

LESSON STUDY AND ITS RELATIONS TO MATHEMATICAL MODELLING

Yoshinori Shimizu

University of Tsukuba, Japan

Lesson study that originated in Japan is an approach to improve teaching and learning mathematics through a particular form of activity in which a group of teachers works collaboratively to design, implement, observe, and reflect on the proposed “research lessons”. Research and practice on lesson study has spread internationally with a focus on its capacity as a vehicle for the professional development of teachers. While recent advocacy of lesson study is focused on its function of professional development, key impacts of lesson study also include development of mathematics curriculum with the design of tasks and instructional sequences (Lewis, 2016).

If mathematical modelling is being introduced as a new product into the complex system of mathematics education in many countries, it has to fit with the existing parts and interfaces in this system (Pollak, 2015). For more than the decades, various approaches were taken for exploring the nature of teaching and learning of mathematical modelling in the classroom. Such approaches include teaching experiment, design research (Lesh et al., 2010), and case studies (Schukajlow et al, 2018).

By examining the phases of lesson study and the process of teaching and learning mathematical modelling in the classroom, this talk illustrates how a cyclic nature of lesson study can contribute to designing tasks and activities for the students and to develop an instructional sequence for teaching and learning mathematical modelling embedded in a teaching unit of mathematical topics.

Focusing on the process of mathematical modelling (e.g. “model-elicit-activities” or “being aware of the prerequisite of a model”), lesson study provide the community of teachers illuminating examples with the “evidences” of students’ work, tasks to be appeared in the textbooks, and a shared vision on the new curriculum. The case of “Be Careful with the Blind Corner from the Car” (Nishimura, 2012), appeared in an “Open House” at a university-affiliated high school, is used for describing how task design and its implementation through lesson study proceed. The example with other cases illustrates how cycles of lesson study can contribute to the task design and then to the curriculum development.

References

- Lesh, R., Young, R. & Fennewald, T. (2010). Modeling in K-16 mathematics classrooms – and beyond. In R. Lesh (Eds.) *Modeling Students’ Mathematical Modeling Competencies* (pp. 275–283). New York: Springer.
- Lewis, C. (2016). How does lesson study improve mathematics instruction? *ZDM Mathematics Education* 48, 571–580.
- Nishimura, K. (2012). *Task Design and Implementation for Developing Students’ Mathematical Modelling Competencies*. Tokyo: Toyokan (in Japanese).
- Pollak, H. O. (2015). The place of mathematical modelling in the system of mathematics education. In G. A. Stillman et al. (Eds.), *International Perspectives on Teaching and Learning Mathematical Modelling*. (pp. 265–276). New York: Springer.
- Schukajlow, S., Kaiser, G. & Stillman, G. (2018) Empirical research on teaching and learning of mathematical modelling: a survey on the current state-of-the-art. *ZDM Mathematics Education* 50, 5–18.