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, theses 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

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[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

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[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 Mean (Std. Dev.)	N	Student Did Not Attend SI 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

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[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 Mean (Std. Dev.)	N	Student Did Not Attend SI 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]	--	--	--	--

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[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 Mean (SD)	N	LC SI Mean (SD)	N	Overall 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	15.93	389
Senior[7]	8.46	131	0.00	0	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	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

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[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 Mean (SD)	N	LC SI Mean (SD)	N	Overall 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
Senior[8]	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

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[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 Mean (SD)	N	LC SI Mean (SD)	N	Overall 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
Senior[9]	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 Gen[10]	--	--	--	--	--	--
Low Income	--	--	--	--	--	--
Not Low Income[11]	--	--	--	--	--	--

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[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 Sign-In	Fall 2011 %	Fall 2011 Sign-In	Winter 2012 %	Winter 2012 Sign-In	Spring 2012 %	Spring 2012 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

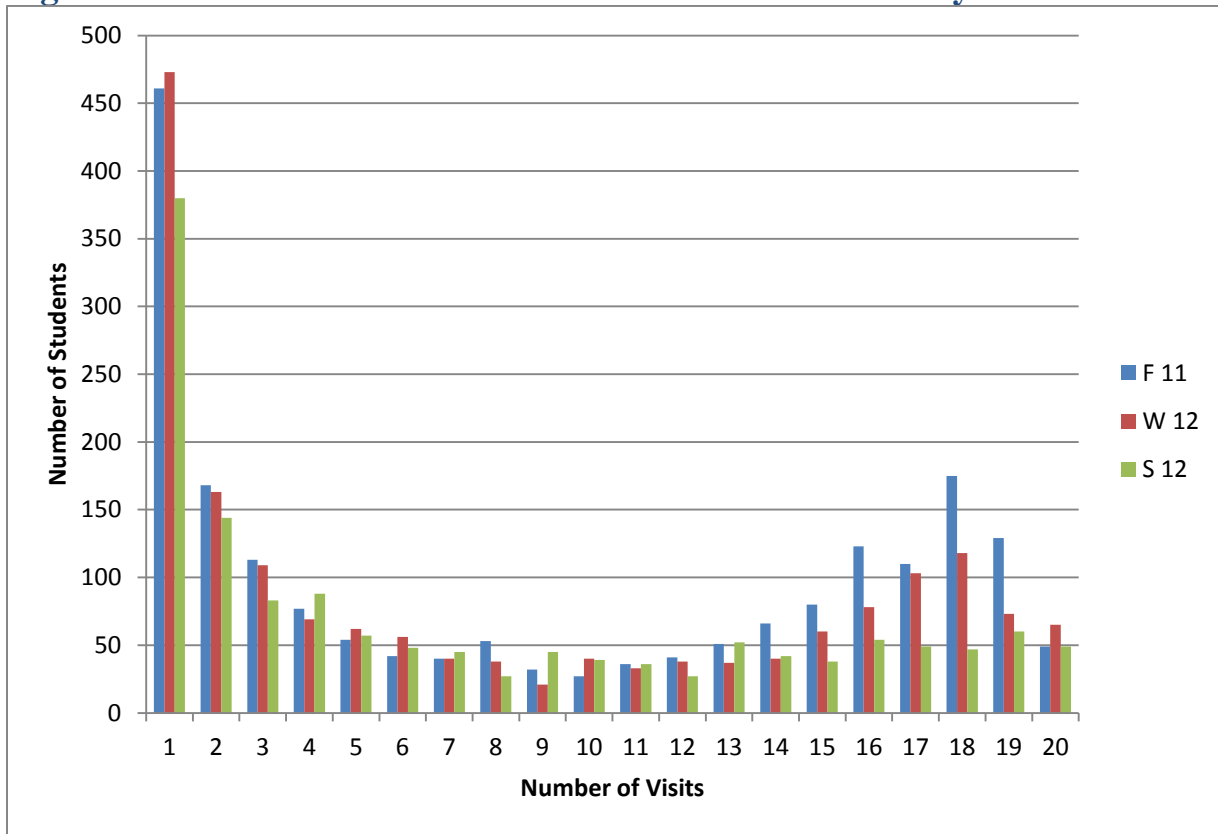## Figure 1: Number of SI visits for students who attended only one SI course

Figure 2: Number of SI visits for students who attended more than one SI course
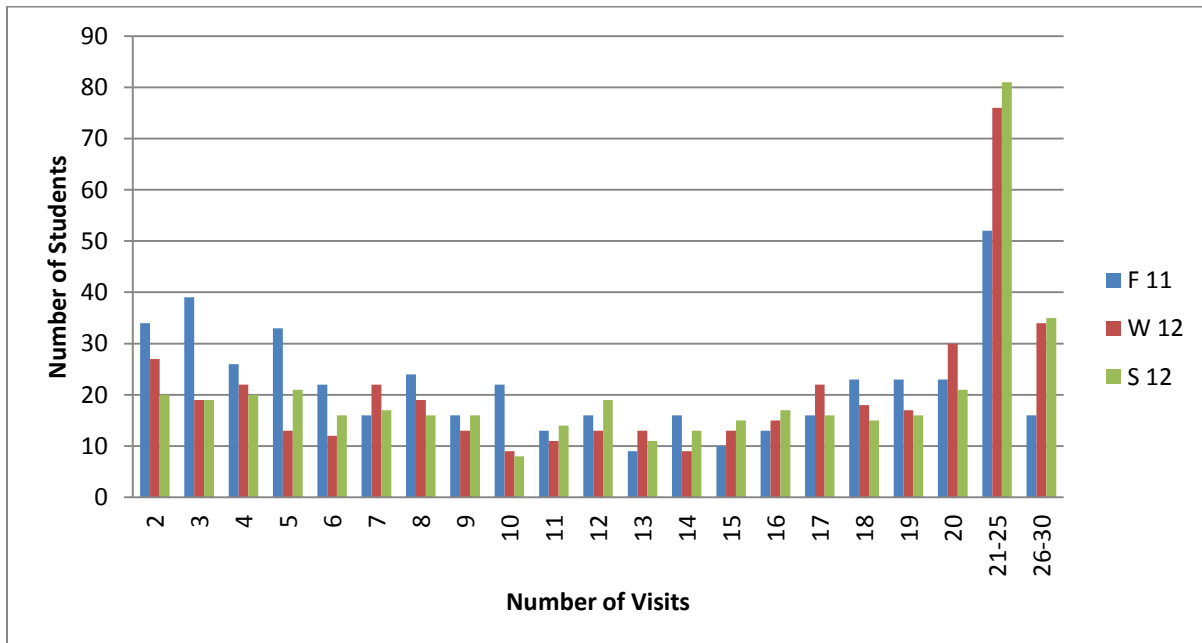
Table 4: Week of Visit for Students who visited SI only once

Week	Fall 2011 %	N	Winter 2012 %	N	Spring 2012 %	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
Week8	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 %	N	Winter 2012 %	N	Spring 2012 %	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

	Student Attended SI		Student Did Not Attend SI	
Course Grade	**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 ≤ 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 ≤ 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 ≤ 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.