Chapter 10
A Pedagogical Experiment in the Italian School

ABSTRACT

This chapter will summarize the extensive and multi-year experimentation carried out in many Italian secondary and primary schools, of the pedagogical-didactic proposal developed in the previous chapters. The teaching/learning of computer-based mathematics, as a programming tool, with software appropriate to the context, named MatCos, is given. In particular, the organization of the experimentation will be described, and the various phases will be illustrated. The results with the relative evaluation method will also be considered. Finally, works prepared independently by some participating students will be presented and commented. The opinion of some experimental teachers and school managers will close the chapter.

… Fantasy, creativity, MatCos and computer … (F. A. Costabile)

On must learn by doing the thing;
For though you think you know it;
You have no certainty until you try.
~Sophocles

1. INTRODUCTION

Between the years 2000-2015, extensive testing was conducted in the Italian Schools on MatCos Project (Costabile F., Aspetti pedagogici e cognitivi dell'apprendimento della matematica con le tecnologie, 2013) (Costabile & Serpe, Matematica e Computer con MatCos: un esperimento nella I media, 2002);

(Costabile & Tricoli, Atti: Giornata di lavoro Matematica & Computer – Progetto ACPAMTSO 2, Quaderni di Didattica, n^21, 2013) (Costabile F., Atti del convegno nazionale Matematica & Computer- Giornata di lavoro con gli studenti protagonisti, 2006) (Costabile & Serpe, Monitoraggio dei Moduli MatCos 2.3 e 2.8, Quaderni di Didattica, n^13, 2009) (Costabile & A., The MatCos Project: A survey of Results of the Experiment, 2009) (Costabile & A., MatCos: A Programming environment for Mathematics, 2012) (Costabile & Serpe, Atti del I Convegno nazionale: Progetto Matematica e Computer, Giornata di lavoro con gli studenti protagonisti, 2005) (Costabile & Serpe, Computer-based Mathematics Instruction with MatCos: A pedagogical experiment, 2013). The pedagogical-didactic architecture of the experimentation essentially rests on new models, which intend to overcome the rigidity of programming by objectives, to the advantage of a didactic activity intended as the preparation of learning opportunities. Within this pedagogical vision, the class assumes more the aspect of a laboratory, in which the pupils also develop an orientation ability in the face of unequivocal stimuli and the teachers fully rediscovers their educational role, leading students by the hand in a natural function: learning to know and master reality, acquiring concepts.

Concepts facilitate and organize reality, but above all they intertwine according to weaves and warps, as awareness of the bonds present in the various aspects of reality is acquired. The computer, used as a tool to be programmed, allows for the dynamic representation of concepts in an economic and manageable way. The programming environment (artefact) helps the teachers in their educational task because they assume a role of cognitive amplifier in the development of mathematical activity. A real integration of this artefact into teaching practice requires a transformation of constraints that characterize the institutional and pedagogical school framework, as well as teachers prepared and trained to manage these transformations.

On the basis of these assumptions, the effective experimentation, first, and subsequent continuation of the MatCos project, as well as any other computer-based mathematics education project, needs an adequate and specific training of teachers (all of this has already been discussed in chapter 3). This is true not only on the technical use of software (or different software) but also, and above all, on its integration into the setting of daily teaching practice. In the following section we will give a few notes on the actual experimentation in the classes of the MatCos Project. To complete the chapter, we will report on some works performed in the classes, which appear in the literature, but in Italian (Costabile F. S., 2005) (Costabile & A., Attività Laboratoriali nella Scuola dell'infanzia e Primaria in ambito Logico-Matematico-Informatico, nell'anno 2009-2010, Quaderni di Didattica, n^16, 2011) (Costabile & Tricoli, Giornata di lavoro MATCOS, Quaderni di Didattica n^22, 2014) (Costabile & A., Atti Secondo Convegno nazionale Matematica e Computer, Quaderni di Didattica, n^5, 2007) (Costabile & A., Attività Laboratoriali nella Scuola dell'infanzia e Primaria in ambito Logico-Matematico-Informatico, nell'anno 2009-2010, Quaderni di Didattica, n^16, 2011). A mention will also be given to the testimony of the experimenting teachers and managers of the heads of Institutes.

2. THE PEDAGOGICAL EXPERIMENT

We would like to avoid the pitfalls of the previous experimentations implemented by the Ministry of Education. That is why we designed a general plan, which includes in-service teacher training for the professionals taking part in the experimentation. The plan has objectives that are organized around the following three aspects:

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