A study of the relations between teachers' belief system and their practice of modeling teaching in mathematics classrooms

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Abstract

We are in a rapidly changeable world and will face problems much more complicated than before. Our students need to learn how to create new knowledge in order to solve tough problems in the future. Also, international assessment, such as PISA, started to emphasize students' modeling competency more and more. Therefore, the transform of mathematics instruction from lecture teaching to modeling teaching is necessary. We definitely need teachers who can teach mathematical modeling in the classroom.

On the other hand, teachers' belief system influences their decision making of instruction. The more we understand teachers' belief system, the more possibility we can change teachers' instruction. In this study, there are have four secondary mathematics teachers as the subjects. They try to implement model-eliciting activities (MEAs, Lesh & Doerr, 2003) in their math class and also attempt to modify MEAs into Taiwan version or adapt problems in the text book into MEAs. This purpose of the study is to investigate the relations between mathematics teachers' belief system and their mathematical modeling teaching.

I have three study questions. First, what are the characteristics of mathematical modeling teaching of these teachers respectively? Second, what are the mathematics teachers' belief systems of these teachers respectively? Third, what are the relations between the mathematics teachers' belief system and their mathematical modeling teaching respectively?

In this study, "mathematical modeling teaching" means teachers implement MEAs in mathematics classroom. There are four parts in each MEAs: 1) Newspaper article: article related to the problem statement, and students need to read it in order to understand the context. 2) Readiness problems: questions in order to make sure that students read the article carefully and prepare for the next stage. 3) Problem statement: the main problem that students solve in a group with three or four persons, 4) Process of sharing solutions: groups present their solutions to the whole class and students can amend their strategy into an elaborate one. Besides, I refer to the constitutive dimensions of students' mathematics-related belief system (Eynde, Corte, & Verschaffel, 2002) and modify it into teachers' mathematics-related belief system which is composed of Object (mathematics education), Self and Context (class). That

is, when I analyze case teachers' belief, I will consider these three parts as a system to interpret their belief better.

In the methodology part, I used "multi-tiered program development" (Clark & Lesh, 2003) to design my study. There are three tiered: researchers, teachers and students. It means that teachers implement MEAs with their students and analysis the results of students' performance. I, as a researcher, work with these teachers in revising MEAs and implementing MEAs, and then analyzing data which collect by these teachers. In the collaborative process, I intend to collect multiple dimension of data include the learning sheets that showed teachers' strategies of MEAs and the results of the MEA they revised or designed, classroom observation journals, reflection journals, questionnaires, interview reports, video tapes of the meetings and video tapes of the classes. My data analysis will be based on Grounded Theory. First, reorganize all data to open coding. Second, extract related characteristics of modeling teaching and teachers' belief system. Third, categorize these characteristics in order to code the key elements. Fourth, structure the relationship among these elements. Fifth, create general model of the relations between modeling teaching and teachers' belief system.