THE DEVELOPMENT OF MATHEMATICAL CONCEPTS: THE CASE OF FUNCTION AND DISTRIBUTION

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The mathematization of physical concepts may require not only the use of mathematical concepts in contexts of different degree of generality and complexity, but also to develop an advanced mathematical thinking. The physical concept of impulse, which is mathematized by means of the δ-Distribution is an example of the result of abstracting and generalizing the concept of (numerical) function, leading to the notion of distribution. A previous exploratory study showed that students' intuitive model of the mathematical impulse as a numerical function, acquired when studying physics, may cause difficulties when formalizing this concept. (Cavallaro &Anaya, 2002).

The historical development of some notions (like number and function), have shown to be a cyclic process which Sfard (1991) refers to, as a long chain of transitions from operational to structural conceptions.

In this work, results will be shown of a research in which the conceptions of functions and distributions were studied following the lines of Sfard (1991) and Dubinsky (1991). This study was carried out with 40 students from the Engineering Faculty of the University of Buenos Aires. Data analysis of two questionnaires on distributions and functions and a modeling activity, show that even if some students could successfully conceive (numerical) functions as mathematical objects, this didn't happen when they were dealing with distributions. Difficulties were found not only in reifying or encapsulating a distribution as a static object on which actions and processes were to be performed, but also in the development of a process conception for distributions (the δ-Distribution case will be analyzed). The cyclic process mentioned above repeats again. Students' conceptions, didactical implications and possible lines of future research will be discussed during the presentation.

References:

Cavallaro, M.I., Anaya, M. (2002). Cognitive Problems of University Students with the Concept of Distribution. *Proceedings PME 26*, Vol. 1, Norwich, p.269.

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Sfard, A. (1992). Operational origins of mathematical objects and the quandary of reification-the case of function, *The Concept of Function: Aspects of Epistemology and Pedagogy,* G.Harel & E. Dubinsky (Eds.), MAA Notes 25, Washington DC, 59-84.