Crafton Hills College
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Research Brief

Relationship of Supplemental Instruction (SI) to Course Success for Students in the Title V STEM SI Program for the Spring 2013 Term

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Purpose of Brief

This brief analyzes the relationship of supplemental instruction (SI) to course success for students utilizing the Title V Science, Technology, Engineering and Mathematics (STEM) SI program in the Spring 2013 term.

Summary of Findings

- Students who attended two or more SI sessions were substantially (ES = .66) and statistically significantly (p > .001) more likely to successfully complete the course (79%) and earn a higher grade in their course (2.57) than students in the same section who did not attend any SI sessions (48% and 1.51, respectively).
- Female students who attended two or more SI sessions were substantially (ES = .71) and statistically significantly (p = .002) more likely to successfully complete the course (77%) than female students in the same section who did not attend any SI sessions (42%).
- Hispanic students who attended two or more SI sessions were substantially (ES = .40) more likely to successfully complete the course (70%) than Hispanic students in the same section who did not attend any SI sessions (50%).

Overview

In response to the third deficit identified in the Title V STEM Grant, Crafton Hills College (CHC) developed an SI program as an alternative learning strategy aimed at improving students' math, technical and conceptual science skills. In the Spring 2013 term, CHC offered supplemental instruction for students enrolled in the following course sections: CHEM-150-25, CHEM-150-26, MATH-103-15, MATH-103-35, MICRO-102-35, MICRO-102-36, and MICRO-102-37. Table 1 illustrates the participation rate (%) of students participating in SI (#) as a percentage of total students in the same sections with a grade on record (N). Eighty-one students (44%) of 183 students attended at least one SI session.

Table 1: Participation rate of students in SI program.

Course	#	N	%
CHEM-150-25	19	26	73.1%
CHEM-150-26	16	20	80.0%
MATH-103-15	5	37	13.5%
MATH-103-35	8	39	20.5%
MICRO-102-35	16	27	59.3%
MICRO-102-36	13	24	54.2%
MICRO-102-37	4	10	40.0%
TOTAL	81	183	44.3%

Methodology

The success (a grade of A, B, C or P) of students who utilized SI was compared to students with a grade on record (a grade of A, B, C, D, F, P, NP, W or I) in the same section who did not utilize SI. Additionally, success rates were also compared between students who attended one or more SI sessions and those who attended two or more SI sessions. Results were disaggregated by ethnicity, gender, and age categories to illustrate success among certain groups and categories of students. Finally, analysis of variance tests and effect size calculated using Cohen's *d* methodology were used to measure the strength and relationship of SI success in the course and grade points earned.

The effect size (ES) statistic is commonly used in meta-analyses. A meta-analysis uses quantitative techniques to determine the average effect of a given technique over multiple studies. Noticing that even small differences can be statistically significant when large pools of data are analyzed, Jacob Cohen developed one method of interpreting effect size. Cohen defined "small," "medium," and "large" effect sizes and explained that an effect size of .20 can be considered small, an effect size of .50 can be considered medium, and an effect size of .80 can be considered large. Effect size is calculated by dividing the difference of the two means by the pooled standard deviation. It is important to mention that the number of students in each group does not influence effect size; whereas, when statistical significance is calculated, the number of students in each group does influence the significance level (i.e., "p" value being less than .05). Accordingly, using Cohen as a guide, a substantial effect would be .20 or higher.

Findings

Table 2 compares the success rates of students who attended at least on SI session and those who did not attend any sessions. Students who attended one or more SI sessions were substantially (ES = .61) and statistically significantly (p > .001) more likely to successfully complete the course (77%) than students in the same section who did not attend any SI sessions (48%). **There was a 29% increase in success for students who attended one or more SI sessions.**

Table 2: Success rates of students in course sections with SI

	Did Not Attend Any SI Sessions			Attended One or More SI Sessions			Effect Size			p-value
	#	N	%	#	N	%	ES	Lower Bound	Upper Bound	
Successful	49	102	48.0%	62	81	76.5%	0.61	0.31	0.90	>.001

Table 2a compares the success rates of students who attended two or more SI sessions and those who did not attend any sessions. Students who attended two or more SI sessions were substantially (ES = .66) and statistically significantly (p > .001) more likely to successfully complete the course (79%) than students in the same section who did not attend any SI sessions (48%). **There was a 31% increase in success for students who attended two or more SI sessions.**

Table 2a: Success rates of students in course sections with SI

	Did Not Attend Any SI Sessions			Attend Two or More SI Sessions			Effect Size			p-value
	#	N	%	#	N	%	ES	Lower Bound	Upper Bound	
Successful	49	102	48.0%	45	57	78.9%	0.66	0.32	0.98	>.001

Figure 1 is a graphical representation of student success rates from Tables 2 and 2a.

Figure 1

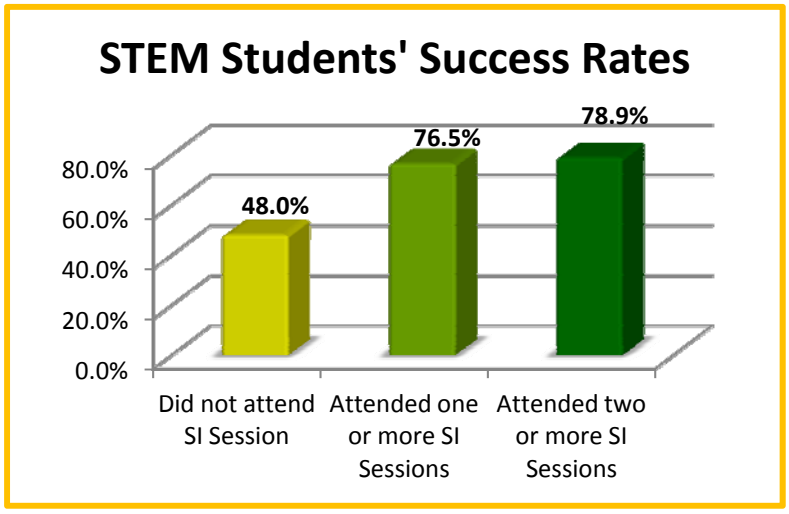

Table 3 illustrates the success rates of students disaggregated by the students' ethnicities, genders, and age categories. Hispanic students who attended two or more SI sessions were substantially (ES = .40) more likely to successfully complete the course (70%) than Hispanic students in the same section who did not attend any SI sessions (50%). Caucasian students who attended two or more SI sessions were substantially (ES = .84) and statistically significantly (p > .001) more likely to successfully complete the course (88%) than Caucasian students in the same section who did not attend any SI sessions (46%). Female students who attended two or more SI sessions were substantially (ES = .71) and statistically significantly (p = .002) more likely to successfully complete the course (77%) than female students in the same section who did not attend any SI sessions (42%). Male students who attended two or more SI sessions were also substantially (ES = .58) and statistically significantly (p = .006) more likely to successfully complete the course (81%) than male students in the same section who did not attend any SI sessions (56%).

Table 3: Disaggregated student success rates

	Did Not Attend Any SI Sessions			Attended One or More SI Sessions			Attended Two or More SI Sessions			Two or More with Did Not Attend	
	#	N	%	#	N	%	#	N	%	ES	p-value
Hispanic	23	46	50.0%	30	44	68.2%	21	30	70.0%	0.40	0.081
Caucasian	19	41	46.3%	25	29	86.2%	21	24	87.5%	0.84	>0.001
African American	2	4	50.0%	6	7	85.7%	3	3	100.0%	0.76	0.296
Asian	2	5	40.0%	1	1	100.0%	0	0			
Native American/Alaskan Native	3	6	50.0%	0	0		0	0			
Female	22	53	41.5%	27	36	75.0%	20	26	76.9%	0.71	0.002
Male	27	48	56.3%	35	45	77.8%	25	31	80.6%	0.58	0.006
19 or younger	15	33	45.5%	10	13	76.9%	7	8	87.5%	0.83	0.009
20-24	25	53	47.2%	27	39	69.2%	18	26	69.2%	0.44	0.060
25-29	7	12	58.3%	9	11	81.8%	6	8	75.0%	0.34	0.461
30-34	1	3	33.3%	7	8	87.5%	6	6	100.0%	1.51	0.086
35-39	1	1	100.0%	4	4	100.0%	3	3	100.0%		
40-49	0	0	0.0%	5	6	83.3%	5	6	83.3%		

a. Ethnicities and age categories without any representation are excluded from the table.

Table 4 illustrates the effect of attending SI sessions on students' course grade points. The mean is the arithmetic average of student grade points earned where A = 4, B = 3, C = 2, D = 1, F = 0, and W = 0 grade points.

Table 4: Relation of SI participation with course grade points

	Mean	N	Std. Deviation
Did Not Attend Any SI Sessions	1.5098	102	1.57797
Attended One or more SI Sessions	2.4875	80	1.38704
Attended Two or More SI Sessions	2.5714	56	1.34647
TOTAL	1.9396	182	1.57033

Figure 2 is a graphical representation of Table 4.

Figure 2

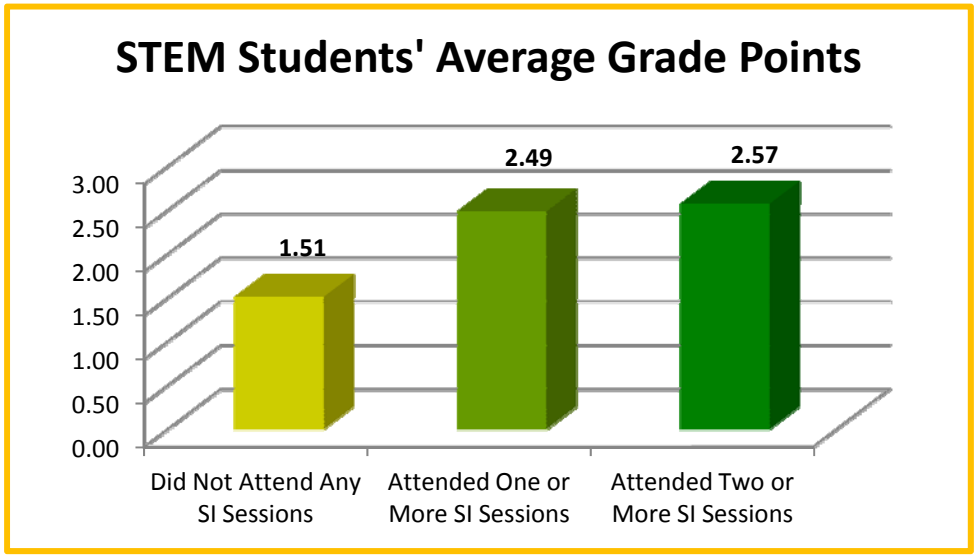

Table 5 compares the earned course grade points of students who attended two or more SI sessions and those in the same section who did not attend any sessions. Students who attended two or more SI sessions were substantially (ES = .71) and statistically significantly (p > .001) more likely to earn a higher grade in their course (2.57) than students in the same section who did not attend any SI sessions (1.51). **Students who attended two or more SI sessions earned on average a full grade point higher than students in the same section who did not attend any SI sessions.**

Table 5: Course grade points of students in course sections with SI

	Did Not Attend SI Session			Attended One or More SI Sessions			Attended Two or More SI Sessions			Two or More Sessions with Did Not Attend Any			
	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.	ES	Lower Bound	Upper Bound	p-value
Course Grade Points	1.510	102	1.578	2.488	80	1.387	2.571	56	1.346	0.71	0.37	1.04	>0.001

Any questions regarding this report can be directed to the Office of Institutional Effectiveness, Research, and Planning at (909) 389-3390 or you may send an email to bgamboa@craftonhills.edu: Brief_664.docx; STEM_SI_Sp2013_GOR.sav.