

Research Brief

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Sacramento City College

Office of Planning, Research, and
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ANALYSIS OF RELATIONSHIPS BETWEEN MATH 120 OUTCOMES AND RECENCY OF MATH 100 PREREQUISITE COURSE: THE CASE OF LOS RIOS COMMUNITY COLLEGE DISTRICT (2003 TO 2014)

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Introduction

The question of a prerequisite course's recency has been of interest to the college community of late; and recency itself has been under consideration as an additional prerequisite condition for enrollment in higher-level courses. Title 5 places *recency* in the same level of scrutiny for prerequisites as communication or computational skills for courses outside the English and math sequences.¹ This level of scrutiny requires data collection and analysis. To fulfill this requirement, we performed what Scroggins calls a "look-back" study to see what the outcomes were for students who had different intervals between taking the course prerequisite and enrolling in the outcome course.

Data

Relative sizes of possible course-pairs were explored and it was determined that the single-largest course-pair for math courses in Los Rios Community College District's (LRCCD) is Math 100 (*elementary algebra*) to Math 120 (*intermediate algebra* and the math graduation competency level). Transcript data were extracted from the LRCCD student data files for over fourteen thousand students who were enrolled in their first attempt at Math 120 ***anywhere in the district*** between Fall 2010 and Fall 2014. The prior Math 100 course data for these students ranges from Fall 2003 to Spring 2014. Transcript data are for students who took their math courses in one of the LRCCD colleges only. The final dataset consisted of 14,430 students for whom we had paired data. The range of elapsed time between courses is from one semester to eleven years.

Methods

We created numeric variables for letter grades and a dichotomous variable for successful course completion.² We also created a "recency" variable based on the spring and fall terms in an academic year. Consequently, we have full- and half-year increments. We used cross-tabulations to analyze the distributions of outcomes by recency of prerequisite. We also used regression methods to examine the relationships between recency of prerequisite and success in the subsequent course.

Key Findings

Key findings include:

- Almost 82% of students take the subsequent course one or fewer years after taking the prerequisite course.
- Only 2.4% of students take the subsequent course five or more years after taking the prerequisite.
- No systematic negative relationship between recency and success is apparent.

¹ See, for example, Chancellor's Office, California Community Colleges Student Services and Special Programs Division. (Fall 1997). *Prerequisites, Corequisites, Advisories, and Limitations on Enrollment*.

Community College League of California, California Community Colleges, Southern California Community College Institutional Research Association, and NOR CAL Community College Research Group (June 1992). *Matriculation Evaluation: Phase III Local Research Options*.

Scroggins, Bill "Are Prerequisites Really That Hard to Establish?" California Community College Chancellor's Office <http://www.cccco.edu/LinkClick.aspx?fileticket=Odti%2BZaJ3BM%3D&tabid=628&mid=1718> (retrieved 11/23/09).

² Grades were coded as 0=F/NC/NP, W, 1=D, 2=C/CR/P, 3=B, 4=A. For the dichotomous outcomes, 0=not successful; 1=successful, where grades A, B, C, CR, and P =1. Analyses were done with and without the "W" grade notations included. "W" grades are issued to students who withdraw from the course between 20% and 75% of the elapsed course.

Descriptive Statistics

Table 1 lists the elapsed time between Math 100 and Math 120, the numbers and percentages of unsuccessful and successful first attempts at Math 120, and the total numbers and percentages of students in each time interval from successful completion of Math 100. The vast majority of students take the subsequent course one or two semesters after taking the initial prerequisite course.

Table 1

Los Rios CCD MATH 120 Enrollment and Success Rates by Elapsed Years from MATH 100 (Fall 2003 to Fall 2014)

Elapsed Years	Not Successful		Successful		Total Students	<i>Percent of Students</i>
	Number	%	Number	%		
0.5	3,931	40	5,942	60	9,873	68.4
1	980	52	917	48	1,897	13.1
1.5	396	50	404	51	800	5.5
2	241	50	241	50	482	3.3
2.5	140	44	179	56	319	2.2
3	133	51	129	49	262	1.8
3.5	88	49	91	51	179	1.2
4	70	48	77	52	147	1.0
4.5	52	42	73	58	125	0.9
5	35	42	48	58	83	0.6
5.5	32	42	44	58	76	0.5
6	19	43	25	57	44	0.3
6.5	16	44	20	56	36	0.2
7	8	33	16	67	24	0.2
7.5	2	12	15	88	17	0.1
8	13	54	11	46	24	0.2
8.5	3	27	8	73	11	0.1
9	3	25	9	75	12	0.1
9.5	5	50	5	50	10	0.1
10	2	33	4	67	6	0.0
10.5	0	0	1	100	1	0.0
11	2	100	0	0	2	0.0
Totals	6,171	43	8,259	57	14,430	100.0

Somewhat surprising and counter-intuitive is the finding that lengthy elapsed time is **not** negatively related to success in the subsequent course. However, the numbers of students with longer intervals between courses are quite small, so it would be difficult to conclude that the results are more than statistical “noise” or occurring randomly—by chance. Any other course-pairs would be even smaller numbers, so it is unlikely that we would find any systematic patterns of evidence to support implementation of a recency policy.

Although our data explorations do not include any control variables, we performed some simple regressions and graphical representations of predicted relationships between elapsed time and

success and between elapsed time and grade distribution. These appear below and on the next few pages.

Regressions

Logistic regression was employed to estimate the relationship between recency and success. The dichotomous nature of the success variable and the continuous independent recency variable makes this method logical. A full explanation of logistic regression is beyond the scope of this brief. For a complete discussion of logistic regression, see Hosmer and Lemeshow 1989. For an example and brief explanation of interpreting the results of logistic regression, see UCLA's website at http://www.ats.ucla.edu/stat/mult_pkg/faq/general/odds_ratio.htm

Table 2 contains the logistic regression results of success regressed on elapsed time between prerequisite (Math 100) and outcome (Math 120) course. The regression was performed twice—once with all observations, and a second time excluding the W grades.

The model fit statistics in the upper right quadrant of each regression suggest that either with or without the W grade, recency accounts for very little of the variation in success. When we examine the odds-ratio for years elapsed in the first model with W included, on average, students are only 5% less likely to pass Math 120 with additional elapsed time. When we exclude the W, on average, students are actually 3% more likely to pass Math 120 with longer elapsed time. Still, these odds-ratios are so close to 1.0 that there is virtually no effect of recency.

Table 2

Regress Success on Number of Years Elapsed (includes W grades)

Logistic regression		Number of obs		14430	
		LR chi2(1)		14.21	
		Prob > chi2		0.0002	
Log likelihood = -9843.4134		Pseudo R2		0.0007	
Success	Odds Ratio	Std. Err.	z	P> z 	[95% Conf. Interval]
Years elapsed	0.9475899	0.013522	-3.77	0.000	0.9214553 to 0.9744658

Regress Success on Number of Years Elapsed (excludes W grades)

Logistic regression		Number of obs		11419	
		LR chi2(1)		2.79	
		Prob > chi2		0.0951	
Log likelihood = -6743.5758		Pseudo R2		0.0002	
Success	Odds Ratio	Std. Err.	z	P> z 	[95% Conf. Interval]
Years elapsed	1.031854	0.019594	1.65	0.099	0.9941563 to 1.07098

Because these models are looking at outcomes—*on average*—and do not express the full range of outcomes, we further illustrate using graphical methods below.

Graphical Estimations

Figures 1 and 2 graph the raw Math 120 success data by elapsed time from Math 100—with and without the W grade. It is apparent from the illustration in Figure 1 below that success is predicted to drop precipitously for students who do not take the subsequent math class the next semester; however, the probability of success rises steadily beginning at year 2. Keep in mind that the numbers of students taking their subsequent math class more than a year after the prerequisite course are quite small.

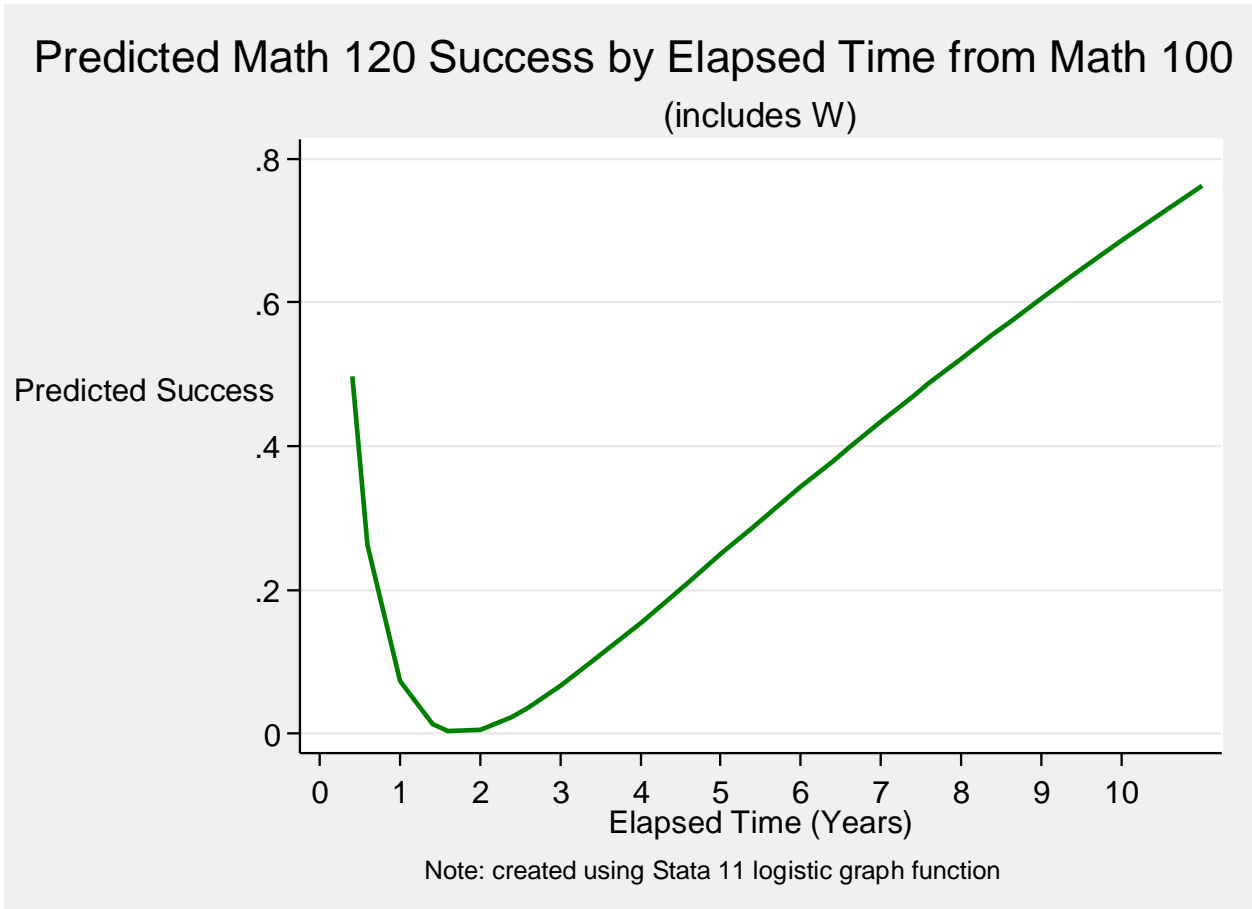
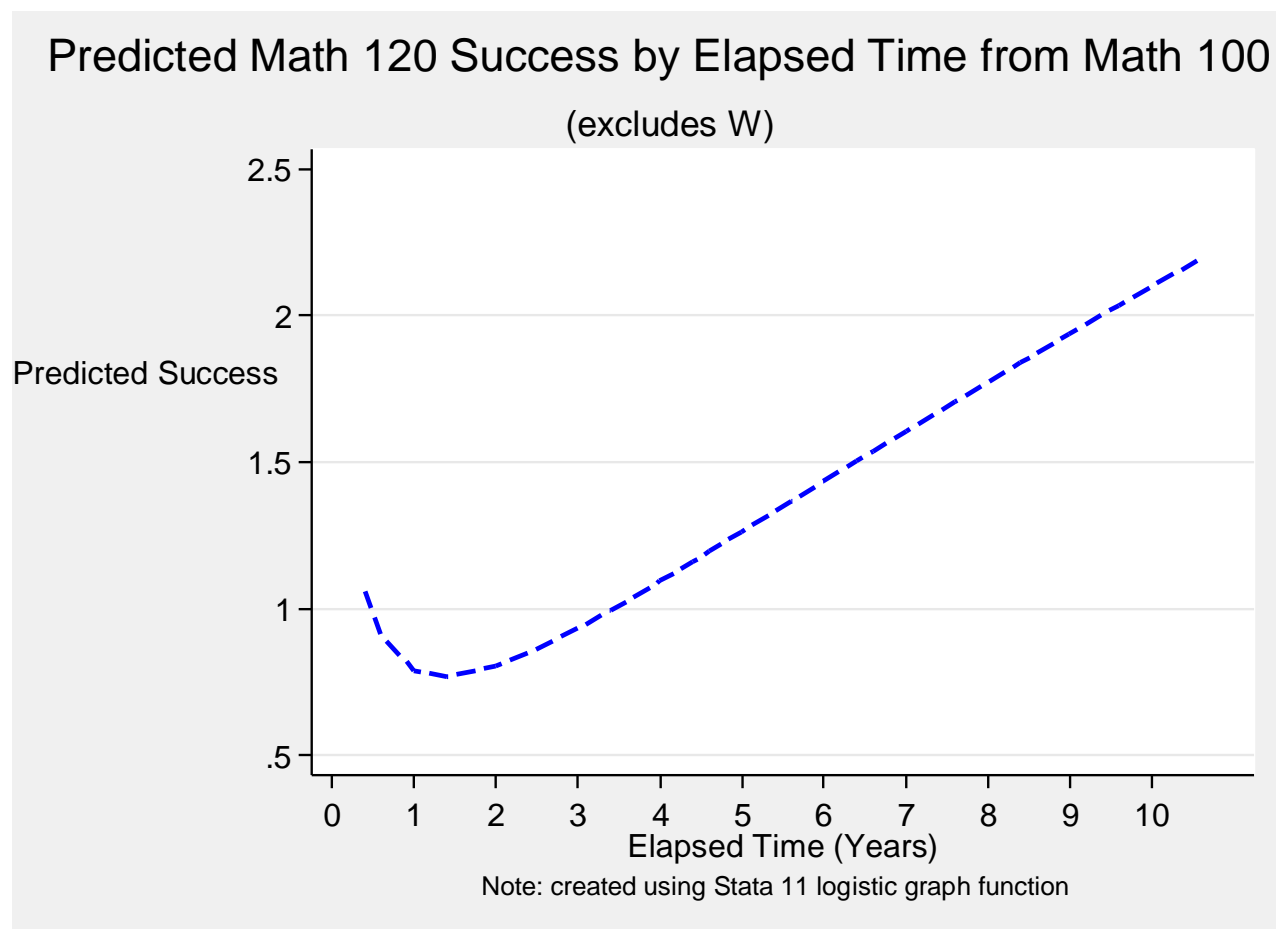
Figure 1

Figure 2 shows the same analysis performed without the W grades. Although the pattern is similar to Figure 1, it is not as dramatic a drop after year 1 or as steep an upward slope starting with year 2.

Figure 2



Given that the Math 100—Math 120 pair has the highest number of observations across the district, it is unlikely that any other pairs of math courses would yield more-conclusive results. The numbers of students who take their subsequent math course five or more years from the prerequisite course is simply too small to initiate a district-wide recency policy. The numbers at the individual colleges are smaller yet. Furthermore, an earlier analysis performed in 2010 for SCC math students only exhibited pattern similar to those observed here. Although it may be interesting to analyze other pairs of courses, the current analysis suggests that a further study of math recency would be unwarranted at this time.

ⁱ Because this research request originated at SCC, an agreement was reached in collaboration with the LRCCD Institutional Research Office that SCC's Planning, Research, and Institutional Effectiveness Office would conduct a district-wide, aggregated analysis of math data for this study. Individual colleges' outcomes were not identified, nor were data on *where* students took their courses within LRCCD.