

SUPPLEMENTAL INSTRUCTION EFFECTIVENESS REPORT
SUMMER 2015

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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

In the summer 2015 semester, Supplemental Instruction (SI) was offered for nine sections of three math courses to a total of 304 students. Descriptive and inferential statistics were utilized to investigate the effects of SI on course outcomes. SI participants were designated as having attended one or more sessions during the semester; this definition of participation differs from previous reports to better accommodate the low sample size of intersession semesters. Course success was categorized as receiving a grade of A, B, or C. Participants showcased higher success rates than non-participants in all courses, except in MATH150 (see Figure 1).

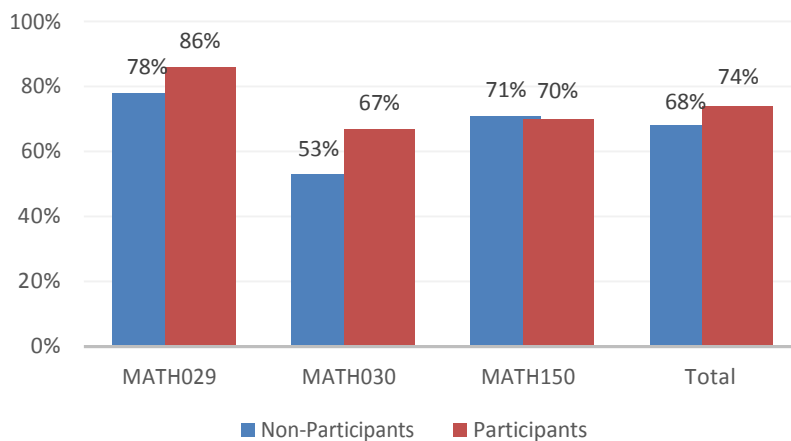


FIGURE 1. Success Rates

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. There were no statistically significant relationships found for MATH029, MATH030, or MATH150.

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. SI was offered for nine sections of three math courses to a total of 304 students.

TABLE 2
Summer 2015 enrollment and sections supported

Course	N	SI Supported Sections
MATH029	69	3
MATH030	76	2
MATH150	159	4
Total	304	9

Student Characteristics

Hispanic students were the largest ethnic group ($n = 198$) for the summer 2015 semester in all courses. In MATH029 and MATH150, Whites were the second largest group, while in MATH030 Asians were the second largest group.

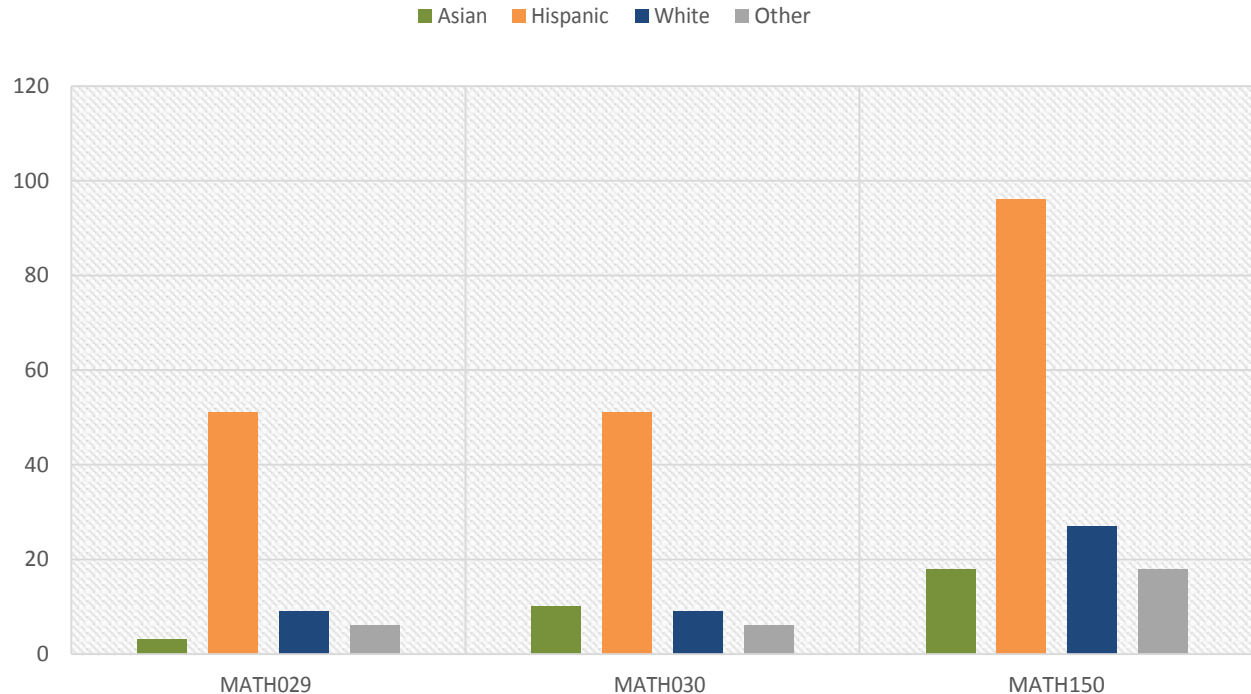


FIGURE 2. Student distribution by ethnicity and course

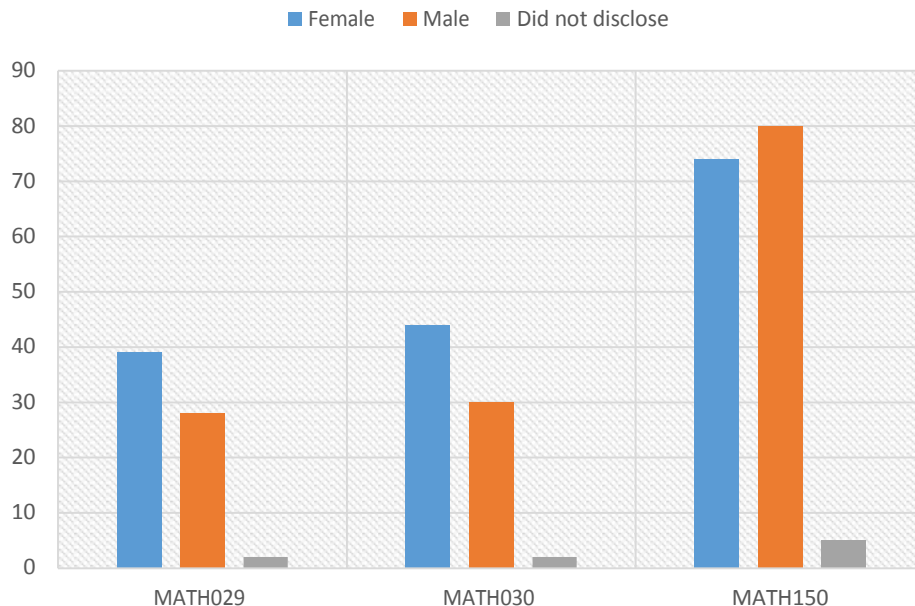


FIGURE 3. Student distribution by gender and course

SI Participation. Students were considered an SI participant if they attended at least one session of SI. For summer 2015, there were a total of 129 students who attended at least one session of SI (participants) and 175 who did not (non-participants); this definition of participation differs from previous reports to better accommodate the low sample size of intersession semesters.

Analytic Strategy

All analyses were performed using statistical package R version 3.2.2. Descriptive statistics were used to depict SI participation across relevant demographic characteristics such as gender and ethnicity; course comparisons were also assessed.

Inferential Statistics: Addressing Q.1

Course success was measured as a binary variable: A, B, C = successful, D, F, FW, W = not successful. SI participants were designated as students who attended one or more sessions of SI. Crosstabulation and chi-square tests were used to examine if success was more likely for participants or non-participants of SI. Inferential tests were evaluated at 0.05 α level.

RESULTS

SI Participation

Participation in SI sessions for all ethnicities is shown below. Hispanic students made up the greatest number of students enrolled in the SI supported summer classes. However, due to their low summer enrollment, Whites had the highest participation rates in MATH029 and MATH030. Thirty students indicated two or more races, unknown, Alaskan Native, Pacific Islander, and African American; therefore, the “Other” ethnic column is the aggregate of these ethnic categories. Figure 4 showcases the distribution of SI participation by gender.

TABLE 3
SI Participation by course and ethnicity

	Hispanic		White		Asian		Other		Total	
	Enrolled	Participated	Enrolled	Participated	Enrolled	Participated	Enrolled	Participated	Enrolled	Participated
MATH029	51	57%	9	78%	3	33%	6	0%	69	54%
MATH030	51	51%	9	56%	10	30%	6	33%	76	47%
MATH150	96	40%	27	37%	18	22%	18	22%	159	35%
Total	198	47%	45	49%	31	26%	30	20%	304	42%

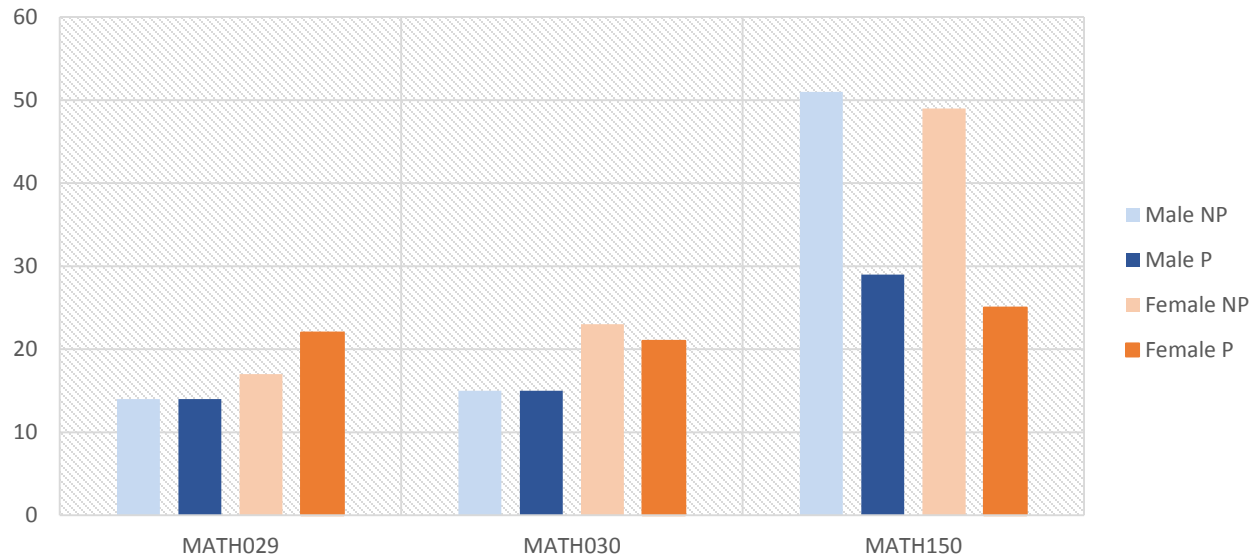


FIGURE 4. Course participation by gender; NP = Non-Participant, P = Participant

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, except in MATH150. Table 4.1 summarizes enrollment and success rates.

TABLE 4.1

Enrollment, participation, and success rates (Withdraws Included)

	Enrollment	Participation		Participation Rates	Success Rates	
		0	≥ 1		Non-Participants	Participants
MATH029	69	32	37	54%	78%	86%
MATH030	76	40	36	47%	53%	67%
MATH150	159	103	56	35%	71%	70%
Total	304	175	129	42%	68%	74%

A chi-square test was conducted to evaluate the association between SI participants and non-participants on success. The analysis revealed that SI participants are not significantly more likely to be successful in **MATH029** compared to non-participants, $\chi^2(1, N = 69) = 0.354, p = .552$.

A chi-square test was conducted to evaluate the association between SI participants and non-participants on success. The analysis revealed that SI participants are not significantly more likely to be successful in **MATH030** compared to non-participants, $\chi^2(1, N = 76) = 1.04, p = .307$.

Visual inspection of **MATH150** shows that non-participants had marginally higher success rates than SI participants, therefore, no inferential test was necessary.

DISCUSSION

For the summer 2015 term, participants demonstrated higher course success rates than non-participants for all of the sections which offered SI support, except for in MATH150. Course success is not significantly more likely for participants of SI compared to non-participants in any course.

Limitations

Several limitations are present in the current study. First, this study is a non-experimental evaluation, and therefore describes a study design that cannot provide the same validity as a double-blind trial. Due to the logistics of facilitating services for student success, maintaining shared governance, and managing complex data systems, randomized, controlled trials are not always feasible within the framework of Institutional Research. Second, this study is limited by the range of variables available to incorporate in analysis. Extraneous variables may exist such as individual variation in student ability, unknown use of math tutoring, 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.

APPENDIX

SI PARTICIPATION BASED OFF OF ≥ 5 SESSIONS

The participation and success rates indicated in the table below reflect the summer 2015 semester using the same SI participant designation used in previous reports. A student is considered a participant if they attended ≥ 5 SI sessions throughout the semester. This table has been included for the readers ease in making success and participation comparisons across semester reports however, it does not reflect the group designation used in this study.

TABLE A

Enrollment, participation, success rates (Withdraws Included)

	Enrollment	Participation		Participation Rates	Success Rates	
		Participation			Non-Participants	Participants
		<5	≥ 5			
MATH029	69	48	21	30%	81%	86%
MATH030	76	64	12	16%	55%	83%
MATH150	159	142	17	11%	70%	71%
Total	304	254	50	16%	69%	80%