RECENT DISSERTATIONS

KARIM HAMZA, 2010

Contingency in high-school students' reasoning about electrochemical cells: Opportunities for learning and teaching in school science

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Abstract

The thesis takes its departure from the extensive literature on students' alternative ideas in science. Although describing students' conceptual knowledge in many science areas, the literature offers little about how this knowledge enters into the science learning process. Neither has it focused on how particulars and contingencies of curricular materials enter into the learning process. In this thesis I make high-resolution analyses of students' learning in action during school science activities about real or idealized electro-chemical cells. I use a discursive mechanism of learning developed to describe how students become participants in new practices through slow changes in word use. Specifically, I examine how alternative and accepted scientific ideas, as well as curricular materials, enter into students' reasoning. The results are then used for producing hypotheses over how a teacher can support students' science learning. Alternative ideas in electrochemistry did not necessarily interfere negatively with, and were sometimes productive for, students' reasoning during the activities. Students included the particulars and contingencies of curricular materials in their reasoning not only when interacting with a real electrochemical cell but also in a more theoretical concept mapping activity about an idealized cell. Through taxonomic and correlational investigations students connected the particulars and contingencies of the real electrochemical cell to the generic knowledge of electro-chemistry. When actively introduced by the researcher, such investigations had consequences for how single students framed their explanations of a real electrochemical cell. The results indicate ways in which teachers may encourage the productive use of contingencies to promote learning within the science classroom. However, this may require consideration of what students say in terms of consequences for their further learning rather than in terms of correct or incorrect content.

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