Effect of cohorts on student retention in engineering

Abstract

Project Succeed is a campus-wide initiative funded by the U.S. Department of Education. Its focus is to improve the 5-year graduation and retention rates and close the achievement gap for Under-Represented Minorities (URMs) across all majors at San José State University (SJSU). There are three major goals: strengthen SJSU's core academic performance in retention and graduation; provide an improved supportive environment for URM students; and enhance the delivery and integration of academic and co-curricular support services.

For Fall 2015, newly matriculated students in the College of Business, College of Engineering, and Child and Adolescent Development Department (CHAD) were assigned schedules that included at least two shared classes with other students in their declared majors. A total of 1,272 new freshmen (37%) of the class participated in the block scheduling program. The block scheduling approach had a significant difference in student retention among engineering freshmen as compared to previous years and led to more retention of freshmen after one year. For students in the College of Business, the one-year retention rate for Fall 2015 freshmen was 88% compared to 87.4% for Fall 2014 freshmen. For students in the College of Engineering, the one-year retention rate for Fall 2015 freshmen was 90% compared to 87.5% for Fall 2014 freshmen. For CHAD students, the one-year retention rate for Fall 2015 freshmen was 90.3% compared to 81.4% for Fall 2014 freshmen. There was also a difference in the retention of URM students. In this paper, we will discuss the techniques and strategies used in block scheduling the engineering students in Fall 2015 and Fall 2016. Also, we will discuss the results of student opinion of block scheduling.

Introduction

SJSU is the oldest campus in California State University (CSU) system. SJSU is a fully-accredited, public, comprehensive university offering bachelor's and master's degrees in 134 areas of study to more than 27,000 undergraduate and graduate students in seven colleges. SJSU is accredited by the Western Association of Schools and Colleges (WASC) and many different programs are accredited by program-specific accrediting agencies. As one of the 23 campuses within the CSU system, SJSU is a leader in high-quality, accessible, student-focused higher education.

The extraordinary diversity of Santa Clara County and the City of San José provide the primary context for our student body. The 1.8 million residents of Santa Clara County are 33% white, 35% Asian, 27% Latino/a, and 3% African American. The county has had a pluralist majority for many years, with more Asian and Latino/a immigrants than any other Bay Area county. The vast majority (70%) of SJSU's incoming freshmen class comes from the greater San Francisco Bay Area; this brings us a diverse student body each academic year.

Table 1. Fall 2015 Student Characteristics of SJSU Total Enrollment of 32,773 students (82% Undergraduate)

Asian	10,519	32.1%	5,635	4,884
Pacific Islander	115	0.4%	59	56
Hispanic	7,601	23.2%	3,429	4,172
Total Minority	19,291	58.9%	9,634	9,657
White	6,511	19.9%	3,380	3,131
Foreign	3,985	12.2%	2,177	1,808
Other/Decline to State	2,986	9.1%	1,556	1,430

SJSU is ranked ninth among universities in the Western United States in terms of ethnic diversity among colleges and universities conferring bachelor's and master's degrees [1]. In Fall 2015, 19,291 (58.9%) of the 32,773 SJSU students were from racial/ethnic minority groups. The largest ethnic group was Asians (32.1%), and the next largest groups were Latino/as (23.2%) and white students (19.9%). Figure 1 above summarizes SJSU's student characteristics as of Fall 2015.

SJSU ranks comparatively low against similar universities in terms of six-year graduation rates. The first-year retention rate for Fall 2013 was 86.4% for all SJSU students and 86.5% for SJSU engineering students. The six-year graduation rate was 48.1% for Fall 2010 engineering students and 56.1% for all Fall 2010 entering freshmen, which is less than comparable CSU campuses. While we have made great improvements in six-year graduation rates, not all students share the benefits of that progress. SJSU reported a six-year graduation rate of 56.8 percent in 2015, up nearly 10 percentage points in the last few years. The university's four-year graduation rates remain stubbornly low at 10 percent.

Graduation rates for underrepresented minority (URM – Black or African American, Hispanic/Latino and Native American) students are increasing at a slower rate than non-URM students, a national trend. SJSU's six-year graduation rates for URM students is 44 percent. Between 2003-2013, 77 percent of universities in the United States increased URM graduation rates, but only 45.7 percent were successful in decreasing the gap between URM and non-URM students, according to a report by the Education Trust [2] that reviewed more than 255 institutions.

The nation faces an imperative to produce an educated workforce accompanied by more than a trillion dollars in outstanding student loan debt that is often debilitating for those who do not complete college, SJSU is not alone in the quest to improve graduation rates. The CSU launched a system-wide Graduation Initiative in 2009 [3] to improve six-year graduation rates and reduce the gap between URM and non-URM student graduation rates. As the 2015 initiative wrapped up, the Chancellor's Office launched CSU Graduation Initiative 2025 with a student success dashboard to track progress of each campus system to increase six-year and four-year graduation rates, and decrease the attainment gap between URM and non-URM students.

To collect more information on our students, SJSU surveyed first-time freshmen who left SJSU

Our *Project Succeed* components are based on effective research practices developed at SJSU and other institutions. Our overarching theoretical model for student retention is based on Vincent Tinto's model [4]. Tinto's model posits student retention as a complex, multifaceted environment where students' background characteristics and educational goals all contribute to student engagement. According to this model, effective and positive interactions in college should increase the student's commitment, persistence and effort in college, and thereby, increase student retention.

SJSU's activities are comprised of four components: *Component 1: Implementing Block Scheduling; Component 2: Developing First-Year Experience Courses; Component 3: Expanding Mentoring Services; and Component 4: Institutionalizing Student Living Learning Communities*. Many of these components are inter-related and work in unison to meet our three overall goals: Goal 1. Strengthen SJSU's core academic performance in two key areas: retention and graduation, Goal 2. Providing campus supportive environment for underrepresented students, and Goal 3. Improve delivery and integration of academic and co-curricular support services for students to enhance student success and improve retention and graduation rates. This paper will discuss the implementation and results of *Component 1: Implementing Block Scheduling* for freshmen students in SJSU College of Engineering.

Component 1: Implementing Block Scheduling is designed to foster a sense of community among freshmen high-need students through the organization of students into student learning communities. We adapted the existing FYE block scheduling models from other institutions [5] to create close-knit communities among freshmen students that additionally satisfy GE requirements.

Review of the literature

Research shows that student learning communities (SLCs) lead to increased student engagement on campus and increased retention and graduation rates [6]. Many diverse students benefit from being placed in learning communities [7] with purposeful integration into the university environment [8]. For example, Georgia State University, found that students in a SLCs had higher GPAs and higher graduation rates than non-SLC students [9]. In a longitudinal study of thirteen two-year and six four-year institutions, Engstrom and Tinto [10] found that, across institutions, students who participated in SLCs were more engaged in the classroom, had higher freshmen to sophomore retention rates, earned more credits, and perceived greater encouragement and support on campus. For example, a program at Kingsborough Community College put freshmen into blocked cohorts with up to 25 fellow students who took three classes together in their first semester [11]. They found that the blocked students passed more courses and had more earned units than unblocked students. As a result, first-year students feel a sense of community and belonging to an institution with embedded peer activities and components throughout their academic pathway that motivates them to continue in college.

In general, there is more attrition in engineering than in non-STEM disciplines and engineering attrition generally happens in the first two years of enrollment [12]. Block scheduling has been tested at several engineering schools over the past two decades. At the University of Buffalo,

freshmen engineering students were registered into a block of classes with the same classmates. They found that blocked scheduling led to a higher retention rate [13]. At the University of Alabama, freshmen engineering students took their mathematics and science classes with the same group of students. Students participating in this program graduated from engineering disciplines in significantly higher numbers as compared to matched students with similar pre-college academic performances [14].

Methodology

At SJSU, all new freshmen attend a required orientation program. The segments of this program that provide basic academic advising and first semester course registration are managed by the

Because the prerequisite string and required knowledge base for Engineering is heavily math dependent, the 818 College of Engineering incoming freshmen were assigned to classes based on their math placement as determined by ACT or SAT math subscores, AP scores, the SJSU math placement exam, or previous college course completion by those in concurrent high school/community college enrollment programs. All students who were General Education math and English ready as defined by California State University Executive Order based on the aforementioned scores were provided with permission codes for specific sections of math, pre-calculus through calculus III levels. Half of these students were provided permission codes for Engineering 10, an *Introduction to Engineering* class, a major requirement class that also carries a General Education designation. Half of these students were assigned to a General Education public speaking class. Some students were grouped in cohorts to an additional General Education class, such as freshman composition. College of Engineering students who were assigned remedial status in math and/or English were assigned to the appropriate developmental class and a General Education public speaking class.

For the College of Business, the 391 incoming freshmen were provided permission codes for a business class, either the Money Matters class, a major requirement that also carries a General Education designation, or the Introduction to Leadership & Innovation class. They were also all assigned a General Education public speaking class. The 63 incoming freshmen for Child and Adolescent Development were assigned to a Child Development class, a major requirement that also carries a General Education designation, and a General Education public speaking class.

Some of the designated class sections had assigned Peer Mentors who met with the students during the first semester. In addition, for both the Engineering and Business, some students in those majors had chosen campus housing in learning communities dedicated to either Engineering or Business. Students in those groups were scheduled together in sub-cohorts and were also provided with Peer Mentors.

Fall 2016 was the second year we block scheduled all new freshmen in the College of Business, College of Engineering, and Child and Adolescent Development Department. For Fall 2016, freshmen from the Department of Music were added. A total of 956 new freshmen (29.8% of the incoming freshman class) participated in the block scheduling program. The classes chosen again followed the pattern of a class required in the major and another that fulfilled a General Education requirement, most often the foundational public speaking class. As much as possible, we used General Education classes that were major specific, such as the math requirement for Engineering or the Child Development for those in the Child and Adolescent Development major.

Based on our experience in Fall 2015, in Fall 2016 we block scheduled only 2 classes and focused on refining the block scheduling process. We deliberately wanted to balance the cohort experience with other students in the major with classes shared with students in other majors. We also chose not to create the entire schedule but to have some choice as to topic and schedule to the students and to provide them the opportunity to experience the registration system they would need to use in subsequent semesters. We registered students for the blocked classes and increased proactive communication with instructors regarding block scheduling, peer

mentors, etc. Preregistration was accomplished using the Block Enrollment function in Oracle/Peoplesoft, our student records management program. A service indicator was placed to allow additions to the schedule but prevent drops so that students could only change the schedule after consultation with an advisor.

Again students were block scheduled into one major class and one General Education class. Classes to be block scheduled were again chosen in consultation with the College Associate Dean (Business and Engineering) or Department Chair (CHAD and Music). For Engineering students, students in calculus or higher were placed into the appropriate math class and the Engineering 10 class. Those who placed into pre-calculus or lower in math were placed into the appropriate math class and the public speaking class. Business students who were General Education math ready were block scheduled into the Introduction to Leadership & Innovation class and either macro- or microeconomics. Any in remedial math status was scheduled into the appropriate math class and Introduction to Leadership & Innovation. Child and Adolescent Development majors were scheduled into Life Span Development in the 21st Century, a major class with a General Education designation, and the public speaking class, while Music majors were scheduled into Music in World Cultures, a major class with a General Education designation, and an additional General Education class.

Non-URM groups at SJSU include students who self-identified as White, Asian, or Not Specified. The gender breakdown was 33.8% female (430) and 66.2% male (842) of those in the blocked schedules as opposed to 54.5% female (1198) and 45.5% male (1000) of those not in blocked schedules. Gender breakdown for the entire freshman class was 46.9% female (1628) and 53.1% male (1842).The URM breakdown wa

after 2 semesters. 7 (2.7%) of Engineering students were disqualified.

The largest URM group at our institution is composed of students who self-identify as Hispanic, 923 of the 1143 students in the URM group (80.8%). This subgroup showed the greatest differences among the URM groups. 322 Hispanic students (34.9%) were in blocked schedules as opposed to 601 students (65.1%) who were in block scheduling. 274 (85.1%) of those in blocked schedules were retained at the end of the first year, while 467 (77.7%) of those not in blocked schedules returned for the second year. Hispanic students in the blocked group earned an average of 23.1 degree applicable units during the first year, and those not in the blocked group earned an average of 21.2 units. The difference in the number of Hispanic students in each group on academic probation at the end for the first year was also significant, with 25 (7.8%) of those in blocked schedules on probation and 65 (10.8%) of those not in blocked schedules on probation. The 217 Engineering students who self-identify as Hispanic showed similar results. 187 (86.2%) of these students were retained at the end of the first year, 5 (2.3%) were

after 1 year				
% Retention	90.0%	89.3%	85.4%	$p<.001$
SJSU units earned	25.1	24.8	23.1	$p<.001$
SJSU GPA	2.8144	2.8772	2.8999	$p<.149$
Probation	70	95	160	
% Probation	8.6%	7.5%	7.3%	$p<.421$
Disqualified	20	31	48	
% Disqualified	2.4%	2.4%	2.2%	$p<.317$

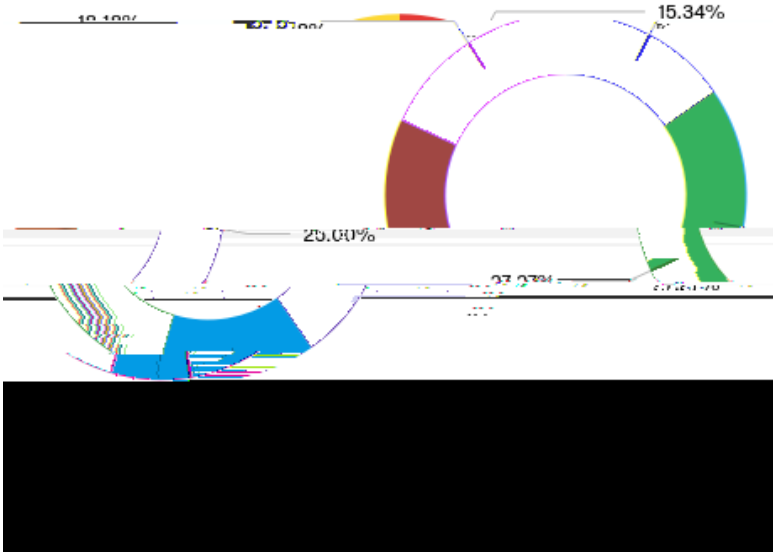
Block scheduling appeared to have a positive impact on the one-year retention of students at SJSU. In 2013 and 2014, the one-year retention of freshmen engineering students was 86.8% and 87.5%, respectively. For the Fall 2015 block scheduled freshmen engineering students, the one-year retention rate was 90%. For students in the College of Business, the one-year retention rate for Fall 2015 freshmen was 88% compared to 87.4% for Fall 2014 freshmen. For CHAD students, the one-year retention rate for Fall 2015 freshmen was 90.3% compared to 81.4% for Fall 2014 freshmen.

Block scheduling also appeared to have a positive impact on the percentage of students who earned 24 or more degree applicable units during the first year. 58% of the Fall 2015 block scheduled engineering freshmen earned 24 or more units during the first year, as compared to 51.2% of the Fall 2014 engineering freshmen. 59% of the the Fall 2015 block scheduled business freshmen earned 24 or more units during the first year, as compared to 51.5% of the Fall 2014 business freshmen.

We surveyed the Fall 2015 freshmen to determine their perspectives about block scheduling as well as the other *Project Succeed* initiatives. Three hundred forty (340) students initiated the survey. Of those 340 students who initiated the survey, 309 agreed to participate (91%). However, of those 309 students who agreed to participate, only 262 (85%) answered any survey questions beyond the initial question of consent. Thus, of the 340 who initiated the survey, only 77% responded to any of its items. 176 of the students who completed the survey were freshmen in the College of Engineering.

Survey results indicate that students generally had a positive appraisal of the block scheduling program. Over half of engineering students surveyed reported that they liked being in blocked scheduling, with an additional 22% as neutral about it. 85% of the freshmen engineering said they interacted with other students from their block at least once during the semester outside of class with 45% interacting with the blocked students either daily or weekly (see Figure 4). Most of the engineering students (61.93%) planned to keep in touch with the other engineering students in their block and 32% of the engineers students scheduled in Spring 2016 classes with other students from their block.

Figure 1. Responses of Engineering Freshmen to Survey Question: Outside of class, how much did you interact with any other students from your block?



Conclusion

By 2025, SJSU expects to meet the target of 57 percent for six-year graduation rates and 17 percent for four-year graduation rates, while reducing the achievement gap between URM and non-URM students to six percent or less. Ideally, university leaders have set goals of increasing six-year graduation rates to at least 60 percent, reducing time to degree, and ensuring that these benefits are shared by all students. Crucial to this plan is increasing the retention of freshmen at SJSU.

One-year retention data from our Fall 2015 freshmen indicate that block scheduling of engineering freshmen has a positive impact on student retention. This year (Fall 2016 freshmen), we have again block scheduled all freshmen in the College of Engineering. The results from this cohort will indicate whether block scheduling is truly one of the solutions for the retention issues at SJSU.

References

6 Astin, A. W. (1993). *What matters in college: Four critical years revisited.* San Francisco: Jossey-Bass; Kuh, G. D. et al. (2005). *Student success in college: Creating conditions that matter.*