How to accelerate the development of math-oriented critical thinking skills among prospective civil engineers

Abstract

The complexity of the current problems in the civil engineering world demand civil engineers to be sound, competent and reliable in their mathematical and engineering manipulations, evaluations and interpretations. This reflects that fluency in engineering mathematics with sound foundation of Math-Oriented Critical Thinking (or simply called MOCT) skills are essential weapons in the modern civil graduate engineers’ armory. Less technically, MOCT skills can operationally be defined as a continual process that involves acquiring and using an appropriate set of mathrelated cognitive skills which are affectively driven by dispositions that promotes and reinforces such skills. Although the profound importance of MOCT skills among civil engineers are evident, there still lies a fundamental issue among mathematics educators teaching undergraduate civil engineering students of what exactly the MOCT skills these students must acquire upon graduation and how to accelerate the development of such skills during the undergraduate training. This paper critically reviews the importance of critical thinking and MOCT skills among civil engineering undergraduates. A brief overview of the current scenario on teaching-learning of engineering mathematics and a preliminary research work of a newly attempted method on the teaching-learning of engineering mathematics among civil engineering undergraduates at University Teknologi Malaysia (UTM) was discussed. The purpose of this overview is to compare and to contrast the two different environments of teaching-learning of engineering mathematics with efforts to highlight the pertinent math-related cognitive elements and the affective elements of MOCT, to understand how these elements can accelerate the development of MOCT skills among civil engineering undergraduates, and to elucidate the relationship between human cognitive development with social interactions.