

A COGNITIVE THEORY-DRIVEN ORIENTATION OF INDONESIAN MATH LESSONS

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Abstract

The main focus of the design research presented in this paper is on students' mathematical thinking and skills and on their understanding of mathematical concepts and methods. The mathematical content this design research project starts with is the introduction of integers. For this content new learning environments have been developed, implemented and evaluated. The results indicate that the cognition-oriented means and methods used in our project have a positive influence on the quality of teaching and learning processes in the class and on students' mathematical thinking and skills.

Keywords: Cognitive Theory, Indonesian Lessons, Mathematical Concept, Integers, Mental Models

Abstrak

Fokus utama dari penelitian *design research* yang dipaparkan dalam tulisan ini adalah terletak pada berfikir matematis siswa dan ketrampilan matematis siswa dan pemahaman mereka terhadap konsep-konsep dan metode-metode matematika. Materi matematika dalam proyek *design research* ini dimulai dengan pengenalan bilangan bulat. Untuk materi ini, lingkungan belajar baru telah dikembangkan, diimplementasikan, dan dievaluasi. Hasil penelitian menunjukkan bahwa sarana dan metode yang orientasi kognitif yang digunakan dalam proyek ini memiliki pengaruh positif pada kualitas dari proses belajar mengajar di kelas dan pada pemikiran dan ketrampilan matematis siswa.

Kata Kunci: Teori Kognitif, Pembelajaran di Indonesia, Konsep Matematika, Bilangan Bulat, dan Model Mental

Since 2009 several design research projects for the improvement of the quality of Math lessons in schools on Java and Sumba have been carried out within the scope of our German-Indonesian collaboration (Kaune at al. 2011, 2012). These projects are characterized by an interdisciplinary, theory-driven development, investigation and analysis of learning environments. By this complex nature these projects fit well to the view of Mathematics Education as a design science as it was specified in the European area by Wittmann (1998). In the author's view, the construction and investigation of suitable learning environments for learning and teaching of mathematics is to be seen as one of the specific tasks in the core of Mathematics Education (ibid, p. 329). This task does not mean, however, the mere development of didactical materials. The complexity of the design of learning environments has been expressed by Cobb at al. (2003, p. 9) with the term "learning ecology". "Elements of a learning ecology typically include the tasks or problems that students are asked to solve, the kinds of discourse that are encouraged, the norms of participation that are established, the tools and related material means provided, and the practical means by which