

# UNDERSTANDING ISSUES IN MATHEMATICAL PROBLEM SOLVING AND MODELLING: LESSONS FROM LESSON STUDY

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At the heart of our concern, and research, has been to understand how, in classroom learning, students might develop capabilities towards mathematical literacy (Steen, 2001). We have sought to gain insight into how to teach students to be able to apply mathematics effectively to solve problems that arise in a range of different contexts. We have, therefore, researched professional learning communities in which teachers work together and learn from each other, informed by ‘knowledgeable others’ who have research-informed expertise. Working to an adaptation of the Japanese lesson-study model (Fernandez & Yoshida, 2004) we asked the general questions:

- What does progress look like in students’ learning in relation to problem solving and modelling competencies?
- How do we support students in making this progress?

More specifically, here we focus on how students’ development of mathematical representations may assist them with structuring and supporting their mathematical thinking.

We developed case studies of 30 research lessons that were carried out within nine schools collecting data that comprised of videos of lessons and post-lesson discussions, students’ work and observer notes. Across lessons our analysis shows that, as expected, students use a variety of approaches when working on modelling tasks. However, often the validity of some of the models being formulated was flawed.

We found this to be a common occurrence with too little time and priority in teaching being dedicated to supporting students in (i) simplifying the reality of the problem context and (ii) developing a mathematical structure that represents, or maps onto, the simplified reality. More specifically we found that many students had little insight into how a change of a quantifiable factor in the reality of the context necessitates a change of a variable in the mathematical structure (model), and vice versa: that is, how variation of a factor in the mathematical model has implications for the reality it represents. We have concluded that a pedagogical approach that focuses on asking students to develop a model that could have repeated application, allowing for variation of a key factor, may have the potential to force this issue in the classroom.

## References

- Fernandez, C., & Yoshida, M. (2004). *Lesson Study: A Japanese approach to improving mathematics teaching and learning*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Steen, L. A. (Ed.). (2001). *Mathematics and democracy: The case for quantitative literacy*. Washington, DC: National Council on Education and the Disciplines.