

COGNITIVE PROBLEMS OF UNIVERSITY STUDENTS WITH THE CONCEPT OF DISTRIBUTION

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The concept of distribution, and specifically the notion of the Dirac's Delta Distribution, was found to be difficult for university students who deal with it in the advanced course of Mathematical Analysis. It is shown that these difficulties are related to mental models and schemes that the students have or develop at the moment when the concept of distribution is first presented to them.

In this study carried out with a group of 30 students from the Engineering Faculty of the University of Buenos Aires, those difficulties are described and discussed within the framework of the cognitive theory of intuitive models (Fischbein, 1987).

A modelling activity was presented to the students with the aim to observe how they established the isomorphism between the mathematical theory and a physical model. A questionnaire and interviews allowed us to study the students' beliefs, their ways of reasoning, and the intuitive models evoked during the problem-solving.

From the data analysis we could conclude that the use of the distribution for modelling has turned out to be unacceptable for the majority of the students. The students preferred to conceive the Dirac's Delta as a function of numerical variable – null everywhere except at zero where it is infinite, but which at the same time has a non-zero integral. However, their misuse of the familiar model of numerical function became an obstacle in understanding such general ideas as function spaces and functions defined on these spaces. The students have ignored these contradictions by giving the Dirac's Delta a status of “special” or “different function”.

In designing didactical interventions, it seems highly recommendable that teachers know students' intuitive models. Modelling activities of real situations seem to be highly helpful to get this information and make the students to be aware of their own intuitive models, enhancing their meta-cognitive skills.

References

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