Changing Embedded Student Attitudes within a Mathematical Setting

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Abstract
Existing student attitudes and beliefs about mathematics often block student learning and deep understanding of mathematical content in the college classroom (e.g. preservice elementary teachers).

Changes in pedagogy, classroom participation, and curriculum were infused into two college mathematics classes for preservice teachers and the attitudinal beliefs of these preservice teachers were assessed to measure change after a course intervention.

Problem
Preservice elementary teachers nationally present attitudes in mathematics about content and their own beliefs in their ability to teach mathematics in the elementary school setting. These attitudes, issues of math anxiety, and in many cases lack of confidence, are interfering with these teachers ability to teach mathematics effectively.

Purpose
The purpose of the research was to study preservice teacher attitudes towards mathematics before and after taking two modified college credit courses in mathematical content and methods. Changes made in the course were focused on improving student experiential learning in the curriculum, improving the quality and quantity of preservice teacher communications to the course teacher, to their classmates, and to others outside the courses, and the pedagogy chosen by the classroom teacher.

Research Questions
Can long-held student beliefs about their current knowledge in mathematics and their attitudes toward learning of new mathematics be changed through course modifications in experiential learning and pedagogical methods modification?

Can the use of specific pedagogical methods (preservice teacher Math Talk and verbal and written explanations of problem solving using drawings and manipulatives) in two college mathematics classes contribute to a positive and measurable change in student attitudes and confidence in mathematical thinking?

Relevant Literature
Math anxiety (MA) in elementary students in a well-documented topic of study, and this type of anxiety is recognized as an impediment to math achievement for elementary students. (Beilock, Gunderson, Ramirez, and Levine (2009)). But math anxiety and subsequent lack of math confidence in elementary classroom teachers has not generated a similar amount of research.

Procedures
This was a population study of all preservice teachers taking the content and method coursework in mathematics at a two-year college in Delaware from 2003-2004, fall and spring classes (n = 156 students). The collection instrument (Student Attitudinal Survey, 2003) was used in a matched blind study of all enrolled students in preservice teacher mathematics classrooms over a two year period and the survey was administered and analyzed by an outside evaluator.

Data Analysis
Data collected were analyzed and compared by using a survey collection model (SAS) on topics of perceived content acquisition and attitudinal changes toward mathematics.

Limitations
Collins’ study was of attitudes towards mathematics of 156 preservice elementary majors at a two-year college in Delaware. Research study at the other sixteen institutions tied quantitative literacy to individual content in other disciplines, but not necessarily math education, limiting the generalizability of the study. Generalizability to other levels of mathematics and to the preservice population nationally was not explored.

Conclusions (ongoing)
Collins has continued to use the results of this research for the last ten years within the national two-year college system and has continued the modifications made to these courses for preservice teachers in mathematics through conference presentations and other college mentoring.

Social Change Implications
National emphasis has focused on the improvement of content standards in mathematics and on teachers and their pedagogical approaches to mathematics (CCSS, 2009). Improving preservice teacher at the undergraduate learning and attitudes towards mathematics will eventually allow those teachers to strengthen their thinking, logical reasoning, and their ability to be effective in classrooms in the U.S. Teacher attitude toward the content is a large piece of the classroom environment and student understanding of that content.

Students apply their understanding of statistics in this example of a human box plot which uses students as data points (Collins, 2005).

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