

Tuesday 24 July 2018, 09:00-10:00

Room: Auditoria PA 113/PA 110

Theme 5: Topics in the history of mathematics education

The fusion of plane and solid geometry in the teaching of geometry: textbooks, aims, discussions

Marta Menghini

Dipartimento di Matematica, Università di Roma Sapienza, Italy

marta.menghini@uniroma1.it

Abstract

The idea of the fusion of plane and solid geometry can be seen as originating from projective and descriptive geometry, which worked with projections in space and plane sections. Different textbooks (starting from Bretschneider in 1844 to Méray in 1874/1903; de Paolis in 1884; Lazzeri & Bassani in 1891, also translated into German by Treutlein in 1911) adopted this idea, mixing plane and solid considerations. For instance, the chapter on the properties of incidence also referred to the mutual position of a plane and a straight line, while homothety was defined in space and then on the plane. Pupils were supposed to have a better intuition of spatial relations when passing from space to plane, and to reason by analogy.

Moreover, proofs could be presented of plane theorems using projections in space of simple known configurations. This is not a novelty within the history of mathematics; the development of conic section is linked to this point, and also Monge used it in his *Géométrie Descriptive* of 1799.

In the textbook by Lazzeri and Bassani, one of the aims of the authors is to prove plane theorems with the help of considerations in space that allow to avoid part of the congruence axioms and the theory of proportions, linking their work also to a choice of axioms that was faced by Hilbert in his *Grundlagen* of 1899.

The question of the fusion of plane and solid geometry was also considered at the ICMI Congress of 1911 - within the more general theme of the fusion of different branches of mathematics - by giving examples of successful textbooks (Fehr 1911; Barbin & Menghini 2013). The presentation will discuss the methodological question of the fusion of plane and solid geometry bringing examples from different textbooks, and presenting the discussions on the subject, as the one held within *Mathesis*, the Italian Association of Mathematics Teachers (Borgato, 2016).

References

- Barbin E., Menghini M. (2013). History of teaching geometry. Chapter XXVII in A. Karp & G. Schubring (eds), *International Handbook on History of Mathematics Education*. Springer, pp.473-492.
 - Borgato M.T. (2016). Il fusionismo: moda didattica o riflessione sui fondamenti della geometria? *Periodico di Matematiche*, 8/2 S. XII a. CXXV, 45-65.
 - Fehr H. (1911). Compte Rendu du Congrès de Milan. *L'Enseignement mathématique* 13, 437-511.
 - Lazzeri G., Bassani A. (1891). *Elementi di Geometria*. Livorno: Giusti.
 - Monge G. (1799). *Géométrie descriptive; leçons données aux Ecoles normales*. Paris: Baudouin.
-
-
-