

Developing Prospective Teachers Competencies to Understand Students Mathematics Understanding

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Abstract

Student-centered teaching is the core rationale of current mathematics teaching; the sensitivity to students mathematics understanding, especially their cognitive process and thinking, becomes the first priority in learning mathematics teaching. Therefore, Psychology of Mathematical Learning is the first course for our prospective teachers to learn mathematics teaching. This course is running developmentally by the two authors during the past two years. This lecture is going to elaborate the design, teaching, reflection, and revision of the yearly developmental course.

As for the teaching content, school students mathematics learning activities are divided into five major topics in this course: 1) intuitive theory with respect to mathematics; 2) conceptual understanding; 3) procedural skill; 4) problem solving; and 5) reasoning and argumentation. In accord with the above five topics, the prospective teachers are supposed to ideally execute 5-time research in the academic year to recognize students cognitive behaviors, analyze their underlying reasons, and predict any possible learning difficulty. These content materials mainly derive from: 1) national surveys; 2) international literature reviews; and 3) corresponding learning theories.

Each year, two teacher educators would simultaneously lead two classes using the same teaching content and method, and one post doc serves as the participant observer in each class. The teaching method of this course, an investigative learning cycle for prospective teachers, includes three stages: 1) sense making; 2) research; and 3) reflection. In the first stage, the educators would ask the prospective teachers to make intuitive analyses as well as analyze the underlying reasons, and then proceed with the dialectics between their analyses and literature, with exemplary mathematical items chosen from literature. In the second stage, the prospective teachers divide into small groups by themselves; each group needs to design their own research question as well as tool, and then conduct a survey or interview with students. In the final stage, these prospective teachers need to compare their research results with literature for validation and then

come up with their claims. Its noticeable that these claims might be somehow biased because the sample data are all in small size. Furthermore, this course would evaluate these prospective teachers achievements through 2-3 times of group research reports, 1 learning report, 1 midterm and final exam in each semester.

This developmental course is continually revised through the processes of design, teaching experiments, and prospective teachers feedback. For example, the sequence of five topics is adjusted as above after our first-year teaching experiment; the frequency of group research is reduced and the discussion of theoretical literature is additionally included based on the prospective teachers feedback every half a semester. Even though the sequence and content are changed, the investigative learning cycle for prospective teachers remains the same. This lecture emphasizes on when, why, and how we design the mathematics teachers educational materials and revise our teaching during our 2-year teaching experiments. Moreover, the preliminary learning effects brought to the prospective teachers are evaluated by their reports, test results and their own perceived effects.