

Project Description for Paraskevi Lioukas:

Title:

Impact of Pathway to College-Level Mathematics on Student Success

Abstract:

Students often enter freshman year unprepared for college-level mathematics (CLM) and avoid certain majors because of the mathematics requirement (Conley 115). At Bridgewater State College, all students must pass one CLM course to graduate, with many students whose majors require more. Placement tests are given to determine whether students have sufficient skills to take CLM. If not, they place into remedial mathematics (RM), which must be passed to reach CLM. Some who place into RM are provided the opportunity to attend a refresher workshop and retake the placement test. Consequently, the four pathways possible to CLM are: placing immediately; participating in the workshop and placing on the retake; participating in the workshop, not placing on the retake, and passing RM; or going directly to RM and passing. For the Fall 2007 incoming class, I will research the impact of each pathway on success in CLM and on second-year retention.

Research Questions:

1. What is the impact of pathway to college-level mathematics on students' *success** in that course?
2. What is the impact of pathway to college-level mathematics on students' retention to their second year of college?

Introduction:

Struggles with mathematics affect higher education. Many times, students are discouraged from doing their ideal major because of the mathematics requirements necessary (Conley 114, Arem 39). So while there may be a major that they would like to be in, it is seen as beyond their reach because of the mathematics requirements. Here at BSC, many majors require more advanced mathematics beyond the one college-level math (CLM) course mandated by the college in the Core Curriculum. Calculus is a requirement for science, technology, and business majors, which include: biology, physics, chemistry, chemistry-geology, geography, earth science, management, economics, aviation science, computer science, accounting and finance, and of course mathematics. In addition, statistics is a requirement for economics, psychology, sociology, social work, geography, computer science, accounting, and aviation science (BSC College Catalog; AAC).

Credit momentum can be defined as the rate to which a student attains credit towards a college degree. *The Toolbox Revisited: Paths to Degree Completion from High School Through*

* For the purpose of this research, *success* is defined as passing the course with a grade of D- or above.

College is a detailed publication of the U.S. Department of Education (DOE) that studies what aspects of formal education contribute to completing a bachelor's degree by a student's mid-twenties. This data essay speaks of the importance of credit momentum during the first year of college in predicting the attainment of a college degree. Earning twenty degree credits within the first year at a four-year institution was found to be a significant level regarding retention. Out of those students who did not earn twenty credits in the 1st year, only twenty-two percent acquired bachelor degrees, while seventy-eight percent of those that did earn twenty credits continued until the attainment of a degree. And for students who completed thirty or more credits in the first year, the statistic jumps to eighty-eight percent obtaining a degree. Thus, credit momentum is tightly correlated to degree completion. Therefore, having students in remedial mathematics classes or failing college-level mathematics (CLM) yield low credit momentum and puts them at a greater risk of not earning a degree (Adelman).

In many cases, students simply have not completed a rigorous enough mathematics program in high school to prepare them for college (Conley 115). Currently, three years of mathematics education is all that is required of students in Massachusetts public schools (Massachusetts DOE). This leaves many students entering college without having seen mathematics in over a year, and taking placement tests and mathematics classes first semester that will set the stage for their college experience. Therefore, *The Toolbox Revisited* recommends having at least 3.75 unit of mathematics, with the highest level as Calculus, Precalculus, or Trigonometry, to yield a sturdy mathematics student prepared for higher education. And to boost credit momentum, *The Toolbox Revisited* also recommends earning Advanced Placement credit or participating in dual enrollment, where a high school student takes college classes (Adelman).

At Bridgewater State College, placement tests are completed during Freshman Orientation in June to adequately place students based on their mathematics knowledge. These placement tests are distributed by College Board and go by the name of Accuplacer (www.CollegeBoard.com). The Academic Achievement Center (AAC) uses SAT scores determine what Accuplacer is taken. Students who score above 540 on the SAT Mathematics and above 500 on the SAT Verbal are presumed to have a strong base knowledge of mathematics. These students take the CLM Accuplacer to place into any CLM up to and including Calculus I. Those whose SAT Mathematics score is below 540 are required to take the Elementary Algebra Accuplacer. Passing grades on this Accuplacer allows students to be placed into any one-hundred CLM course, excluding Calculus. However, if students' Elementary Algebra Accuplacer score does not meet the standard required to take CLM, they are placed into a non-credit remedial mathematics (RM) course called Freshman Skills. This remedial mathematics course must be passed before continuing on to CLM (AAC).

The purpose of RM is to build sufficient math knowledge to be successful in CLM. By placing underprepared students into remedial mathematics, failure is reduced in introductory mathematics courses (Conley 145). And according to a study by Peter Bahr, students at community colleges who take a remedial mathematics course are shown to have comparable outcomes to those who did not, indicating that the remediation was "highly effective in resolving skill deficiencies" (Bahr).

However, the results of placement tests are not necessarily indicative of a student's knowledge because students rarely take the time to prepare and review, though they are given prior notice (Conley 145; AAC). Because of this, Bridgewater State College created the Algebra Review Workshop to give students the opportunity to review the material if a student's

Elementary Algebra Accuplacer score fell short of the standard for CLM. The workshops are in the summer and last an hour and a half, serving as a refresher of the mathematics which is asked on the Accuplacer. Immediately following the workshop, students take the Accuplacer for the second time. Many students do meet the standard this time and get to continue onto CLM, bypassing the RM course which they would have otherwise had to take without this review and retake opportunity. Supporting at-risk students by getting them into credited courses sooner is the main goal of the Workshop (AAC). However, a concern for students that pass after this Workshop is that since the retake immediately follows the review, students may be using short-term memory to pass, and that may be hurting them in the later on when they enter CLM in the fall.

Eventually, all students end up at their appropriate CLM course. Four pathways are possible to get there: by placing immediately (Path 1), by participating in the workshop and then placing on the retake (Path 2), by participating in the workshop, not placing on the retake, and passing remedial mathematics (Path 3), or passing remedial mathematics without having attended the workshop (Path 4). The CLM courses I will be looking at are the CLM courses which can be placed into through the Elementary Algebra Accuplacer: MATH 100, 105, 107, and 108. I will look for relations between the pathway taken to CLM and *success* in the course, and between pathway and retention into the second year of college.

Methodology:

My population will be the class of first-time, full-time students entering BSC in Fall 2007. I will collect the data from the Office of Institutional Research and disaggregate it according to pathway and CLM course taken. The following data will be given to me stripped of all student identification: Accuplacer score(s), pathway to CLM, pass or fail status in CLM, and retention into the 2008/2009 academic year.

I will use basic statistical tests on each data set such as finding the mean and standard deviation for pass/fail proportion of students in each pathway. Comparisons will be done using a chi-squared test. Firstly, Path 1 and Path 2 will be compared, looking for similarities. Secondly, Path 3 and Path 4 will be compared. Finally, all four pathways will be compared to each other. In addition, I will do a statistical analysis on the Accuplacer scores of those students who participated in the Workshop to find the entering Accuplacer score from the first test where the likelihood of success is greater than that of failure.

The final aspect of my research will be using the results from my research to make recommendations for supporting BSC's incoming freshman students struggling in mathematics. This could include recommending a different cut score for entering the workshop or devising a new program for supporting students.

Because of the use of human subject data, I have submitted my application to the Institutional Review Board.

Logistics:

Where research will be conducted:

Moakley Computer Lab, BSC Campus: Approximately 2 days per week (in close proximity to my mentor's office)

Office of Institutional Research, BSC Campus: Approximately 3 days per week (to gather data, get guidance on using correct statistical data, receive help in defining a quality cohort of students)

Equipment necessary:

Computer with Internet Access, Microsoft Office, and SPSS (Available through IT)

Timeline:

Week 1: Receive mentoring on analyzing statistical data.

Receive faculty/staff mentoring on SPSS.

Week 2: Continue mentoring on analyzing statistical data specific to this project.

Learn how to use SPSS.

Week 3: Continue learning how to use SPSS.

Gather data from Office of Institutional Research.

Week 4: Continue learning how to use SPSS.

Disaggregate data according to course and pathway.

Week 5: Perform analysis of each course and pathway individually.

Week 6: Perform comparative analysis of courses.

Week 7: Continue performing comparative analysis of courses.

Week 8: Prepare first draft of report

Week 9: Devise recommendations for BSC based on research.

Continue work on report.

Week 10: Completion of project with final report.

How/When will meet with Mentor:

For the first week, I will email my mentor daily to inform her of the progress of my research. In addition, I will meet with her twice a week for the entirety of the ten weeks for more in depth discussions on the findings of my research and the direction to take for the days to follow.

Works Cited:

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Conley, David T. *College Knowledge What It Really Takes for Students to Succeed and What We Can Do to Get Them Ready*. San Francisco: Jossey-Bass, 2005.

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