Creating Digital Learning Objects to Introduce Grade 5 Students to the Nature of Models and the Particle Nature of Matter

This session reports on a series of five digital learning objects (DLOs) created by the presenters to introduce Grade 5 (ages 10-12) students to the nature of models, the particle nature of matter, and particle explanations for physical change. Digital learning object design was informed by research drawn from three areas: a) students’ understanding of small, unseen particles - a research area largely based on constructivist theories of learning, b) model-based learning and the inevitable reliance on models to teach about particles, and c) research about DLO design features that may play a role in supporting students’ conceptual understanding - a research area informed by dual coding theory, cognitive load theory, multimedia learning theory, and more recently by social constructivist learning theory.

Digital learning objects were created in Adobe Flash with each DLO containing a variety of images, sound files, and animations. Additionally, two virtual characters, Sam and Olivia, were created who wondered about the science explanations, voiced some common misconceptions found in the literature, provided some explanations, and drew attention to the salient features of featured models – in effect, they provided viewers with a tacit tutorial on DLO content. Students responses to questions embedded in each DLO as well as time on task for each response item were collected on a MySQL database housed on a remote site. Data analysis showed the majority of students were able to understand: a) how every model has strengths and limitations, b) how models help to ‘see’ the unseen world, c) that particle behaviour varies among solids, liquids, and gases, and d) changes to movement, holding, and spacing helped explain transitions seen during physical change.