RECENT DISSERTATIONS

OLAVI HAKKARAINEN, 2007

Pupils' mental models of a pulley in balance, and how the models are changed by successive pulley demonstrations

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Abstract

This study explores changes in the Finnish comprehensive school pupils' (age eleven to fifteen) conceptions of hanging objects in balance under successive demonstrations. The study aims to address the understanding of a young pupil's conceptual change and to capture the factors of the instructional processes which foster or hinder the process of conceptual change. The aim of the study is to promote science teaching in comprehensive schools.

The theoretical part of the study considers historical conceptions of weight, the conceptions pupils have about the concept of weight, the descriptions of different theories about conceptual change, and some learning methods applicable for changing pupils' conceptions towards the scientific concept of weight.

The empirical part of this dissertation, *the learning intervention*, is described and based on the following five articles:

1. Hakkarainen, Olavi and Ahtee, Maija (2005). Pupils' mental models of a pulley in balance. *Journal of Baltic Science Education*, 2005, 2(8), 26-34.
2. Hakkarainen, Olavi. Mental models in manual weight comparisons between two objects of different size. *Themes in Education*, Vol. 6, No 2, 151-167.
3. Ahtee, Maija and Hakkarainen, Olavi (2005). Importance of the order of demonstrations in changing pupils' conceptions. *NorDiNa Nordic Studies in Science Education*, 1, 31- 42,
4. Hakkarainen, Olavi and Ahtee, Maija. The durability of conceptual change in learning the concept of weight in the case of a pulley in balance. *International Journal of Science and Mathematics Education*, 5, 3, 461-483.
5. Ahtee, Maija and Hakkarainen, Olavi (2007). Changing pupils' conceptions about weight applying variation theory. *Science Education in a Changing Society. Problems of Education in the 21st Century*, Volume 1, 2007. Scientific Methodical Centre "Scientia Educologica", Siauliai: Lithuania.

The success of the learning intervention in the case of the fifth and ninth grade pupils can be explained with Marton's theory of variation because the use of successive demonstrations is based on simultaneous variation. A particular way of experiencing something is a set of related critical aspects focused at the same time. Teachers can help pupils' learning by using appropriate variations in the successive demonstrations so that the pupils will recognize the cognitive conflict present in their earlier thinking.

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