

TEACHER STUDENTS' MATHEMATICAL UNDERSTANDING FROM THE VIEW POINT OF CONCEPTUAL CHANGE

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Mathematics is often considered to form a hierarchical structure where all the new concepts logically follow from prior ones, which allow students to enrich their knowledge step by step. The very fundamental idea of successor, for example, is necessary for learning the notion of natural numbers. It is, however, seriously conflicting with the understanding of the very character of both rational and real numbers (cf. Sowder, 1992). According to the theories on conceptual change (cf. Carey, 1985; Vosniadou, 1994; Duit, 1995) the relationship between learners' prior knowledge and new information to be learned is one of the most crucial factors in determining the quality of learning.

The objective of this paper is to analyze the results of a level test in mathematics done by elementary teacher students at the University of Turku (Finland), and to explain these from the viewpoint of conceptual change theories. Elementary teacher students' basic skills and attitudes towards mathematics were measured in November 2000. The results refer to serious problems in the understanding of basic concepts of numbers and to low level of students' mathematical thinking. The thinking of whole numbers and everyday experiences seems to be restrictive to a higher level of thinking, which refers to the problems of conceptual change. This suggests also that the extension of the number domains has not been dealt with thoroughly enough from a theoretical viewpoint, but it has been rushed into practice with new numbers.

Within the theories of conceptual change, it has been recently emphasized how a process of a radical change seems to be very slow. One of the presumptions for the conceptual change is the increasing meta-conceptual awareness of one's thinking. Thinking of whole numbers dominated the students' answers that refer to problems of conceptual change. As a result, we suggest that the perspective of conceptual change would be profitable in the mathematics education of teachers' pre-service and in-service training.

References

- Carey, S. 1985. *Conceptual change in childhood*. Cambridge, MA: MIT Press.
- Duit, R. 1995. The constructivist view: A fashionable and fruitful paradigm for science education research and practice. In L. P. Steffe & J. Gale (Eds.) *Constructivism in education*. NJ, Hillsdale: Lawrence Erlbaum Associates.
- Sowder, J. T. 1992. Making sense of numbers in school mathematics. In G. Leinhardt, Putnam, R. & Hatrup, R. (Eds.) *Analysis of arithmetic for mathematics teaching*. NJ: Lawrence Erlbaum Associates, 1 - 46.
- Vosniadou, S. 1994. Capturing and modeling the process of conceptual change. *Learning and Instruction*, 4, 45-69.