

Representational competencies in chemistry: Mapping the student learning experience

Abstract:

Multiple external representations (MERs) are commonly employed in chemistry when discussing molecular structure, including physical models, digital images, and numerous hand drawn representations. Learning to interpret and utilize MERs to solve chemical problems requires the development of a set of representational competencies: interpreting, transforming, coordinating, and constructing (Kaberman & Dori, 2009). Assessment of alternative instructional strategies for the development of representational competencies most often focuses on “what works” through quantitative analysis of learner performance on tasks (Stieff et al., 2011; McCollum et al., 2014). However, this style of experiment does not reveal what the students are thinking when problem-solving, and thus cannot explain why some students are more successful than others.

To better understand student learning experiences, a series of experiments were conducted using a qualitative research framework: phenomenography. This framework is used to map the variation in ways that individuals experience a shared phenomenon (Marton, 1981), such as learning to use MERs in chemistry. In this talk, McCollum will discuss how students explore the concept of stereochemistry using traditional and digital technologies, how students engage in organic mechanistic problems, and what strategies faculty can employ to better support students in mastering the language of chemistry.