

# **Practice of probability teaching: A comparative analysis of teaching probability in classes of different levels**

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## **ABSTRACT**

In the recent years, there is growing interest in the practice of teaching mathematics. However, little research concerning the complexity of the practice of teaching mathematics has compared the mathematical teaching of students of different levels.

This research compares practices of teaching the topic of probability in high school classes of different levels. Specifically, it focuses on teaching probability in classes preparing for the Matriculation Examination on this topic, at the three and four unit levels, within the same school. The research examines two dimensions of probability teaching practice: Emphases made in probability teaching, and the role of the teacher and students in the teaching/learning process.

The research is composed of two case studies. Each case study refers to a teacher who teaches probability in two high school classes of different levels (3 and 4 unit level). The content of the probability syllabus taught in the 3 unit level is identical to the one taught in the 4 unit level, with the exception of one topic (binomial distribution). The research concentrated on the topics studied in both levels. It compares the nature of teaching carried out by the same teacher, according to the same syllabus, in two classes of different unit levels. The research also examines the ways in which the same syllabus is taught by different teachers.

Data was collected by observing all probability lessons taught in the two classes of each teacher (total of 46 lessons in four classes). It also includes interviews with both teachers, conducted at the end of the probability teaching period in those four classes. The data was analyzed both qualitatively and quantitatively. Analysis was made based on three main methods: a) The "Grounded Theory" method, b) an analytical framework developed by Even (1990) and adapted for the purpose of this research, and c) coding and

statistical analysis methods used in the TIMSS Video Studies in the years 1995 and 1999.

The main findings of the research are as follows:

We have found that despite the identical syllabus and the similarity of both textbooks and the content of the Matriculation Examinations, the teachers employed different practices that vary from teacher to teacher and from level to level. Two types of teachers were identified: 'the traditional teacher' and 'the modern teacher'. Batia is the 'traditional teacher', as was reflected in teaching aspects such as class organization, the nature of mathematical activity and discourse. Gila is the 'modern teacher', Batia's role is central in the teaching/learning process, and so is Gila's, however with different emphases. Class organization, the nature of mathematical activity and discourse, as well as other aspects, point out to certain teaching patterns which are characteristic of modern teaching approaches.

In addition to identifying two types of teachers ('traditional' and 'modern') it was discerned that the intensity of the teacher profile was determined by the level of the class taught. For both teachers, the different types were more emphasized in the 3 units level classes. That is to say, more 'traditional' characteristics were identified in Batia's 3 units level class than in her 4 units level class. Differences between the teaching practices were recognized in Gila's classes as well: Modern teaching practices were more apparent in her teaching of the 3 units level class.

In regard to emphases made by the teachers when teaching probability, differences were observed between the two teachers and according to class level. As for representations, we have found differences in teacher preferences of certain representations. In some cases these were class related. Both teachers provided rules for choosing representations to be used while solving problems. However, differences were found in the types of rules given by the two teachers. Differences were also found between teachers in the forms of knowledge used while solving problems. In addition, it was found that both teachers related to the uncertainty aspect of probability problems. Both teachers did this in a similar way in the 3 units level classes. Gila referred to the uncertainty aspect more often than Batia. However, we have found differences in the way in which the teachers related to probability. While Gila sometimes used the experimental approach, Batia used only the classical approach.

We have also discovered that some aspects were absent from both teachers' practices: Both teachers did not connect probability concepts to other fields, such as biology, although some of their students study this subject. They also

did not mention conditional probability and the subjective school in their teaching.

This research provides important information regarding the different emphases made in probability teaching, focusing on aspects that relate to the content of probability teaching and to teaching in different levels, carried out differently according to the teacher and class level. This information is important for the development of pre-service and in-service teacher education programs. Another contribution of the research is that it suggests an analytical framework for the examination of probability teaching practices.