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Understanding velocity and distance travelled through graphs. (Inzicht in snelheid en afgelegde weg via grafieken.)

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Traditionally graphs play an important role in the teaching of calculus and kinematics. Distance-time graphs are used in mathematics education to give meaning to the difference quotient as a measure of velocity. This presupposes that students understand the relation between velocity and distance travelled. However, this relationship is taught in physics education with the use of graphs and the difference quotient. We argue that an overestimation of the role of graphs is the cause of many problems with the learning of these topics for students. Many computer environments seem to implement a similar approach. It is expected that students learn the meaning and the use of formal representations by exploring a simulation where specific elements of the simulation are dynamically connected with these representations. Instead, we suggest an approach where students are involved in a development from informal inscriptions to formal representations. This article describes a research for the possibilities of such an approach for an integrated approach of calculus and kinematics. We developed a hypothetical learning trajectory in which inscriptions and concepts develop in a dialectic process. We especially focus on the role of ICT-use that affords students to make the desired steps on the learning route. The experiences give insight in the possibilities of an approach to calculus and kinematics that prevents the described problems with graphs. It appears that students develop language and reasoning during the use of ICT, and that this development concurs with a development in graphical representations and concepts. (orig.)

Classification: I20 D40

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