

# Mathematical Modeling by Prospective Teachers Using Technology

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Three studies were conducted to investigate prospective mathematics teachers' understanding of mathematical modeling when using technology to solve a variety of problems. The purpose was neither to verify an existing theory nor to test a priori hypotheses. Rather, the intent was to develop a framework for exploring the students' difficulties with mathematical modeling by observing and interviewing them in the context of a regular, if unique, course on mathematical modeling. The framework illustrates how different sources of authority as well as conceptions and misconceptions of mathematics and mathematics modeling play different roles in the mathematical modeling process. Technology acted both as a tool and as a source of authority in this process.

The studies were conducted at the University of Gothenburg during the fall semester of 1997, the spring semester of 1998, and the fall semester of 1998. A qualitative approach was used in which special attention was focused on a small group of students working together in the laboratory. Data were collected from questionnaires, videotaped interviews, observations, and written documents such as course assignments and examinations.

The first study revealed that the students in general favored the use of technology, especially when solving complex mathematical modeling problems. On the other hand, they easily "got lost" and trusted the technology far too much when working on mathematical modeling problems, thereby neglecting a necessary validity check. This trust, in turn, seemed to profoundly disturb their ability to relate mathematical models to

reality. The second study, in addition to verifying the findings from the first, indicated that the students had misconceptions associated with their knowledge of mathematics, of technology, and of problem contexts. A major finding of the third study concerned a transformation of authority that occurred after the first few weeks of the course. The students became rather uncritical of the results they got from the computer or graphing calculator despite the fact that in lectures and laboratory sessions they had been urged to be very cautious when employing software to select models. All three studies confirmed the essential role played by the validation part of mathematical modeling when technology is present.

INDEX WORDS: Mathematical Modeling, Assessment, Authority, Responsibility, Open-Ended Questions, Technology, Teacher Education.

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