

DESIGN OF ANTICIPATORY TASKS ALONG A HYPOTHETICAL LEARNING TRAJECTORY FOR UNDERSTANDING PROBABILITY DISTRIBUTION

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Stochastic understanding of probability distribution undergirds development of conceptual connections between probability and statistics. In this work I describe the design of instructional supports structured to promote stochastic anticipations along a hypothetical learning trajectory (Simon, 1995) for stochastic understanding of probability distribution in a calculus-based, introductory probability and statistics course.

Instructional supports consisted of supplemental lab assignments comprised of anticipatory tasks (Simon, 2013) designed to engage students in coordinating thinking about complementary probabilistic and statistical notions. The rationale for the lab assignment tasks was the hypothesis that students learn through their activity in all situations and that learning can be engendered through a well-designed task sequence (Simon, et al., 2010). Each lab assignment was aimed at developing students' thinking and reasoning about probability distribution as a stochastic model with an emphasis on stochastic conceptions of probability, variability, and distribution. A hypothetical learning trajectory for probability distribution adapted from Liu and Thompson's framework (2007) informed the sequence of tasks and development of each lab assignment.

The tasks, which comprised these lab assignments, were designed to elicit students' probabilistic intuitions and then to build on those intuitions through use of *Fathom* software to simulate and model probability experiments. The tasks were designed to engage students in coordinating their thinking about complementary notions related to probability distribution such as randomness and determinism, experimental and theoretical probabilities, and independence versus dependence (Abrahamson & Wilensky, 2007). An aim of these tasks was to enable students to couple the "real world" with "the real math" by connecting their intuitive and experimental knowledge with their formal mathematical knowledge (Abrahamson, 2007). By engaging in these tasks, students had the opportunity to develop appropriate prior knowledge, which helped set the stage for deeper understanding of content and explanations offered by their professor in lecture and discussion classes (Schwartz & Bransford, 1998). Results of implementation in an instructional setting showed these tasks influenced development of stochastic understanding (Conant, 2013).

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