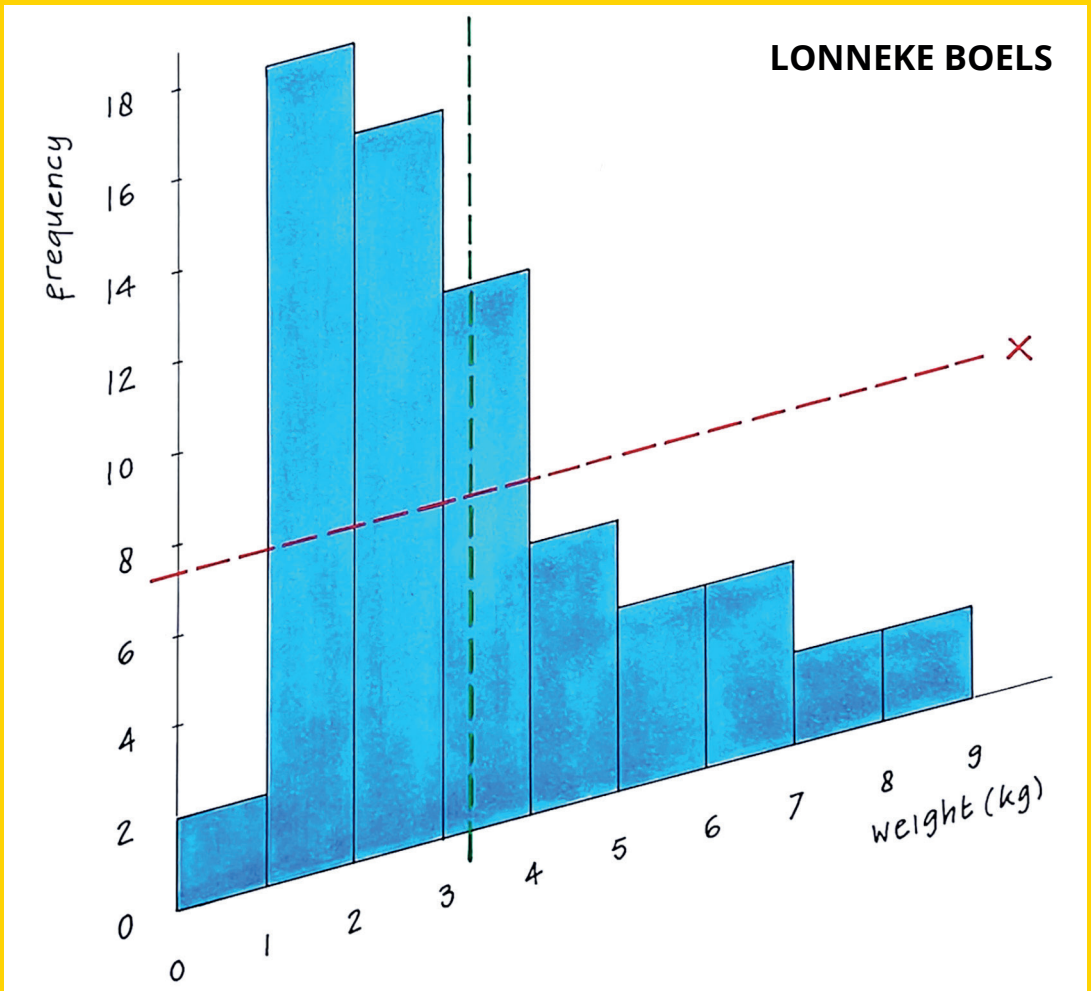


Histograms

An educational eye





Many high school students are unable to draw justified conclusions from statistical data in histograms. A literature review revealed various misinterpretations. Current statistics education often falls short of preventing these. In preparation for new instructional materials, several studies were conducted to better understand where these misinterpretations come from. Five solution strategies were found through qualitative analysis of students' eye movements on histogram and case-value plot tasks. Quantitative analysis of some tasks using a mathematical model and a machine learning model confirmed the results of the qualitative analysis which implied that the strategies could be identified reliably and automatically. Literature suggested that lesson materials with dotplot tasks can support students to correctly interpret histograms. An analysis of students' eye movements on histogram tasks before and after dotplot tasks suggested that students improved their strategies but not their answers. Based on the literature and eye-tracking studies, we conjectured that students most likely lacked embodied experiences with the actions required to construct histograms. Inspired by ideas of embodied instrumentation, we designed and tested instructional materials that provide starting points for scaling up. Together, the studies contribute to theorizing about teaching histograms and the use in statistics education of eye-tracking research, quantitative methods from data science, and instructional materials designed from the perspective of embodied instrumentation.



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