"Using Tasks to Explore Teacher Knowledge in Situation-Specific Contexts"

Summary of the "Biza, I., Nardi, E., & Zachariades, T. (2007). Using tasks to explore teacher knowledge in situation-specific contexts. *Journal of Mathematics Teacher Education, 10,* 301-309."

What is it about?

We support the view that teacher knowledge is "better explored in situation-specific contexts" (p. 301) rather than theoretically and out-of-context. From this standpoint we have developed tasks that can trigger teachers' reflections on their knowledge and practices within specific situation. One of these tasks – the Algebra task – is used in this paper. The situation in this task involves the equation $|x|+|x-1|= 0$ and a student's flawed solution to this equation. In the task, the student has followed what the authors call the *routine* method, which is a lengthy procedural method that includes squaring both sides of the equation, and carrying out a case by case study of the signs of x and x-1. The solution involves heavy algebraic manipulation and the student fails to observe that the produced result (that x is ½) is not acceptable due to the x and x-1 sign limitations. However, there is another method, what the authors call "optimal solution", which is shorter and draws on understanding the properties and characteristics of absolute value. This method is based on noticing the non-negative nature of absolute value (| |) and the observation that $|x|$ and $|x-1|$ can make zero only if both are zero, which is impossible. 53 in-service Greek teachers were invited to respond to the task in writing: solve the problem, reflect on this situation and the issues it highlights and offer feedback to the student. The analysis of the teachers' responses explores teachers' knowledge of their subject and approaches to its teaching as well as their awareness of their students' needs and its effect on the way they act in classrooms.

Key results:

In terms of teachers' knowledge:

- Most teachers' responses reflected a preference of the long procedural *routine* method, used in the student answer, over the *optimum* short method.
- Preference of routine methods might be due to teachers thinking that their students are not ready yet to think of alternative solution as they are still not confident with the routine ones.
- In some cases teachers themselves did not observe the *optimum* method, and this can be due to inadequate mathematical training.
- Teachers' tendency to use standard routine methods might be based on the fact that school mathematics relies heavily on procedural approaches.
- Teachers' pedagogical sensitivity is in some cases mathematically constrained due to: overreliance on standard procedures; good pedagogical intentions not being well utilized; and, insufficient consideration of students' thinking.

In terms of the methodological approach of this study:

- The task in this paper was designed to operate "at least at three levels: the substantive (algebraic and logical manipulations in solving equations; conceptual understanding of absolute value), the meta-cognitive (acknowledgement of the multiple and qualitatively different ways in which an equation can be solved; optimal choice of solution) and the didactical (utilise the opportunity offered by the problem to discuss problem-solving skills such as the above mentioned elements of meta-cognitive awareness)" (p.305).
- Looking at teachers' knowledge in light of their feedback to this task allows more aspects of their knowledge to arise.
- For such tasks to be enlightening, they need to replicate specific mathematical and pedagogical issues. Then, they can be used "as triggers for teacher reflection …" (p. 308).

How to put these ideas into practice?

- Why not share the task in this paper with your colleagues and discuss it with them? What different responses did you and your colleagues come up with?
- Can you think of similar examples?
- Tell us your thoughts at @mathtask, https://www.uea.ac.uk/groups-and-centres/a-z/mathtask.