Abstract

STUDENTS’ REASONING ABOUT PROBABILITY

SIMULATIONS DURING INSTRUCTION

Gwendolyn Zimmermann

This study examined the role instruction played in changing students’ individual and collective reasoning and beliefs about probability simulation and what impact technology had in these changes.

Twenty-three students from a high school Advanced Placement Statistics class participated in a 12-day whole-class teaching experiment. Students were administered a pre-, post-, and retention assessment to provide quantitative data to examine changes in student reasoning. Audio and videotapes of instructional sessions and interviews of 4 target students provided qualitative data related to their reasoning and beliefs.

Quantitative analysis revealed that the post- and retention assessment scores were significantly higher than the preassessment, but there was not a significant difference between the post- and retention assessment scores. Qualitative analysis discerned that following instruction, the frequency of valid responses increased in 5 of the 6 simulation components. More specifically, students made significant progress in their ability to use simulated outcomes to determine the probability of an event and to recognize the effect of repeated trials on the empirical probability. Students’ use of the graphing calculator was found to have a considerable impact on students’ reasoning about probability simulation.

Specifically, the syntax needed to operate the calculator focused students on the components of simulation, and the calculator provided a transparent medium for handling more complex problems that involved dependent events.

This study identified a number of helpful and problematic beliefs. Some of the helpful beliefs included the belief that assumptions are part of simulation and as the number of trials increased, the empirical probability approached the theoretical probability. Problematic beliefs were related to misconceptions, such as representativeness.

As students reasoned collectively, a number of sociomathematical norms emerged about how students justified valid simulation components. From these norms emerged one or more classroom mathematical practices, many of which became taken as shared by the students.

(299 words)