Student Approaches and Difficulties in Understanding and Using of Vectors

(Preliminary Research Report)

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Abstract

A configuration of vector representations based on multiple representation, cognitive development, and mathematical conceptualization, to serve as a new unifying framework for studying undergraduate student approaches and difficulties in understanding and using of vectors is proposed. Using this configuration, the study will explore 5 important transitions, 'physics to mathematics', 'arithmetic to algebraic', 'analytic to synthetic', 'geometric to symbolic', 'concrete to abstract', and corresponding student difficulties along epistemological and ontological axes. As a part of validation of the framework, a study on undergraduate students' approaches and difficulties in understanding and using of vectors with both quantitative and qualitative methods will be introduced, and we will see how useful this new framework is to analyze student approaches and difficulties in understanding and using of vectors.

Keywords: Vector, Representation, Vector Representation, Undergraduate Mathematics Education