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Managing engineering educational changes under the AI revolution

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ABSTRACT

Artificial Intellegence (AI) is an ustoppable force set to revolutionise engineering higher education. While offering significant benefits, AI integration into education brings substantial challenges for engineering educators - from both practical and ethical standpoints. As early adopters, engineering educators must grapple with the "when" and "how"of AI integration. Such challnges must be addressed quickly, considering AI tools are already readily avaiable to our students and are already being used by students throughout traditional assessments. It is clear that student learning and learning competencies in engineering education must change and adapt to the new paradigm. In this article we illustrate how the integration of AI could provide both academic advantages and disadvantages, in the context of student learning.

AI integration offers up a number of unique philosophical challenges for educators, especially conflicts that arise between AI resource use and AI impact on employment futures, and more recent focus on sustainability, ethics and values in engineering education. Take for example, the challenges associated with AI infrastructure, the generation of e-waste, and massive energy and water consumtpion. In this article we propose a focus on ethical AI use as a framework to enable students to develop appropriate judgement and critical analysis skills to understand how AI is best used to enhance, rather than replace, their engineering skills and capability.

In this paper we also introduce the example of using AI in life cycle assessment analysis; a challenging and time-consuming activity when delivered using traditional teaching methods. Such a case study illustrates the fundamental issues at play: Is the use of AI to generate lecture material appropriate?; Do engineering students still need deep knowledge and fundamental skills?; How can we emphasise critical thinking and problem solving capabilites in our students?; Are tasks such as coding and mathematics still relevant in an engineering degree?; How can we prepare our students to assess AI outputs in the engineering domain?; What new set of competencies are required to manage the transition? Will our students be workplace-ready?

KEY WORDS

Sustainability, Life Cycle Assessment, Education, Project-Based Learning, Ethics, Generative AI

BIOGRAPHY

Leynard Natividad-Marin, PhD, is an Australian-Peruvian chemical engineer with interest in sustainable process systems engineering. With a PhD from James Cook University (2019) focused on advanced mathematical modelling of nutrient recovery from source-separated urine, he has pioneered thermodynamics- and kinetics-based approaches to struvite precipitation and circular phosphorus recovery. As Lecturer at JCU (bachellor), and at Peruvian Universities (bachellor, masters and doctorate) he had the opportunity to teach reactor design, simulation, water engineering, biotechnology, process analysis and thermodynamics. He is motivated by the potential of turning waste into valuable resources and enjoys connecting academic research with circular economy.

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