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How do pupils understand and apply line graphs in mathematics and physics?

Abstract

Connections between mathematics and physics are strong at all levels and historically evident in both directions. In education, it is of great importance to establish those links and to appreciate, beside the disciplinary, interdisciplinary approaches as well. We witness often the lack of coordination between the curricula of mathematics and physics and the question is posed whether this is one of the principal causes of students' difficulties in transfer of knowledge between mathematics and physics.

In this talk, we are primarily interested in understanding, interpreting and applying line graphs in mathematics and physics. In mathematics, the graph of a linear function and the notion of slope are already introduced in primary school. On the other hand, these notions have a great importance in physics, especially introductory kinematics. We will discuss students' difficulties with them in both contexts. Similarly, we will discuss connections and difficulties regarding the notion of "area under the graph", as a notion that connects the mathematical notion of area and the idea of accumulation with concepts from physics. It is worth to mention that both, the concept of slope and of area under the graph, are fundamental concepts in calculus and therefore they provide a learning line from primary school to higher education mathematics and physics.