

Student Performance in Mathematics: Should we be Concerned?

Evidence from a Retail Course

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ABSTRACT

This article describes how for many college students the transition to college-level mathematics courses presents new challenges beyond those that were part of the high school experience. In this interdisciplinary study forty-four non-mathematics and non-science majors, enrolled in a retail-buying course, were studied to examine student confidence in performing applied mathematical tasks, mathematics achievement in college, and the relationship between predictors of college success (mathematics studied in high school, SAT/ACT scores, and mathematics courses taken in college). Measurements used for the study included a subset of items from the Mathematics Self-Efficacy Scale (MSES) on a 5-point Likert-type scale, course grades, number of years studying mathematics in high school and number of mathematics courses in college. Findings indicate that mathematics courses taken in college increased confidence in working mathematical tasks and were significant predictors of achievement in the retail course. In addition, SAT/ACT scores also were critical to the overall mathematics achievement.

KEYWORDS

College Readiness, College Success, Everyday Mathematics, High-School Preparation, Mathematics, Retail

INTRODUCTION

Research indicates that mathematics acts as a critical filter in pursuit of scientific and technical careers (Betz & Hackett 1983). However, competence in mathematics is important in almost all professional career areas including business and social sciences (Luzzo et al., 1999). Specifically, knowledge of basic mathematical concepts is critical for successful performance of a variety of roles across industries such as finance, purchasing, supply-chain management, sales and so on. However, students outside the bounds of science and mathematics often avoid taking applied mathematics courses (e.g., accounting, statistics, and retail mathematics etc.) or fail to perform in these courses (Flynn and Sandberg, 1993). Further, students lacking confidence in mathematics often fail to translate previously learned mathematical concepts to new contexts (Boaler, 1993). Low mathematics confidence and achievement can restrict students' ability to explore career opportunities that require quantitative skills, thereby calling for a need to address lack of mathematical confidence and achievement among non-mathematics and non-science college students (Flynn & Sandberg, 1993; House, 1995). Although national and international reports provide data that indicate lack of mathematics achievement of U.S. students, academic research conducted in the context of business and marketing education is somewhat limited. This lack of research prompted us to look more intently into the area of confidence and

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achievement to see what impact they may have on student performance in courses with a substantial mathematics piece.

There are a variety of factors that can contribute towards a students' confidence in performing every-day mathematical tasks and mathematical achievement in college. First, the nature of high school preparation can have a bearing on students' mathematical ability. While a greater number of mathematics courses at the high-school level can potentially improve success in college and improve overall confidence in mathematics, disconnect between the nature of high-school preparation and college needs can compromise the positive impact. For instance, existing research has found mixed results regarding the impact of high-school mathematics courses on performance in college-level science (Sadler & Tai 2001). Therefore, the relationship between high school preparation and mathematics confidence and achievement remains unclear. Second, national tests like the SAT and ACT have been shown to be reliable indicators of college readiness (College Board 2013); however, it is unclear if these assessments are a reliable indicator of students' confidence in every day mathematics tasks. Third, exposure to mathematics via entry-level college courses can play a key role in increasing students' confidence and success. On one hand, college-level courses encourage students to develop problem solving and critical thinking skills (Conley 2005). On the other hand, if taught within a context driven framework they can limit students' ability to extrapolate knowledge to new contexts. Accordingly, success in college-level courses may not necessarily indicate students' ability to perform real-world mathematics.

Motivated by the ambiguity, the purpose of this study is to better understand how the aforementioned factors affect mathematics achievement and confidence among non-mathematics and non-science majors. Specifically, the goals of this study are twofold: first to examine the role of (a) high-school preparation (number of mathematics courses), (b) SAT/ACT score, and (c) number of college-level mathematics courses in enhancing achievement in a college-level course that had an applied mathematics segment. Second, to address the "school-real" world mathematics divide by examining the role of (a) high-school preparation in the form of number of mathematics courses, (b) SAT/ACT score, (c) number of college-level mathematics courses, and (d) mathematics achievement in a college-level course in enhancing students' confidence in performing everyday mathematics tasks.

By facilitating interaction between mathematics and social science, we take an interdisciplinary approach in addressing the two goals of this study. Analogous to a study by Flynn and Sandberg (1993) that focused on students' mathematical ability in a retail mathematics course, we also situate our study in a retail mathematics course. While Flynn and Sandberg (1993) tracked student achievement to provide recommendations for improving student performance in the course, we address the overarching issues corresponding to mathematics confidence and achievement in an applied context by combining expertise in the use of applied mathematics in a professional career (marketing and retail) and teaching pedagogies and mathematics content knowledge. The interdisciplinary approach adopted for this study was supported by the collaboration of two researchers; one whose expertise is in marketing and retail and the other whose expertise is in mathematics and mathematics education. We worked in partnership to better understand student performance in required coursework that had a heavy component of mathematics applications. Through the unique collaboration and context of this study, recommendations regarding the need of strong mathematical foundation for success in careers such as marketing and retail, which lie outside the bounds of the sciences, are provided.

REVIEW OF LITERATURE

One does not have to look far to see the dismal picture painted of United States student performance in the area of mathematics. The National Center for Education Statistics (2009) reports that students in the USA rank below the average in mathematics literacy on an international level. This lack of mathematical literacy follows students into university studies where non-math and non-science majors often take one or two mathematics courses focused on consumer-type mathematics or mathematics for

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