RESEARCH ON THE PROCESS OF UNDERSTANDING CONCEPTS OF TRIANGLE AND QUADRILATERAL IN A CLASSROOM

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In order to understand 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 an elementary school mathematics class in Japan, Koyama (2000) demonstrated the validity and effectiveness of this model and suggested that a teacher should make a plan of teaching and learning mathematics in the light of "two-axes process model" and embody it with teaching materials of a topic 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.

The purpose of this research is to examine closely the 38 second-graders' process of understanding concepts of triangle and quadrilateral in a classroom at the national elementary school attached to Hiroshima University. These students are characterized to be at transitive stage from the first to the second level of geometrical thinking in terms of van Hiele Model (1986). In order to promote and improve their understanding concepts of triangle and quadrilateral, with a classroom teacher, we planned the teaching unit of "Let's make figures with geo-board" and in total of 11 forty-five minutes' classes were allocated for the unit in the light of "two-axes process model". The data was collected in the way of observation, videotape-record, and pre- and post-tests during these classes, and analyzed quantitatively and qualitatively to see the change of students' thinking level and the dialectic process of individual and social constructions through discussion among them with their teacher in the classroom. First, as a result of first two classes of them, the quantitative analysis of pre- and pre-tests showed the remarkable improvement of students' understanding concepts of triangle and quadrilateral from the first to the second level. Second, as a result of the qualitative analysis of students' discussion on whether a "concave quadrilateral" is triangle or quadrilateral in the fifth class, we found that students could investigate and communicate the reason of their own judgment with geo-board, geo-paper or matchsticks, and that such a new idea/definition was emerged that a "concave quadrilateral" is not triangle but quadrilateral because it is divided into two triangles by the line segment connecting two opposite vertices.

References

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