# Semiotic Mediation in the Mathematics Classroom: ICT tools and theoretical thinking

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**Abstract**
My lecture will discuss on some results from different teaching experiments carried out with the aim of clarifying the role of information technologies in introducing students to a theoretical perspective. The first part of the lecture will be devoted to introduce the Theory of Semiotic Mediation (TSM) and the related model that was developed with the aim of describing the teaching – learning processes centred on the use of an artefact.

The notion of mediation is widely used in the current mathematic education literature, but it is here elaborated in a more complex way that overcomes the basic assumption about the contribution of integrating tools in the human activity, and in mathematics activity in particular.

The TSM, elaborated in (Bartolini Bussi and Mariotti, 2008), is centred around the seminal idea of semiotic mediation introduced by Vygotsky (1978) and aims to describe and explain the process that starts with the student's use of an artefact and leads to the student's appropriation of a particular mathematical content. The TSM addresses specifically this issue combining a semiotic and an educational perspective, and elaborating on the notion of mediation considering the crucial role of *human mediation* (Kozulin, 2003, p.19) in the teaching-learning process .

We postulate that an artefact (either an abacus or a pocket calculator or a microworld) can be exploited by the teacher as a tool of semiotic mediation to develop genuine mathematical signs, detached from the use of the artefact, but maintaining with it a deep semiotic link.

The evolution of signs, corresponding to the move from personal meanings rooted in the context of the artefact to conscious mathematical meanings, is a long term process that, according to our assumption, is neither spontaneous nor granted. The teaching organization is modelled by the iteration of what we have called the didactical cycle. In particular, we assumed the centrality of the design of semiotic activities and, in particular, collective mathematical discussion where the intentional action of the teacher is focussed on guiding the evolution of signs.

The second part of my lecture will focus on the theoretical construct of 'semiotic potential', that is "the double semiotic link which may occur between an artefact and on the one hand the personal meanings emerging from its use to accomplish a task, and on the other hand the mathematical meanings evoked by its use and recognizable as mathematics by an expert."(Bartolini Bussi & Mariotti, 2008, pag. 754)

Two examples will be discussed, concerning the use of two different artefacts. The first example addresses the issue of identifying the semiotic potential of a particular dynamic geometry environment, *Cabri*. The second example addresses the issue of designing a particular artefact as a tool of semiotic mediation with the specific educational goal of developing the idea of *Algebra Theory*. (Mariotti, 2010).

**References**

Bartolini Bussi, M. G., and Mariotti, M. A. (2008), Semiotic mediation in the mathematics classroom: artifacts and signs after a Vygotskian perspective, in: *Handbook of International Research in Mathematics Education, second revised edition*, L. English, M. Bartolini Bussi, G. Jones, R. Lesh, and D. Tirosh, eds., Lawrence Erlbaum, Mahwah, NJ., pp. 746-805.

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