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How mathematics teaching develops pupils' reasoning systems.

Fujita, Hiroshi et al., Proceedings of the ninth international congress on mathematical education (ICME-9). Kluwer Academic Publ., Norwell, MA (ISBN 1-4020-7902-8). 58-72 (2004).

In this paper, I argue that Piagetian constructivism and Vygotsky's social constructivism are coherent and complementary. If we can reach a synthesis of these two theories, we will have a more encompassing approach to analysing how pupils learn mathematics and how mathematics teaching develops their minds. I suggest that the theories are consistent because they are based on the same metaphor of the mind and that they are complementary because they explain different aspects of the development of reasoning. Together they can help us understand the developments in pupils' reasoning systems that result from changes in the thinker (Piaget's contribution) and in the thinker's activity when using different thinking tools (Vygotsky's contribution). In order to develop these ideas, I will first discuss the concept of thinking systems. I will then work with a simple example in mathematics education, multiplicative reasoning. I will first consider the origin of multiplicative reasoning i.e., the development of the thinker and then discuss how mathematics teaching can affect pupils' reasoning systems in this domain. To conclude the discussion, I will consider a research agenda for mathematics education based on the conception of thinking systems. (orig.)

Classification: C30 C70

Keywords: learning; reasoning; theory of mathematics education; teaching-learning processes; constructivism; Vygotsky