EXPLORING TEACHER MATHEMATICAL MODELLING KNOWLEDGE FOR THE DESIGN OF SIMULATION AND CODING TASKS

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THEME:

Teacher education and professional learning in STEM

BACKGROUND

There is a growing interest in incorporating mathematical modelling in education around the world due to its role in fostering critical thinking, as well as the relevance for applications in other domains, including science, technology, engineering, and mathematics (STEM) education (English, 2015). This research intends to shed light on the mathematical knowledge required by teachers to successfully integrate modelling with a particular focus on simulation and coding at K to 12 school levels.

In this presentation, we will draw on two main findings yielded from the data analysis: (1) The teachers' pedagogical knowledge depends on perceptions about the disciplinary field and the role of the educational tool used and (2) the way teachers use computational simulations is integrated with their pedagogical approaches.

METHODOLOGY

This study involves seven one-to-one virtual semi-structured interviews with teachers in Mexico and Canada. Researchers and teachers engaged in a conversation about the specialized knowledge needed for the design and classroom implementation of fourteen mathematical modelling tasks (two for each teacher). The design part of the interview focused on the design objectives and process highlighting the challenges teachers faced in designing the task. The classroom implementation part focused on the task's challenges and affordances when interacting with the students underscoring their learning processes.

RESULTS AND CONCLUSIONS

We will discuss two representative examples that shared commonalities within all interviews. Supporting the first finding, we observed that the geometry knowledge is different for programming a robot. For example, the notion of angle has a different meaning from the traditional definition in geometry as the intersection of two lines. In contrast, the angle notion is embedded in the physical experience of the robot in motion led by the number and direction of wheel rotations.

The second finding is supported by teachers using simulations for the development of probabilistic reasoning. Teachers made sense that making a distinction between teaching probability and supporting students to develop probability thinking led to the development of relevant practices that involved decision-making in uncertain situations.

These findings suggest a new perspective in task design leading to a meaningful and agential space for the integration of virtual simulations and coding that privilege critical learning rather than the traditional schemes of mathematical modelling.

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REFERENCES

English, L. (2015). STEM: Challenges and opportunities for mathematics education. In Beswick, K., Muir, T., & Fielding-Wells, J. (Eds.), *Proceedings of the 39th Psychology of Mathematics Education Conference*, (1, pp. 1–16). Australia.