

Critical Issues of Technology Use in Undergraduate Mathematics

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ABSTRACT

The effective integration of technology into the teaching and learning of mathematics remains one of the critical challenges facing contemporary tertiary mathematics. This presentation reports on several key findings from a PhD study investigating the use of technology in some 72 different undergraduate mathematics courses, representing 31 tertiary institutions in 8 different countries. Given that integrated technology is interpreted in a considerable variety of ways in the literature, and that technology use in undergraduate mathematics also varies widely, the initial phase of the study sought to identify the features of an *Integrated Technology Mathematics Curriculum* (ITMC), as a means of characterising and comparing technology use in and between courses. This phase of the study resulted in the development of a taxonomy of integrated technology that identifies six characteristics, each with a number of associated elements, which may be used to assess the degree of integration in a particular undergraduate mathematics course or department. The findings suggest that while the underlying complexity of the taxonomy limits a categorical definition of integrated technology, it does provide an effective means for examining the issues confronting those wishing to implement and sustain integrated technology in undergraduate mathematics. An integrated, holistic approach, which aims for curricular consistency across all the characteristics described in the taxonomy, provides the basis for a more effective and sustainable ITMC. The presentation then highlights two critical elements identified in the taxonomy, using evidence gathered from an observational study of technology implementation at The University of Auckland. The first of these revisits the issue of changes to the relative value of curriculum topics, when using computer algebra systems, as previously considered with respect to secondary school mathematics (Artigue, 2002; Stacey, 2003). This study suggests that issues of curricular value as described by Artigue (2002) and Stacey (2003) are a critical factor in the successful implementation of integrated technology, and that a re-examination of the relative values of fundamental topics remains a significant challenge for undergraduate mathematics in a rapidly evolving technological environment. The second concerns assessment issues, and suggests that aspects of assessment such as curricular congruency, equity and the advantages and affordances provided by different technologies require continued attention and constant vigilance, if integrated technology is to be successfully implemented and sustained.

Keywords

Curriculum review, Undergraduate mathematics, Assessment, Policy.