



Supplemental Instruction: Patterns of Student Use and Impact on Course Grades, Academic Year 2011-2012

Gary Coyne, PhD
Interim Director of Evaluation and Assessment
Office of Undergraduate Education

Michaela Curran
Doctoral Student in Sociology
Office of Undergraduate Education

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Summary:

This report summarizes patterns of student use of Supplemental Instruction (SI) and the impact of use on student course grades during academic year 2011-12. About 15% of UCR undergraduates use SI each quarter and this group may be better academically prepared than those students who do not use SI; those who use SI as part of Learning Communities may be better prepared still. SI users can be categorized as (1) one time users, (2) those who use SI a few times per quarter and (3) those who use SI once a week or more. SI attendance generally has a positive and significant impact on course grades, although this is not always true for students who attend SI only once.

Introduction

The Supplemental Instruction (SI) program in the Academic Resource Center (ARC) provides students with additional coverage of course-specific material in study sessions outside of normally scheduled lectures and discussion sections. SI study sessions are offered for courses which, historically, have had high numbers of students earn D's, F's or withdrawal. Previous assessments of SI in the fall of 2006, 2007 and 2008 were generally positive (see <http://irue.ucr.edu/reports.html>).

Many SI sections are “open” with students free to attend as they see fit, although space is often a limiting factor and many SI sessions are full. SI is also part of learning communities (LCs) in the Bourns College of Engineering (BCoE) and the College of Natural and Agricultural Sciences (CNAS).

This report uses data from all three quarters of the 2011-12 academic year to address the following issues:

1. What is the demographic profile of students who attend SI?
2. What are the patterns of use by quarter, class and at the student level? Do LC students only attend SI session designated for their learning community?
3. Do students who attend SI session have higher course grades than students who do not?
4. How does the number of SI sessions attended affect course grades?

Data Sources

To answer these questions, this report draws on data from two main sources. Data on student characteristics and outcomes were collected from student enrollment data. Participation in SI was recorded through the ARC's AccuTrack system, which requires students to sign in before using ARC services. Data on LC participation came from both student data and the ARC.

Supplemental Instruction Attendees

Demographic characteristics for students who attended any SI session and those who did not are displayed in Tables 1A, 1B and 1C for the fall of 2011, winter of 2012 and spring of 2012, respectively.. Across all three quarters SI served 4,289 separate students; this represents approximately 24% of enrolled undergraduate students. Students in their first or second year at UCR make up about three quarters of all SI users. This is expected given that SI is largely offered for lower division courses and, in many cases, linked to first year LCs. Other demographic differences between SI and non-SI users are small. Asian students are somewhat overrepresented among users of SI; Hispanic students, and, in some quarters, Caucasian students are somewhat underrepresented. There are more first generation students and fewer low income students among users of SI. Figures in Tables 1A-C represent all UCR undergraduate students which makes significance testing less relevant. Students who attend SI have somewhat higher high school GPAs compared to students who do not. For the SI group, SAT Verbal and Writing scores are 10-15 points higher and SAT Math scores are about 25 points higher. These differences seem to indicate that SI students are academically better prepared for university study than those who do not participate in SI. Conversely, less academically prepared students may not be as willing or able to seek support services like SI.

Supplemental Instruction and Learning Communities

Both CNAS and BCoE integrate SI into Learning Communities (LCs). In LCs, incoming students are grouped together to take a common sequence of classes in their first year to promote a feeling of community and, thereby, academic success and retention. CNAS students participate in an advising seminar, take the CHEM001 sequence and appropriate mathematics courses as well as have mandatory SI sessions. In BCoE, students enroll in the same sections of math, science and introductory engineering courses, participate in mandatory SI sections and have the opportunity to live in Ingenuity Hall.

Tables 2A-C show the demographic differences between students who use SI as part of LC and those who do not. (The final two columns show all SI users.) Virtually all who use SI as part of a LC are freshman. More males participate in SI as part of LCs. This is attributable to the strong gender imbalance in BCoE, with more than four male students for every female student. The relatively larger share of females who use SI outside of LCs is, likewise, attributable to the demographic profile of CHASS, where about two-thirds of students are females. Note, CHASS also offers LCs; these courses do not have a SI component but students are able to participate in open SI sessions for courses outside their LC.

Members of LCs in BCoE and CNAS seem to be better academically prepared, as indicated by high school GPAs, SAT scores and quarterly GPAs. First generation and low income students make up about half of SI users both in and out of learning communities.

Patterns of Supplemental Instruction Use

Table 3 lists the courses for which SI was offered. SI was offered for 20 courses in the fall, 22 for the winter and 24 for the spring. Total visits and visits per class fell across the academic year, although this mirrors smaller total enrollments in the course for which SI was offered. Overall enrollment in SI-offered courses dropped from 10,142 in the fall to 9,876 in the winter and 7,921 in the spring. Across all three quarters, the classes for which SI is most often used are CHEM 001A, BIO 005A, CHEM 001B, CHEM 112B and CHEM 112A. Some of the courses with just a few visits in a particular quarter may be misreporting on the part of students, although Table 3 eliminated all obvious errors. Table A1 in the Appendix shows all SI sign-ins, whether or not the class the student signed-in for was actually being offered that quarter.

Figures 1 and 2 disaggregate patterns of use at the student level. Figure 1 shows use patterns for the SI users who attend for just one class. This group accounts for about three-quarters of all SI users (fall N=1,927; winter N=1,716; spring N=1,410). A significant share of these students (26%) attend just one SI session. Students that use SI only once are likely to visit to SI early in the quarter, but as Table 4 shows, a quarter or more of these students visit SI during Week 7 or later. According to Figure 1, 41% of students attend heavily, more than once a week, as opposed to 33% of students who attend less regularly, between 2 and 9 times each quarter. Among the smaller number of students who attend for more than one course (fall, N=481; winter, N=457; spring, N=459) shown in Figure 2, most are attending a fairly large total number of SI sections. About one-third (34%) are attending between 10 and 20 sections and 28% are going to more than 20 sessions per quarter. Most of the students in this group are attending for two courses, but some report three or more. A handful of very large values, more than 30 visits per quarter, were almost certainly driven by inaccurate student reporting and were excluded from analysis; misreporting may still be an issue with some of the higher values here.

Those who use SI heavily, more than once a week, by and large, are part of a LC. For these students, SI meetings are integrated into a larger set of activities focused on promoting academic success. In the fall and winter, the most common number of SI visits for LC members was 18 and for the spring, the most common was 20. Across the three quarters, 85-95% of those who attend more than ten SI meetings are part of the BCoE or CNAS LCs. Members of LCs use open SI courses as well. As Table 5 shows, while the majority of BCoE or CNAS LC members attend only the SI sessions designated for their courses, 15% to 30% attend open SI meetings each quarter.

Impact of Supplemental Instruction Attendance on Course Grades

The impact of SI on grades is assessed in three ways. For all analyses, we match course-specific SI visits to course-specific grades. For analyses in Tables 6 and 7 students were matched by college, class level and high school GPA to better isolate the effect of attending SI. Note, this means a smaller sample for these analyses as the data from students for which no match could be found were not used. Additionally, SI courses with less than 40 students total were not used.

First, Tables 6A-C show the impact of attending SI versus not attending SI for matched students in each course offered over all three quarters. SI appears, by and large, to have a positive impact on grades. For about two-thirds of classes, the group of students who used SI has a higher course grade than those who did not. For 24 of 56 classes, the difference in grades is significant. Moreover, the average difference for all (matched) students in each of the three quarters is significant, with SI students scoring 0.23 grade points higher.

With regards to particular courses, it is noteworthy that for BCH 100, CHEM001A, CHEM001B, CHEM 112C, ECON002 and PHYS002A SI students scored significantly better in more than one quarter. With the exception of ECON 002 and ECON 003, all classes for which SI significantly improves grades are in math and the sciences. Surprisingly students who participated in SI for MATH 004 in the fall of 2011 scored significantly *lower* than students who did not. These findings warrant further investigation.¹

A second line of analysis focuses on the frequency of attendance. Recall that patterns of use largely fell into four categories: those that never used SI, students that attended SI once, students that attended between two and nine times and students that attended 10 or more times. Tables 7A-C show the difference in mean course grades for comparisons between these groups. Significance was assessed with t-tests and where differences in group means were significant at the $p \leq 0.05$ level (two tail test) and this is marked with an asterisk (*). So, for example, in the top left cell of Table 7A we see that the group of students who attended SI once during the fall of 2011 scored 0.07 points higher than students who never attended SI, although this difference is not significant. With the partial exception of the comparison between one time users and those that do not use SI at all, groups that use SI more tend to have higher course grades than groups who attend SI less. As another example, in the fall of 2011 the difference in course grade between those who use SI once a quarter (second column) and those that use SI once a week (fourth row) is 0.46 grade points and is significant. The difference between those that use SI heavily and those who do not attend SI or attend SI only once is always significant and consistently 0.50 points higher, or more than half a letter grade. This is particularly noteworthy given that, because of matching, these comparisons involve students at the same class level, in the same college and with similar high school GPAs.

Tables 7A-C also compare those who use SI as part of LC and those that attend open sessions of SI. Both groups have higher course-grades, although the difference is somewhat larger for the LC group.

Finally, the impact of frequency of SI attendance is assessed with regression techniques. This has the advantage of allowing us to treat SI attendance as a continuous variable, while controlling for a number of factors and without the matching procedure constraining sample size. The data here, however, present modeling challenges and an ordered logistical regression is employed to deal with these difficulties. Because this is a less common technique, details are discussed in the Table A2 in the appendix. The results of the regression models show attending SI more often has a positive impact on course-specific grade, controlling for ethnicity, sex, class standing, low income status and being a first generation college student. This line of analysis arrives at fundamentally the same conclusion: SI participation has a positive impact on grades.

Discussion

SI has a positive impact on grades across a number of courses, both for students in and out of LCs. Results indicate heavy and occasional users are very likely to see benefits, although one time users are less likely to see impacts on course grades.

These analyses indicate that SI seems to be serving three distinct groups. First, there are freshman who attend SI more than once a week and are members of LCs in CNAS and BCoE. The Chemistry and

¹ SI users for MATH004 score higher in other quarters (although not significantly so) and those who use SI for other Math courses also score higher than those who do not (with some of the differences being significant). In the fall of 2011, preliminary analysis indicates students who utilized SI for this course may be less well prepared for college level math (as indicated by lower SAT math scores) than those who did not.

Biology classes which are part of LCs in these colleges account for a large share of all SI visits. Second, there are students who use SI a few times a quarter. Third, there are students who use SI one time or infrequently. The nature of courses where SI is offered means that most of the students in the second and third categories come primarily from CNAS, but students from CHASS and BCoE are also part of this group. As currently delivered, the benefits of SI are heavily concentrated in the sciences.

Math courses accounted for about a third of all SI course offerings, with mixed results regarding SI impact on course-specific grades (see Tables 6A-C). Many students report that the MATH008 and MATH009 sequences are not only difficult but, because they are necessary for majors in CNAS and BCoE, can also constitute a barrier to selecting major or future career plans. These considerations, and the fact that these courses are integrated into a sequence, suggests a more focused look at SI support being offered for Math classes not embedded in existing learning communities.

In general, these findings suggest that students who do not currently participate in SI would likely benefit from doing so. In terms of outreach, the demographic analysis presented in Tables 1A-C showed that students who identify as Hispanic are underrepresented among SI users. Cooperation with organizations that represent and serve this group would be one way to raise awareness of the existence and benefits of SI. The SI program is, for the most part, used by first and second year students and it might be useful to explore the possibility of extending SI support to upper-division courses. At the same time, a student's grades in their first few quarters are a powerful predictor of student success and, ultimately, retention and graduation. Working to increase the number of freshman students who attend SI for classes where many students have historically earned Ds and Fs can pay dividends in future student success. Finally, findings with regards to students who participate in SI as part of a LC suggest that SI may be particularly effective when embedded in a larger set of activities oriented to student success. Expanding the number of LCs in CNAS and BCoE that provide SI as well as expanding LCs with a SI component into CHASS (e.g.: Pre-Business majors) would be ways to promote student success.

From the point of view of administering the SI program, experience suggests other ways to increase the impact of SI. First, giving students the opportunity to participate in SI shortly after material has been covered in lecture facilitates student learning and retention. However, limited room availability means scheduling SI sessions at times that are convenient for students can be challenging. These preferred times include the daytime hours when most students are on campus and times that do not conflict with lecture, discussion, or office hours. Greater collaboration with the colleges might facilitate the identification of suitable classroom space. Second, well prepared SI leaders are critical for the success of the students using SI. This is partly a matter of selection and training, but it is also important for ARC staff to sit in on SI sessions to provide feedback to SI leaders. For this reason we consider it essential that a strong appointment be made for an assistant director of SI. Working with Director Ali Saadat, the assistant director will visit SI classes and provide feedback on instructional practices to SI leaders. Third, SI has more impact when participating faculty members collaborate closely with the ARC staff members who run the program. Close cooperation between faculty and ARC staff can significantly increase the impact of SI at little to no cost.

Table 1A: SI Students vs. Non-SI Students, Fall 2011

| Academic Chars | Student Attended SI | | Student Did Not Attend SI | |
|-----------------------|---------------------|----------|---------------------------|----------|
| | Mean (Std. Dev.) | N | Mean (Std. Dev.) | N |
| High School GPA | 3.59 (0.33) | 2,331 | 3.47 (0.35) | 13,489 |
| SAT Verbal | 519.11 (81.78) | 2,308 | 510.76 (83.94) | 13,546 |
| SAT Math | 571.07 (90.67) | 2,308 | 543.52 (95.61) | 13,546 |
| SAT Writing | 527.85 (83.80) | 2,301 | 514.28 (81.00) | 13,325 |
| Fall 2011 Cum GPA | 2.90 (0.60) | 2,436 | 2.81 (0.56) | 16,176 |
| Fall 2011 Current GPA | 2.84 (0.73) | 2,425 | 2.83 (0.74) | 15,792 |
| Demographics | % | N | % | N |
| Female | 50.74 | 1,241 | 52.23 | 8,456 |
| Male | 49.26 | 1,205 | 47.77 | 7,734 |
| Hispanic | 30.11 | 737 | 33.38 | 5,423 |
| Asian | 48.33 | 1,183 | 38.70 | 6,287 |
| Caucasian | 11.97 | 293 | 16.16 | 2,626 |
| African American | 7.11 | 174 | 7.50 | 1,218 |
| Native American | 0.29 | 7 | 0.42 | 69 |
| Unknown/Other | 2.21 | 54 | 3.83 | 623 |
| Freshman | 52.41 | 1,283 | 21.50 | 3,493 |
| Sophomore | 26.10 | 639 | 21.09 | 3,427 |
| Junior | 15.89 | 389 | 28.38 | 4,611 |
| Senior ² | 5.35 | 131 | 28.53 | 4,635 |
| BCoE | 21.94 | 537 | 9.85 | 1,601 |
| CNAS | 58.09 | 1,422 | 20.02 | 3,253 |
| CHASS | 19.28 | 472 | 62.96 | 10,228 |
| SoBA | 0.49 | 12 | 7.16 | 1,164 |
| First Generation | 50.37 | 1,233 | 54.28 | 8,818 |
| Not First Generation | 49.63 | 1,215 | 45.72 | 7,427 |
| Low Income | 52.94 | 1,296 | 49.43 | 8,030 |
| Not Low Income | 47.06 | 1,152 | 50.57 | 8,215 |

² Records indicate six students working on a degree other than their first bachelors also participated in SI.

Table 1B: SI Students vs. Non-SI Students, Winter 2012

| Academic Chars | Student Attended SI | | Student Did Not Attend SI | |
|-------------------------|---------------------|----------|---------------------------|----------|
| | Mean (Std. Dev.) | N | Mean (Std. Dev.) | N |
| High School GPA | 3.60 (0.32) | 2,085 | 3.47 (0.35) | 13,149 |
| SAT Verbal | 517.76 (81.49) | 2,061 | 511.25 (83.94) | 13,197 |
| SAT Math | 569.18 (91.52) | 2,061 | 544.45 (95.51) | 13,197 |
| SAT Writing | 527.96 (83.16) | 2,059 | 514.62 (81.12) | 12,998 |
| Winter 2012 Cum GPA | 2.89 (0.55) | 2,188 | 2.83 (0.54) | 15,684 |
| Winter 2012 Current GPA | 2.84 (0.71) | 2,174 | 2.86 (0.73) | 15,283 |
| Demographics | % | N | % | N |
| Female | 52.52 | 1,155 | 52.22 | 8,171 |
| Male | 47.48 | 1,044 | 47.78 | 7,476 |
| Hispanic | 30.74 | 676 | 33.37 | 5,240 |
| Asian | 47.07 | 1,035 | 39.05 | 6,133 |
| Caucasian | 12.46 | 274 | 16.00 | 2,513 |
| African American | 7.28 | 160 | 7.47 | 1,173 |
| Native American | 0.23 | 5 | 0.43 | 67 |
| Unknown/Other | 2.23 | 49 | 3.68 | 578 |
| Freshman | 43.97 | 967 | 15.80 | 2,481 |
| Sophomore | 35.74 | 786 | 21.17 | 3,324 |
| Junior | 14.14 | 311 | 28.70 | 4,507 |
| Senior ³ | 5.68 | 125 | 33.93 | 5,328 |
| BCoE | 20.19 | 444 | 9.95 | 1,562 |
| CNAS | 57.75 | 1,270 | 18.63 | 2,925 |
| CHASS | 21.24 | 467 | 63.81 | 10,021 |
| SoBA | 0.36 | 8 | 7.62 | 1,196 |
| First Generation | 51.16 | 1,125 | 45.70 | 7,177 |
| Not First Generation | 48.84 | 1,074 | 54.30 | 8,526 |
| Low Income | 51.71 | 1,137 | 49.77 | 7,816 |
| Not Low Income | 48.29 | 1,062 | 50.23 | 7,887 |

³ Records indicate ten students working on a degree other than their first bachelors also participated in SI.

Table 1C: SI Students vs. Non-SI Students, Spring 2012

| Academic Chars | Student Attended SI | | Student Did Not Attend SI | |
|-----------------------------------|---------------------|----------|---------------------------|----------|
| | Mean (Std. Dev.) | N | Mean (Std. Dev.) | N |
| High School GPA | 3.60 (0.33) | 1,798 | 3.48 (0.35) | 12,827 |
| SAT Verbal | 520.45 (79.69) | 1,782 | 511.28 (83.99) | 12,846 |
| SAT Math | 568.37 (89.54) | 1,782 | 544.73 (95.96) | 12,846 |
| SAT Writing | 530.37 (83.27) | 1,781 | 514.89 (80.91) | 12,846 |
| Spring 2012 Cum GPA | 2.90 (0.49) | 1,884 | 2.85 (0.52) | 15,193 |
| Spring 2012 Current GPA | 2.78 (0.69) | 1,874 | 2.89 (0.74) | 14,856 |
| Demographics | % | N | % | N |
| Female | 52.23 | 984 | 52.41 | 7,938 |
| Male | 47.77 | 900 | 47.59 | 7,209 |
| Hispanic | 28.05 | 529 | 33.65 | 5,113 |
| Asian | 49.73 | 938 | 38.88 | 5,908 |
| Caucasian | 15.57 | 237 | 15.81 | 2,403 |
| African American | 7.42 | 140 | 7.57 | 1,150 |
| Native American | 0.27 | 5 | 0.40 | 61 |
| Unknown/Other | 1.96 | 37 | 3.69 | 561 |
| Freshman | 29.06 | 548 | 13.11 | 1,992 |
| Sophomore | 45.02 | 849 | 20.13 | 3,059 |
| Junior | 19.14 | 361 | 27.37 | 4,159 |
| Senior ⁴ | 6.73 | 127 | 39.02 | 5,929 |
| BCoE | 17.87 | 337 | 10.22 | 1,553 |
| CNAS | 61.29 | 1,156 | 18.62 | 2,829 |
| CHASS | 20.63 | 389 | 62.60 | 9,513 |
| SoBA | 0.16 | 3 | 8.56 | 1,301 |
| First Generation | -- | -- | -- | -- |
| Not First Generation ⁵ | -- | -- | -- | -- |
| Low Income | -- | -- | -- | -- |
| Not Low Income ⁶ | -- | -- | -- | -- |

⁴ Records indicate one students working on a degree other than their first bachelors participated in SI.

⁵ The data needed to determine if a particular student is a first generation college student or meets the definition of low income was not properly recorded for the spring of 2012 and thus this information could not be presented.

⁶ See note 5.

Table 2A: Background Characteristics of SI Attendees, Fall 2011

| Academic Chars | Non-LC SI | | LC SI | | Overall | |
|------------------------------|-------------------|----------|-------------------|----------|-------------------|----------|
| | Mean (SD) | N | Mean (SD) | N | Mean (SD) | N |
| High School GPA | 3.55 (0.34) | 1,445 | 3.66 (0.29) | 886 | 3.59 (0.33) | 2,331 |
| SAT Verbal | 507.24 (78.64) | 1,431 | 538.48 (83.15) | 877 | 519.11 (81.78) | 2,308 |
| SAT Math | 550.31 (89.04) | 1,431 | 604.93 (82.82) | 877 | 571.07 (90.67) | 2,308 |
| SAT Writing | 517.79 (81.05) | 1,425 | 544.22 (85.63) | 876 | 527.85 (83.80) | 2,301 |
| | | | | | | |
| Fall 2011 Cum GPA | 2.87 (0.55) | 1,546 | 2.95 (0.67) | 890 | 2.90 (0.60) | 2,436 |
| Fall 2011 Current GPA | 2.77 (0.75) | 1,538 | 2.94 (0.68) | 887 | 2.84 (0.73) | 2,425 |
| Demographics | % | N | % | N | % | N |
| Female | 56.21 | 873 | 41.21 | 368 | 50.74 | 1,241 |
| Male | 43.79 | 680 | 58.79 | 525 | 49.26 | 1,205 |
| | | | | | | |
| Hispanic | 29.32 | 456 | 31.47 | 281 | 30.11 | 737 |
| Asian | 47.33 | 736 | 50.06 | 447 | 48.33 | 1,183 |
| Caucasian | 11.90 | 185 | 12.09 | 108 | 11.97 | 293 |
| African American | 8.49 | 132 | 4.70 | 42 | 7.11 | 174 |
| Native American | 0.32 | 5 | 0.22 | 2 | 0.29 | 7 |
| Unknown/Other | 2.63 | 41 | 1.46 | 13 | 2.21 | 54 |
| | | | | | | |
| Freshmen | 28.08 | 435 | 94.96 | 848 | 52.54 | 1,283 |
| Sophomore | 38.35 | 594 | 5.04 | 45 | 26.17 | 639 |
| Junior | 25.11 | 389 | 0.00 | 0.00 | 15.93 | 389 |
| Senior⁷ | 8.46 | 131 | 0.00 | 0.00 | 5.36 | 131 |
| | | | | | | |
| BCoE | 12.77 | 198 | 37.96 | 339 | 21.98 | 537 |
| CNAS | 56.13 | 870 | 61.81 | 552 | 58.21 | 1,422 |
| CHASS | 30.32 | 470 | 0.22 | 2 | 19.32 | 472 |
| SoBA | 0.77 | 12 | 0.00 | 0.00 | 0.49 | 12 |
| | | | | | | |
| First Generation | 49.20 | 765 | 52.41 | 468 | 50.37 | 1,233 |
| Not First Gen | 50.80 | 790 | 47.59 | 425 | 49.63 | 1,215 |
| | | | | | | |
| Low Income | 53.18 | 827 | 52.52 | 469 | 52.94 | 1,296 |
| Not Low Income | 46.82 | 728 | 47.48 | 424 | 47.06 | 1,152 |

⁷ Records indicate six students working on degrees other than their first bachelors also participated in SI.

Table 2B: Background Characteristics of SI Attendees, Winter 2012

| Academic Chars | Non-LC SI | | LC SI | | Overall | |
|--------------------------------|-------------------|----------|-------------------|----------|-------------------|----------|
| | Mean (SD) | N | Mean (SD) | N | Mean (SD) | N |
| High School GPA | 3.57 (0.33) | 1,321 | 3.66 (0.30) | 764 | 3.60 (0.32) | 2,085 |
| SAT Verbal | 505.79 (78.55) | 1,304 | 538.39 (82.38) | 757 | 517.76 (81.49) | 2,061 |
| SAT Math | 547.99 (89.17) | 1,304 | 605.68 (83.71) | 757 | 569.18 (91.52) | 2,061 |
| SAT Writing | 518.13 (79.77) | 1,303 | 544.89 (86.17) | 756 | 527.96 (83.16) | 2,059 |
| Winter 2012 Cum GPA | 2.86 (0.51) | 1,417 | 2.93 (0.60) | 771 | 2.89 (0.55) | 2,188 |
| Winter 2012 Current GPA | 2.86 (0.70) | 1,404 | 2.80 (0.74) | 770 | 2.84 (0.71) | 2,174 |
| Demographics | % | N | % | N | % | N |
| Female | 58.47 | 835 | 41.50 | 320 | 52.52 | 1,155 |
| Male | 41.53 | 593 | 58.50 | 451 | 47.48 | 1,044 |
| Hispanic | 31.16 | 445 | 29.96 | 231 | 30.74 | 676 |
| Asian | 44.75 | 639 | 51.36 | 396 | 47.07 | 1,035 |
| Caucasian | 12.32 | 176 | 12.71 | 98 | 12.46 | 274 |
| African American | 8.89 | 127 | 4.28 | 33 | 7.28 | 160 |
| Native American | 0.21 | 3 | 0.26 | 2 | 0.23 | 5 |
| Unknown/Other | 2.66 | 38 | 1.43 | 11 | 2.23 | 49 |
| Freshmen | 23.13 | 328 | 82.88 | 639 | 44.18 | 967 |
| Sophomore | 46.19 | 655 | 16.99 | 131 | 35.91 | 786 |
| Junior | 21.86 | 310 | 0.13 | 1 | 14.21 | 311 |
| Senior⁸ | 8.82 | 125 | 0.00 | 0.00 | 5.71 | 125 |
| BCoE | 11.92 | 169 | 35.67 | 275 | 20.28 | 444 |
| CNAS | 54.87 | 778 | 63.81 | 492 | 58.02 | 1,270 |
| CHASS | 32.65 | 463 | 0.52 | 4 | 21.33 | 467 |
| SoBA | 0.56 | 8 | 0.00 | 0.00 | 0.37 | 8 |
| First Generation | 50.56 | 722 | 52.27 | 403 | 51.16 | 1,125 |
| Not First Gen | 49.44 | 706 | 47.73 | 368 | 48.84 | 1,074 |
| Low Income | 51.75 | 739 | 51.62 | 398 | 51.71 | 1,137 |
| Not Low Income | 48.25 | 689 | 48.38 | 373 | 48.29 | 1,062 |

⁸ Records indicate ten students working on degrees other than their first bachelors also participated in SI.

Table 2C: Background Characteristics of SI Attendees, Spring 2012

| Academic Chars | Non-LC SI | | LC SI | | Overall | |
|------------------------------------|-------------------|----------|-------------------|----------|-------------------|----------|
| | Mean (SD) | N | Mean (SD) | N | Mean (SD) | N |
| High School GPA | 3.56 (0.33) | 1,228 | 3.67 (0.30) | 570 | 3.60 (0.33) | 1,798 |
| SAT Verbal | 508.77 (76.43) | 1,216 | 545.55 (80.82) | 566 | 520.45 (79.69) | 1,782 |
| SAT Math | 549.85 (86.23) | 1,216 | 608.16 (83.43) | 566 | 568.37 (89.54) | 1,782 |
| SAT Writing | 521.00 (79.04) | 1,216 | 549.58 (91.37) | 566 | 530.07 (84.19) | 1,782 |
| Spring 2012 Cum GPA | 2.85 (0.47) | 1,311 | 3.01 (0.51) | 573 | 2.90 (0.49) | 1,884 |
| Spring 2012 Current GPA | 2.75 (0.70) | 1,303 | 2.87 (0.68) | 571 | 2.79 (0.69) | 1,874 |
| Demographics | % | N | % | N | % | N |
| Female | 56.22 | 737 | 43.11 | 247 | 52.23 | 984 |
| Male | 43.78 | 574 | 56.89 | 326 | 47.77 | 900 |
| Hispanic | 28.64 | 376 | 26.70 | 153 | 28.05 | 529 |
| Asian | 47.83 | 628 | 54.10 | 310 | 49.73 | 938 |
| Caucasian | 12.03 | 158 | 13.79 | 79 | 12.57 | 237 |
| African American | 9.06 | 119 | 3.66 | 21 | 7.42 | 140 |
| Native American | 0.30 | 4 | 0.17 | 1 | 0.27 | 5 |
| Unknown/Other | 2.13 | 28 | 1.57 | 9 | 1.96 | 37 |
| Freshmen | 18.29 | 240 | 53.75 | 308 | 29.07 | 548 |
| Sophomore | 44.97 | 590 | 45.20 | 259 | 45.04 | 849 |
| Junior | 27.06 | 355 | 1.05 | 6 | 19.15 | 361 |
| Senior⁹ | 9.68 | 127 | 0.00 | 0.00 | 6.74 | 127 |
| BCoE | 12.88 | 169 | 29.32 | 168 | 17.88 | 337 |
| CNAS | 57.24 | 751 | 70.68 | 405 | 61.33 | 1,156 |
| CHASS | 29.65 | 389 | 0.00 | 0.00 | 20.64 | 389 |
| SoBA | 0.23 | 3 | 0.00 | 0.00 | 0.16 | 3 |
| First Generation | -- | -- | -- | -- | -- | -- |
| Not First Gen¹⁰ | -- | -- | -- | -- | -- | -- |
| Low Income | -- | -- | -- | -- | -- | -- |
| Not Low Income¹¹ | -- | -- | -- | -- | -- | -- |

⁹ Records indicate one student working on a degree other than their first bachelor also participated in SI.

¹⁰ The data needed to determine if a particular student is a first generation college student or meets the definition of low income was not properly recorded for the spring of 2012 and thus this information could not be presented.

¹¹ See note 9.

Table 3: Supplemental Instruction Sign-Ins, Fall 2011-Spring 2012

| Course | All Quarters | | Fall 2011 | | Winter 2012 | | Spring 2012 | |
|--------------------------|--------------|-------|-----------|-------|-------------|-------|-------------|--|
| | Sign-In | % | Sign-In | % | Sign-In | % | Sign-In | |
| CHEM 001A | 1,023 | 24.89 | 757 | 9.51 | 260 | 0.25 | 6 | |
| BIO 005A | 721 | 5.79 | 176 | 19.93 | 545 | | | |
| CHEM 001B | 606 | | | 12.69 | 347 | 10.58 | 259 | |
| CHEM 112B | 535 | | | 8.92 | 244 | 11.89 | 291 | |
| CHEM 112A | 516 | 9.01 | 274 | 8.85 | 242 | | | |
| BIO 005B | 431 | | | 0.04 | 1 | 17.57 | 430 | |
| BCH 100 | 396 | 5.29 | 161 | 3.73 | 102 | 5.43 | 133 | |
| CHEM 001C | 374 | 3.65 | 111 | | | 10.74 | 263 | |
| PHYS 002A | 352 | 5.79 | 176 | | | 7.19 | 176 | |
| ECON 002 | 336 | 5.39 | 164 | 3.69 | 101 | 2.90 | 71 | |
| MATH 009B | 297 | 3.72 | 113 | 2.49 | 68 | 4.74 | 116 | |
| CHEM 112C | 263 | 3.58 | 109 | | | 6.29 | 154 | |
| CS 010 | 257 | 3.85 | 117 | 3.80 | 104 | 1.47 | 36 | |
| MATH 009C | 240 | 3.32 | 101 | 2.56 | 70 | 2.82 | 69 | |
| ECON 003 | 227 | 2.24 | 68 | 3.47 | 95 | 2.61 | 64 | |
| MATH 008A | 202 | 4.67 | 142 | 2.12 | 58 | 0.08 | 2 | |
| MATH 009A | 176 | 3.35 | 102 | 1.76 | 48 | 1.06 | 26 | |
| PHYS 002B | 176 | 2.04 | 62 | 4.13 | 113 | 0.04 | 1 | |
| PHYS 002C | 149 | | | 1.28 | 35 | 4.66 | 114 | |
| BIO 005C | 147 | 4.83 | 147 | | | | | |
| MATH 004 | 145 | 1.84 | 56 | 1.32 | 36 | 2.17 | 53 | |
| MATH 008B | 141 | 1.15 | 35 | 2.63 | 72 | 1.39 | 34 | |
| MATH 005 | 127 | 4.18 | 127 | | | | | |
| PHYS 040A | 104 | | | 3.73 | 102 | 0.08 | 2 | |
| CS 012 | 92 | | | 2.52 | 69 | 0.94 | 23 | |
| MATH 022 | 85 | 1.41 | 43 | 0.80 | 22 | 0.82 | 20 | |
| PHYS 040B | 62 | | | 0.04 | 1 | 2.49 | 61 | |
| CS 014 | 39 | | | | | 1.59 | 39 | |
| Total Visits | 8,219 | 100.0 | 3,041 | 100.0 | 2,735 | 100.0 | 2,448 | |
| Visits Per Course | 294 | | 152 | | 124 | | 106 | |

Figure 1: Number of SI visits for students who attended only one SI course

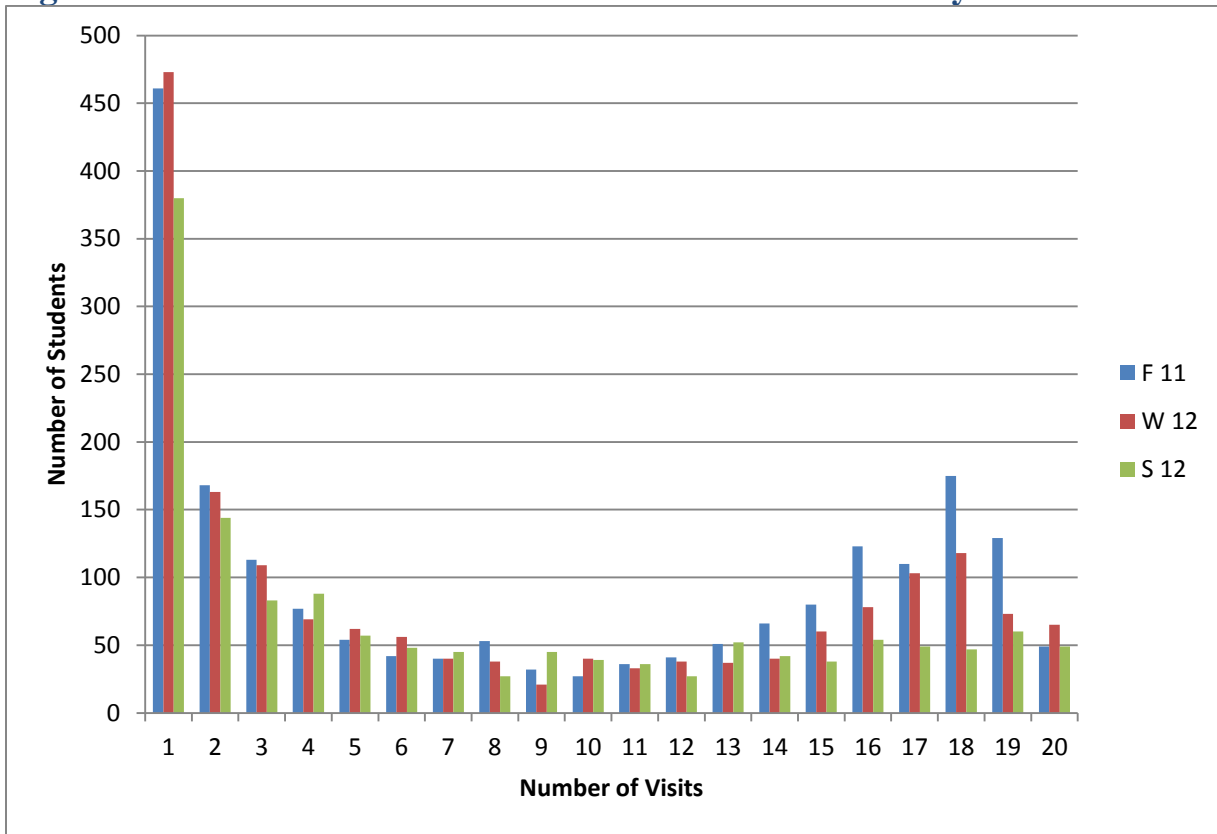


Figure 2: Number of SI visits for students who attended more than one SI course

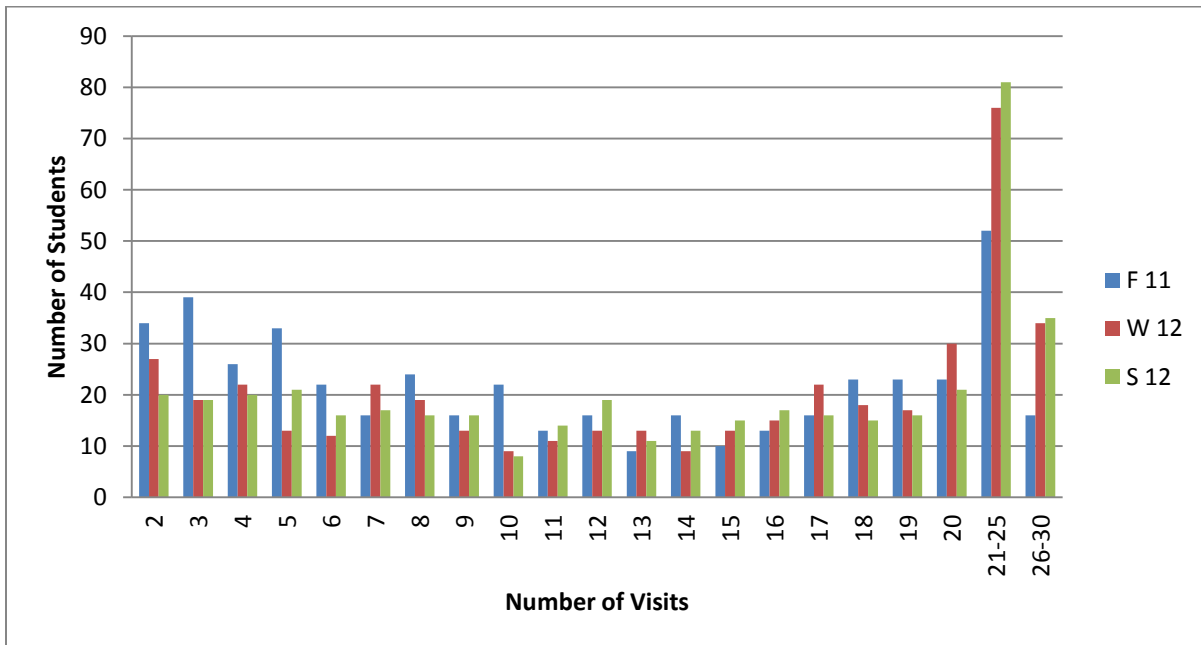


Table 4: Week of Visit for Students who visited SI only once

| Week | Fall 2011 | | Winter 2012 | | Spring 2012 | |
|--------------|-----------|----|-------------|----|-------------|----|
| | % | N | % | N | % | N |
| Week 0 and 1 | 20.60 | 95 | 2.54 | 12 | 16.58 | 63 |
| Week 2 | 15.84 | 73 | 12.26 | 58 | 16.32 | 62 |
| Week 3 | 17.79 | 82 | 10.99 | 52 | 16.05 | 61 |
| Week 4 | 12.58 | 58 | 12.47 | 59 | 13.68 | 52 |
| Week 5 | 4.56 | 21 | 12.47 | 59 | 4.74 | 18 |
| Week 6 | 4.12 | 19 | 15.43 | 73 | 6.05 | 23 |
| Week 7 | 4.56 | 21 | 5.07 | 24 | 5.26 | 20 |
| Week 8 | 8.68 | 40 | 8.25 | 39 | 4.74 | 18 |
| Week 9 | 1.74 | 8 | 6.98 | 33 | 6.32 | 24 |
| Week 10 | 9.54 | 44 | 5.07 | 24 | 10.26 | 39 |
| Week 11 | -- | -- | 8.46 | 40 | -- | -- |

Table 5: Overlap of BCoE and CNAS learning community SI use and “open” SI, BCoE and CNAS LC students only

| | Fall 2011 | | Winter 2012 | | Spring 2012 | |
|---------------------|-----------|-------|-------------|-------|-------------|-----|
| | % | N | % | N | % | N |
| Attended Only LC SI | 85.54 | 1,325 | 71.67 | 1,336 | 72.98 | 902 |
| Attended Other SI | 14.46 | 224 | 28.33 | 528 | 27.02 | 334 |

Table 6A: Average course grades for SI students vs. matched non-SI students, Fall 2011

| Course Grade | Student Attended SI | | Student Did Not Attend SI | |
|-----------------|-------------------------------|--------------|-------------------------------|--------------|
| | Mean (Std. Dev.) | N | Mean (Std. Dev.) | N |
| Overall | 2.65* (1.05) | 1,960 | 2.43* (1.07) | 1,933 |
| BCH 100 | 3.06* (1.05) | 86 | 2.43* (1.36) | 85 |
| BIOL005A | 2.31* (1.09) | 156 | 2.07* (1.07) | 152 |
| BIOL005C | 2.48 (1.03) | 110 | 2.36 (1.02) | 106 |
| CHEM001A | 3.10* (0.85) | 290 | 2.55* (1.01) | 292 |
| CHEM001C | 2.39 (0.87) | 92 | 2.30 (0.80) | 90 |
| CHEM112A | 2.30 (1.03) | 225 | 2.30 (1.02) | 222 |
| CHEM112C | 2.66* (0.91) | 83 | 2.19* (0.99) | 82 |
| CS 010 | 2.58 (1.26) | 56 | 2.34 (1.21) | 54 |
| ECON002 | 3.09 (0.67) | 146 | 2.93 (0.84) | 144 |
| ECON003 | 2.51 (1.16) | 53 | 2.42 (1.04) | 54 |
| MATH004 | 1.83* (1.12) | 43 | 2.39* (1.12) | 44 |
| MATH005 | 2.67* (0.90) | 66 | 2.20* (0.97) | 67 |
| MATH008A | 2.32 (1.10) | 81 | 2.09 (1.13) | 79 |
| MATH008B | 3.10* (0.82) | 31 | 2.66* (0.94) | 30 |
| MATH009A | 3.05 (0.92) | 73 | 3.02 (0.81) | 71 |
| MATH009B | 2.24 (1.26) | 85 | 2.32 (1.38) | 83 |
| MATH009C | 2.10 (1.46) | 73 | 2.09 (1.27) | 65 |
| MATH022 | 3.38 (0.85) | 37 | 3.03 (1.01) | 37 |
| PHYS002A | 2.73 (0.80) | 131 | 2.53 (0.99) | 133 |
| PHYS002B | 2.93 (0.71) | 43 | 2.84 (0.54) | 43 |

* Indicates statistically significant at $p \leq 0.05$ level, two-tail test.

Table 6B: Average course grades for SI students vs. matched non-SI students, Winter 2012

| Course Grade | Student Attended SI | | Student Did Not Attend SI | |
|-----------------|-------------------------------|--------------|-------------------------------|--------------|
| | Mean (Std. Dev.) | N | Mean (Std. Dev.) | N |
| Overall | 2.77* (0.95) | 1,841 | 2.51* (1.02) | 1,817 |
| BCH 100 | 2.76 (0.70) | 67 | 2.65 (0.79) | 66 |
| BIOL005A | 2.70* (1.02) | 189 | 2.16* (1.11) | 189 |
| CHEM001A | 2.73* (0.86) | 168 | 2.52* (0.93) | 166 |
| CHEM001B | 2.93* (0.94) | 270 | 2.64* (0.97) | 266 |
| CHEM112A | 3.18* (0.67) | 192 | 2.78* (0.87) | 190 |
| CHEM112B | 2.53 (0.86) | 206 | 2.55 (0.95) | 206 |
| CS 010 | 2.99 (1.07) | 52 | 2.54 (1.30) | 44 |
| CS 012 | 2.60 (0.93) | 20 | 2.67 (0.87) | 19 |
| ECON002 | 2.63* (0.83) | 90 | 2.15* (1.16) | 87 |
| ECON003 | 3.00* (0.64) | 76 | 2.64* (0.85) | 75 |
| MATH004 | 2.15 (1.25) | 27 | 2.02 (1.33) | 26 |
| MATH008A | 1.57 (1.40) | 48 | 1.52 (1.13) | 49 |
| MATH008B | 2.05 (1.00) | 56 | 2.08 (0.89) | 55 |
| MATH009A | 3.32* (0.65) | 36 | 2.74* (1.11) | 36 |
| MATH009B | 2.40 (1.00) | 55 | 2.27 (1.22) | 56 |
| MATH009C | 2.56 (1.17) | 55 | 2.42 (1.08) | 55 |
| MATH022 | 3.17* (0.68) | 19 | 2.63* (0.82) | 19 |
| PHYS002B | 3.26 (0.61) | 98 | 3.11 (0.65) | 96 |
| PHYS002C | 2.79 (0.73) | 28 | 2.45 (0.70) | 27 |
| PHYS040A | 2.72 (0.84) | 88 | 2.80 (0.83) | 89 |

* Indicates statistically significant at $p \leq 0.05$ level, two-tail test.

Table 6C: Average course grades for SI students vs. matched non-SI students, Spring 2012

| Course Grade | Student Attended SI | | Student Did Not Attend SI | |
|--------------|---------------------|-------|---------------------------|-------|
| | Mean (Std. Dev.) | N | Mean (Std. Dev.) | N |
| Overall | 2.69* (0.94) | 1,584 | 2.36* (1.04) | 1,569 |
| BCH 100 | 2.74* (1.23) | 70 | 1.73* (1.33) | 70 |
| BIOL005B | 2.39* (0.98) | 159 | 1.92* (1.04) | 160 |
| CHEM001B | 2.27* (0.84) | 143 | 2.05* (0.97) | 140 |
| CHEM001C | 3.04* (0.83) | 209 | 2.74* (1.00) | 207 |
| CHEM112B | 2.49* (0.79) | 192 | 2.11* (0.79) | 191 |
| CHEM112C | 2.87* (0.88) | 130 | 2.43* (0.89) | 132 |
| CS 010 | 2.83 (0.97) | 25 | 2.57 (1.28) | 24 |
| ECON002 | 2.54 (1.18) | 56 | 2.28 (1.23) | 56 |
| ECON003 | 2.29 (0.89) | 56 | 2.07 (1.08) | 55 |
| MATH004 | 1.99 (1.28) | 33 | 1.83 (1.17) | 33 |
| MATH008B | 2.33 (1.22) | 17 | 2.80 (1.02) | 16 |
| MATH009B | 2.69 (0.86) | 96 | 2.60 (0.98) | 95 |
| MATH009C | 2.97* (0.99) | 49 | 2.41* (1.29) | 47 |
| PHYS002A | 2.89* (0.79) | 154 | 2.70* (0.83) | 150 |
| PHYS002C | 3.04* (0.65) | 89 | 2.70* (0.71) | 89 |
| PHYS040B | 2.92 (0.86) | 47 | 2.97 (0.72) | 47 |

* Indicates statistically significant at $p \leq 0.05$ level, two-tail test.

Table 7A: Average course grades by sessions attended for SI students and matched non-SI students, Fall 2011

| | Never Used SI | Used SI Once | Used SI Occasionally |
|-----------------------------|--------------------|--------------------|----------------------|
| | Difference in Mean | Difference in Mean | Difference in Mean |
| Never used SI | | | |
| Used SI once | 0.07 | | |
| Used SI two to nine times | 0.13* | 0.09 | |
| Used SI more than ten times | 0.58* | 0.46* | 0.33* |
| Used SI in LC | 0.38* | | |
| Used open SI | 0.14* | | |

* Indicates statistically significant at $p \leq 0.05$ level, two-tail test.

Table 7B: Average course grades by sessions attended for SI students and matched non-SI students, Winter 2012

| | Never Used SI | Used SI Once | Used SI Occasionally |
|-----------------------------|--------------------|--------------------|----------------------|
| | Difference in Mean | Difference in Mean | Difference in Mean |
| Never used SI | | | |
| Used SI once | 0.21* | | |
| Used SI two to nine times | 0.14* | 0.10 | |
| Used SI more than ten times | 0.45* | 0.45* | 0.46* |
| Used SI in LC | 0.34* | | |
| Used open SI | 0.19* | | |

* Indicates statistically significant at $p \leq 0.05$ level, two-tail test.

Table 7C: Average course grades by sessions attended for SI students and matched non-SI students, Spring 2012

| | Never Used SI | Used SI Once | Used SI Occasionally |
|-----------------------------|--------------------|--------------------|----------------------|
| | Difference in Mean | Difference in Mean | Difference in Mean |
| Never used SI | | | |
| Used SI once | 0.09 | | |
| Used SI two to nine times | 0.29* | 0.19* | |
| Used SI more than ten times | 0.56* | 0.45* | 0.44* |
| Used SI in LC | 0.36* | | |
| Used open SI | 0.29* | | |

* Indicates statistically significant at $p \leq 0.05$ level, two-tail test.

Appendix

Table A1: Supplemental Instruction Sign-Ins, Fall 2011-Spring 2012

| Course | Fall 2011 | | | Winter 2012 | | | Spring 2012 | | |
|------------------|-----------|--------------------|-------|-------------|--------------------|--------|-------------|--------------------|--------|
| | Sign-In | Unmatched Sign-Ins | % | Sign-In | Unmatched Sign-Ins | % | Sign-In | Unmatched Sign-Ins | % |
| BCH 100 | 161 | 9 | 5.59 | 102 | 12 | 11.76 | 133 | 19 | 14.29 |
| BIO 005A | 176 | 13 | 7.39 | 545 | 60 | 11.01 | 3 | 3 | 100.00 |
| BIO 005B | | | | 1 | 1 | 100.00 | 430 | 42 | 9.77 |
| BIO 005C | 147 | 19 | 12.93 | | | | | | |
| CHEM 001A | 757 | 83 | 10.96 | 260 | 39 | 15.00 | 6 | 6 | 100.00 |
| CHEM 001B | | | | 347 | 28 | 8.07 | 259 | 33 | 12.74 |
| CHEM 001C | 111 | 5 | 4.50 | | | | 263 | 21 | 7.98 |
| CHEM 112A | 274 | 21 | 7.66 | 242 | 31 | 12.81 | 2 | 2 | 100.00 |
| CHEM 112B | | | | 244 | 17 | 6.97 | 291 | 18 | 6.19 |
| CHEM 112C | 109 | 10 | 9.17 | | | | 154 | 12 | 7.79 |
| CS 010 | 117 | 11 | 9.40 | 104 | 20 | 19.23 | 36 | 1 | 2.78 |
| CS 012 | | | | 69 | 9 | 13.04 | 23 | 3 | 13.04 |
| CS 014 | | | | | | | 39 | 4 | 10.26 |
| ECON 002 | 164 | 12 | 7.32 | 101 | 10 | 9.90 | 71 | 11 | 15.49 |
| ECON 003 | 68 | 7 | 10.29 | 95 | 14 | 14.74 | 64 | 6 | 9.38 |
| MATH 004 | 56 | 9 | 16.07 | 36 | 6 | 16.67 | 53 | 7 | 13.21 |
| MATH 005 | 127 | 16 | 12.60 | | | | | | |
| MATH 008A | 142 | 26 | 18.31 | 58 | 6 | 10.34 | 2 | 2 | 100.00 |
| MATH 008B | 35 | 4 | 11.43 | 72 | 7 | 9.72 | 34 | 11 | 32.35 |
| MATH 009A | 102 | 18 | 17.65 | 48 | 7 | 14.58 | 26 | 8 | 30.77 |
| MATH 009B | 113 | 20 | 17.70 | 68 | 7 | 10.29 | 116 | 12 | 10.34 |
| MATH 009C | 101 | 18 | 17.82 | 70 | 7 | 10.00 | 69 | 15 | 21.74 |
| MATH 022 | 43 | 1 | 2.33 | 22 | 2 | 9.09 | 20 | 1 | 5.00 |
| PHYS 002A | 176 | 15 | 8.52 | | | | 176 | 10 | 5.68 |
| PHYS 002B | 62 | 11 | 17.74 | 113 | 5 | 4.42 | 1 | 1 | 100.00 |
| PHYS 002C | | | | 35 | 2 | 5.71 | 114 | 18 | 15.79 |
| PHYS 040A | | | | 102 | 12 | 11.76 | 2 | 2 | 100.00 |
| PHYS 040B | | | | 1 | 0 | 0.00 | 61 | 12 | 19.67 |
| TOTAL | 3,041 | 328 | 10.79 | 2,735 | 302 | 11.04 | 2,448 | 280 | 11.44 |

Table A2: Regression results, course GPA and SI visits

| | Fall 2011 | Winter 2012 | Spring 2012 |
|--|-------------------------|-------------------------|-------------------------|
| SI Count | 0.05* (0.00) | 0.05* (0.00) | 0.05* (0.00) |
| Female | -0.36* (0.07) | -0.36* (0.07) | -0.40* (0.08) |
| Asian | 0.48* (0.08) | 0.34* (0.09) | 0.32* (0.09) |
| Black | 0.07 (0.14) | 0.21 (0.14) | -0.09 (0.16) |
| White | 0.61* (0.13) | 0.52* (0.12) | 0.63* (0.12) |
| Native American | -0.98 (0.80) | -0.08 (0.88) | 1.05 (0.90) |
| Class Level (Fresh.=1 ; Senior=4) | -0.11* (0.04) | 0.34* (0.05) | 0.29* (0.05) |
| Low Income | -0.30* (0.08) | -0.29* (0.08) | ----- ¹² |
| First Generation | -0.12 (0.08) | -0.15 (0.09) | ----- ¹² |
| High School GPA | 0.09 (0.05) | 0.22* (0.05) | 0.15* (0.05) |
| N | 2,674 | 2,392 | 2,138 |
| Pseudo-R | 0.03 | 0.03 | 0.02 |

Standard errors in parentheses.

* Indicates statistically significant at $p \leq 0.05$ level, two-tail test.

¹² Low Income and First Generation are missing for spring.

The two main variables of interest here – number of SI visits and course grade – each present a challenge to ordinal least squares regression. The main independent variable, the number of SI visits, is not normally distributed, while course grades do not constitute a true continuous variable, as grades for a single course will fall into one of several categories (that is, A+ , A, A- and so on). Ordered logistic regression is suitable for dependent variables made up of ordered categories and diagnostics indicated that this technique produced models which fit these data reasonably well.

Substantively, the coefficient of 0.05 indicate in Table A2 means that for each additional SI section a student attends there is a 5% of chance of moving from a given letter grade category to the next higher category. Although the effect of each additional SI visit is modest, recall that it is not uncommon for students to visit SI ten or more times per quarter.