Abstract

My thesis addresses several issues of importance to probability education, presented in four separate studies.

The first study attends to definitions and examples of probability offered through resources and produced by undergraduate students. The findings suggest that the everyday notion of probability predates and dominates students’ conception of mathematical probability and point out the important role learner-generated examples play in identifying the scope of learners’ understanding of probability.

The second study examines the distinction between mathematical and everyday aspects of zero-probable and one-probable (extreme) events as featured in a variety of resources and as exemplified by prospective secondary school teachers. Moreover, different types of probability apparent from examples are identified and discussed. The results suggest that the participants use a range of subjective, theoretical, and logical approaches to construct probability examples in everyday and mathematical contexts. The results identified the need for a clear distinction between the notions of ‘zero-probable’ and ‘impossible’ in probability instruction and called for a pedagogical attention to this issue.

The third study provides an overview of some of the ways in which randomness is defined in mathematics. The study examines and interprets undergraduate students’ examples, definitions, and ideas related to randomness by analyzing the participants’ written responses, verbal communications, and gestures. The findings were strongly related to the findings of previous research. The gesture analysis further identified some aspects of randomness that were less apparent in participants’ verbal responses.

The fourth study examines undergraduate students’ arguments to the probability of a fixed and unknown event. The goal of study is to identify ambiguity caused by the interaction between everyday and mathematical probability in participants’ responses. The findings suggest that reflective tasks in which students are asked to examine and reflect on opposing probability arguments may help learners to reconcile some conflicting probability ideas.

Overall, my research provides enhanced understanding of how participants perceive probability related ideas, as evident in their examples, definitions and gestures. Based on the
results of my research, I present ideas and tasks for instructional implementation aimed at provoking discussion about different interpretation of probability, and strengthening student understanding.

**Keywords:** Probability; Undergraduate; Randomness; Ambiguity; Definitions; Examples.