APPLYING THEORETICAL KNOWLEDGE TO REFLECT PROFESSIONAL DEVELOPMENT IN ELEMENTARY SCHOOL MATHEMATICS INSTRUCTION USING A LEARNER-CENTERED APPROACH

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Based on the learner-centered concept, social constructivism, and the interaction of teacher educators and teachers, this study examines how elementary teachers apply theoretical knowledge in teaching mathematics. This article reports the professional development process of a lower grade elementary school teacher T1. This research used case methodology, and the study was conducted for three years. The researcher (the first author, and a teachers' educator) pursued teachers in a school who were willing to participate in a group for teacher instructional development. Teachers observed each other's teaching every two weeks and participated in a course on mathematics teaching. They used their time in afternoon advanced courses to discuss teaching issues together. The qualitative data include teacher instruction videos, teacher interviews, discussions between the teacher and teacher educators, and research journals. The triangulation method was used to test the reliability and validity of this quantitative research.

The findings show that the teacher was improved his professional development. For example, T1 said, "*These three years I have learned many things. …this afternoon's discussion has clarified mathematics knowledge and key concepts, misconceptions, and how to teach*" (20110630T1, Interview).

This study found that the participating teacher was able to use theoretical knowledge to reflect her own teaching. For example, T1 said, "*Today I gave students some exercises which were the same types of questions about two-place subtraction without carrying a number. All of these exercises were about the take-away type and the comparison type of word problems. These two types of word problems had already been practiced in the first grade, so I gave them these exercises to practice simultaneously*" (20101013 Teaching and Discussion). T1 also reflected the four mathematical operations, including the situation structure (discrete quantity, one-dimensional or two-dimensional continual quantity), the meaning structure (change, merge, comparison, and equivalence), the operation structure (augment, addend, or unknowns), and the representation theory (manipulative, pictures, or written symbolic), the key concepts of each unit, and possible misconceptions students may have, to enhance mathematics teaching (20101223T1, Teaching and Discussion, 20110302, Teaching and Discussion, and 20110630T1, Interview).

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