CLEARvoz Journal Vol. 3, No. 1 (2016), pp. 1-13

CLEARvoz Journal

College Readiness through an Innovative Concurrent Enrollment Program for Underrepresented College Bound Students

Lynn Cevallos, *College Bridge*
Pedro Cevallos, *College Bridge*
Kristin Webster, *California State University, Los Angeles*

***Authors Note**: The authors want to express their gratitude to The Michael & Susan Dell Foundation for the generous grant used to study the South Los Angeles Math (SLAM) Project.*

Abstract: This paper explores several key findings of the first three cohorts of the South Los Angeles Mathematics (SLAM) Project. The SLAM Project is a longitudinal study designed to learn the best practices to employ in order to increase college access and success for underrepresented students. In particular, this project tackles the mathematics remediation crisis directly in order to ensure that the students in the program begin their postsecondary careers in credit bearing courses and shorten their time to degree. The program is unique in its student selection and instructional model. Quantitative and qualitative results indicate significant effects of college level coursework on student perceptions, attitudes, and persistence rates.

Key words: college readiness, underrepresented students, best practices, concurrent enrollment, remediation

Introduction

The South Los Angeles Math (SLAM) Project is a strategic partnership forged with Los Angeles Unified School District (LAUSD), College Bridge, and California State University, Los Angeles (CSULA). This program brings together high school teachers and college professors to co-teach college level math concurrent enrollment courses in order to offer students the opportunity to bypass academic remediation. These courses are offered to at-risk students on urban public high school campuses during the regular school day free of charge. Students who successfully complete these classes earn college math credit and completely satisfy remediation requirements at all 23 of The California State University (CSU) system's campuses.

Theoretical Framework

This research project builds upon Kirst & Usdan (2009) Academic Disjuncture Theory, which postulates that, the overarching barrier to college access and success is "the deeply-embedded chasm that separates K–12 from postsecondary education in the United States" (Kirst

& Usdan, 2009, p. 5). They contend that a seamless educational pipeline between K-12 schools and higher education is key to the unfettered progress of students between educational segments. Currently the systemic disconnections are most pronounced in the areas of curricula, assessments, financial processes, data systems, and accountability (Brown & Niemi, 2007; Domina & Ruzek, 2012; Kurlaender, Jackson, & Howell, 2012). The SLAM Project attempts to fuse K-12 and higher education together by bringing high school teachers and college professors to work collaboratively to decrease the high rates of mathematics remediation.

The Need

Access to a college education is critical for improving people's quality of life and society as a whole. On average, graduating with a Bachelor's degree will result in $2.8 million in earned wages over a lifetime as opposed to $1.3 million with only a high school diploma (Carnevale, Stephen, & Ban, 2011). Society also benefits from a college-educated population with a robust economy, stronger civic engagement, and lower levels of crime, poverty, and health care costs (Baum, Ma, & Payea, 2010). Unfortunately, college graduation rates for underrepresented students (minority, first-generation, low-income) are decreasing in comparison to white, non-Hispanic students even though students of color constitute the nation's fastest growing demographic (US Census Bureau, 2010). The six-year graduation rates and degree attainment rates by race at 4-year postsecondary institutions are listed in Table 1.

Table 1

	American Indian/ Alaska Native	Black	Pacific Islander	Hispanic	White	Asian	Total
6-year graduation rates (2013)	40.6%	40.8%	49.6%	52.5%	62.9%	70.5%	59.4%
Degree Attainment (2014)	5.6%	22.4%	N/A	15.1%	40.8%	63.2%	34%

(Kena et al., 2015)

If current college graduation trends continue, there will be shortage of 16 million college-educated workers nationally and one million in California by the year 2025 (Matthews, 2015). A major factor that hinders students' ability to graduate from college is the high rate of academic remediation. Specifically, 1.7 million students nationwide place in remedial college classes annually (Alliance for Excellent Education, 2011) at a staggering cost of $7 billion to states and the Federal government (Scott-Clayton, Crosta, & Belfield, 2012). Of these students, fewer than 10% earn a degree from community colleges within three years and little more than one-third complete bachelor's degrees in six years (Complete College America, 2012). Students who are able to complete their college degree are adversely affected by remediation through the accumulation of greater debt, spending more time in college, and delaying their entrance into the workforce (Tierney & Garcia, 2011). This has a toxic effect on the nation and the state of California through lower income tax revenues and an unskilled workforce (Johnson, Sengupta, & Murphy, 2009).

The remediation problem is particularly pervasive across the largest public university system in the nation, The California State University (CSU), which serves more than 400,000 students across 23 campuses. The CSU system spends close to $30 million annually on remediation. In 2014, 27.3% of incoming freshmen across the Cal State system placed in remedial mathematics courses, despite the fact that the University draws from the top third of California's high school graduates (The California State University, 2014b). At CSULA the problem is exacerbated with 54.9% of their incoming freshmen requiring math remediation (The California State University, 2014a) resulting in a particularly pernicious effect on minority, first-generation, and low-income students. Cal State LA, as a US Department of Education Accredited Postsecondary Minority Serving Institution, matriculated 50.9% Latino and 9.6% African American students in 2015. In addition, 53% are first generation college students and 71% of incoming freshmen are Pell Grant eligible due to their families earning less than $31,000 annually.

The Intervention

The strategy of the SLAM Project is to bridge the high school and university curriculum and leverage the students' senior year in high school as a catalyst for college success. As such, students eligible for the SLAM project were offered the opportunity to take a free college level math course during the first semester of their senior year of high school. The curriculum and structure of the course were developed and delivered collaboratively by University and high school faculty. Unlike most concurrent enrollment courses that target gifted students and are offered on college campuses, the SLAM course is taught to at-risk high school seniors on their home campus during the regular school day. This was developed in this manner in order to accommodate as many students as possible within the regular structure of their schooling.

Curriculum

Quantitative Reasoning with Statistics (MATH 109) is one of the general education mathematics options for CSULA students. Statistics is the science of collecting, organizing, interpreting and making inferences from data. As such, statistics is an important tool in most fields of study. Statistics was chosen for this project as the mechanism for developing college level quantitative reasoning skills due to its immediate applications in education, humanities, and social sciences.

Specific teaching and learning practices have been found to be beneficial for all college students and have been shown particularly beneficial for underrepresented student retention and persistence (Kuh, 2008). Among these high impact practices, the SLAM curriculum incorporates collaborative learning and projects, and community-based undergraduate primary research.

Civic Engagement. University level statistics, even at the general education (GE) level, has often been criticized for being overly theoretical and taught in uninteresting ways (Hogg, 1991; Willett & Singer, 1992). Much effort has been put into proposing teaching strategies to encourage students to become more engaged with the material. These strategies include emphasizing statistical thinking, promoting active learning, using analysis of real data, building quantitative intuition and using context to support analysis and prediction (Cobb, 1993; Makar & Ben-Zvi, 2011; Scheaffer, 2001). In a general education statistics class, the problem of context is one that is not easily solved. Not all students are interested in specific topics (the standards are sports, health science, or psychology). Finding data sets that appeal to all students is a significant challenge. In addition, at the University Freshman level, it is not expected that students will have insight into what types of data are analyzed in their field. By utilizing a civic engagement platform to study statistics, students can have a personal connection to the data they are studying, collecting and analyzing. This promotes deeper learning and the student's belief that statistics is applicable to their lives.

The main goal of incorporating the statistics curriculum in connection to civic engagement is primarily to deepen students learning of statistics as well as foster a sense of civic responsibility. The students become aware of the power of the use of statistics as a persuasive tool. Specifically, the goals of this curriculum are: (1) students demonstrate comprehension of significant statistical learning, (2) students display evidence of the ability to use statistical principles in civic engagement, and (3) students apply statistical practices in their everyday world.

Throughout the course, in-class activities and discussions were related to the ideas of civic engagement. These activities included:

- Finding statistics reported on our community in the Los Angeles Times.
- Watching video clips of documentaries reporting statistics and reflecting on how statistics were used in a persuasive manner
- Watching online presentations related to community issues utilizing statistics and examining whether the information was presented accurately.
- Collecting information from their classmates on community issues to use for statistical analysis as related to the statistical content of the class (called "Mini-Projects").
- The students are encouraged throughout the class to be critical consumers of statistical information. In addition, they are encouraged to note the ways that statistics is used as a tool to elicit feeling and also to persuade.

Although the college course is only held during the first semester, during the second semester, the student put their statistical knowledge to work doing a community based primary research. There were three major parts to the final group project: (1) a literature review and analysis of national data sets to inform their research questions, (2) collecting and analyzing statistics, and (3) presenting their results. The presentation is a persuasive communication of their findings that could be presented to community leaders and community members to inspire a call to action, or enhance awareness.

As previously noted, it is difficult to find data sets to appeal to all students in a statistics class. Using civic engagement as a platform for gathering statistics allowed the students to have control over the data they collected and studied therefore giving them a vested interest. However, student data collection is often "messy" in that the data often give inaccurate results. In order to combat this, the students critique their own data collection in the same way that they critiqued professional data collection throughout the first semester. In addition, they were required to reflect on the method and motivation of their data collection and predict how it may have influenced their results.

For the main component of the first part of the project, students analyzed large data sets from governmental agencies looking for trends that would inform their own primary research projects. This serves as part of their literature review. Next, they design a survey that includes collection of both qualitative and quantitative data. With the quantitative data, they are able to construct at least one confidence interval and one hypothesis test. By including this requirement, it provided the ability to assess the student's statistical learning on many of the statistical learning outcomes listed above. One of the most powerful connections that students needed to make was what type of information needs to be collected so that the required statistical tools can be used.

Site and Student Selection

In LAUSD, school performance varies significantly. School sites were chosen based on demographics, remediation rates of college bound seniors, and because they were feeder schools to CSULA. Student eligible for the SLAM class are those who would likely place in remediation and, instead of falling into a senior "slump," utilize their senior year of high school as a catalyst for college success. These are students who have either demonstrated difficulty in math in grades 9 through 11 or those who may feel competent in math but have only completed Algebra 2 by the end of their junior year. We exclude University of California eligible students (top 9% in the state) but included only CSU eligible students (top 30%). Additionally, eligible SLAM students must indicate a desire to attend college in the following year.

Research Design

SLAM is a mixed-methods longitudinal study whose overarching purpose is to learn the best practices to employ in order to increase college access and completion for underrepresented students from LAUSD and CSULA. This inquiry method was chosen because it is the most appropriate and effective way to investigate the research questions. Both quantitative and qualitative methods are critical to adequately comprehend the effects a senior-year intervention of a college-level math course has on the access and persistence rates of underrepresented students. Furthermore, it is imperative to answer both the "what" (quantitative) as well as the "how and why" (qualitative) factors that influence college retention rates for this specific population.

In optimal circumstances, an experimental design could be used to empirically verify the conclusions derived from the study. However, the exploratory nature of this research inhibits the ability to accurately identify and operationally define the most relevant variables in advance. In addition, a randomized control trial would be both inappropriate and impossible for an investigation such as this one. The fact that SLAM Project serves a very specific population limits the use of inferential statistics to construct generalizable conclusions. Similarly, a quasi-experimental design would only be able to answer the quantitative research questions largely ignoring the rich qualitative data that complement the study and increase its validity. For these reasons, statistical analyses will be limited to the use of descriptive statistics. The two quantitative data collection methods that will be used are: (1) pre and post student surveys, and (2) exam and course pass rates. SLAM students will be compared to a control group from the same LAUSD High Schools in the study using National Student Clearinghouse data. Conversely, qualitative methods are crucial to drill down beyond the numbers and understand the specific personal challenges underrepresented students face that hinder their success in college. The literature on student retention in higher education centers on three levels: (1) individual, (2) institutional, and (3) social and external. The only way to investigate how the interplay of these factors influence their retention rates is to take into account demographic, academic achievement, attendance, as well as English Learner data. The two qualitative data collection methods that will be used with all students, families, professors, and teachers are: (1) in-depth interviews, and (2) focus groups.

Research Questions

This study was anchored by the following four research questions:

1. What effect, if any, do the SLAM Program's interventions have on the pass rates of MATH 109?
    1. The co-teaching by a CSULA professor and a LAUSD high school teacher.

    2. The co-teaching by a SLAM certified LAUSD teacher and a colleague.
    3. The teaching by a SLAM certified LAUSD teacher.
2. What effect, if any, does the SLAM Project have on:
    1. the college math remediation rates of underrepresented students?
    2. the college persistence rates of the six cohorts?
3. How does SLAM Project shape students' perceptions of:
    1. themselves as college-ready?
    2. their choice of college majors?
4. What are the SLAM Project best practices?
    1. How can they be scaled-up to the entire LAUSD?
    2. How can they be scaled-up to the entire CSULA's service area?

Data Collection and Analysis

In order to obtain baseline quantitative data from the SLAM students, a pre-course formative diagnostic exam was administered at the beginning of the course. The results were used to identify each student's strengths and weaknesses in their conceptual understanding of mathematics. In addition, both the instructor(s) and the professional development (PD) provider utilized these data to formulate a cogent strategy to use with the whole class in general and specific students in particular in order to rebuild their mathematical foundation(s) and get them ready to succeed in Statistics.

Next, Pre-Math 109 qualitative data were collected through open ended surveys to gauge the students' perceptions regarding their level of college readiness in general, and college level mathematics in particular, as well as their potential college majors. These data also served as the baseline to measure perceptual changes in all stakeholders after the intervention. Post-Math 109 qualitative data were captured using the same methods and were used to measure any changes after the SLAM intervention.

Thirdly, an analysis of the Math 109 quantitative midterm exam data were used to target the next iteration of the feedback loop cycle of instruction. The instructor(s) and PD provider, analyzed these data in order to specifically target instruction to remediate areas of weakness for the entire class and specific students. "Office Hours" were used to differentiate instruction with specific students who needed remediation or acceleration.

Instructional Model

The SLAM Project is evaluating three instructional models: (1) co-teaching with a CSULA professor and LAUSD teacher, (2) co-teaching with two LAUSD teachers, and (3) one LAUSD teacher teaching alone. The professor/teacher co-teaching model is implemented first. Once a teacher has co-taught the entire course with a professor, the teacher co-teaches the course with a colleague. During this phase, the certified teacher assumes the professor role. In year three, the teacher teaches the course alone.

These researchers are concerned with the effects the different teaching models have on student outcomes while also controlling for the scalability of the program.

Structure of Class. In order to prove that passing students are college-ready, it is imperative that the course retains the level of rigor, integrity, and fidelity of a college course. It is equally important that the students are provided proper support to help them make the transition from high school to college. In order to achieve this balance, the course is split into lecture days where the professor (or teacher assuming the professor role) leads the course using the familiar college lecture format. The lectures are bookended with student-centered "workshop" days where the high school teacher addresses questions from the previous day's lecture.

Findings

To date, the SLAM Project's impact is as follows: (1) 83 participating students from three cohorts spanning two LAUSD high schools, (2) a 15% (n = 29, Cohort 1) math remediation rate, (3) a 93% (n = 29) college matriculation rate and 89% persistence rate, (4) a 66% (N = 83) aggregate pass rate with a 15% variation for the professor-teacher configuration as opposed to the teacher-teacher model, (5) 92% (N = 83) of students' changed their self-perception of college readiness, and (6) 13% (N = 83) of students with a previous self-perceived weakness in mathematics changed their view and decided to major in Science, Technology, Engineering and Mathematics (STEM) fields. The findings are coded as follows to protect the identity of the participants:

Table 2: Participant Coding

	Year 1	Year 2
High School 1	Professor Teacher 1 Cohort 1	Teacher 1 Teacher 3 Cohort 3
High School 2		Professor Teacher 2 Cohort 2

The students are coded Student 1C1, 1C2, 1C3,…,2C1, 2C2, 3C3,…, and 3C1, 3C2, 3C3, for Cohorts 1, 2 and 3 respectively, all with the last character being randomly assigned.

Math Remediation Rate

The overarching purpose of the SLAM project is to increase college access and success for underrepresented students by removing the barrier of mathematics remediation. The project specifically targeted students who are CSU eligible and, based on multiple measures, deemed likely to place in remediation when matriculating into college. Although remediation data were not available for all students from a particular high school, the CSU does provide high school proficiency reports with these data for all students who matriculate to any of the 23 CSU campuses. In the fall of 2013, students entering the CSU from high school one had a math remediation rate of 83%. Cohorts 1 and 3 attended this high school, in 2013 and 2014 respectively. High school two, representing Cohort 2, had a remediation rate of 68% in the fall of 2014, the same term the SLAM Cohort 2 students began the program.

Cohort 1 students passed the MATH109 component of the SLAM project at a rate of 76% (n = 29). This rate is 11% percentage points higher than the aggregate pass rate of the same course at CSULA during the same term. Since passing MATH109 satisfied all math remediation requirements at any CSU, the highest remediation rate for this cohort would be 24%. Once placement exam results were available, Cohort 1's remediation rate result was 15%.

Cohorts 2 and 3 have begun their first year of college but survey and National Student Clearinghouse (NSC) data are still being collected on these students. Therefore, the remediation rate of 39% (N = 54) is currently being reported based solely on MATH 109 pass rates for the two cohorts. These data, obviously, might still drop lower.

Matriculation and Retention

Schools in the SLAM project are targeted based on their population of underrepresented students, remediation rate, and college matriculation rate. Based on data available from the California Department of Education for students matriculating in 2008, high school one had a rate of 54% (N = 533) and high school two 67.6% (N = 500), with 66.2% (n = 461) for the underrepresented subgroup. SLAM Cohort 1 has matriculated to college at a rate of 93%. Based on survey data, at least 89% of students have persisted from year one to year two. NSC data will complete this statistic for the next writing. Survey data from Cohorts 2 and 3 reveal a remediation rate of at least 73%, with 83% of students reporting. Again, these numbers could drop even lower once it is verified with National Student Clearinghouse data.

Instructional Model Results

To date, the first two models have been studied with two samples of the professor-teacher model and one sample of the teacher-teacher configuration. SLAM Cohorts 1 and 2 co-taught by LAUSD Teachers and the CSULA Professor have an average MATH 109 pass rate of 71% (n = 56). This exceeds both the SLAM goal of 70% and CSULA's average pass rate of 65%. Specifically, SLAM Cohort 1 had a 76% pass rate (n = 29) exceeding both the SLAM goal of 70% and CSULA's average of 65%. SLAM Cohort 2 had a 66% pass rate (n = 27) below the SLAM goal of 70% but exceeding CSULA's average of 65%.

The findings stated above indicate a 15% higher MATH 109 pass rate when the CSULA professor co-teaches with the LAUSD teacher compared to two LAUSD teachers co-teaching the same course. This increase correlates to the qualitative finding that the students take the course more seriously when taught by a college professor. Further, the teachers and professor stated that the professor/teacher co-teaching model provided a valuable bidirectional professional development opportunity.

Overall, the students, teachers, and professor credited the pass rates to the lecture/workshop course format with 62% (N = 83) of students and 100% (N = 4) of instructors insisting that this practice remain unchanged with future cohorts. A common emergent theme is that students react differently when taught by a university professor as opposed to high school teachers only. Specifically, the fact that a college professor was teaching the course was exciting for the students and caused them to take the course more seriously from the onset.

Teacher 1, having experienced both configurations, compared the experiences and explained the different effect on students:

> I think the students started off taking the class a little more seriously last year when [the professor] was co-teaching with me. I don't want to say fear but for lack of a better word they were a little bit intimidated by her, which also made them take the class a little bit more seriously at the beginning. As this class progressed…where the students view me now and where they viewed [the professor] last year at this point is very similar. But like I said, the start was much better last year with [the professor].

Even though she had no control group to compare to, the professor also noticed that the students were intimidated during the first few weeks of school. She explained:

> The students both years were kind of afraid of me in the beginning so all questions filtered through the teachers and the teachers would then ask me what the students wanted to know. So the students definitely react differently to the teacher than to me. They communicate differently with the teacher than with me.

Although the students were not explicitly asked how they felt about having a professor teach their class, 37.5% (n = 56) who were in a class with the professor/teacher configuration discussed the professor in their responses. Twenty-one students provided this information in response to the questions: “What did you like BEST about MATH109?” and “What should be continued with future cohorts?” The most common response was that they loved having a professor come in and enjoyed the lectures.

When using an adjective in relation to the professor, the students used the term “excited” most frequently as opposed to the teachers’ and professor’s use of the term “intimidated.” In one such response, Student 2C5 explained, "I loved the fact that we had a professor come to our school to teach us; that makes it more exciting.” Further evidence of this was provided by Student 2C3 who reported, "The interaction with an actual college professor and knowing it was a college class made me try even harder." Whether the students were intimidated, excited or a combination of both, the presence of the professor impacted how the students felt about, and approached, the class.

Student Perceptions of College Readiness

Students in the SLAM Project reported a large shift in their self-perceptions of college readiness as a result of the program. At the onset of the program, 28% (N =83) deemed themselves college ready. After completing MATH 109, 92% felt prepared for college. The statistics illustrate the fact that there was a 64% increase in the number of students who perceived themselves as college ready based on their experiences in the course; however, this is a limited response to the research question. In all, 86% of students stated that their self-perception of as college ready changed upon completion of the course. The reason for this is that there were two types of perceptual changes: (1) those who thought they were ready but realized the class was more difficult than anticipated and, in hindsight, realized they were not ready prior to the class, and (2) those who changed from feeling not ready to feeling ready.

Misperceptions of College Readiness. All of the 28% of students who considered themselves college-ready prior to participating in the SLAM Project changed their perception after completing the course. The students in this group claimed that they had never previously felt challenged in math and assumed college-level math would be no different. One example was Student 3C20 who stated that prior to SLAM, “Yes, I did feel ready for college-level math classwork” but after completing the program said her perception changed “because throughout this semester I struggled in understanding some stuff that seemed very easy for other classmates.” The feeling described by this student was actually a design of the program. The professor was intentional in providing the students with the rigor of a college-level course. The professor explained:

> Some of the problems I chose I pulled out of a graduate level stats book I had so I went beyond to try to challenge them. Really have them get a taste of – you know that feeling when, as a student you feel like everyone understands but you. I think they really got to experience that a little bit when they thought, ‘Is everybody else understanding what they’re saying?’ and no, not everyone does.

Another important note about Student 3C20 is the fact that she did not pass MATH 109. Yet she was one of the students who felt college-ready prior to taking the class. She shared that before the SLAM Project, “I did feel ready for college-level math classwork due to the fact that I found [my] previous Algebra 2 class easy.” Despite failing the course, she claims that she feels more ready for college now after her experience in the class.

The realization that college coursework is more challenging than anticipated was echoed by all of the students who claimed to be strong in math from the onset. The sentiment provided by Student 1C7 was the common theme discussed by this subset of students. He admitted, “I thought that I was ready but when I started this class I saw that the math was very different and I started to struggle in math for the first time.” Students who had a similar experience also discussed surprise, shock, struggling and described statistics as “different.” It is important to note that the students who were surprised by the level of difficulty were not turned off by their struggle; instead, they realized what they needed to do in order to succeed in college. Student 1C7 explained, “I started to work harder…I learned it’s easier when you work together with friends.” His comment aligns with the teachers’ observations that the students began creating study groups after the mid-term exam. Further along these lines, the students realized they would have to become self-reliant to succeed. Student 3C22 reported, “I realized that it was up to me to look for help if I didn’t understand what was going on.” Students used words like independent, adult, and responsible to explain how their perceptions of themselves as college-ready had changed.

Changes from Not Ready to Ready. Conversely, more than two-thirds of students (67%) who did not perceive themselves as college-ready at the onset came into the program feeling insecure and left feeling confident. Student 3C25 shared, “I did not think I was ready. The main reason I was not confident was because I did not think I was smart enough in math.” Students with similar perceptions reported working hard and feeling proud with their success in the class. The student quoted above followed up by stating, “[my perception] has changed. I now feel like I could do well in college, especially in math.” This student earned the only A in year two of the program.

Change in Mathematical Practices

For mathematics, the Common Core State Standards has two components: the Common Core Content Standards – Math (CCCS-M) and eight Common Core Practice Standards – Math (CCPS-M). Since 2012, LAUSD’s focus has been explicitly on CCPS-M to help students develop and hone their mathematical practices.

Therefore, the SLAM Project’s pre- and post-tests measured students’ mathematical practices as defined by the CSULA professor (referred to as the SLAM Practice Standards). The SLAM Practice Standards consist of six practices that encompass all eight CCPS-M to varying degrees plus one additional practice (finding the correct solution). Based on the pre- and post-test, the SLAM students demonstrated an 64% aggregate increase in mathematical practices. The specific practices measured, and the students’ gain in practice, are as follows:

- Attempted Problems: Pre-test: 41%, Post-Test: 91%, Gain: 51%.
- Demonstrated Understanding: Pre-test: 24%, Post-Test: 76%, Gain: 52%.
- Tenacity in Problem Solving: Pre-test: 7%, Post-Test: 96%, Gain: 89%.
- Utilized Appropriate Tools: Pre-test: 12%, Post-Test: 70%, Gain: 58%.
- All Constraints Considered: Pre-test: 12%, Post-Test: 97%, Gain: 85%.
- Correct Answers: Pre-test: 8%, Post-Test: 69%, Gain: 61%.

Impact on STEM Majors

The SLAM Project is designed for students who would most likely place in math remediation when matriculating into college. These are students who have either demonstrated difficulty in math in grades 9-11 or those who may feel competent in math but have only completed Algebra 2 by the end of their junior year. The former group generally reports a plan to avoid mathematics coursework in the future and, as such, gravitates toward college majors without a math emphasis. The latter consider themselves good in math and are interested in pursuing STEM majors; however, these students report that they have not been previously challenged in math.

The research team was curious what impact, if any, the experience of a college-level math class would have on students' choice of major. Early findings show that 13% of students decided to change their major as a result of the SLAM Project. This result is based on survey data; the statistic may change when the students officially declare their majors. All eleven are students who began the program with a self-perceived weakness in mathematics but found a passion for the subject during the course.

For some students the change was slight, from an avoidance of math to openness to future math coursework. A subtle example was provided by Student 3C25 who reported, "I was going to avoid math classes in college but, since going through this course, I have seen that with more effort I can succeed in and understand college math." This shift in attitude was also noticed by Teacher 2 who shared that, "We actually have some students who said, 'you know, I might actually like to continue taking math after this class.'" A stronger shift in attitude came from Student 2C9 who exclaimed, "I am actually starting to want to pursue a statistics major! It would be cool because you can use stats in any job." Of the eleven students, 10 cited a desire to change to a major with a math emphasis. The new majors included engineering, mathematics, math education, and business with a math concentration (finance and accounting).

Future Directions

Scaling the SLAM project so that larger numbers of students will be served requires several key factors to come into alignment. LAUSD is the nation's second largest school district so scaling within the district as well as expansion into other school districts and CSUs would be beneficial and a desirable outcome. However, significant issues exist with both funding and implementation. Promising changes to the Pell Grant program may allow for use of these funds for concurrent enrollment programs. In addition, the question of the ability to support quality of instruction and student success with larger implementation remains a concern.

References

Alliance for Excellent Education. (2011). *Saving now and saving later: How high school reform can reduce the nation's wasted remediation dollars*. Retrieved from Washington, DC: http://www.all4ed.org/publication_material/IssueBrief/SavingNowSavingLaterRemediation

Baum, S., Ma, J., & Payea, K. (2010). *Education Pays 2010: The benefits of higher education for individuals and society*. Retrieved from New York, NY: http://trends.collegeboard.org/sites/default/files/education-pays-2010-full-report.pdf

Brown, R. S., & Niemi, D. N. (2007). Investigating the alignment of high school and community college assessments in California. *National Center for Public Policy in Higher*

Education. San Jose, CA.

Carnevale, A. P., Stephen, J. R., & Ban, C. (2011). *The college payoff: Education, occupation and lifetime earnings*. Retrieved from Washington, D.C.:

Cobb, G. W. (1993). Reconsidering statistics education: A national science foundation conference. *Journal of statistics education, 1*(1), 25.

Complete College America. (2012). *Remediation: Higher education's bridge to nowhere*. Retrieved from Washington, DC: http://www.completecollege.org/resources_and_reports/

Domina, T., & Ruzek, E. (2012). Paving the Way: K-16 Partnerships for Higher Education Diversity and High School Reform. *Educational Policy, 26*(2), 243-267. doi:10.1177/0895904810386586

Hogg, R. V. (1991). Statistical education: Improvements are badly needed. *The American Statistician, 45*(4), 342-343.

Johnson, H. P., Sengupta, R., & Murphy, P. J. (2009). *Closing the gap: Meeting California's need for college graduates* (9781582131344). Retrieved from http://www.ppic.org/main/publication.asp?i=835

Kena, G., Musu-Gillette, L., Robinson, J., Wang, X., Rathbun, A., Zhang, J., . . . Dunlop Velez, E. (2015). The condition of education 2015 (NCES 2015-144). US Department of Education. *National Center for Education Statistics. Washington, DC. Retrieved, 30*. Retrieved from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015144

Kirst, M. W., & Usdan, M. D. (2009). *The historical context of the divide between K–12 and higher education*. Retrieved from http://www.highereducation.org/reports/ssc/

Kuh, G. D. (2008). *High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter* Aac (Ed.)

Kurlaender, M., Jackson, J., & Howell, J. S. (2012). *K–12 postsecondary alignment and school accountability: Investigating high school responses to California's Early Assessment Program*. Retrieved from New York, NY:

Makar, K., & Ben-Zvi, D. (2011). The role of context in developing reasoning about informal statistical inference. *Mathematical Thinking and Learning, 13*(1-2), 1-4.

Matthews, D. (2015). *A stronger nation through higher education: Ten-year time horizon brings Goal 2025 into sharp focus*. Retrieved from Indianapolis, IN: http://www.luminafoundation.org/stronger_nation/

Scheaffer, R. L. (2001). Statistics education: Perusing the past, embracing the present, and charting the future. *Newsletter for the section on statistical education, 7*(1).

Scott-Clayton, J., Crosta, P. M., & Belfield, C. R. (2012). Improving the Targeting of Treatment Evidence From College Remediation. *Educational Evaluation and Policy Analysis, 36*(3), 371-393.

The California State University. (2014a). *Fall 2014 Final Regularly Admitted First-time Freshmen Remediation (Los Angeles)*. Retrieved from Long Beach: http://asd.calstate.edu/performance/remediation/14/Rem_LA_Fall2014.htm

The California State University. (2014b). *Fall 2014 Final Regularly Admitted First-time Freshmen Remediation (Systemwide)*. Retrieved from Long Beach: http://asd.calstate.edu/performance/remediation/14/Rem_Sys_Final_Fall2014.htm

Tierney, W. G., & Garcia, L. D. (2011). Remediation in higher education: The role of information. *American Behavioral Scientist, 55*(2), 102-120. doi:10.1177/0002764210381869

US Census Bureau. (2010). *USA QuickFacts*. Retrieved from http://quickfacts.census.gov/qfd/states/00000.html.

Willett, J. B., & Singer, J. D. (1992). Providing a StatisticalModel': Teaching Applied Statistics Using Real-World Data. *Statistics for the Twentyfirst Century, MAA Notes*(26), 83-98.