

SUPPLEMENTAL INSTRUCTION EFFECTIVENESS REPORT
Winter 2015

Office of Institutional Research, Planning and Effectiveness
Citrus College
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PROGRAM OVERVIEW

The Race to STEM program aims to achieve six program objectives including:

- **Objective 2:** Increase the percentage of STEM Academy students and college-wide STEM students who successfully transition from Bridge-to-STEM to STEM by successfully completing both college-level Math and enrollment in at least one core science course.
- **Objective 3:** Increase the percentage of students, especially Hispanics, who complete the Citrus STEM Academy Program as measured by completion of at least one transfer-level Math course, at least one transferable core science course, and completion of a STEM Academy approved project.

One of the primary strategies in achieving these objectives is through Supplemental Instruction. Supplemental Instruction targets traditionally difficult academic courses and provides regularly scheduled, informal out-of-class review sessions lead by the Supplemental Instruction Leader, a student who has successfully taken the course. Supplemental Instruction Leaders will plan and conduct study sessions two times a week, directly before or after the class.

To assess the efficacy of Supplemental Instruction on student outcomes, the following three research questions should be investigated:

- Question #1: Does participation in Supplemental Instruction increase the likelihood of success in basic skills and college level?
- Question #2: Is there a difference on final course grades between Supplemental Instruction participants and non-participants for basic skills and college level?
- Question #3: Does the frequency of attending Supplemental Instruction lead to the achievement of higher final course grades for basic skills and college level?

EXECUTIVE SUMMARY

Supplemental Instruction (SI) was offered for four courses in math to a total of 387 students. Descriptive and inferential statistics were utilized to investigate the effects of SI on course outcomes. As per previous studies, SI participants were designated as having attended five or more sessions during the semester; course success was categorized as receiving a grade of A, B, or C. For all courses except MATH151, success rates for participants were higher than for non-participants (see Table 4.1 on page 7).

Chi-Square test revealed that the likelihood of success was not greater for SI participants in any course. Low sample size and participation rates contribute to the lack of significance. These results should be interpreted with caution.

Table 1
Executive Summary

Research Question	Statistical Technique	Result
Q.1: <i>Does participation in Supplemental Instruction increase the likelihood of success in basic skills and college level Math and core science courses?</i>	Pearson's Chi-Square	No significant results

METHODS

The current analysis evaluates Supplemental Instruction in relation to meeting STEM program objectives. The purpose of this investigation is to examine the underlying hypothesis that Supplemental Instruction (SI) positively affects student outcomes by addressing three primary research questions. SI was offered for four courses in math to a total of 387 students.

Table 2
Winter 2015 enrollment and sections supported

Course	<i>n</i>	SI Supported Sections
MATH029	84	3
MATH030	109	3
MATH150	158	4
MATH151	36	1
Total	387	11

Analytic Strategy

Descriptive statistics were used to depict SI participation across relevant demographic characteristics such as gender and ethnicity; course comparisons were also assessed. Inferential tests were evaluated at 0.05 α level. Additionally, final grade was operationalized as a continuous variable and comparisons were made for each course between participants and non-participants.

Inferential Statistics: Addressing Q.1

Crosstabulation and chi-square tests were used to examine if success was more likely for participants or non-participants of SI. Course success was measured as a binary variable: A, B, C = successful, D, F, FW, W = not successful. SI participants were designated as students whom attended five (5) or more sessions of SI.

RESULTS

Descriptives

Ethnicity breakdown by course is shown below. Hispanic students ($n = 254$) made up the highest percentage students in all courses.

Table 3.1
Ethnicity breakdown by course

	Hispanic		White		Asian		Other		Total	
	#	%	#	%	#	%	#	%	#	%
MATH029	54	64%	16	19%	3	4%	11	13%	84	100%
MATH030	80	73%	18	17%	3	3%	8	7%	109	100%
MATH150	98	62%	21	13%	22	14%	17	11%	158	100%
MATH151	22	61%	6	17%	6	17%	2	6%	36	100%
Total	254	66%	61	16%	34	9%	38	10%	387	100%

Equal proportion of male and female participants (11%) attended SI sessions for MATH 151. For all other courses, a greater percentage of females attended SI than did males.

Table 3.2
SI participation by course and gender

	Male				Female				Total			
	P		NP		P		NP		P		NP	
	#	%	#	%	#	%	#	%	#	%	#	%
MATH029	3	4%	42	53%	2	3%	33	41%	5	6%	75	94%
MATH030	5	5%	33	32%	13	13%	53	51%	18	17%	86	83%
MATH150	10	6%	63	40%	14	9%	69	44%	24	15%	132	85%
MATH151	4	11%	14	39%	4	11%	14	39%	8	22%	28	78%
Total	22	6%	152	40%	33	9%	169	45%	55	15%	321	85%

*11 students did not disclose gender, 2 participants and 9 non-participants

**P= SI participant/NP= Non-Participant; participants defined as having attended ≥ 5 SI sessions

***Percentaged across by total number in course

Addressing Question #1

Supplemental Instruction has been shown to be most effective in courses with a pass rate less than or equal to 70%. All courses showed higher pass rates for participants than non-participants with the exception of MATH151 (96% for non-participants vs. 88% for participants). Table 4.1 summarizes enrollment and success rates.

Table 4.1
Enrollment and success rates

	<i>Enrollment</i>	<i>Participation</i>			<i>Success Rates</i>	
		<i>Participation</i>	<i>Rates</i>		<i>Participants</i>	<i>Non-Participants</i>
			<i><5</i>	<i>≥5</i>		
MATH029	84	78	6	7%	83%	71%
MATH030	109	90	19	17%	74%	71%
MATH150	158	134	24	15%	92%	84%
MATH151	36	28	8	22%	88%	96%
Total	387	330	57	15%	84%	79%

A larger percentage of SI participants earned A's than did non-participants in MATH029, MATH030, and MATH151. SI participants earned a larger percentage of B's than non-participants in MATH150; in all other courses non-participants earned more B's and C's.

Table 4.2
Percent of final grade by course and participation

	<i>A</i>		<i>B</i>		<i>C</i>		<i>D</i>		<i>F/FW</i>	
	<i>P</i>	<i>NP</i>	<i>P</i>	<i>NP</i>	<i>P</i>	<i>NP</i>	<i>P</i>	<i>NP</i>	<i>P</i>	<i>NP</i>
MATH029	50%	17%	17%	30%	17%	24%	17%	12%	0%	18%
MATH030	21%	16%	26%	27%	26%	29%	11%	16%	16%	13%
MATH150	17%	24%	54%	31%	21%	29%	4%	5%	4%	10%
MATH151	25%	18%	38%	46%	25%	32%	13%	4%	0%	0%

*P = participant, NP = Non-Participant; Percentaged across by P/NP

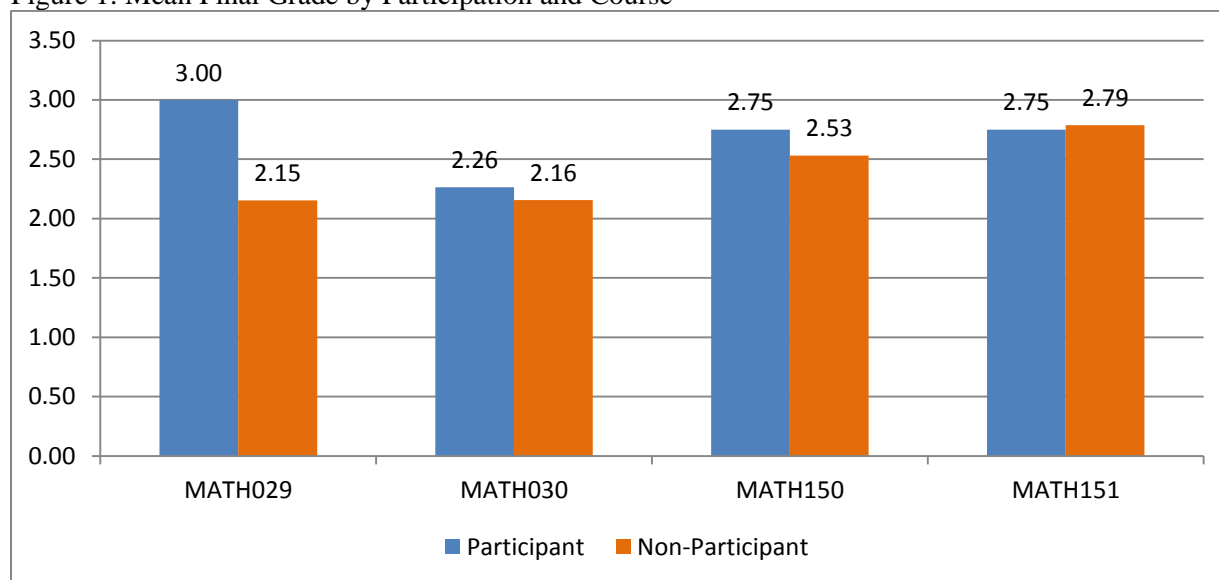
A Chi-square test was conducted for each course. Analysis revealed that the likelihood of success was not significantly more likely for SI participants compared to non-participants. No statistically significant relationships were found for MATH029, MATH030, MATH150, or MATH151. Table 4.3 summarizes the outcomes of the chi-square analysis.

Table 4.3
Summary of Chi-Square Results

	<i>df</i>	<i>N</i>	χ^2	<i>p</i>
MATH029	1	84	.449	.503
MATH030	1	109	.051	.821
MATH150	1	158	.881	.348
MATH151	1	36	.945	.331

Because there was no significance found in the initial test and low sample size contributes to uninformative results, further inferential testing was not warranted. However, descriptive comparisons for mean final grade (operationalized continuously) were conducted between SI and non-SI participants. Comparisons can be viewed below on Figure 1.

Figure 1: Mean Final Grade by Participation and Course



Participants had a higher mean final grade than non-participants except in MATH151, where non-participants ($M = 2.79$, $SD = .77$) were marginally higher than participants ($M = 2.75$, $SD = 1.04$). Table 4.4 compares participants to participants on final grade and SI sessions attended.

Table 4.4

Participant comparisons on final grade and SI sessions attended by course

Course	<i>n</i>	Final Grade				SI Sessions Attended			
		<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
MATH029	6.00	3.00	1.26	1.00	4.00	8.00	2.97	5.00	11.00
MATH030	19.00	2.26	1.37	0.00	4.00	7.00	1.97	5.00	11.00
MATH150	24.00	2.75	0.94	0.00	4.00	8.04	2.24	5.00	12.00
MATH151	8.00	2.75	1.04	1.00	4.00	9.75	2.12	6.00	12.00
Total	57.00	2.61	1.15	0.00	4.00	7.93	2.33	5.00	12.00

CONCLUSION

For the winter 2015 term, participants demonstrated higher course success rates than non-participants for all of the courses which offered SI support except MATH151. Course success is not significantly more likely for participants of SI compared to non-participants in any course.

Limitations

Several limitations surfaced during the inspection of this data, including sample size. SI participants were low in all courses. Due to the logistics of facilitating student success, shared governance, and data management, randomized, controlled trials are not always feasible within the framework of Institutional Research. Also, a student motivation variable was unmeasured and therefore unable to be accounted for in this analysis. In addition, extraneous variables may exist such as individual variation in student ability, home/work life, and other personal factors left unmeasured in the current study that also may account for some of the variability in student academic outcomes.

Future Implications

According to this analysis, SI has no effect on course success. These results should be interpreted with caution, as poor participation rates and overall course sample size increase Type II error. Activities aimed at increasing participation rates should be considered if SI is to be critically evaluated for winter and summer sessions.