COSUMNES RIVER COLLEGE

OFFICE OF RESEARCH & EQUITY

Brief Evaluation of the Impact of Math Bootcamp on Course Success

Research Office

Spring 2024

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Executive Summary

Background

In Summer 2023, the Math Department at Cosumnes River College (CRC) revamped their MATH 83 (Math Bootcamp) course offering. MATH 83 uses adaptive learning software (ALEKS PPL) to identify areas for growth in math skills and provide lessons/evaluations in those areas. Additionally, all three sections of Math Bootcamp (with a total of 62 students) had tutors and an assigned faculty member. These individuals assisted students by supplementing the explanations of ALEKS PPL when students needed additional help and by providing short ("mini") lectures on potentially confusing topics.

A previous evaluation of the Math Bootcamp focused on summarizing survey data and enrollment patterns for students[1]. This evaluation focused on the impact of the Math Bootcamp on course success – particularly for students who were retaking a course or entering the next level of math with a "C" grade in the pre-requisite.

Summary of Findings

1) Among students retaking or taking a higher course after a "C" grade, Math Bootcamp participants in Summer 2024 had a higher success rate relative to non-participants (53.6% vs. 39.0%; *Table 2b*, page 3). This difference was only trending towards significance, $z = 1.716$, $p < .10$.

Caveats and Limitations

For various reasons, this study did not (and could not) use the entire sample of Math Bootcamp students from summer 2023. Analysis focused on students from the Math Bootcamp that had either (1) completed a pre-requisite with a low-successful grade and were attempting the next course or (2) had failed a course and were repeating that course. As such, the sample size was small ($N = 28$). This may have left analyses underpowered to find an effect.

On the other hand, small sample sizes are vulnerable to sampling effects. For example, it's possible that bootcamp students enrolled in courses that were less technical (e.g. MATH 300) than non-bootcamp students (MATH 401). There may also be some underlying difference between Math Bootcamp students and non-Math Bootcamp students that explain the possible differences observed here (e.g. motivation to invest extra time, etc.).

Conclusions and Recommendations

Although findings look potentially promising, continue monitoring course success and qualitative feedback from survey instruments. The Research Office and Bootcamp coordinators should revisit the evaluation in Summer 2024.

[1] Meinz, P. (2023). *Math Bootcamp: Student Feedback and Enrollment Pathways*.

Background and Methodology

Method

The present analysis sought to investigate the association between Math Bootcamp and course success. A total of 62 students took the Math Bootcamp in Summer 2023. These students came from varying math backgrounds and exhibited various enrollment patterns. Some were preparing for their first math course at CRC, others did not enroll in math in Fall 2023, some planned on retaking a math course they had not passed, etc.[2] This evaluation focused on students from two particular enrollment paths – students who were reattempting a failed course in Fall 2023 and students who had received a low successful grade (a "C") and were attempting the next level of math in Fall 2023. Analyses focused on these students for two reasons. First, among students taking the Math Bootcamp, the two aforementioned paths constituted the largest portion of students (aside from students who did not enroll in a math course in fall 2023). Second, it was less difficult to identify a control group for these students. Had Math Bootcamp students simply been compared to all other math students in Fall 2023, confounding factors may have led to difficulties interpreting findings. In particular, students who do not take the Math Bootcamp may not be as challenged in mathematics (on average) as students who do take the Math Bootcamp. The difference in mathematics ability (due to confidence, prior experience, etc.) may obscure any effect of the MATH 83 experience.

To that end, the two aforementioned student groups were compared to non-bootcamp students with the same enrollment patterns from Spring 2023 into Fall 2023. That is, data were gathered on students in Spring 2023 who failed a math course and reattempted the same course in Fall 2023, and students were identified in Spring 2023 that earned a "C" grade and were attempting the next level in Fall 2023. In order to ensure an adequate comparison, this control group was selected from students who attempted the same courses in Fall 2023 as the Bootcamp sample – MATH 300, MATH 333, MATH 335, MATH 355, MATH 400, MATH 401, and STAT 300. Grade data from these attempted courses were gathered for analysis. The course success rate for the control group was compared to the course success rate for the Bootcamp students to identify any potential effect of MATH 83. Here a course success rate is defined by the percentage of A, B, C or P grades out of the total number of enrollments.

Student Demographics

A total of 28 students were included in the Math Bootcamp sample and 177 were included in the control group. A demographic breakdown of each group can be found in *Table 1* below. Hispanic/Latinx students and Male students constituted the largest race/ethnicity and gender groups, respectively. A breakdown of control and Bootcamp students by their enrollment path can be found in *Table 2a*. In both cases, reattempting students constituted the largest portion of the sample.

[2] For a complete description of the enrollment patterns, see: Meinz, P. (2023). *Math Bootcamp: Student Feedback and Enrollment Pathways*.

Table 1. Demographic Breakdown of Control vs. Bootcamp Groups

	Bootcamp		Control	
Demographic	**Count**	**% of Total**	**Count**	**% of Total**
African American	3	10.7%	13	7.3%
Asian	3	10.7%	48	27.1%
Filipino	2	7.1%	13	7.3%
Hispanic/Latino	12	42.9%	65	36.7%
Multi-Race	3	10.7%	9	5.1%
Pacific Islander	1	3.6%	5	2.8%
Other Non-White	1	3.6%	0	0.0%
Unknown	0	0.0%	1	0.6%
White	3	10.7%	23	13.0%
Female	12	42.9%	67	37.9%
Male	16	57.1%	107	60.5%
Unknown/Other Gender	0	0.0%	3	1.7%
Total	**28**		**177**	

Table 2a. Path Counts

Path	Bootcamp	Control
Attempting Higher	8	25
Reattempting	20	152
Total	28	177

Findings and Analysis

Finding 1

Data were analyzed by a logistic regression with binomial error. After controlling for enrollment path, there was a trending significant effect such that Bootcamp students had higher success rate than control students, $z = 1.716$, $p < .10$. Success rates for each group can be found in *Table 2b* below.

Table 2b. Course Success Rates by Path and Group

Path	Bootcamp	Control
Attempting Higher	50.0%	20.0%
Reattempting	55.0%	42.1%
Total	53.6%	39.0%

Conclusions and Recommendations

Although findings look potentially promising, continue monitoring course success and qualitative feedback from survey instruments. The Research Office and Bootcamp coordinators should revisit the evaluation in Summer 2024.

Caveats and Limitations

This study focused on students from the Math Bootcamp that had either (1) completed a pre-requisite with a low grade and were attempting the next course or (2) had failed a course and were repeating that course. As such, the sample size in the bootcamp group was small (N = 28). This may have left analyses underpowered to find and effect.

On the other hand, small sample sizes are vulnerable to sampling effects. For example, it's possible that bootcamp students enrolled in courses that were less technical (e.g. MATH 300) than non-bootcamp students (MATH 401). There may also be some underlying difference between Math Bootcamp students and non-Math Bootcamp students that explain the possible differences observed here.