

SUPPLEMENTAL INSTRUCTION

Impact on Course Performance
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Abstract

This report evaluates the impact of Supplemental Instruction (SI) a year after its inception at UCR. The evaluation compares the course grades of students who participated in SI and those who did not and were enrolled in courses where SI was offered. Due to variations in pre-entry and background characteristics of these two populations, we control for gender, race/ethnicity, SAT scores, high school GPA, and first generation status. Additionally, we control for class status (e.g., freshman, sophomore, etc.), and for the courses themselves as average grades may vary across courses. This analysis compares the mean course grades for the treatment and comparison group, the conditional means controlling for pre-entry and background characteristics, then present the conditional grade differences separately for each SI course.

Introduction

Implemented in fall 2005 as a pilot program, Supplemental Instruction (SI) is designed to provide course-specific academic support in courses in which students have historically received high D and F grades. While SI is open to all students, the program targets courses that students take in their first-year. The program is design to help students who are struggling with their coursework and need assistance.

SI sessions are facilitated by upper division students (SI Leaders) who, as a part of their job, attend the course lectures and work with the professor and TAs to make sure the materials they are presenting in their sessions are current with the course. The SI sessions provide an informal and interactive setting in which students can receive help for their specific course. Participation is recommended and sessions are free to students. Weekly sessions are held for one hour and the number of students in attendance varies from session to session. The weekly SI session schedules and campus locations are maintained on the course's iLearn site, on si.ucr.edu, and learningcenter.ucr.edu.

Data

Undergraduate Education in conjunction with the SI Coordinator in the Learning Center developed attendance sheets. SI participants are required to sign at every

session they attend. The attendance sheet identifies the name of the SI Leader facilitating the session, course name, date, and time of the session. Students are asked to provide their first and last name, an email address, and signature to verify their attendance. The sign-in sheet allows the program to identify the students who participate in SI and measure the time they devote to SI by course. Table 1 provides the variables list to be used in this analysis.

Results

The analysis begins with a comparison of students who participated in SI and students enrolled in courses in which SI was offered but did not participate. Table 2 provides the basic descriptive statistics for each group. Students who participated in SI achieved higher course grades than the comparison group, perhaps an encouraging sign about the impact of the program. However, there are also significant differences in characteristics across these two populations – for example, higher high-school GPAs in the participant population – that might account for the observed difference in mean grades.

Table 2.1 provides the mean demographic characteristics of the SI participant population. We see that freshmen and sophomores participated in SI at a higher rate than upperclassmen. The College of Natural and Agricultural Sciences (CNAS) had a greater participation rate compared to the other two

undergraduate colleges, Humanities, Arts, and Social Sciences (CHASS) and Bourns College of Engineering (BCOE).

Table 3 offers the results of a regression analysis that generates the difference in mean grades across the two populations, controlling for a host of demographic and situational characteristics. These results suggest that, controlling for a range of factors (column 3), the impact of participating in SI is roughly one-third (0.32) of a grade point. That is, a participant with a C+ grade in a given course could expect to have received a B- if they attended SI sessions. This is the average, within-course effect.

In Table 4, we estimate this same relationship, but for the amount of time spent in SI sessions, conditional on being an SI participant. Spending more time in SI sessions clearly pays off, at the rate of roughly 0.03 points per hour of participation (column 3).

Finally, in Table 5, we generate estimates of the participation effect for each course separately. The participation rate and hours spent in participation for each course are reported as well. Columns 1 and 2 reveal that participation rates and hours vary significantly across courses, with very high participation rates in the sciences – and especially Biology 5A, Chemistry 1A, and Chemistry 112A – and much lower participation rates in CHASS courses. Judging from the grade impacts shown in column 3, Supplemental Instruction also

appears to have been much more successful in the sciences and math courses than in the humanities and social sciences courses.

In separate results, we asked the question whether the grade impacts we observe are different across the grade distribution. And, in particular, did SI help to alleviate the high D and F rates initially observed in these courses? Controlling for demographic and performance variables and course, participation in SI decreases the likelihood of receiving a D or F grade by 11.3 percentage points (statistically significant at the 0.05 level, two-tailed test). The mean incidence of D's and F's for non-participants is 24.1 percent. Thus, according to our results, students participating in SI experience a D/F rate that is 11.3 percentage points lower, or 12.7 percent.

Conclusion

Supplemental Instruction at UCR is, on average, a successful program. It enhances student performance, and especially does so at the lower end of the grade distribution, which was its original purpose. That said, the extent of participation and grade impacts vary significantly across courses. SI appears to be most successful in classes in the hard sciences, perhaps due to the prominence of problem sets and structured exercises on which SI leaders can productively focus during sessions.

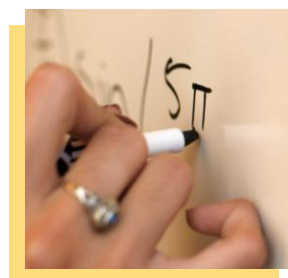


Table 1: Variable Definitions

Course Grade	End of fall term grade received: A+/A = 4.00, A- = 3.70, B+ = 3.30, B = 3.00 S = 2.00, and F = 0.00
Supplemental Instruction Participant (SIP)	1 if participated; 0 otherwise
Contact Hours (HRS)	Number of hours a student attended an S.I. session
Gender	1 if female; 0 if male
African American	1 if African American; 0 else
Native American	1 if Native American; 0 else
Hispanic	1 if Hispanic; 0 else
Asian/P.I.	1 if Asian/P.I.; 0 else
Caucasian	1 if Caucasian; 0 else
Other	1 if Other; 0 else
Freshmen	1 if Freshmen; 0 else
Sophomore	1 if Sophomore; 0 else
Junior	1 if Junior; 0 else
Senior/5th yr+	1 if Senior/5th yr+; 0 else
CHASS	1 if CHASS; 0 otherwise
CNAS	1 if CNAS; 0 otherwise
BCOE	1 if BCOE; 0 otherwise
First Generation Status	1 if either Parent Education LE no 4-yr degree received; 0 GE 4-yr degree or higher
High School GPA	GPA score
SAT Verbal	SAT Verbal score
SAT Math	SAT Math score
Biology 5	1 if fall course enrolled in Biology 5; 0 otherwise
Business Administration 20A	1 if fall course enrolled in Business Administration 20; 0 otherwise
Chemistry 1A	1 if fall course enrolled in Chemistry 1A; 0 otherwise
Chemistry 112A	1 if fall course enrolled in Chemistry 112A; 0 otherwise
CHF10	1 if fall course enrolled in CHF10; 0 otherwise
Computer Science 10	1 if fall course enrolled in Computer Science 10; 0 otherwise
Math 4	1 if fall course enrolled in Math 4; 0 otherwise
Math 5	1 if fall course enrolled in Math 5; 0 otherwise
Math 8A	1 if fall course enrolled in Math 8A; 0 otherwise
Math 9A	1 if fall course enrolled in Math 9A; 0 otherwise
History 20	1 if fall course enrolled in History 20; 0 otherwise

Philosophy 1	1 if fall course enrolled in Philosophy 1; 0 otherwise
Philosophy 3	1 if fall course enrolled in Philosophy 3; 0 otherwise
Physics 2A	1 if fall course enrolled in Physics 2A; 0 otherwise
Physics 2B	1 if fall course enrolled in Physics 2B; 0 otherwise
Physics 40C	1 if fall course enrolled in Physics 40C; 0 otherwise
Political Science 20	1 if fall course enrolled in Political Science 20; 0 otherwise
Psychology 1	1 if fall course enrolled in Psychology 1; 0 otherwise
Sociology 1	1 if fall course enrolled in Sociology 1; 0 otherwise

Table 2: Descriptive Statistics, Mean (Std. Dev)

	SIP Mean (Std. Dev.)	Non - SIP Mean (Std. Dev.)
Course Grade	2.37 (1.09)	2.25 (1.19)
Gender	0.55 (0.50)	0.51 (0.50)
African American	0.07 (0.26)	0.07 (0.26)
Native American	0.00 (0.07)	0.00 (0.06)
Hispanic	0.22 (0.41)	0.26 (0.44)
Asian/P.I.	0.50 (0.50)	0.45 (0.50)
Caucasian	0.14 (0.34)	0.16 (0.37)
Other	0.03 (0.16)	0.02 (0.15)
Freshmen	0.58 (0.49)	0.55 (0.50)
Sophomore	0.30 (0.46)	0.30 (0.46)
Junior	0.09 (0.28)	0.11 (0.31)
Senior/5th yr+	0.03 (0.16)	0.04 (0.19)
CHASS	0.19 (0.39)	0.48 (0.50)
CNAS	0.66 (0.47)	0.42 (0.49)
BCOE	0.13 (0.34)	0.10 (0.30)
First Generation Status	0.45 (0.50)	0.48 (0.50)
High School GPA	3.30 (0.82)	3.20 (0.93)
SAT Verbal	473 (127)	478 (144)
SAT Math	526 (140)	520 (156)
Biology 5	0.19 (0.39)	0.05 (0.22)
Business Administration 20A	0.04 (0.19)	0.04 (0.20)
Chemistry 1A	0.23 (0.42)	0.07 (0.26)
Chemistry 112A	0.12 (0.32)	0.05 (0.21)
CHF10	0.03 (0.17)	0.01 (0.12)
Computer Science 10	0.01 (0.11)	0.02 (0.14)
Math 4	0.02 (0.14)	0.07 (0.26)

	SIP Mean (Std. Dev.)	Non - SIP Mean (Std. Dev.)
Math 8A	0.07 (0.26)	0.05 (0.21)
Math 5	0.13 (0.34)	0.11 (0.31)
Math 9A	0.03 (0.17)	0.09 (0.29)
History 20	0.01 (0.12)	0.07 (0.25)
Philosophy 1	0.01 (0.11)	0.04 (0.19)
Philosophy 3	0.01 (0.8)	0.03 (0.18)
Physics 2A	0.05 (0.22)	0.05 (0.22)
Physics 2B	0.02 (0.14)	0.03 (0.16)
Physics 40C	0.00 (0.07)	0.02 (0.14)
Political Science 20	0.02 (0.12)	0.04 (0.20)
Psychology 1	0.00 (0.04)	0.08 (0.27)
Sociology 1	0.00 (0.00)	0.08 (0.26)

Table 2.1: Descriptive Statistics, Mean (Std. Dev.)

	SIP
	Mean (Std. Dev.)
Gender = 1 (Female)	0.15 (0.35)
Gender = 0 (Male)	0.13 (0.34)
African American	0.14 (0.34)
Native American	0.18 (0.39)
Hispanic	0.12 (0.33)
Asian/P.I.	0.15 (0.36)
Caucasian	0.12 (0.32)
Other	0.15 (0.36)
Freshmen	0.15 (0.35)
Sophomore	0.14 (0.35)
Junior	0.11 (0.31)
Senior/5th yr+	0.10 (0.30)
CHASS	0.06 (0.24)
CNAS	0.20 (0.40)
BCOE	0.18 (0.38)

Table 3: Course Grade Regression (SIP)

	[^] B (Std. Error)	[^] B (Std. Error)	[^] B (Std. Error)
SIP	0.12* (0.04)	0.14* (0.04)	0.32* (0.04)
Gender		-0.09* (0.03)	-0.09* (0.03)
African American		0.00 (0.08)	-0.03 (0.07)
Native American		0.18 (0.25)	0.09 (0.23)
Hispanic		-0.08 (0.06)	-0.13* (0.06)
Asian/P.I.		0.01 (0.06)	0.01 (0.06)
Caucasian		0.16* (0.07)	0.12* (0.06)
Freshmen		-0.17* (0.08)	-0.12 (0.08)
Sophomore		-0.22* (0.08)	-0.11 (0.08)
Junior		-0.07 (0.09)	-0.03 (0.08)
High School GPA		0.76* (0.03)	0.78* (0.03)
SAT Verbal		0.00* (0.00)	0.00* (0.00)
SAT Math		0.00* (0.00)	0.00* (0.00)
First Generation Status		0.03 (0.03)	0.02 (0.03)
Biology 5			-1.69* (0.07)
Business Administration 20A			0.85* (0.08)
Chemistry 1A			-0.80* (0.06)
Chemistry 112A			-0.96* (0.07)
CHFV10			0.10 (0.10)
Computer Science 10			-0.53* (0.10)
History 20			-0.39* (0.07)

	[^] B (Std. Error)	[^] B (Std. Error)	[^] B (Std. Error)
Math 4			-0.96* (0.07)
Math 5			-1.05* (0.06)
Math 8A			-1.07* (0.07)
Math 9A			-1.12* (0.06)
Philosophy 1			-0.46* (0.08)
Philosophy 3			-0.64* (0.08)
Physics 2A			-0.81* (0.07)
Physics 2B			-0.76* (0.09)
Physics 40C			-0.98* (0.10)
Political Science 20			-0.13 (0.07)
Psychology 1			-1.20* (0.07)
Constant	2.25* (0.01)	-2.23* (0.19)	-1.38* (0.18)

* Indicates statistically significant at the 0.05 level (two-tailed).

Table 4: Course Grade Regression (SIP HRS)

	[^] B (Std. Error)	[^] B (Std. Error)	[^] B (Std. Error)
SIP HRS	0.02* (0.01)	0.01* (0.01)	0.03* (0.01)
Gender		-0.13* (0.07)	-0.11 (0.06)
African American		-0.40* (0.18)	-0.38* (0.17)
Native American		-0.23 (0.47)	-0.45 (0.44)
Hispanic		-0.01 (0.15)	-0.09 (0.14)
Asian/P.I.		0.03 (0.14)	0.06 (0.13)
Caucasian		-0.01 (0.16)	0.05 (0.15)
Freshmen		0.09 (0.23)	-0.55* (0.24)
Sophomore		-0.30 (0.23)	-0.46* (0.22)
Junior		0.04 (0.26)	-0.13 (0.24)
High School GPA		0.26* (0.06)	0.27* (0.05)
SAT Verbal		0.00* (0.00)	0.00* (0.00)
SAT Math		0.00* (0.00)	0.00* (0.00)
First Generation Status		0.10 (0.07)	0.15* (0.06)
Biology 5			-0.83* (0.14)
Business Administration 20A			-0.10 (0.19)
Chemistry 1A			dropped
Chemistry 112A			-0.29* (0.15)
CHF10			1.08* (0.19)
Computer Science 10			0.52* (0.27)
History 20			0.65* (0.26)

	$\hat{\beta}$ B (Std. Error)	$\hat{\beta}$ B (Std. Error)	$\hat{\beta}$ B (Std. Error)
Math 4			-0.60* (0.22)
Math 5			-0.36* (0.10)
Math 8A			0.04 (0.13)
Math 9A			-0.11 (0.17)
Philosophy 1			0.49 (0.27)
Philosophy 3			0.76* (0.34)
Physics 2A			0.03 (0.17)
Physics 2B			-0.36 (0.24)
Physics 40C			-0.67 (0.44)
Political Science 20			0.96* (0.24)
Psychology 1			-0.04 (0.67)
Constant	2.23* (0.05)	-0.89* (0.42)	-0.41 (0.43)

* Indicates statistically significant at the 0.05 level (two-tailed).

Table 5: Individual Courses (SIP)

	SIP (Std. Dev.)	HRS (Std. Dev.)	^ B(SIP) (Std. Error)
Biology 5	0.38 (0.48)	2.84 (1.83)	0.36* (0.08)
Business Administration 20A	0.13 (0.33)	2.98 (1.92)	0.23 (0.21)
Chemistry 1A	0.33 (0.47)	9.97 (5.40)	0.36* (0.08)
Chemistry 112A	0.29 (0.45)	4.34 (3.77)	0.06 (0.11)
CHF10	0.25 (0.43)	1.32 (0.48)	0.42* (0.14)
Computer Science 10	0.10 (0.30)	3.60 (1.67)	0.64 (0.34)
History 20	0.03 (0.18)	1.08 (0.29)	0.63* (0.26)
Math 4	0.05 (0.21)	3.30 (3.96)	-0.23 (0.27)
Math 5	0.17 (0.37)	12.68 (6.86)	0.32* (0.10)
Math 8A	0.20 (0.40)	4.78 (4.34)	0.52* (0.14)
Math 9A	0.05 (0.22)	4.00 (3.46)	0.48* (0.20)
Philosophy 1	0.05 (0.22)	1.35 (0.65)	0.28 (0.24)
Philosophy 3	0.03 (0.18)	2.08 (1.32)	0.42 (0.33)
Physics 2A	0.13 (0.34)	4.51 (4.88)	0.32* (0.14)
Physics 2B	0.11 (0.31)	3.38 (2.32)	-0.07 (0.20)
Physics 40C	0.04 (0.18)	4.67 (2.88)	-0.09 (0.45)
Political Science 20	0.06 (0.23)	1.70 (1.43)	0.40 (0.22)
Psychology 1	0.00 (0.06)	3.50 (1.73)	0.63 (0.71)
Sociology 1	0.00 (0.00)	1.67 (0.58)	dropped
Entire Sample (N=8,312)	0.14 (0.35)	6.10 (5.76)	

Note: SIP=Supplemental Instruction Participation, HRS= Supplemental Instruction Contact Hours conditional on SIP=1.

* Indicates statistically significant at the 0.05 level (two-tailed).