

ABSTRACT

Dispersion measures in compulsory secondary education: analysis of textbooks and student understanding.

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Variation is in the heart of statistics, (Moore, 1990) but students usually have troubles with the use and understanding of dispersion measures. (DelMas & Liu, 2005; Garfield, DelMas, y Chance, 2007; Lee & Lee, 2011; Sánchez & Orta, 2013; Dubreil-Frémont, Chevallier-Gaté & Zendrera, 2014). Standard deviation is the first area of difficulty a student of statistic may encounter (Hart, 1983).

In Spain, Estepa & Ortega had researched the students' understanding and set a reference meaning for the different measures of dispersion under the onto-semiotic approach (Estepa & Ortega, 2005, 2006) finding the same difficulties than in other studies out of Spain.

The purpose of this study was to examine the national curriculum and the didactic transposition to textbooks, designing a test to check the student understanding of the dispersion measures and finally conducting a survey to verify if dispersion measures are taught in schools.

We studied the evolution of national curriculum since 1975. Batanero (2001) affirmed that, although the importance of statistics in the curriculum had been increasing, these improvements do not transfer to school. The current curriculum specifies the dispersion measures for the levels equivalent to K9 and K10 to a greater degree than the previous normative developments.

We chose a sample of books in which we chose the four most used textbooks in schools for each educational level. We analyzed textbooks from different perspectives. A study of the macrostructure and microstructure was carried out. For the macrostructure, the structure referring to the chapters of the books and the percentage of them that work the statistic block was studied. For the microstructure we focus attention on the structure of each chapter of the book and on the structure exhibition - example - exercises for each mandatory content of the curriculum. Textbooks were also studied from the semiotic onto approach. In this part of the study we analyzed the elements of meaning that are defined in said theoretical framework: linguistic elements, situations - problem, concept - definition, actions or procedures, propositions, arguments. With this analysis we were able to determine the didactic suitability of the different books and establish the potential semiotic conflicts.

We designed a test based on the items in the artist database (Garfield, delMas, y Chance, 2003). To select the questions, we rely on the curriculum and the type of exercises and problems that students usually perform. The study was exploratory and the sample intentional.

Finally, we conducted a survey in the public high schools of Andalusia. In it we asked several questions, if the statistics were indentured or not in 3rd of ESO (K9 equivalent), in case of answer not, indicating the reason and finally the opinion that produces as a teacher who does not know work teaching statistics unit at these levels.

The result was that despite the improvement of the contents in the curriculum, these are not properly transposed into textbooks, generating different semiotic conflicts. One of the possible causes is that the administration does not currently supervise the edition of textbooks. In addition, we find that despite the work of the statistical unit, the problems of calculation and reasoning about dispersion measures persist, as all previous studies in other countries already pointed out. As indicated by Batanero (2001) the statistics are left to the end and in many cases, it is not worked. In the survey we obtained that the statistical unit is only worked on in 30% of the centers surveyed, a low result.

Index words: dispersion measures, spread, variability, teaching and learning statistics.

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