Basil room
1.10-1.35pm

A design software to facilitate learning of quantitative critical thinking by Chemical Engineering students

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Critical thinking is an important component of many medium-complexity and high-complexity jobs in various industries. It is also an important life skill that is valuable to the individual as well as the workforce at large. Despite the importance and interests ascribed to this life skill by governments, employers and educators, the teaching of critical thinking is seldom infused explicitly into the curriculum of an undergraduate programme. Based on the result of a covert pedagogical experiment conducted on second year Chemical Engineering students enrolled in a core module at the National University of Singapore, an important gap in engineering education in terms of helping students develop higher order thinking skills was apparent. It was discovered that engineering graduates may not be adequately equipped with the ability to apply critical thinking within the engineering domain and towards the quantitative evaluation of engineering systems, referred to as quantitative critical thinking.

To address this gap, the repeated practice approach was applied in this pedagogical study to develop an intervention with the aim of enhancing quantitative critical thinking skills amongst chemical engineering students. The intervention was in the form of a software, referred to as a Quantitative Critical Thinking (QCT) software, developed using the Matlab programming language. This software generates detailed calculation steps to typical engineering design problems encountered by chemical engineering students that are "imperfect". In other words, the engineering design presented by the QCT software for any given design problem will contain weaknesses, flaws, or even errors. Students would utilise the software to practice identifying weaknesses, flaws and errors in the design calculations and then derive better or correct designs by applying concepts and knowledge acquired in the module. The extent of achievement of the intended learning outcome was measured quantitatively by comparing performances in the final examination between students who have and those who have not utilised the QCT software to apply a repeated practice approach towards their learning of quantitative critical thinking.

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