RESEARCH ON UNDERSTANDING MATHEMATICS: WAYS OF MEASURING AREA OF TRAPEZOID

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In the research on the process of understanding mathematics, Koyama (1992) presented the so-called "two-axes process model" of understanding mathematics as a useful and effective framework for mathematics teachers. The model consists of two axes, i.e. the vertical axis implying levels of understanding such as mathematical entities, relations of them, and general relations, and the horizontal axis implying three learning stages of intuitive, reflective, and analytic at each level. By analyzing elementary school mathematics classes in Japan, Koyama (2000, 2002) suggested that a teacher should make plan teaching and learning mathematics in the light of "two-axes process model" and embody it with teaching materials of in due consideration both of the objectives and the actual state of students, and that she/he should play a role as a facilitator for the dialectic process of individual and social constructions through a discussion with students.

This research closely examines 39 fifth-graders' process of understanding how to find the area of trapezoid in a classroom at the national elementary school attached to Hiroshima University. In the 4^{th} grade, these students had learned how to measure areas of square and rectangle. In order to improve their understanding of measurement and promote their mathematical thinking, with a classroom teacher, we planned the unit "Measurement of areas of fundamental geometrical figures" and in total of 15 forty-five minutes' classes were allocated for the unit in the light of "two-axes process model". Throughout the classes we attached importance not to memorizing the formula but to thinking mathematically ways of measuring area of trapezoid. The data were collected in the way of observation and videotape-record during these classes, and analyzed it qualitatively to see the change of students' thinking and the dialectic process of individual and social constructions through discussion among them with their teacher in the classroom. First, as a result of individual construction activities, the students could create different ways of measuring area of trapezoid by using mathematical thinking of transformation a trapezoid into geometrical figures acquired already, i.e. triangle, rectangle and parallelogram. Second, as a result of the qualitative analysis of students' discussion, we found that students were interested in creating more than one way and investigating the reason of their ways of measuring area of trapezoid, and that for the students it was the most impressive way that transformed a trapezoid into one rectangle and two triangles.

References

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