

# USING THRESHOLD CONCEPTS TO DESIGN A FIRST YEAR BIOLOGY CURRICULUM

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## ABSTRACT

We used a matrix of threshold concepts, which incorporates a network of discipline ideas/processes (Ross, Taylor, Hughes, Kofod, Whitaker, & Lutze-Mann, 2010) and encapsulates our conceptual understanding of biology, as a useful construct for integrating 'ways of thinking and practicing as a biologist' into curriculum design and delivery (Taylor, 2006, 2008). Our new laboratory program for first year biology students focuses more explicitly on key abstract threshold concepts such as hypothesis testing, and scale, using challenging hands-on investigations and increased levels of student independence. We also integrated into the course, a broad range of activities which address key problems in understanding and help students to monitor their progress (Lawson, 2003; Oh, 2010; Kim, 2011). We used our extensive surveys of students' understanding of concepts such as hypothesis testing, to create a diagnostic survey instrument (Zimbardi, Meyer, Chunduri, Taylor, Ross, Tzioumis & Lluka, 2012), which could be used to track student progress. Similarly our data on student writing of hypotheses and testing protocols (Taylor & Meyer, 2010), which showed a huge variation in understanding of the how and what of testing, led us to design a series of experimental design and interpretive writing activities which allowed students to develop and practice their understanding of the concept.

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