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Solving techniques of future mathematics teachers: the case of reflection

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INTRODUCTION

The work presented in this poster is part of a research project aimed at equal access to quality learning opportunities for all learners, particularly those defined as having special educational needs, in line with the principles of inclusive schooling promoted by UNESCO (2017). Two secondary school mathematics teachers taking part in this research designed and implemented a mathematical task in their class (grade 6, 11-12 years old). This task involves using prescribed materials to construct an instrument that can be used to determine the symmetric of a given point with respect to a straight line. We proposed the same task to first-year and second-year Master's students intending to teach mathematics in secondary schools in order to compare their knowledge involved in solving the task with that of the pupils.

We position our study in relation to Klein's second transition (Winsløw, 2020), which occurs for future mathematics teachers between their university studies and the time when they obtain a teaching position in secondary education. To quote Felix Klein (2008), an important aim of didactic research dedicated to this transition is to enable future teachers to adopt “a higher standpoint on mathematics”. At the very least, the aim is to enable them to see to what extent the mathematical knowledge they have acquired at university may (or may not) be relevant to their future profession, in dedicated courses – called “capstone courses” – such as geometry (Hoffmann & Biehler, 2020). In our case, these objectives are relevant, since on the one hand the notion of reflection is present at primary school and during the first years of secondary education in France, and on the other hand students have approached symmetries (reflection or not) or isometries from different points of view (affine space, vector space, complex numbers) in the course of their university studies.

MAIN ISSUE AND THEORETICAL FRAMEWORK

In order to compare them, we have chosen to model the mathematical activity of pupils and students in terms of praxeologies (Bosch et al, 2019), based on the process of didactic transposition (Chevallard & Bosch, 2014) linked to the secondary and higher education curricula.

In this poster, our main issue is to determine the (components of) praxeologies that are mobilised by pupils and students in carrying out the task under consideration.

More specifically, to what extent do the students supplement the pupils' praxeologies with elements of a technological or even theoretical nature?

In addition to a more precise presentation of the context and process, the aim of the poster will be to present the results of our study (in progress) with respect to this main issue. In order to enable a more detailed comparison of the activities of pupils and students, we will highlight the identification of possible mute, weak or strong praxeologies among students (Barquero et al, 2019), and we will report on the semiotic analyses of their activities (Petitfour & Houdement, 2022).

REFERENCES

- Barquero, B., Bosch, M., & Wozniak, F. (2019). Modelling praxeologies in teacher education: the cake box. In U. T. Jankvist, M. van den Heuvel-Panhuizen, & M. Veldhuis (Eds.), *Proceedings of the Eleventh Congress of the European Society for Research in Mathematics Education* (pp. 1144-1151). Utrecht, the Netherlands: Freudenthal Group & Freudenthal Institute, Utrecht University and ERME.
- Bosch, M., Chevallard, Y., García, F., & Monaghan, J. (Eds.). (2019). *Working with the Anthropological Theory of the Didactic in Mathematics Education: A Comprehensive Casebook* (1st ed.). Routledge.
- Chevallard, Y., & Bosch, M. (2014). Didactic Transposition in Mathematics Education. In Lerman, S. (Ed.) *Encyclopedia of Mathematics Education*. Springer, Dordrecht.
- Hoffmann, M., & Biehler, R. (2020). Designing a Geometry Capstone Course for Student Teachers: Bridging the gap between academic mathematics and school mathematics in the case of congruence. In T. Hausberger, M. Bosch & F. Chellougui (Eds.), *Proceedings of the Third Conference of the International Network for Didactic Research in University Mathematics* (INDRUM 2020, 12-19 September 2020) (pp. 338-347). Bizerte, Tunisia: University of Carthage and INDRUM.
- Petitfour, E., & Houdement, C. (2022). The Didactic Effects of Semiotic Microphenomena in Mathematics. In C. Houdement, C. de Hosson & C. Hache (Eds), *Semiotic Approaches in Science Didactics*, (pp. 209-246). ISTE Editions.
- Klein, F. (2008). *Elementary Mathematics from a Higher Standpoint. Volume I: Arithmetic, Algebra, Analysis (Translation by Gert Schubring)*. Springer.
- UNESCO. (2017). *A guide for ensuring inclusion and equity in education*. Paris.
- Winsløw, C. (2020). Professional and academic bases of university mathematics teaching for the 21st century: the anthropological approach to practice-based research. In T. Hausberger, M. Bosch & F. Chellougui (Eds.), *Proceedings of the Third Conference of the International Network for Didactic Research in University Mathematics* (INDRUM 2020, 12-19 September 2020) (pp. 8-27). Bizerte, Tunisia: University of Carthage and INDRUM.