RECENT DISSERTATIONS

NIKLAS GERICKE, 2009

Science versus School-science. Multiple models in genetics - The depiction of gene function in upper secondary textbooks and its influence on students' understanding
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Abstract

In this thesis I describe a study of how the science of genetics is transformed into school science in upper secondary level textbooks and the impact that this transformation has on students' understanding. The didactic challenge that we face is to decide which science from the academic disciplines we should bring into schools.

Using the History and Philosophy of Science as my point of reference, I identified and categorized five multiple historical models of gene function: the Mendelian model, the classical model, the biochemical-classical model, the neoclassical model and the modern model. I then developed a research instrument to be used to analyse how these models are transformed within the educational system via textbooks. Biology and chemistry textbooks from Sweden, as well as a number from English speaking countries, were studied. The models used to describe gene function in the textbooks were investigated, as were the conceptual changes between the actual models and the way they are presented in textbooks. Finally I studied how the transformed science in textbooks is understood by students.

I found that all the multiple historical models were used implicitly in the textbooks. The older historical models were presented more frequently, resulting in a simplified and deterministic description of genetics. Throughout the textbooks a specific model was usually described in a particular subject matter context. The models used in the textbooks were usually hybrid models consisting of features from several of the historical models, thus creating incommensurability. The textbooks do not provide any epistemological foundations to facilitate readers' understanding of the implications of multiple models. Furthermore my results show that, when reading the textbooks, students' have difficulties in detecting the use of multiple models, incommensurability, and the conceptual changes that occur in a content-specific context such as gene function. Overall, students' understanding of the use of multiple models, conceptual change, and incommensurability reflects the way in which they are depicted in the textbooks. Students' domain-specific difficulties in understanding genetics might therefore be due to the way science is transformed into school science.

These findings indicate the importance of epistemological aspects in the transformation of science into school science, i.e. science as a way of knowing, not only for students' understanding of the nature of science, but also for their understanding of the conceptual knowledge. The degree to which school science should mimic the academic discipline, as well as an understanding of what is lost in the transformation of science into school science, are key issues discussed in the thesis.

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