EASE'ing Students into College:
The Impact of Multidimensional Support for Underprepared Students

Sabrina Solanki
Di Xu
Peter McPartlan
Brian Sato

"I have made amazing friends in my cohort. EASE has helped me find my 'people' at UCI that I can have fun with as well as study and learn from. EASE gave me a ton of resources."

1. Introduction

An extensive theoretical literature and qualitative evidence nominates learning communities as a promising strategy to improve persistence and success among at-risk populations in STEM fields by better engaging them both academically and socially. Yet, rigorous quantitative evidence on the impacts of these programs is limited. This paper estimates the causal effects of a first-year learning communities program --- Enhanced Academic Success Experience initiative (EASE) --- provided to freshmen majored in Biological Sciences at a large public Hispanic-serving institution. The key methodological strategy used is a regression discontinuity design based on the fact that students assigned to the program fall below an SAT-math threshold. The promising results on both academic and non-academic outcomes provide compelling evidence that cohort programs can provide effective support to at-risk populations when implemented with high level of fidelity.

2. Data and Research Background

2.1 Research Setting

At this institution, Biological Sciences houses the largest group of students, among STEM disciplines, and is the second largest major on campus. It also contains an equal or greater fraction of URM and first-generation students compared to other STEM disciplines (University of California Information Center, 2016). In the past decade, roughly 35% of incoming freshmen who enrolled as Bio Sci majors did not graduate with this major in four years. Furthermore, at-risk students disproportionately left the major. Thus, this institution is an ideal setting to investigate issues related to inequalities in STEM education and ways to improve them.

2.2 The EASE Cohort Program

The EASE program targets all freshmen with an SAT-math score below 600 and provides these students with multi-dimensional support including:

(1) Academic remediation -- EASE students are required to take an additional developmental chemistry course during fall quarter designed to prepare them for subsequent Bio Sci major courses.
(2) Academic and social support -- EASE students are grouped into cohorts of 30. Each cohort is enrolled in the same biology and chemistry courses for two years. Cohorts are also matched

with a senior Bio Sci mentor. The primary purpose of the EASE mentor is to provide increased academic support and to serve as students' main guide to all campus resources and opportunities. Lastly, EASE students participate in a weekly 50-minute seminar led by an EASE mentor. Seminar topics are generally academic-related with a special focus on study skills and metacognition. However, first-year issues are also discussed.

2.3 Data and Sample Description

The sample of this study includes all Biology freshmen majors who entered during Fall 2016 (N=907). Nearly half of the entering cohort scored below 600 in SAT-math and were hence required to enroll in the EASE program. Data for this study comes from multiple sources. The Registrar's Office provided information on student demographic characteristics, SAT scores, as well as transcript data. We also collected program-level data that recorded students' actual enrollment and participation in the EASE program. Lastly, students' academic and social-emotional engagement measures were collected through three waves of surveys.

3. Methodology

3.1 Addressing Ability Sorting: Regression Discontinuity Design

Because the EASE program strictly follows an SAT cutoff score for assignment, we are able to utilize a regression discontinuity (RD) design to estimate the causal impacts of the program on student outcomes. The basic implementation of the RD design identifies the impact of the EASE program by comparing outcomes of students who score barely above the 600 SAT cutoff scores with those who score barely below; these students sharply differ in EASE assignment, yet are otherwise very similar. As a result, the regression coefficient can then be interpreted as the causal impact of the intervention for students on the margin of passing the cutoff (Levin & Calcagno, 2008).

3.2 Addressing Noncompliance: Fuzzy RD Design

In the context of the current study, however, not all students below the 600 cutoff score followed the EASE assignment. To deal with potential bias associated with noncompliance, we followed existing literature for a "fuzzy RD" design where we used EASE assignment as an instrumental variable for actual participation in EASE and employed a two-stage least squares strategy to provide a consistent estimate of EASE on student outcomes. The correlations between recommendation and participation were strong, with an overall compliance rate of 83%.

3.3 Validity of the RD Design

There are three testable assumptions underlying the validity of the RD design. First, the probability of EASE program enrollment should be discontinuous at the passing cutoff. Figure 1 plots the likelihood of participating in the EASE program as a function of the SAT-math score. The graph clearly shows a discontinuity at the passing cutoff for EASE enrollment.

Second, the expectations of pre-treatment covariates should be continuous at the passing cutoff. Figure 2 visually presents the distribution of SAT-math scores by baseline covariates around the cutoff score. In only one case could we reject a zero discontinuity in the relationship between baseline covariates and SAT-math score. We also ran the corresponding regressions to test for discontinuities. The only covariate for which we found a statistically significant difference is for female around the math SAT cutoff.

Lastly, there should be no discontinuity in density around the cutoff. Figure 3 examines assumption three by showing the distribution of scores around the cutoff and none of them showed clear discontinuity in distribution of students above and below the score.

4. Results

4.1 Impacts of EASE on Academic and Social-psychological Outcomes

Figure 4 plots outcome measures as a function of the SAT-math score (centered to be zero at the passing cutoff); discontinuities are detected for all measures indicating a positive treatment effect. Table 1 supports the graphical plots; positive and significant coefficients were identified for both the intent-to-treat estimates and for the two-stage least squares estimates across course grades in both Biology 93 and in Biology 94 and for the measure of sense of belonging.

5. Conclusion and Next Steps

For next steps, we will also examine the impacts of EASE on students' persistence within the Biology major at the end of the first year and cumulative first-year GPA. Having established the causal impacts of EASE on students' academic outcomes and social integration, we will further examine which component of the EASE program benefits students the most. Specific policy implications and program implementation will be discussed during the SREE presentation.

References

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Tables & Figures

Table 1. Impacts of EASE program on Academic & Non-Cognitive Outcomes
(Bandwidth: ± 60 Points)

	Biology 93	Biology 94	SB
Intent-to-treat estimates	0.317*	0.421**	0.525***
	(0.165)	(0.189)	(0.191)
Instrumental variable estimates	0.592*	0.723**	1.023**
	(0.318)	(0.318)	(0.412)
N	393	375	359

Note. Each cell represents a separate regression within a 60-point band. Each analysis includes the following covariates: a gender dummy variable, race dummy variables, a dummy variable for low-income status, a dummy variable for first-generation status, SAT-read score, and wave 1 survey measure (for non-cognitive measures). SB = sense of belonging. Robust standard errors used.
*p<.10. **p<.05. ***p<.01.

Figure 1. Probability of EASE Participation by SAT-math Test Scores.

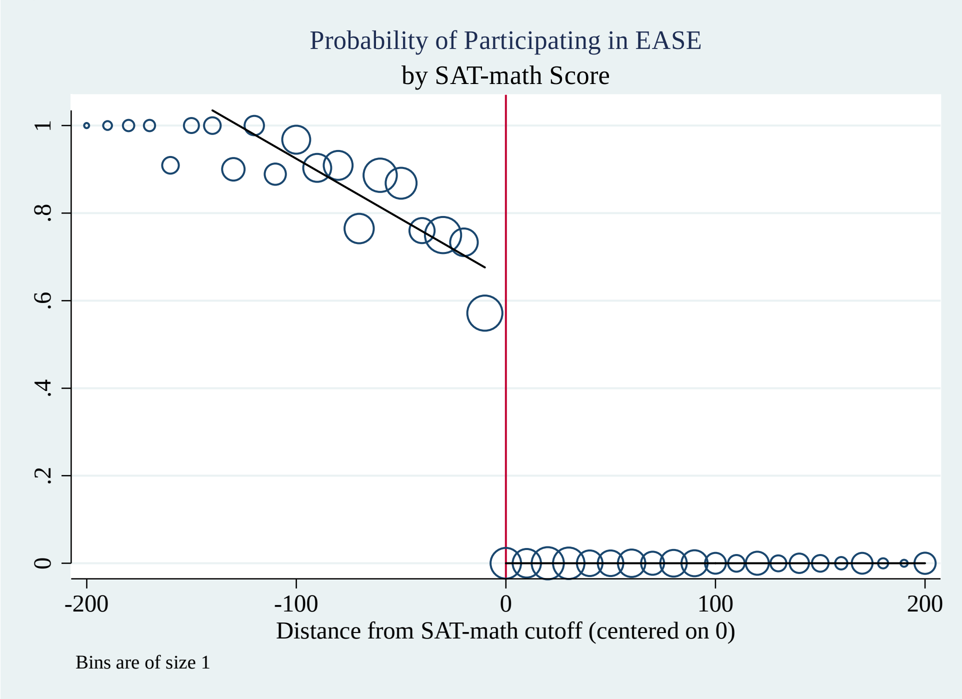

Figure 2. Regression Discontinuity Validity Check: SAT-math Score Distribution by Pre-Treatment Individual Characteristics

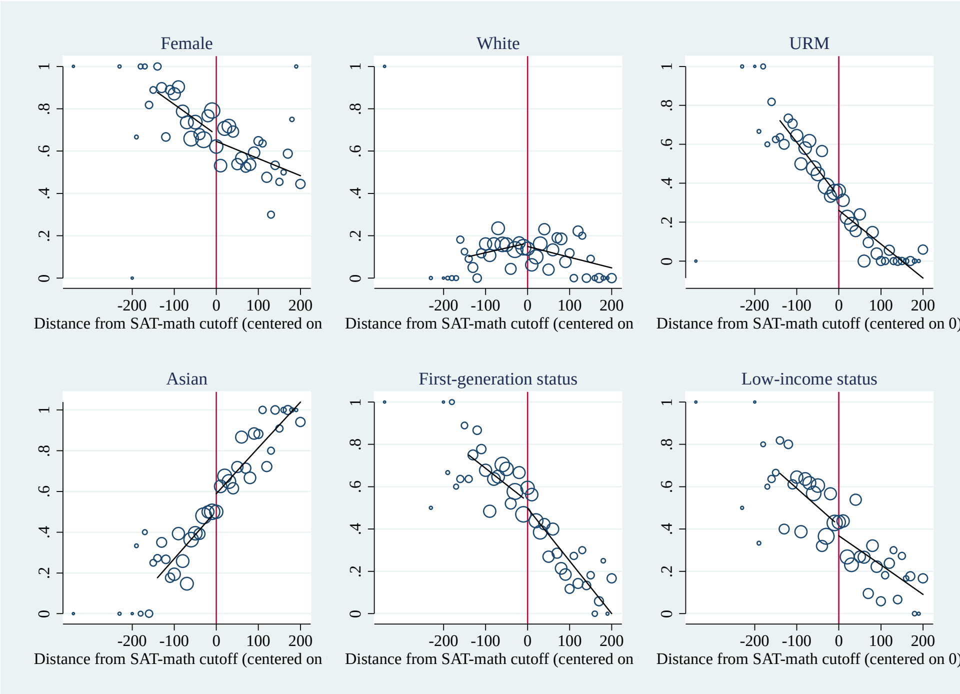

Figure 3. Regression Discontinuity Validity Check: Density of Observations around Cutoff

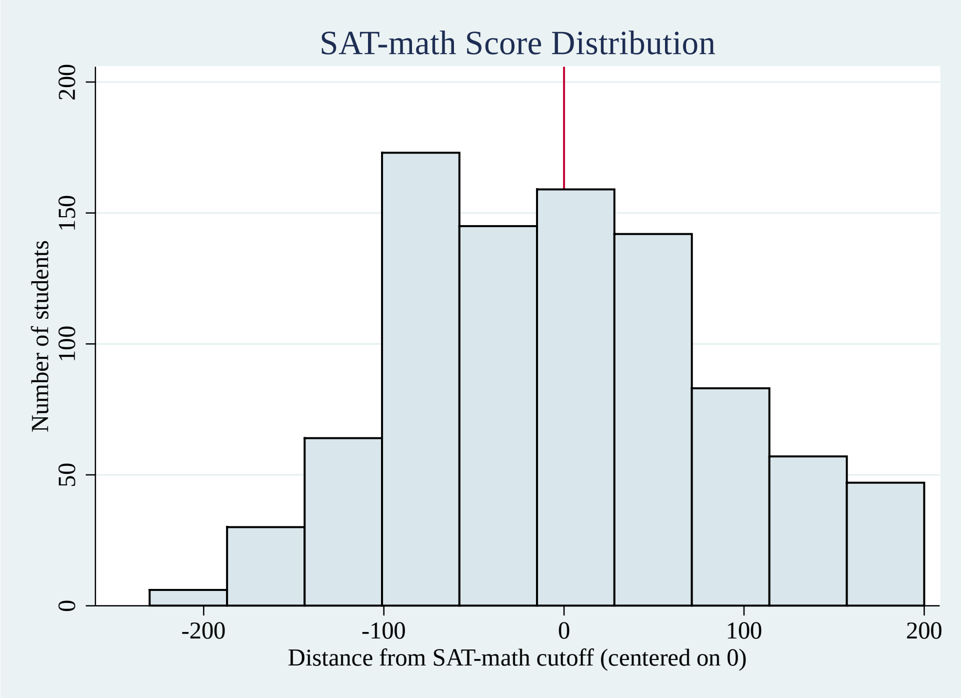

Figure 4. Outcomes by SAT-math score