

ZMATH 2014d.00816

Prodromou, Theodosia

Developing a modelling approach to probability using computer-based simulations.

Chernoff, Egan J. (ed.) et al., Probabilistic thinking. Presenting plural perspectives. Dordrecht: Springer (ISBN 978-94-007-7154-3/hbk; 978-94-007-7155-0/ebook). Advances in Mathematics Education, 417-439 (2014).

Summary: The introduction of digital technology into secondary schools is ideally suited for supporting students as they manipulate and portray data in a range of different representations to draw inferences from it without relying on a classical understanding of probability theory. As a result, probability is overlooked from school curricula and is gradually becoming almost a non-existent topic. The aim of recent curricula to support the parallel development of statistics and probability and then progressively build the links between them seems utopic since statistics prevails over probability in mathematics curricula. In this chapter, it is argued that it is worthwhile to consider an alternative approach for teaching probability – presenting probability as a modelling tool, which reflects the mindset of an expert when using probability to model random behaviour in real-world contexts. This chapter discusses results from two recent research studies [the author, Connecting thinking about distribution. (PhD Thesis) Warwick: University of Warwick (2008); “The role of causality in the co-ordination of the two epistemological perspectives on distribution”, Int. J. Stat. Probab. 1, No. 2, 283–300 (2012)] that investigated middle school students’ understanding of probability as a modelling tool. Within this chapter, the students’ reasoning will be considered from different perspectives: How students articulated fundamental probabilistic concepts associated with the construction of univariate probability models when using probability to model random behaviour. Students’ discussion as they engaged in exploring recently developed computer-based simulations which treat probability as a modelling tool. In this chapter, references will be limited to students in grades 6 to 9. The author’s research studies address four research questions as follows: (1) How do middle school students use probability to model random behaviour in real-world contexts? (2) What connections do they build among fundamental probabilistic concepts when treating probability as a modelling tool? (3) How do they synthesize the modelling approach to probability with the use of distributions while concurrently making inferences about data? (4) What activities can be designed to support the proposed alternative approach for teaching probability? The results of this study provide answers to the aforementioned research questions and suggest that the way students express the relationship between signal and noise is of importance while building models from the observation of a real situation. This relationship seems to have a particular importance in students’ abilities to build comprehensive models that link observed data with modelling distributions.

Classification: K53 M13 K93 U73

Keywords: modelling; probability; middle school; computer-based simulations; random behaviour; signal; noise; data

doi:10.1007/978-94-007-7155-0_22