTRACT

A thriving and sustainable world needs engineers, including chemical engineers. Engineers for a sustainable world require generalist Education for Sustainable Development competencies, and generalist Engineering Education for Sustainable Development competencies. Extensive work has already been dedicated to these two types of competencies, but little work has been dedicated to chemical engineering-specific knowledge for sustainable development. This discipline-specific knowledge would enable meaningful integration of sustainable development into chemical engineering curricula.

Chemical engineering curricula are already full, with technical content and professional skills. Rather than try to add sustainable development to full curricula, this work aims to identify where sustainable development can be integrated into existing curricula. This work focuses on chemical engineering principles, which are already taught in all chemical engineering subjects. In this light, this works aims to create a framework of connections between chemical engineering principles and sustainable development.

To identify these connections, a Delphi survey was performed, a technique that identifies consensus between experts. Three rounds of surveys were performed, with late-stage chemical engineering students, chemical engineering educators, and practicing chemical engineers as participants. Participants were asked to rate the importance of connections between chemical engineering principles and sustainable development. Ninety-six connections were rated on a Likert scale by 26 participants across the three participant groups. Sixty-six of the connections were agreed by participants to be sufficiently important and were thus included in the framework. Chemical engineering educators can use this framework by identifying which principles are taught in a particular subject, and then finding the corresponding sustainable development connections that can be integrated into the subject's curriculum. This meaningful integration will better prepare future chemical engineers with the knowledge and skills they will need to contribute to a sustainable society through their engineering practice.

KEY WORDS

Engineering Education for Sustainable Development, Sustainability, Delphi Survey

BIOGRAPHY

Naomi Bury (she/ her) is a Graduate Researcher in the Department of Chemical Engineering and the Faculty of Engineering and IT's Teaching and Learning Laboratory at the University of Melbourne. Naomi is completing her PhD on engineering education research, with a focus on sustainable development in the chemical engineering curriculum. She has been teaching in the Department, as both a tutor and guest lecturer, since 2019. Naomi's PhD is supervised by Prof. David Shallcross and Prof. Sally Male.

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