

Computer tools as tools of semiotic mediation in studying infinitesimal analysis: The didactical challenge

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The use of computer technology can offer a lot to math education. The interactivity and dynamics of technology can enable the creation of representations and tools that allow teachers to present and demonstrate mathematical ideas and concepts. These tools also allow students to explore these concepts and reach conclusions about their properties and relations between them by considering the effect of the manipulations performed on them in a certain virtual environment (Moyer-Packenham & Westenskow, 2013).

I argue that these digital representations and tools become cognitive artifacts (in the Vygotskian perspective) used by learners as tools of semiotic mediation (Bartolini Bussi & Mariotti, 2008). These may be determined by the specific interface of a certain digital environment, as well as by the learner's personal perception.

From my research (which was conducted with first year engineering students) I observed that as a result of that mediation, students (sometimes) construct a vague and inconsistent world of mathematical meanings. I speculate that to overcome this problem we need an appropriate didactical design of computer-based tasks that allow (through the use of specific artifacts in the mediation process) the construction of the appropriate mathematical meaning in students' minds.

In the conference I will demonstrate the empirical evidence of students' work in a digital environment that leads them to inconsistent and problematic mathematics concepts, and I will discuss how to identify the origin of students' difficulties as well as how to design digital tasks to overcome (or even prevent) these difficulties in the case of studying infinitesimal analysis.

Keywords

Computer tools, semiotic mediation, infinitesimal analysis, task design

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