Development of didactic devices at the boundary of social worlds

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The observation of both the rise of social demands regarding mathematics and the increasing invisibility of this discipline, in particular in light of technological development, is nothing new (Keitel et al., 1993).

Either, mathematics can be found embedded in cultural constructs (numeracy, Goos et al., 2013, techno-mathematical literacy, Hoyles et al., 2010), or within an interdisciplinary set (STEM). Sometimes, it can be considered part of a more general recombination of the disciplines which then creates new "disciplines". Statistics, for example, is a hybrid discipline whose relationship with mathematics varies from one country to another, rebuilt itself through a process of merging with other disciplines: combined with economy it becomes econometrics, and so on. In the case of Big Data, which is much discussed today, it is not only the recomposition of the disciplinary landscape that is changing. The techniques applied in Big Data further entail the advancement or re-invention of statistical procedures. In addition, they influence the modes of the development of knowledge through research, such as in the field of medicine**.** The development of Big Data raises other questions as well, especially ethical ones. As a matter of fact, technology can never inhabit a neutral position because it is always connected to a specific conception of the world.

How can we organise mathematics education in an environment that is changing in this way? What specific activities can we develop for the classroom to anchor mathematical education in a world where mathematics is both omnipresent and becoming more and more invisible?

This question leads us to another debate, which is not new, but still significant. It focuses on the introduction of the extra-curricular "reality" in the classroom to create a link between school activities and the world beyond school as well as the question on how to proceed. It is long known that importing extra-mathematical contexts is not sufficient (Adda, 1976). To go further, researchers refer to various operational frameworks (in the sense of "framework for action", DiSessa & Cobb, 2004), which are based on different theoretical approaches. Therefore, they have been driven to conceptualise the process of learning mathematics in a different manner. According to the frameworks, developing the understanding of mathematics results from the mastery of a modelling expertise, the "reinvention" of mathematics, the overcoming of epistemological obstacles, the integration in a culturally situated practice etc.

Is it necessary to broaden the perspective, to create a global framework to help students combine different, or even contradictory, approaches to mathematics, and to problematise a more and more complex environment (Fabre, 2011)? Where should mathematics be contextualised in such a framework?

This is a topic that I have researched for several years. Therefore, I put a special focus on vocational and professional education, which I think is at the heart of the tension between the emancipatory and the functional dimension of mathematics education. My work is focused on the development and the analysis of the effects of didactic devices at the boundary of social worlds. I will present the framework I refer to, the specific context of the

teaching of mathematics and statistics in vocational and professional education, the didactical engineering that has been devised and the results that have been obtained. I will discuss how this research contributes to the general question of mathematisation.

References

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