

Fostering Change in College Students' Statistical Reasoning and Motivation through
Statistical Investigation

By

CAROLINE ANN RAMIREZ-FAGHIIH
B.S. (University of the Pacific, Stockton, California) 2003
M.S. (University of California, Davis) 2005

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Approved:

Dr. Rebecca C. Ambrose, Chair

Dr. Jessica Utts

Dr. Tobin White

Committee in Charge
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Caroline Ann Ramirez-Faghih
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Education

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Abstract

The goal of this study was to examine the reciprocal relationship between statistical investigation and motivation of college students in a Mathematical Reasoning course (Math 1). Unlike previous studies in which students' projects or statistical investigations have been examined as the final product that shows evidence of statistical literacy, reasoning and thinking, the focus of this dissertation was to explore students' motivation as they completed the process of statistical investigation. The purpose of this study was to give voice to students' experiences with the statistical investigation, and to showcase the development of their projects.

The statistical investigation had the following phases: (1) formulating a question; (2) collecting data; (3) analyzing the data and interpreting the results; and (4) final project and reflection on the process. These phases were developed based on the Guidelines for Assessment and Instruction in Statistics Education (GAISE) framework. I analyzed the written assignments in all four phases from a group of 60 students. An artifact-driven interview was conducted on a subset of seven students, who were purposely selected to represent students with projects of varying quality. In order to understand whether and

how students' motivations were manifested within the context of a statistical investigation activity, I used the Expectancy-Value Theory (Wigfield & Eccles, 2000) to analyze students' statements. The central research question that guided this study was: When students are given the opportunity to pick their own topics, write their own survey questionnaire, collect their own data, and analyze the results, what can we learn about changes in students' statistical reasoning and motivation?

There were three major findings that emerged through this study. First, although the students were required to collect both categorical and continuous data in their survey, some students only collected and used categorical variables. Second, the quality of the analysis was significantly associated with the nature of the data (i.e., categorical and continuous data). Most students who focused on collecting and analyzing categorical variables were able to adequately analyze their data; while the majority of those who focused on collecting and analyzing both types of variables were not successful in analyzing their data. Third, the statistical investigation task provided a context for understanding students' motivation and learning. Analyzing these projects in terms of motivation made clear the trade-offs between the cost of doing the project and the value that students assigned to completing it. Findings have implications for helping instructors find the right balance between promoting students' motivation by encouraging them to choose topics of interest and the difficulties of conducting statistical investigations, in particular designing appropriate survey questions and figuring out how to analyze the subsequent data. Researchers and instructors need to pay attention to the ways in which student generated data can limit or support the analysis.