Student Difficulties Understanding and Visualizing External Representations of Microscope Images in Biochemistry

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Goals: My goal is to identify and remediate students’ conceptual, reasoning and visual skill difficulties (Schönborn & Anderson, 2009) with microscopic images in biochemistry, with a particular focus on cutting-edge microscopy techniques (such as electron microscopy or fluorescent microscopy). I am specifically interested in student understanding of vertical, horizontal and spatial translation of microscopic images. For example, vertical translation involves translating between macroscopic, microscopic and molecular levels of biological organization. Our group’s long-term interest is to improve students’ representational competence so that they are better able to use representations to explain phenomena and solve problems in biochemistry. In this regard, my approach is to identify and model the strategies used by expert microscopists and to use such information to improve student competence. By performing this research in cutting-edge areas of biochemistry, I aim to update and improve course curricula in this vitally important area of biochemistry.

Methods: I use qualitative research to address my research questions. This includes inductive analysis (Thomas, 2003) of expert and student data obtained from open-ended questions, interviews, think-aloud and drawing tasks (Schönborn and Anderson, 2009) and eye-tracking exercises.

Expected Outcomes: With my doctoral research, I intend to enrich the current scientific knowledge about student understanding and visualization of external representations in biochemistry and particularly how knowledge is learned in regards to the use of external representations of micrographs.

Work Cited: