THE NOTION OF PROJECTILE MOTION – A CASE STUDY

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This study adds to research on the use of mathematics in physics classrooms at upper secondary school. The aim is to look closer into what types of transfer do the teacher and textbook set up for the pupils with respect to ways of reasoning from other physics contexts as well as from mathematics. The frame for analysis is an analytical model based on relations made between Reality, Theoretical models and Mathematics (Redfors, Hansson, Hansson & Juter, 2016). Horizontal and vertical transfer is defined as mappings of new information to an activated known structure and as the creation of a new structure in the learner's mind, respectively (Rebello, Cui, Benett, Zollman & Ozimek, 2007). Transfer occurs within mathematics and physics and also between the topics.

We will focus on a physics lecture (40 min, video recorded) in a 3rd year class. When reasoning movement of charged particles in electric fields the teacher stresses horizontal transfer from mechanics and projectile motion. The procedure used is focused on analysing movement in "x direction" and "y direction" separately, not explicitly relating movement to the field direction. Whereas the argumentation in the textbook is based on movement in relation to the existence of a field direction. When considering velocity, the main focus is in both cases on a framework where the components of velocity is central.

The tangent of a curve is a notion the students in the present study are quite familiar with from their courses in mathematics, which makes an opportunity for transfer from a mathematics context to help understanding physics. However, the notion of tangent is not used in the textbook or by the teacher in relation to velocity. Using the vector concept in this way would require students and teachers to perform a vertical transfer. This has been shown hard for both students and teachers. However, introducing this way of reasoning had made use of an opportunity for structural use of mathematics – an opportunity overlooked by both teacher and textbook.

References

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