

An Investigation of the Components Affecting Knowledge Construction Processes of Students with Differing Mathematical Power

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Abstract

Problem Statement: The acquisition of certain mathematical skills is part of many curricula around the world. These skills involve problem-solving, effective use of mathematics in daily life, thinking logically and systematically, taking risks and making decisions. The US National Council of Teachers of Mathematics ([NCTM], 1991) relates these skills to mathematical power. Knowledge construction and abstraction might have an impact on mathematical power. In this paper, the primary concern is with the construction of new knowledge structures rather than with consolidation or abstraction for that matter. Recognizing, Building-with, and Constructing (RBC hereafter) theory of abstraction provides a particularly useful framework in achieving a detailed examination of the new mathematical constructions through epistemic actions. Therefore, this paper, with reference to the RBC epistemic actions, examines the knowledge construction process of students with different mathematical power.

Purpose of Study: The purpose of the study is to explain the similarities and differences between the knowledge construction processes of 6th grade students with different mathematical power.

Methods: A case study was used as the main research approach. The mathematical power scale was applied to 282 students. The case study was conducted with four students who were chosen purposefully among them. The RBC theory of abstraction was used as an analytical tool. The patterns noticed in the case study were determined and interpreted.

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Findings and Results: According to findings, it was seen that the students with low mathematical power, whose knowledge constructing processes were examined, could recognize structures while they could not building-with and constructing. When observing that the students with low mathematical power have low communication, connection and reasoning skills, in general, it can be said that for building-with and constructing, it is important to have these three skills. The students who reflected themselves and used the feedback to continue had high mathematical power. They also were able to construct mathematical knowledge more quickly.

Conclusions and Recommendations: The RBC theory of abstraction can be useful in explaining the relationship between the components of mathematical power and other mental activities. For this purpose, the usage of the RBC theory of abstraction in the mathematical knowledge construction process in the classroom can be proposed as a new study.

Keywords: Knowledge construction, mathematical thinking, mathematical power, abstraction