

WHAT CAN HISTORY DO FOR THE TEACHING OF MATHEMATICAL MODELLING IN SCIENTIFIC CONTEXTS: WHY AND HOW?

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The notions of mathematical model and modelling took form and entered the discourse of mathematics during the 20th century with the increasing mathematization of a variety of fields such as e.g. economics, climate science, biology and medicine. The mathematization of these fields has initiated new scientific practices and new sub-disciplines have emerged where problems and new knowledge are gained through mathematical modelling. In the talk, we will analyse concrete modelling episodes from the 20th century in biology and economics with respect to modelling strategies, modelling as a scientific practice and discussions of what constitute valuable knowledge across disciplinary boundaries. The analyses will be discussed in relation to literature about the teaching and learning of mathematical modelling in mathematics education such as modelling competency and modelling cycles. Furthermore, it will be illustrated how and in what sense history makes it possible to invite students into the work place of scientists that use and experiment with mathematical modelling as a research practice, i.e. its significance in the creation of such teaching environments. Finally, the value of developing students' historical awareness for preparing them for tertiary studies where mathematical modelling might play a role will be discussed.

References

- Abraham, T. (2004). Nicholas Rashevsky's Mathematical Biophysics. *Journal of the History of Biology*, 37, 333-385
- Boumans, M. (2005). *How Economists Model the World into Numbers*. London, England: Routledge
- Jessen, B., & Kjeldsen, T. H. (forthcoming). An analysis of the relation between mathematical modelling in scientific contexts and upper secondary education. *Quadrante*
- Kjeldsen, T. H. (2017). An early Debate in Mathematical Biology and Its Value for Teaching: Rashevsky's 1934 Paper on Cell Division. *The Mathematical Intelligencer*, 39, 36-45.
- Kjeldsen, T. H., & Blomhøj, M. (2013). Developing Students' Reflections on the Function and Status of Mathematical Modeling in Different Scientific Practices: History as a Provider of Cases. *Science & Education*, 22, 2157-2171
- Knuuttila, T., & Loettgers, A. (2017). Modelling as Indirect Representation? The Lotka-Volterra Model Revisited. *The British Journal for the Philosophy of Science*, 68, 1007-1036
- Niss, M., & Blum, W. (2020). *The Learning and Teaching of Mathematical Modelling*. London, England: Routledge