Chapter 7
Activities in the Secondary School: A Geometric Path

ABSTRACT

With the same methodology of the previous chapter, in this chapter there is an outline of vertical path about geometric topics typical of the secondary school. Of course, the algorithm and computational aspect in the MatCos 3.X environment are more developed with respect to classical arguments, surely of interest. In particular, the presentation of conics in both the Euclidean and Cartesian plan is emphasized, based on construction algorithms by points, which can be easily implemented in the MatCos 3.X programming environment. Even solid geometry, or in three dimensions, will be characterized by effective construction algorithms of the solid figures presented. Some of these algorithms are general in nature.

"…the original works of the forerunners of Euclide, Archimede and Apollonius are lost, having probably been discarded and forgotten almost immediately after the appearance of the masterpieces of that great trio." ~T. L. Heath,1926, vol I,p.29

Like the geometer, who gives himself wholly to measuring the circle, nor, by thinking, finds the principle he needs; ev'n such was I at that new sight. ~Dante Alighieri, Divina Commedia, Translate: Courtney Langdon

1. INTRODUCTION

In Secondary School, the Geometry has the pedagogical-didactic objective of contributing to the formation of thought in its intuitive, logical and fantasy-creative components; a greater abstraction and

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formalization, in respect to the primary school, therefore, accompanied by a clear and precise use of linguistic expression. All this, without however losing the connection with the physical reality that surrounds us, in its description in rational terms and in its interpretation, also intuitive and predictive. As amply illustrated in the previous chapters it is difficult to arrive at a reasonable degree of abstraction, without a gradual process that starts from intuition about the concrete reality, passes through a phase of virtual reality, to then idealize it, internalizing the concepts. The phase of virtual reality, in which models of physical reality are imagined or schematized with the help of modern technology, is the essential novelty of the twenty-first century. It is clear that in this mental training the student completes a formative process that goes through the salient phases of observation, then of the intuitive abilities, of the first formalization, therefore the imagination with the consequent acquisition of a model, finally of abstraction and formalization with the consequent formation of ideas and concepts in a completely rational sense. In this chapter we will trace a path that runs vertically through all or the main part of the geometric contents of the secondary school, according to the aforementioned scheme. In this way the teachers have a panoramic view of the geometric theme of the secondary school, but of course they will have to adapt it to their daily and annual work plan from time to time. Naturally the virtual phase mentioned above will be considered fundamental by us, due to the novelty it constitutes, and will be developed with the MatCos 3.X programming environment. There will also be some examples of a complete TLS.

2. POINT, LINE, SEGMENT, STRAIGHT-LINE, HALF-LINE: A REMINDER WITH SOME INSIGHTS.

In the primary school we have already met the fundamental geometric entities of plane geometry, in this brief reference we mean to emphasize the abstract nature of the geometric entities, differentiating them from their visual or interpretative representation in the reality that surrounds us. For example, the following MatCos 3.X commands represent points that would appear to be different in size and shape, but as geometric entities they represent only the geometric object Point. The following genetic and axiomatic commands draw points of different sizes and colours:

PenColor(0,0,255);
PenWidth(1);
Point;
PenWidth(6);
Point;