HIGH SCHOOL MATHEMATICS TEACHERS' KNOWLEDGE AND VIEWS OF CONDITIONAL PROBABILITY

by

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ABSTRACT

In this study, United States high school mathematics teachers were interviewed about topics related to conditional probability. U.S. mathematics teachers need to understand conditional probability to help students learn to make reasoned decisions under uncertainty and because many school curricula now include the topic. Researchers have identified probabilistic misconceptions held by learners and have developed some useful instructional approaches, but existing research on teachers' knowledge of probability is sparse. Therefore, I investigated (a) how teachers solve conditional probability tasks, (b) how teachers respond to student misconceptions in conditional probability tasks, and (c) teachers' perceived needs to teach conditional probability.

Between May and July 2014, I interviewed 25 teachers from Georgia, Pennsylvania, and South Carolina. The sample contained a few experienced probability instructors, but three-quarters of the sample had not taught a course on probability and statistics. The interview protocol included 9 task-based questions. Participants solved problems, identified potential student misconceptions, and offered responses to misconceptions. After the tasks, participants answered open-ended questions about curriculum, teaching concerns, and requests for assistance.

Problem solutions, identified misconceptions, and participants' responses to misconceptions were catalogued. Open-ended remarks were analyzed using thematic analysis.

Participants avoided most misconceptions in their solutions. Independence was an exception; most participants erroneously defined independent events. Participants recognized known student misconceptions on less complicated tasks, but had fewer ideas about more complex problems. They generally would respond to misconceptions with legitimate arguments. Their responses incorporated explanations of vocabulary, confrontations about computational errors, and some innovative approaches such as physical representations, classroom demonstrations, and analogies.

Participants considered probability practical and relevant, but courses often covered little probability because it was the last chapter in the book and a minor part of standardized tests. Participants divided teaching concerns and requests for assistance among subject matter, pedagogical, and curricular needs. The most commonly expressed needs were for classroom-ready tasks, task-based pedagogical training, and subject matter instruction.

The study results provide evidence to frame many research activities. The most pressing areas are unraveling misconceptions about independence, creating practical classroom tasks, and developing teacher training about multiple ways of responding to student misconceptions.

INDEX WORDS: Mathematics education, conditional probability, teachers, content knowledge, pedagogy, professional development