Revealing Student Difficulties as a Tool to Promote Teacher Growth in Teaching of Mathematics Lessons through Lesson Study

Sachiko Tosa, Assistant Professor, Departments of Physics & Teacher Education, Wright State University
Ann M. Farrell, Professor, Department of Mathematics and Statistics, Wright State University

Since the publication of *The Teaching Gap* by Stigler and Hiebert in 1999, Lesson Study has been gaining in popularity slowly but steadily in the United States as an effective professional development model for in-service teachers. For this Japanese-born model to be successful in the U.S. where the cultural context is very different from that in Japan, it is important to identify essential components in Lesson Study that have the potential to promote teacher growth during the process.

This study examines how teachers’ choices of activities and questions in mathematics lessons affect student thinking, and in turn develop teachers’ awareness of the importance of student thinking through Lesson Study. Thirty-eight (38) research lessons in K-8 mathematics were designed and implemented during the 2010-11 academic year by 61 teachers in 13 teams in the U.S. Midwest. The lessons and subsequent post-lesson discussions were examined in this study. Videos, field notes, and teacher reflections submitted at the end of the post-lesson discussions were analyzed qualitatively. Three types of lessons were identified in terms of how the lesson reveals student difficulties in carrying out the mathematical tasks incorporated in the lesson: (a) lessons in which student difficulties were obvious because teacher did not provide students with enough instruction in mathematics to carry out the tasks, (b) lessons in which student difficulties were not revealed through activities and/or discussions, and (c) lessons in which student difficulties were revealed through activities and/or discussions. Student difficulties observed in this study were all unintentional by teachers. In other words, teachers did not anticipate student difficulties until they implemented the lessons. Post-lesson discussions were transcribed and coded in order to find patterns in the depth of teachers’ reflection on student thinking. Based on the frequencies of teachers’ remarks on student thinking, post-lesson discussions were classified into three levels: no attention, shallow awareness, and deeper awareness of student thinking. The relationships between the types of research lessons and the levels of teachers’ remarks were examined. Preliminary results indicate that incorporating activities that reveal student difficulties in mathematics is an essential component for increasing teachers’ awareness of student thinking. Implications of the findings in the development of a lesson study professional development model in the U.S. are discussed.

During our recent Lesson Study Showcase in which all the teams of lesson study practitioners gathered and exchanged ideas, one of the teachers remarked to the whole group that, contrary to what she believed for her 20 years of teaching, now she sees that it is important to let students struggle so that they can think more deeply about the mathematical concepts on their own. This remark is about an intentional incorporation of student difficulties in the lesson. It is interesting to find that our research findings have a connection with the teacher’s realization of a new way of teaching. It seems that when teachers observed student difficulties in lessons, teachers themselves learned more about student thinking and realized that incorporating prompts or questions that make student struggle would be beneficial to them. Lesson Study is still new in the United States. Incorporating teachers’ research questions in lesson study or challenges to students during the lesson is not a common practice yet. However, the situation may allow us to identify essential components needed in the Lesson Study process. We found that lessons that went well and smoothly without revealing student difficulties did not seem to help teachers for their growth. It would be interesting to exchange ideas and opinions between US and Japanese educators on the question of how revealing student difficulties is important to promote growth in teacher education.