



Calculus-Prep Fast Track Learning Community, 2014-2015

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Summary of Findings

- Students in the Calculus-Prep Fast Track LC were substantially ($d=0.80$) and statistically significantly ($p=0.020$) more likely to persist to MATH-250 (29%) and successfully complete MATH-250 (86%) than students in the same course in the same term (7% and 77%, respectively).
- STEM-major students in the Fast Track LC were substantially more likely ($d>0.20$) to successfully complete MATH-102 (68%) and MATH-103 (77%) than non-STEM major students in the same Fast Track LC (50%).
- Students in the Fast Track LC receiving STEM grant support services were substantially ($d>0.20$) and statistically significantly ($p<0.050$) more likely to successfully complete MATH-102 (69%) and MATH-103 (78%) than students not receiving STEM grant support services in the same Fast Track LC (38% and 31%, respectively).

Possible Implications

- Crafton Hills College should consider continuing the Calculus-Prep Fast Track LC.
- STEM-major students should consider enrolling in the Calculus-Prep Fast Track LC.
- Crafton Hills College should consider continuing to provide additional support services similar to those provided by the Title III HSI STEM grant for students enrolled in the Calculus-Prep Fast Track LC.

Overview

In order to assist students' successful persistence through the mathematics sequence, the mathematics department began piloting Fast Track learning communities (LC) which sequence two math courses into a single 18-week semester. In 2014-2015, the mathematics department, in collaboration with the Title III HSI STEM (science, technology, engineering, and mathematics) grant, offered a Fast Track LC to prepare students for calculus. Students enrolled in the Calculus-Prep Fast Track LC took MATH-102, college algebra, and MATH-103, trigonometry.

This study analyzes the success and persistence of students enrolled in the Calculus-Prep Fast Track LC. Additionally, this study compares the relationship of students who are STEM majors and students who received services offered by the Title III HSI STEM grant with course outcomes.

Methodology

The success (a grade of A, B, C or P) and persistence (earning a grade of record—a grade of A, B, C, D, F, P, NP, W or I—in two consecutive terms) of students in MATH-102, MATH-103, and MATH-250 (Fast Track group) were compared to students with a grade on record in the same courses during the same terms (control group). Additionally, success rates were also compared between students who are STEM majors with students who are not STEM majors and students who received services offered by the Title III HSI STEM grant with students who had not within the same term. Analysis of variance tests and effect size were calculated using Cohen's d methodology were used to measure the strength and relationship of the various factors with student performance.

Effect size is calculated by dividing the difference of the two means by the pooled standard deviation. Jacob Cohen developed one method of interpreting effect size (d) where 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. Accordingly, using Cohen as a guide, a substantial effect would be .20 or higher. The number of students in each group does not influence effect size making ES; 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).

Findings

Table 1 illustrates the difference between how students in the Calculus-Prep Fast Track LC performed in comparison to students in the same courses in the same terms. Students in the Calculus-Prep Fast Track LC were substantially ($d=0.80$) and statistically significantly ($p=0.020$) more likely to persist to MATH-250 (29%) in Spring 2015 than students in the

same course in the same term (7%). Students in the Calculus-Prep Fast Track LC were substantially more likely ($d=0.22$) to successfully complete MATH-250 (86%) than students in the same course in the same term (77%).

Table 1. Student performance between Fast Track and control groups.

Measure	Control Group		Fast Track Group		<i>d</i>	<i>p</i>
	#	%	#	%		
Success in MATH-102	279	52.3	28	58.3	0.12	0.426
Success in MATH-103	151	59.0	30	62.5	0.07	0.648
Persist to MATH-250	17	6.6	7	29.2	0.80	0.020
Success in MATH-250	13	76.5	6	85.7	0.22	0.609

Note: '#' denotes the number of individuals meeting the measurement, and '%' denotes the # divided by the total number of students within the group. For example, 29% of students—or seven students out of 24 total—in the Fast Track group persisted to MATH-250 in Spring 2015.

Table 2 illustrates the difference between how students in the Calculus-Prep Fast Track LC performed in comparison to students controlling for course, term, and major. STEM-major students in the Calculus-Prep Fast Track LC were substantially ($d>0.20$) more likely to successfully complete MATH-102 (68%) and MATH-103 (77%) than STEM-major students in the same course in the same term (55% and 67%, respectively). STEM-major students in the Calculus-Prep Fast Track LC were also substantially more likely ($d>0.20$) to successfully complete MATH-102 (68%) and MATH-103 (77%) than non-STEM major students in the Calculus-Prep Fast Track LC (50%).

Table 2. Student performance between Fast Track group, control group, and students' majors.

Measure	Control Group				Fast Track Group				Between STEM Majors		Within Fast Track	
	Not STEM Major		STEM Major		Not STEM Major		STEM Major		<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>
	#	%	#	%	#	%	#	%				
Success in MATH-102	212	51.6	67	54.9	13	50.0	15	68.2	0.27	0.235	0.36	0.209
Success in MATH-103	67	51.1	84	67.2	13	50.0	17	77.3	0.22	0.319	0.56	0.050
Success in MATH-250					10	76.9	9	81.8			0.12	0.779

Table 3 illustrates the difference between how students in the Calculus-Prep Fast Track LC performed in comparison to students controlling for course, term, and STEM grant support services. Students receiving STEM grant support services in the Calculus-Prep Fast Track LC were substantially ($d>0.20$) and statistically significantly ($p<0.050$) more likely to successfully complete MATH-102 (69%) and MATH-103 (78%) than students not receiving STEM grant support services in the Calculus-Prep Fast Track LC (38% and 31%, respectively). Students receiving STEM grant support services in the Calculus-Prep Fast Track LC were also substantially more likely ($d=0.41$) to successfully complete MATH-250 (87%) than students not receiving STEM grant support services in the same course in the same term (70%).

Table 3. Student performance between Fast Track group, control group, and whether students received services offered by Title III HSI STEM grant.

Measure	Control Group				Fast Track Group				Between STEM Service Recipients		Within Fast Track	
	No STEM Services		Rec'd STEM Services		No STEM Services		Rec'd STEM Services		<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>
	#	%	#	%	#	%	#	%				
Success in MATH-102	251	51.2	28	65.1	6	37.5	22	68.8	0.08	0.745	0.63	0.043
Success in MATH-103	111	56.3	40	67.8	5	31.3	25	78.1	0.23	0.286	0.96	0.002
Success in MATH-250					7	70.0	13	86.7			0.41	0.358