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University students' models of two geometrical problems.

International conference on the teaching of mathematics. Wiley, New York, NY. 275-277 (1998).

Over the last thirty years a large amount of research has been produced concerning children's thinking in Science and Mathematics and this has led to discussion about the existence of any relationship with the actual classroom teaching and learning in the primary and secondary schools. University education has been considered as a safe situation for the grown up students who have overcome their conceptual problems and are expected to integrate their cognitive systems in an even way. The question raised here is whether thinkers of advanced mathematics like university students confront the new issues in an unproblematic way or if they often use their own personal models to face problems related to their mathematical knowledge. Do features specific to the learning of advanced mathematics exist? More specifically what kind of thinking features do university students bring into play when they solve problems in an everyday context? How do they model situations which they have to face using their mathematical knowledge? What kind of models do students express during a thinking process? An expressed model is considered to be the outcome when a mental model is put into the public domain through action, speech, writing, or the use of some other symbolic form. The focus of this paper is on the dimensions of university students' expressed models while solving two problems. The first problem refers to an oil tank. The question is: 'An open parallelepiped oil tank needs to be constructed. Its volume should be $32 m^3$. What should its dimensions be in order for its whole surface area to be the least possible? The second problem refers to a billiard table. The question is 'Which is the shortest route a billiard ball must take, in order to hit another ball on the table after a shot which has come off the side of the table?' The two problems have been answered by a total of sixty second year students of the Mathematical Department of the University of Patras, at the beginning of the second semester.

Classification: C35