

CONCEPTIONS AND BELIEFS OF MATHEMATICS UNIVERSITY PROFESSORS ABOUT THE TEACHING OF DIFFERENTIAL EQUATIONS

Mar Moreno and Carmen Azcárate
Department of Mathematics (University of Lleida)

The present research is an approach to the conceptions and beliefs of mathematics university professors related to the teaching of differential equations within the first years of scientific and experimental studies (Moreno, 2001). The teaching objectives are twofold: on the one side, to discern the most relevant characteristics of present way of teaching differential equations and to explain the persistence of traditional teaching methods; and secondly, to categorise each professor under study in terms of his conceptions and beliefs about the subject matter itself, about the teaching and learning of it, and also to establish the level of coherence and consistency or permeability of such conceptions and beliefs.

The theoretical elements on which the conceptual framework is built on comprehend aspects related to the knowledge each professor has of the subject matter and his relations with the elements of the teaching practices and with his conceptions and beliefs (Brophy, 1991). Furthermore, we resort to epistemology as a bridge to link the subject matter and the teaching and learning process with the conceptions and beliefs. The study is a qualitative one, involving six mathematics university professors, all specialised in practical mathematics. An *ad hoc* designed questionnaire and a recorded interview are used for data collection. The data analysis includes eight phases, during which the corresponding tables, layouts, descriptor lists and the like are produced.

The analysis results corroborate the predominance of teaching approaches encouraging algorithmic and algebraic practices towards differential equations (Artigue, 1995; Yusof and Tall, 1999), also signaling some asymmetry and a certain lack of transparency as far as the teaching objectives are concerned. In addition, we explain: the professors persistence in their conception and belief of the conceptual difficulty of this mathematical subject, the personal conception each professor has about this equations, within mathematics in general, their fear to lose the mathematical contents considered as "real mathematics" and the ease and simplicity implied in a way of teachings based on mechanical solving.

The differences when categorising each professor arise from coherence between his conceptions and his beliefs, and they allow us to set up three groups of professors (I, II and III). Group I consist of the most incoherent holding the most permeable beliefs; group II includes the most coherent and consistent; and finally, professor of group III is fairly incoherent though consistent in his beliefs about teaching differential equations.

ARTIGUE, M. (1998). L'évolution des problématiques en didactique de l'analyse. *Recherches en Didactique des Mathématiques*, Vol. 18, no 2, pp. 231-262.

YUSOF, M. y TALL, D. (1999). Changing Attitudes to University Mathematics through Problem Solving. *Educational Studies in Mathematics*, Vol. 37, pp. 67-82.

BROPHY, J. (1991) (Ed.). *Advances in Research on Teaching*, Vol. 2. Teachers' knowledge of subject matter as it relates to their teaching practices, Greenwich, Connecticut, Jai Press.

MORENO, M. (2001). *El profesor universitario de matemáticas. Estudio de las concepciones y creencias acerca de la enseñanza de las ecuaciones diferenciales. Estudio de casos*. PhD thesis. Director: Carmen Azcárate. Universitat Autònoma de Barcelona.