

Digital representations of mathematical objects in the teaching-learning process: a cross European research project.

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The development of digital technologies broadens the diversity of representations of mathematical objects and offers new ways to handle them. It should then contribute to teaching/learning. Because the relationship between representation and object is part of social conventions marked by the culture of a community, this contribution of digital representations can not be considered only through the isolated interaction between a student and digital representations: it must be questioned in a teaching/learning process considered holistically.

To address this question, I will draw from the Remath ("Representing Mathematics with digital technologies") European project (IST4-26751), involving six laboratories in Italy, Great Britain, Greece and France (including my team in the LDAR). The project stressed the gap between the potential of technology and the disappointing reality of the actual classroom uses, and therefore the need to go beyond a simple cognitive point of view in order to support students and teachers in the use of technology. The participation of six teams working not only in three different national contexts, but with different approaches to issues of representations of mathematical objects in digital environments was a rich potential but also a challenge: understanding these contexts and their role, and coordinating these approaches. The research methodology was based on a cyclic process (a) the design of a learning software environment by each team, (2) an explanation of the design choices using an "integrated theoretical framework" (3) a series of cross experiments in different contexts and (4) a cross analysis of these experiments. Designed for teachers and researchers a website (<http://remath.cti.gr>) presents the results of the project.

The talk will develop this presentation, and then focus on the case of Casyopée, the software environment developed by the LDAR and dedicated to functions. It will specify the representations manipulated by this environment and how theoretical frameworks and the French context influenced the design. It will present the research questions posed by the two teams experimenting Casyopée, the experiments actually implemented and the results of the cross analysis, in relationship with theoretical approaches favoured by each team. The conclusion will reposition these results in the general frame of ReMath and reviews progress on representations and on the coordination of theoretical frameworks.