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The Heritage of Cartesian Geometry in Elements from Arnauld to Lacroix

Abstract :

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When Descartes wrote his *Géométrie* in 1637, his purpose was not to write “Elements” with theorems and proofs, but to give a method to solve “all the problems of geometry”. However, thirty years later, Antoine Arnauld wrote a textbook for the schools of Port-Royal, titled *Nouveaux Éléments de Géométrie*, where he included two important cartesian conceptions. The first one is the introduction of the arithmetical operations for geometrical magnitudes and the second one is the cartesian order, which goes from the simplest geometrical objects (straight lines) to the others. This last conception led Arnauld to numerous novelties, mainly, a new geometrical order with a theory on oblique and perpendicular lines, new definition and treatment of angles, new proofs for Thales and Pythagoras theorems. In 1680, Bernard Lamy followed the textbook of Arnauld in his *Éléments de mathématiques ou traité de la grandeur en général*, where he also introduced the cartesian method to solve problems. He was an oratorian, a teacher and a Descartes’ disciple. His textbook knew different versions and it met a great audience in the 18th century with eight editions until 1765. Our first aim is to analyze the incorporation of cartesian conceptions into Arnauld and Lamy’s *Éléments*. We will begin by replacing them in the context of the mathematical, scientific and educational purposes of the two authors. Then we will study the tension between deductive order and cartesian order, and,

in complementarity, the presence of the argument of evidence into the different textbooks. Our second aim is to estimate the impact of these textbooks on mathematical education until 19th century, especially concerning the geometrical order introduced by Arnauld and followed by Lamy. In particular, we will examine the book of 1762, titled *Émile*, where Jean-Jacques Rousseau praised Lamy's textbook into his general plan of education. Also, in the turn of the next century, the ideas promoted by Arnauld and amplified by Lamy are well present in the geometrical teaching of Sylvestre-François Lacroix. We will question this aspect in Lacroix's writings, who taught mathematics in the Lycée in 1785 near Nicolas de Condorcet, before to become the author of *Éléments de géométrie* in 1799, intended for the students of the *École Centrale des Quatre Nations*. References Barbin, Évelyne, *Méthode cartésienne et figure géométrique dans les "Éléments de géométrie" de Lamy*, in *La figure et l'espace*. Lyon: IREM, 1991, p.17-32. Barbin, Évelyne, *La méthode analytique de Descartes et l'évidence comme détermination de la vérité*, in *Analyse et démarche analytique*. Reims: IREM, 1998, p. 79-101. Barbin, Évelyne, Rousseau, lecteur des mathématiques de Bernard Lamy, in B. Bensaude-Vincent et B. Bernardi (éds), *Rousseau et les sciences*. Paris: L'Harmattan, 2003, p. 45-57. Barbin, Évelyne, *Evolving Geometric Proofs in the 17th Century: From Icons to Symbols*, in G. Hanna, N. Jahnke, H. Pulte (eds.), *Explanation and Proof in Mathematics : Philosophical and Educational Perspectives*. New-York: Springer-Verlag, 2010, p. 237-252. Barbin, Évelyne, Menghini, Marta, *History of Teaching Geometry*, in A. Karp, G. Schubring (éds.). *Handbook on History of the Teaching of Mathematics*. New York ; Springer, 2014, p. 473-492.