

ZMATH 2015d.00920

López-Gay, R.; Martínez Sáez, J.; Martínez Torregrosa, J.

Obstacles to mathematization in physics: the case of the differential.

Sci. Educ. (Dordrecht) 24, No. 5-6, 591-613 (2015).

Summary: The process of the mathematization of physical situations through differential calculus requires an understanding of the justification for and the meaning of the differential in the context of physics. In this work, four different conceptions about the differential in physics are identified and assessed according to their utility for the mathematization process. We also present an empirical study to probe the conceptions about the differential that are used by students in physics, as well students' perceptions of how they are expected to use differential calculus in physics. The results support the claim that students have a quasi-exclusive conception of the differential as an infinitesimal increment and that they perceive that their teachers only expect them to use differential calculus in an algorithmic way, without a sound understanding of what are they doing and why. These results are related to the lack of attention paid by conventional physics teaching to the mathematization process. Finally, some proposals for action are put forward.

Classification: M50 I40 I50 D70

Keywords: modeling; mathematization; mathematics and physics; differential; different conceptions
doi:10.1007/s11191-015-9757-7