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Abstract

When students are learning scientific concepts, interacting with visual representations, in the form of static or animated images, can bring unique benefits. However, the instructional potential of images is still largely untapped, as is proven, for example, by merely decorative images in science textbooks, and by the limited use of students-generated drawings in the teaching and assessment of science concepts. In this paper, I consider the possible elements of integration between Cognitive Science and Instructional Design, with an emphasis on theoretical approaches that can be meaningful for an instructional effective use of visual communication in textbooks and in the classroom. I underscore that indications for identifying design features that can greatly impact learning (positively or negatively) are offered by Cognitive Load Theory (CLT). Moreover, when the learning goals require the restructuring of students' mental models, as in the instance of conceptual change in science education, an important contribution is that of Model-Based Learning and Teaching (MBLT), in which meaningul learning is viewed as a learning-dependent progression of mental models , which go from a student's initial model of the system under study to a more precise and scientifically correct target model, passing through a series of intermediate models.

Keywords: science education, conceptual change, instructional images, cognitive load, mental models, model-based learning, simulation.