

STUDENTS' CONCEPTUAL UNDERSTANDING AND ATTITUDES IN RME-BASED DIFFERENTIAL EQUATIONS CLASS[□]

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This paper presents the results of a comparative analysis of students' understanding in differential equations and their attitudes toward mathematics. Data were collected from two classes, one an RME-based reform-oriented differential equations course (RME-DE) emphasizing guided reinvention through students' discussion. The other was a traditional differential equations class (TRAD-DE).

The RME-DE basically introduced reform-oriented differential equations approach. Thus, the class integrated technology with symbolic, graphical, numerical, and qualitative ways for analyzing a wide variety of differential equations of real-world concern. Second, in the RME-DE, the students discussed key concepts embedded in given context problems.

Although the RME-DE had decreased emphasis on analytic techniques, these students scored higher than TRAD-DE students on routine tests including problems to find a general solution to a given differential equation. RME-DE students solved a problem based on meaning, while TRAD-DE students simply memorized techniques. A more remarkable difference between the two groups was observed in the way the students answered the conceptual questions. The RME-DE students understood the relationship between an exact solution and rate (or rate of change) more meaningfully. RME-DE students gained profound understanding in linking multiple representations of differential equations, and most RME-DE students were more successful in mathematical modeling.

We administered the revised Views About Mathematics Survey (VAMS), which had been designed to assess students' views about knowing and learning mathematics by Carlson (1997), at the beginning and at the end of the semester. According to the result of the survey, RME-DE students' attitude changed toward an expert view: They valued understanding of conceptions, discussion of problems and representation of ideas, and the relation between mathematics and life more highly than TRAD-DE students.

The findings suggest adapting the instructional design perspective of RME to mathematics education at university level. Most students evaluated the design of this course highly. Some enthusiastically expressed their willingness to apply the method in their future teaching careers. This suggests how to improve a university-based teacher education program. Traditional teacher education programs provide pedagogical knowledge isolated from subject matter knowledge. This kind of inertia is of the most serious obstacles to school mathematics reform. In this aspect, the RME-DE can be a model of teacher education to connect theory and practice of mathematics education.

Reference

Carlson, M., (1997). Views about mathematics survey: Design and results, Proceedings of the Eighteenth Annual Meeting/North American Chapter of the International Group for the Psychology of Mathematics Education 2, 395-402.

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