RECENT DISSERTATIONS

TORUNN AANESLAND STRØMME, 2015

Supporting students' conceptual sense-making in computer-based settings in science.

Exploring the support aspects of digital tools, peer collaboration, teacher intervention, and instructional design

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Abstract

The thesis investigates how to support students' conceptual sense-making as it takes place in naturalistic computer-based settings in science. When students work in computer-based settings, different types of support may be simultaneously present, and the thesis argues for the value of focusing on multiple support aspects. By taking a sociocultural perspective on learning and by focusing on students' learning processes as they unfold through an activity, the thesis provides in-depth information regarding how students make sense of digital tools, such as animations and simulations, as well as how teacher intervention, peer collaboration, and instructional design support students' development of conceptual understanding in science. In so doing, the thesis illustrates the complexity inherent in supporting students' development of conceptual understanding in computer-based settings. The undertaken research can be described as design-based: Two computer-based learning environments (Viten.no and SCY-Lab) were designed and used as part of regular science instruction in grades 10 and 11 in Norwegian schools. The main data consist of video recordings of student groups' and teachers' interactions during computer-supported science projects. Additionally, pre- and posttest data targeting students' understanding of a science topic and post-interview data of students' conceptual understanding of specific science concepts constitute the central data. The undertaken research is reported on in three articles:

Article I reports on a comparative mixed-method study of students' conceptual sense-making of animations versus static visualizations of protein synthesis. A dual focus on digital tools and peer collaboration provided new knowledge of *why* animations may be superior to static visualization in supporting students' conceptual understanding, as described above. The article brings theoretical perspectives from the field of science education into the field of students' learning from animations versus static visualizations. *Article II* reports on a case study of how students work on comparing and contrasting other students' simulation results with their own on heat transfer. A multiple focus on digital tools, peer collaboration, and instructional design provided new knowledge regarding how learning opportunities emerge, what types of learning opportunities may be created, and how students' learning opportunities may be constrained by their conceptual framings of the settings involving the support aspects. The article makes a theoretical contribution by proposing an analytical model of how learning opportunities are created in a specific setting. *Article III* reports on a case study targeting all four support aspects (i.e., digital tools, peer collaboration, instructional design, and teacher intervention). By focusing on the science teacher's role at the intersection of these support aspects, the study illustrates the significant role of the science teacher in supporting students' learning processes in computer-supported settings. The science teacher constitutes the pivotal "glue" that enables students to link and make use of coexisting support aspects.

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