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Borel's approach to mathematics, probability and citizenship

Abstract

One of the most significant changes in the French mathematics curriculum for secondary schools in the past two decades is the introduction of a new approach to statistics and probability. The latter combines a frequentist conception of probability and an experimental methodology to problems involving random processes, with the use of traditional models based on epistemic probabilities. This change has been controversial from its very beginning, because it diminished the place of other important subjects in the mathematics curriculum, in particular theoretical and analytical geometry. Therefore, this represented a significant change in the underlying philosophy of mathematics: less emphasis on geometrical demonstration and calculus, more on model-making and experience in relation to the call of introducing and studying "real-life" problems. Among these problems, those calling for a critical reflection on the role of statistics and probability in society were given a significant role.

What is striking in retrospect is that this mixture of epistemological and political debate on the very nature of mathematical thinking on the one side, with a reflection on the importance of statistics and probability for the modern notion of citizenship, on the other, is hardly a new one. Already at the beginning of the 20th century eminent mathematicians such as Henri Poincaré, Vito Volterra and Emile Borel had called the attention of mathematicians and of the educated elite, on the significant changes implied by the role of probability in science, industry and insurance or daily life in general (Mazliak and Durand, 2011). Emile Borel (1914) and his later followers like Maurice Fréchet (1924), were especially influential in disseminating these ideas and pushing the idea that these questions should imply a reform of mathematics teaching, by the systematic inclusion of statistics and probability as a key subject (Courtebras 2006; 94 & 114).

In this talk I will focus on the very first incentives for Borel's interest in probability around 1905-6, in relation to his own epistemology of mathematics, his involvement in the reform of secondary teaching of mathematics, and his growing interest for politics and political debates, such as those related at that time to the founding of a "secular State" (*Etat laïque*). Basing myself on a recent study of mine on the subject (Bernard, 2018) and on the last biography of Borel (Pinault, 2017), I will comment in particular on the forms and contents of some key articles published by him in the *Revue du Mois* on what he called the "practical value of probability calculations" (Borel 1906, 1908). I shall point out the main elements of context explaining his interest for this question, its relation to contemporary debates both in science and in society. I shall also focus on the "pedagogical form" Borel gave to his thoughts, especially through the use of simple problems calling for critical reflection on probabilistic notions and their interpretation. I will discuss, in conclusion, how this material might inspire the teaching of mathematics today.

References

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