

# THE EFFECT OF MULTI-REPRESENTATIONAL METHODS ON COLLEGE STUDENTS' SUCCESS IN INTERMEDIATE ALGEBRA

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This article presents results from a study examining the effect of an algebra curriculum incorporating multiple representations, presented simultaneously, with an emphasis on the relationship between them. The findings indicate that the students enrolled in a curriculum involving multiple representations were significantly more successful in solving routine algebra problems than students enrolled in a traditional curriculum.

## OVERVIEW

There continues to be increased emphasis on the use of multiple representations and the connection between them in mathematics education. Yet, after a decade of reform curriculum, many entering college freshman still lack any structural understanding of functions or the aspects highlighted by the different representations. This is clear in research in which, when given more than one representation, students tend to be dependent on algebraic representations to solve problems (Knuth, 2000). Knuth suggests that “perhaps the most significant influence on students’ choices of solution methods is a curricular and instructional emphasis dominated by a focus on algebraic representations and their manipulations” (p.505). This study provides evidence to support the hypothesis that introducing representations simultaneously and emphasizing links between them can increase success in entry-level college mathematics and make students less dependent on algebraic representations.

From a constructivist perspective, mathematical learning is a re-conceptualization of ideas to incorporate new information, thereby adding to a student’s framework and building conceptual knowledge (Koehler & Grouws, 1992). Since most entering college freshmen have had experience with function concepts in secondary school, a teaching approach was utilized which emphasized multiple representations to build on students’ existing knowledge and to add their structural understanding of functions. The study compared students enrolled in a curriculum emphasizing multiple representations (n=102) with students enrolled in a similar course relying on traditional teaching methods (n=213). Effectiveness of the teaching methods was evaluated by pre- and post-assessments and task-based interviews. The results showed that students enrolled in the multi-representational algebra course showed significantly higher ( $p < 0.001$ ) gains in number of correct problems and solved a significantly higher ( $p < 0.001$ ) proportion of problems with non-symbolic representations.

## References

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- Knuth, E. J. (2000). Student understanding of the cartesian connection: An exploratory study. *Journal for Research in Mathematics Education*, 31(4), 500-508.