

Experimentation on Fostering Critical Thinking in Stem Education

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ABSTRACT

Critical thinking (CT) has long been recognized as essential by educators in many areas in Science, Technology, Engineering and Mathematics. For accreditation purpose, the University of Houston-Clear Lake adopted a Quality Enhancement Plan (QEP) entitled “Applied Critical Thinking (ACT) for Lifelong Learning and Adaptability” in 2012. To foster critical thinking in individual courses, the QEP established a formal process for endorsing ACT syllabi. This process is based on incorporating selected CT elements into the student learning outcomes (SLOs), identifying CT-enhancing activities, and setting up CT assessment plans according to a common evaluation guideline. The School of Science and Engineering currently has 18 approved ACT courses encompassing 10 majors. Based on our experience and experimentation on computer science and computer information systems ACT courses, we elaborate how the CT framework of the Foundation of Critical Thinking (FCT) was used to pillar our incorporation of ACT. Concrete examples will show how FCT’s elements of thought, intellectual standards, and theories and techniques such as Fundamental and Powerful Concept, and State, Elaborate, Exemplify – Illustrate, were imbibed into SLOs, lectures, classroom activities, assignments, and assessments in our courses. Results of accompanying surveys will be shared with a discussion of lessons learnt from our experimentation. It will include a special focus on concept map, a visual and versatile knowledge representation tool that we used in many ACT activities.