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Undergraduate Retention Rates for Students in Learning Support Math Classes versus Traditional Math Classes Controlling for ACT Mathematics Scores

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ABSTRACT

The purpose of this study was to determine if the 1 – and 2-term retention rates for students with the same ACT mathematics subsection scores were different between students who took a regular section of Probability and Statistics and students who took a learning support section of the same course. The subjects of this study were 2,714 students enrolled in a Probability and Statistics course (either regular sections or learning support sections) at a 4-year institution from the 2013 summer semester to the 2014 fall semester. As expected, students who scored a 19 or greater on the mathematics section of the ACT were significantly more likely to be enrolled in later semesters than students who scored below a 19. When students were grouped by matching ACT mathematics sub scores there was not a significant difference in 1-term and 2-term retention rates between students who took a 4-hour learning support section of probability and statistics and students who opted to take a regular 3-hour version of the same course.

INTRODUCTION

Every spring millions of students graduate from high schools across the country and prepare for the next step in their lives. For about two-thirds of high school graduates the next step is to continue their education at a college or university (NCES, 2014). Many of these students already have a college in mind, some have started the enrollment process, and a large number have applied for funding to pay for their education. It may seem that these students are ready to take the step into higher education; but unfortunately many of these students are not academically prepared especially in the area of mathematics and English (Jimenez, Sargrad, Morales, & Thompson, 2016).

In many universities students that are identified as underprepared are typically given a diagnostic test to determine if they will be required to complete remedial coursework or participate in some form of learning support (Fields & Parsad, 2012). However, these tests along with other aspects of remedial reform have come into question (Complete College America, 2011; Jimenez et al., 2016). Remedial classes, which underperforming students are required to take but receive no credit towards their degree, have been deemed by the Complete College America report and others as ineffective (Complete College America). Data from the report indicate many students need remediation, but few students succeed when they get it. As a result many states are requiring higher education institutions to find alternatives to remedial courses. Many colleges and universities have instituted other measures such as learning support programs that will help students fill in content knowledge deficiencies while still moving through a credited course.

One solution for dealing with underprepared students in math is using a 1-hour learning support course, sometimes referred to as a "side cart," to go alongside a college level course to assist in filling knowledge gaps leading up to the course and providing extra assistance for difficult concepts during the semester. Institutions use these classes to give underprepared students an increased opportunity to succeed and increase their likelihood of remaining at the university. Another solution has been to build this 1-hour course into the regular program, thus creating a 4-hour learning support course, however only 3 hours count for credit. The participating university in this study used the 4-hour learning support course approach for the probability and statistics course that was the focus of the research.

The present study was designed to determine if the 1-term and 2-term retention rates for students with the same ACT mathematics subsection scores were different for students taking a regular 3-hour probability and statistics course and students taking a 4-hour learning support version of the same course. The researchers measured and compared the success in one mathematics course of underprepared students who were taking a learning support mathematics class versus students not needing learning support. We also compared the retention rates of students participating in mathematics learning support to the retention rate of those students not participating in learning support. The following terms are defined in this study: When students who enrolled in a section (either learning support or not) of probability and statistics re-enrolled in the institution the following term, then the institution has retained them for 1-term, and when students who enrolled in a section (either learning support or not) of probability and statistics re-enrolled in the institution the following 2 terms, then then institution has retained them for 2-terms.

RELATED LITERATURE

There is no uniform approach within postsecondary institutions in determining whether a student is in need of remediation. For most institutions, a student's performance on a college placement or admissions exam determines, or is at least a factor, in the decision (Jimenez, et al., 2016). The American College Testing (ACT) is the most common standardized test used to assess college readiness in the subjects of English, mathematics, reading, and science. Each subject has been assigned a college readiness assessment score, called a benchmark. If students meet the benchmark for that subject, they have a 50% chance of attaining a grade of B or higher and a 75% chance of attaining a grade of C or higher in their corresponding college course or courses. (ACT, 2013). The mathematics benchmark is set at 22 out of a possible score of 36. At a 5-year average, only 45% of our nation's graduates are meeting this benchmark from 2009 to 2013 (ACT, 2012). In addition to the ACT, some colleges require students to take additional tests to determine individual deficiencies; the most often used exams for these situations are the ACCUPLACER Elementary Algebra and College-level Mathematics placement tests developed by College Board and the COMPASS Algebra and College Algebra placement test developed by ACT (Fields & Parsad, 2012). The COMPASS exam is also used as second chance for students at the participating university who scored below the ACT benchmark to test out of required learning support courses.

Approximately 50% of students entering two-year colleges and almost 20% of students entering 4-year institutions are in need of remediation (Complete College America, 2011). Remedial courses, also called developmental or basic skills courses, consist of below-college-level instruction that is aimed at teaching students the academic competencies necessary to succeed in college-level coursework (National Conference of State Legislatures, 2013). The design of remedial courses varies from institutions. Students may be placed in courses that range from one to as many as four sequential courses that are below college level. Unfortunately, students do not receive credit for these courses and less than 50% of remedial students complete their recommended remedial courses (National Conference of State Legislatures, 2013). Additionally, only 27% of high school graduates who require at least one remedial math course earn a bachelor's degree (Adelman, 1999). Furthermore, enrollment in these courses cost the states and students around $2.3 billion each year (Jimenez et al., 2016; National Conference of State Legislatures, 2013).

The overwhelming expense of remediation coupled with low college success rates for remedial students have prompted a wave of innovation in remedial instruction (Fulton, 2012). For example, after Complete College America conducted a 2009 study on graduation rates and student success, a report was submitted to Tennessee's then governor, Phil Bredesen, that highlighted suggestions designed to improve graduation rates and student success for higher education institutions in Tennessee. Removing remedial courses from four-year universities was among the suggestions: "Remedial and developmental instruction should be eliminated at four-year universities and only provided at community colleges where it can be provided at a lower cost to students and the state and where new models for more effective developmental education are being required" (p. 8).

This suggestion was adopted by the Tennessee Board of Regents (TBR) in 2010 with full implementation to be completed by 2013 (TBR, 2014). While this change was not important to highly selective institutions, it provided

a great strain on four-year state institutions who rely heavily on the enrollment of students from less qualified populations with lower ACT scores. Many of these state institutions have incoming classes with median ACT scores that do not reach the benchmark of 22 (About Education, 2014). These institutions could face financial hardships if they had to reduce their admitted students by 50%, so they were forced to find innovative methods to help unprepared students to succeed without using remedial or developmental courses. One of these methods was the use of learning support courses and is the current method at the university being studied.

Learning support is defined by the TBR as "academic support needed by a student to be college ready as established by the ACT college readiness benchmarks and standards" (TBR, 2014, p. 4). One way that universities have met this guideline is by offering a one-hour support class for freshman level courses. For example a student registering for Probability and Statistics who does not meet college readiness standards for mathematics may still enroll in the course, but will be required to participate in a one-hour per week mathematics support class in which fundamental concepts are reviewed and specific deficits addressed. This concept is relatively new, and very little research exists at the University being studied on the effectiveness of such supports in both bringing underprepared students up to their prepared classmates and providing enough support to retain students who are behind.

RESEARCH METHOD

For the present study an ACT score of 19 was used as the benchmark for college readiness because it is the benchmark used by the university being studied. One-term retention was used because it represents retaining a student through the semester in which they enroll in a probability and statistics course at the university into the next term, and 2-term retention was used because it represents retaining a student from their first year into their second, a time that has been shown to produce the highest levels of attrition (Murtaugh, Burns, & Schuster, 1999). The learning support program being studied was formed to support a first year probability and statistics course. Students generally take this course in their first or second semester of their first year of enrollment.

Population

The subjects in this study were students enrolled in a Probability and Statistics class (either regular sections or learning support sections) from the 2013 summer semester to the 2014 fall semester. Students had a valid ACT score on file with the university to be included in the study. Access to the data was provided by the institution and retrieved from the Office of Institutional Research. To insure anonymity of the subjects, all personal identifiers were removed from the data before it was acquired by the researchers.

Data Collection

The data came from course extracts from the Banner data system. Course information came from course extracts and student information came from student enrollment extracts. Those extracts were collected at the same point each semester to form an enrollment count. The database included type of course (regular or learning support) and ACT mathematics sub score.

RESULTS

Research Question 1

Is there a significant difference in the 2-term retention rates between students who score a 19 or greater on the mathematics section of the ACT (and took a regular 3-hour Probability and Statistics course) and students who score less than 19 (and took a 4-hour learning support version of the same course)?

A two-way contingency table analysis was calculated to evaluate whether the 2-term retention rates were significantly different between students who scored a 19 or greater on the mathematics section of the ACT (and took a 3-hour Probability and Statistics course) and students who scored less than 19 (and took a 4-hour learning support version of the same course). The two variables were type of course (learning support with an ACT < 19 or regular with an ACT ≥ 19) and continued to enroll in their third semester (yes or no). Type of course and retention were found to be significantly related, Pearson χ^2 (1, N = 2714) = 7.78, p < .001, Cramer's V = .05. The percentages of students in the two class-type categories who enrolled in their third semester were 78.0% (learning support) and 82.7% (regular). Therefore, students who scored an 18 or less on the mathematics section of the ACT and took a learning support section of Probability and Statistics were significantly less likely to continue to be enrolled in their third semester than students who scored a 19 or greater and took a regular section of the course.

Research Question 2

For students who scored 19 or greater on the mathematics section of the ACT, is there a significant difference in the 1-term retention rate between those who took a regular

3-hour Probability and Statistics course and those who took a 4-hour learning support version of the same course?

A two-way contingency table analysis was calculated to evaluate whether the 1-term retention rates were significantly different between students who scored 19 or greater on the mathematics section of the ACT and took a 3-hour Probability and Statistics course and students who took a 4-hour learning support version of the same course. The two variables were type of course (learning support or regular) and enrolled in the following semester (yes or no). Type of course and retention were not found to be significantly related, Pearson χ^2 (1, N = 2537) = .60, p = .439, Cramer's V = .02. The percentages of students in the two class type categories who enrolled in the following semester were 76.5% (learning support) and 78.3% (regular). Therefore, among students who scored 19 or greater on the ACT mathematics subsection, those who took the learning support section of Probability and Statistics were not significantly more or less likely to be enrolled one semester after taking the course than students who took a regular section.

Research Question 3

For students who scored 19 or greater on the mathematics section of the ACT, is there a significant difference in the 2-term retention rate between those who took a regular 3-hour Probability and Statistics course and those who took a 4-hour learning support version of the same course?

A two-way contingency table analysis was calculated to evaluate whether the 2-term retention rates were significantly different between students who scored 19 or greater on the mathematics section of the ACT and took a 3-hour Probability and Statistics course and students who took a 4-hour learning support version of the same course. The two variables were type of course (learning support or regular) and enrolled in the following two semesters (yes or no). Type of course and retention were not found to be significantly related, Pearson χ^2 (1, N = 2537) = 1.55, p = .213, Cramer's V = .03. The percentages of students in the two class type categories who enrolled in the following semester were 56.6% (learning support) and 60.5% (regular). Therefore, among students who scored 19 or greater on the ACT mathematics subsection, those who took the learning support section of Probability and Statistics were not significantly more or less likely to be enrolled two semesters after taking the course than students who took a regular section.

Research Question 4

For students who scored less than 19 on the mathematics section of the ACT, is there a significant difference in the 1-term retention rates between students who took a regular 3-hour Probability and Statistics course and students who took a 4-hour learning support version of the same course?

A two-way contingency table analysis was calculated to evaluate whether the 1-term retention rates were significantly different between students who scored less than 19 on the mathematics section of the ACT (and took a 3-hour Probability and Statistics course) and students who scored less than 19 (and took a 4-hour learning support version of the same course). The two variables were type of course (learning support or regular) and enrolled in the following semester (yes or no). Type of course and retention were not found to be significantly related, Pearson χ^2 (1, N = 1201) = .63, p = .464, Cramer's V = .02. The percentages of students in the two class type categories who enrolled in the following semester were 78.1% (learning support) and 80.0% (regular). Therefore, among students who scored less than 19 on the ACT mathematics subsection, those who took the learning support section of Probability and Statistics were not significantly more or less likely to be enrolled one semester after taking the course than students who took a regular section.

Research Question 5

For students who scored less than 19 on the mathematics section of the ACT, is there a significant difference in the 2-term retention rates between students who took a regular 3-hour Probability and Statistics course and students who took a 4-hour learning support version of the same course?

A two-way contingency table analysis was calculated to evaluate whether the 2-term retention rates were significantly different between students who scored less than 19 on the mathematics section of the ACT (and took a 3-hour Probability and Statistics course) and students who scored less than 19 (and took a 4-hour learning support version of the same course). The two variables were type of course (learning support or regular) and enrolled in the following two semesters (yes or no). Type of course and retention were not found to be significantly related, Pearson χ^2 (1, N = 803) = .06, p = .800, Cramer's V = .01. The percentages of students in the two class type categories who enrolled in the following semester were 60.5% (learning support) and 61.4% (regular). Therefore, among students who scored less than 19 on the ACT mathematics subsection, those who took the learning support section of Probability and Statistics were not significantly

more or less likely to be enrolled two semesters after taking the course than students who took a regular section.

CONCLUSION

The following conclusions were drawn based on the analysis of data relevant to this study:

Students who were academically prepared to take a college level mathematics course showed significantly higher 2-term retention rates than did students who were not academically prepared.

When grouped into ACT math sub score categories of 19 or greater, students in the learning support courses had similar 1 – and 2-term retention percentages compared to students in the regular course offerings.

When students were grouped into ACT math sub score categories of less than 19, students in the learning support courses had similar 1 – and 2-term retention percentages compared to students in the regular course offerings.

Underprepared students who were enrolled in the 4-hour learning support sections of Probability and Statistics were not more likely to be enrolled in future semesters than students who were equally underprepared and opted to take a regular 3-hour section of the course.

Recommendations

The findings of this study would suggest that the learning support program for mathematics at the institution being studied should be re-evaluated. Underprepared students who were required to take the additional 1-hour with the learning support course performed no better than students who took the regular course. However, this does not mean that the learning support courses are completely ineffective. One major qualitative factor that was not presented in this study was why students choose to take the regular course over the learning support course. It could be that students who were more confident in their own abilities opted for the regular course, while students who were less confident asked for the learning support section. For these students to perform at the same level could be a large victory for the program. However, because the only factor used to establish groups was the ACT mathematics sub score, these factors could not be examined.

Many studies have been conducted at the institutional level to determine efficient and effective methods of remediation, but no national system has been proposed. The issue that is being debated at the state and national level is whether or not developmental education should exist at four-year universities. To eliminate remedial classes from 4-year universities, states have looked at programs at the secondary level which could eliminate the need for remediation and also move remediation to community colleges that may be better equipped to handle it. Having more college-ready students would be welcomed by 4-year universities, but losing the underprepared population of students, even for a year, may not be an option because of financial concerns.

REFERENCES

About Education. (2014). College Profiles. Retrieved from http://collegeapps.about.com /od/collegeprofiles/

Adelman, C. (1999). *Answers in the toolbox: Academic intensity, attendance patterns, and bachelor's degree attainment*. Washington, D.C.: Office of Education Research and Improvement, U.S. Department of Education.

American College Testing. (2012). 2012 ACT National and State Scores. Retrieved from http://www.act.org/newsroom/data/2012/states.html

American College Testing. (2013). ACT Profile Report. Retrieved from http://www.act.org/newsroom/data/2013/pdf/profile/National2013.pdf

Aycaster, P. W. (2001). Factors impacting success in community college developmental mathematics courses and subsequent courses. *Community College Journal of Research & Practice*, *25*(5-6), 403-416.

National Conference of State Legislatures. (2013). *Hot topics in higher education: Reforming remedial education*. Denver, CO: Bautsch.

Complete College America. (2011). *Time is the enemy: The surprising truth about why today's college students aren't graduating and what needs to change*. Retrieved from http://completecollege.org/docs/Time_Is_the_Enemy.pdf

Complete College America. (2014). *Complete College Tennessee: Challenges and Opportunities*. Retrieved from http://media.timesfreepress.com/docs/2010/01/TN_ College_Completion_Recommendations.pdf

Fields, R., & Parsad, B. (2012). *Tests and cut scores used for student placement in postsecondary education: Fall 2011*. Washington, DC: National Assessment Governing Board.

Fulton, M. (2012). *Using state policies to ensure effective assessment and placement in remedial education*. Getting past go project: Education Commission of the States.

Jimenez, L., Sargrad, S., Morales, J, & Thompson, M. (2016). *Remedial Education: The cost of catching up*.

Retrieved from the Center for American Progress website: http://www.americanprogress.com

Murtaugh, P. A., Burns, L. D., & Schuster, J. (1999). Predicting the retention of university students. *Research in Higher Education,* 40, 355–371.

National Center for Educational Statistics. (2014). Fast Facts. Retrieved from http://nces.ed.gov/fastfacts/display.asp?id=372

Tennessee Board of Regents. (2014). Office of General Counsel: Policies and Guidelines. Retrieved from https://policies.tbr.edu/guidelines/learning-support