

GIVING SENSE TO STUDENT'S PRODUCTIONS – A WAY TO IMPROVE (FUTURE) TEACHERS' KNOWLEDGE AND TRAINING

¹Maria Nascimento; ²C. Miguel Ribeiro; ³J. Alexandre Martins; ⁴Fernando Martins; ⁵Manuel Vara Pires; ⁵Cristina Martins; ⁶Margarida Rodrigues; ⁶Joana Castro; ⁶Ana Caseiro

¹Tras-os-Montes e Alto Douro University; ²University of Algarve; ³Guarda Polytechnique Institute; ⁴School of Education of Coimbra; ⁵School of Education of Bragança; ⁶School of Education of Lisbon

Teachers' knowledge is one of the core aspects influencing student's learning and achievement. One of the tasks of teaching in which such knowledge is evidenced concerns giving sense to the students' productions. Thus, such situations are perceived as having a great potential for training, with the goal of promoting prospective teachers' knowledge and understanding. In this poster we will present and discuss some results from a wider study aiming to access and develop prospective primary teachers' statistical knowledge.

The last few years have been fruitful in changes in teachers' training. Portugal was no exception. In the Portuguese context, three different approaches were followed: it was nationally defined the amount of credits (ECTS) that each study program should cover in each of the core topics – being mathematics (education) one of such topics; the implementation of a national program for professional development of primary teachers (teaching from year 1 till year 6); and a new national curriculum for the first 9 years of schooling was implemented (a single document which also aims to allow teachers to envisage students learning as a continuum). In all these different approaches and contexts, a topic named “Data Organization and Analysis” has emerged as a focus of attention (at least theoretically), appearing now, for the first time as a specific matter topic, in primary school curriculum (pupils aged 6 to 10). In the Portuguese national guidelines for kindergarten we can find (implicitly) references to the topics included in data collection and analysis (in a much broader way that it is considered for primary). From kindergarten, children's are supposed to have experiences from activities that will contribute to the development of their statistical literacy.

With those goals, we consider that kindergarten and primary teachers have to be aware of the need to explore “data analysis” topic with their pupils. However, data collecting and analysis is one of the topics in which teacher's usually have lack of training, thus being it's one of the topics that needs to be reinforced in teachers' training – contributing to allow prospective teachers to prepare and implement mathematical challenging tasks (in the sense of Stein, Smith, Henningsen and Silver, 2000). For that purpose – preparing and implementing challenging tasks – teachers' knowledge assumes a critical role (e.g., Ribeiro and Carrillo, 2011). Thus it is of fundamental importance to improve teachers' training and knowledge on data

collecting and analysis, allowing them to prepare and implement such kind of tasks, and to give sense to students' productions, reasoning and argumentation. With this view, it's essential that future teachers' have a knowledge that allows them to integrate, both the mathematical (statistical) and didactical dimensions in their practice (actual and/or future) in a coherently and intertwined way. Such knowledge is perceived here as the Mathematical Knowledge for Teaching (MKT) within data collecting and analysis (e.g., Ball, Thames and Phelps, 2008; Burgess, 2011). Aligned with Batanero (2009), we consider that researching these dimensions is an important aspect for the development of a sustainable initial and continuous teachers' training.

This poster is part of a wider research project involving five Teachers' Training Higher Education Institutions, focusing on early years (prospective) teachers' MKT on data gathering and analysis. Amongst others we aim to identify, discuss and reflect upon the mathematical critical situations on (prospective) teachers' knowledge (where some kinds of difficulties are shown – in terms of subject matter knowledge and/or pedagogical content knowledge). With such focus at first our goal is to access the mathematical (statistical) reasons (whys and hows) which are at the core of such difficulties leading to the conceptualisation of tasks to develop teachers' MKT.

Having as a starting point a set of tasks aiming at giving sense to students' productions, in this poster we report some preliminary findings concerning kindergarten and primary prospective teachers' knowledge related with bar charts and pictograms. The shortcomings detected concern different levels of understanding and knowledge leading to an inability to give sense to students' productions that differ from their own as well as to navigate between equivalent justifications and representations. From those results we will address the need for a change in the conceptualization of tasks for teachers' training teacher's – aiming their MKT development in data collecting and analysis.

Acknowledgements:

This poster is part of the research project "Mathematical knowledge for teaching with respect to problem solving and reasoning" (EDU2009-09789), funded by the Spanish Ministry of Science and Innovation. The presenting author thanks the support of the Mathematics Centre of UTAD from Portugal.

References

- Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: what makes it special? *Journal of Teacher Education*, 59(5), 389-407.
- Batanero, C. (2009). *Retos para la formación estadística de los profesores*. Paper presented at the II Encontro de Probabilidade e Estatística na Escola, Braga.
- Burgess, T. A. (2011). Teaching Statistics in School Mathematics-Challenges for Teaching and Teacher Education *New ICMI Study Series* (Vol. 14, pp. 259-270).
- Ribeiro, C. M., & Carrillo, J. (2011). Discussing a teacher MKT and its role on teacher practice when exploring data analysis. In B. Ubuz (Ed.), *Proceedings of the 35th Conference of the International Group for the Psychology of Mathematics Education* (Vol. 4, pp. 41-48). Ankara, Turkey: PME.
- Stein, M. K., Smith, M. S., Henningsen, M. A., & Silver, E. A. (2000). *Implementing standards-based mathematics instruction: a Casebook for Professional Development*. New York: Teachers College Press.