Mathematics & Mathematics Education Seminar

Date: 11 October 2023
Time: 1430 – 1530
Venue: MME Journal Room

Learning linear equations: Capitalizing on cognitive load theory and learning by analogy

Seminar Abstract:

Capitalizing on cognitive load theory and learning by analogy, we propose two instructional methods to learn a complex linear equation (e.g. two-step equation) by building on prior knowledge of a simpler linear equation (e.g. one-step equation). We will examine the proposal theoretically in this paper. In line with the design principles of cognitive load theory, we propose to strengthen students' prior knowledge of simpler linear equations before they learn complex linear equations with the aid of worked examples. Because a subset of the complex linear equation shares the same schema as the simpler linear equation, students can draw on their schema for the simpler linear equation to understand the complex linear equation, thus alleviating the limitation on working memory load. Based on the principles of learning by analogy, we place a simpler linear equation and a complex linear equation side-by-side and label the solution procedure of both linear equations to encourage active analogical comparison between these two equations. Making both the simpler linear equation and the complex linear equation visible to learners may help to reduce cognitive load demands in retrieving the simpler linear equation in order to facilitate the learning of the complex linear equation.

Biography:

Dr Bing H. Ngu works as an academic in mathematics education at the University of New England, Australia. She has over 15 years of mathematics and science teaching experience in secondary schools in in Australia as well as abroad. Her current research is mainly shaped by her previous mathematics teaching experience. Specifically, based on cognitive load theory, learning by analogy theory and learning by comparison, she has conducted experimental studies with secondary students to enhance mathematics learning (e.g., linear equations). She has also conducted cross-cultural mathematics education research with secondary students between Asian countries and Australia from a cognitive load perspective. Her research has made a strong impact on pedagogical approaches, informing the development of various pre-service mathematics teacher education units that she currently teaches at the University of New England.