"Collecting, analyzing, interpreting, and delivering institutional information."

Colorado State University Math Grades: Comparing FRCC and CSU Algebra Students

In spring of 2013, Dr. Laura Jensen, the Director of Institutional Research (IR) at Colorado State University suggested a joint research project between our two institutions comparing the subsequent CSU math grades of students who took their foundational (Algebra) math course at FRCC or at CSU. In August, Dr. Jensen provided FRCC IR with the grades of CSU math students, indicating if students took their foundational course at FRCC or at CSU. FRCC IR completed the following analysis to evaluate if FRCC math students are as prepared for their subsequent math courses as their CSU counterparts.

Population

This analysis consists of 32,537 students who took a foundational math course between fall 2000 and spring 2013. The bulk of these students (86%) took this course at CSU. Three-fourths of them attempted at least one additional math course at CSU, but this had a large variance between the two populations. Only 34% of FRCC students took any math at CSU while 80% of CSU students attempted a second math course. This is due in part to the nature of the data. Since it only covers CSU courses, FRCC students who took additional math courses at FRCC or any other institutions would not show up in this dataset.

Algebra Institution	Foundational Math	Did not attempt Subsequent Math at CSU	
CSU	27,963	5,673	20%
FRCC	4,574	3,034	66%
Percentage point difference			46

Foundational Math Courses

The foundational math courses were all titled College Algebra or College Algebra II, but their course numbers ranged from MAT117 to MAT124.
While the majority of CSU students had MAT118 as their Foundational course, the majority of FRCC students had MAT124. This has implications for what course their "subsequent" course at CSU can be.

Foundational Math Courses					
Course	Title	CSU		FRCC	
117	College Algebra			7	0%
118	College Algebra II	21,174	76%	1,508	33%
121	College Algebra II	6,789	24%	446	10%
124	College Algebra			2,613	57%
	Total	**27,963**	**100%**	**4,574**	**100%**

Subsequent Math Courses

The subsequent math course for each student was the first course at CSU taken after their foundational math, and this includes re-taking Algebra. The most common courses were MAT124, MAT141, and MAT125, though the range included 300 level courses. It is certainly possible that some students took intervening math courses at other institutions but that history is not available in this dataset.

CSU and FRCC students had large variations in their choice of subsequent math courses.

- 29% of CSU took MAT124 while only 1% of FRCC students did so (primarily because the majority of them had taken this as their foundational course).
- FRCC students were more likely to take MAT141 (34%) than CSU students (24%).
- FRCC students were more likely to take MAT125 (28%) than CSU students (20%).
- Though the numbers are small, FRCC students were more likely to take 200 level or above (7% vs. 1%).

Subsequent Math Course after Foundational Math (Includes Repeating Foundational course)

Course	Title	CSU		FRCC	
117	College Algebra in Context I	281	1%	2	0%
118	College Algebra in Context II	1,135	5%	3	0%
120	College Algebra I	76	0%	1	0%
121	College Algebra II	401	2%		0%
124	Logarithmic & Exponential Func.	6,413	29%	18	1%
125	Numerical Trigonometry	4,474	20%	426	28%
126	Analytic Trigonometry	1,331	6%	165	11%
130	Math in the Social Sciences	336	2%	5	0%
133	Financial Mathematics	40	0%	4	0%
135	Patterns of Phenomena	16	0%		0%
141	Calculus-Management Sciences	5,358	24%	522	34%
151	Mathematic Algorithms	3	0%	2	0%
155	Calculus-Biolog Scientists I	637	3%	105	7%
160	Calculus-Physical Scientists I	1,046	5%	89	6%
161	Calculus-Physical Scientists II	368	2%	79	5%
166	Discrete Structures	5	0%		0%
180	Concepts for Calculus	37	0%	5	0%
192	First Year Sem/Math Sciences	5	0%	4	0%
200 and Above		233	1%	78	5%
300 and Above		95	0%	32	2%
	Total	**22,290**	**100%**	**1,540**	**100%**

Pass Rates

The breakout of grades in students' subsequent math course is shown below. FRCC students' pass rate was three percentage points lower than CSU students, a statistically significant difference at the .05 level. In addition, FRCC students had a higher percent of "C"s and a lower percent of "A"s than their CSU counterparts.

Algebra Institution	Subsequent Math Grade									Pass Rate
	A	B	C	D	F	Satis factory	Incom plete	Unsatis factory	With draw	
CSU	7,513	5,926	2,790	606	1,007	43	1,275	2,220	910	
	34%	27%	13%	3%	5%	0%	6%	10%	4%	73%
FRCC	416	408	248	81	128	6	32	107	114	
	27%	26%	16%	5%	8%	0%	2%	7%	7%	70%
Percentage point difference	-7	0	4	3	4	0	-4	-3	3	-3

Elapsed time between Foundational and Subsequent Math Course

One of the factors that affect math grades more than most disciplines is the elapsed time between each subsequent course. Students lose math concepts quickly if they are not reinforced. To see if the amount of elapsed time varied between these two groups, we compared the pass rates broken out by the number of terms between the foundational math and the subsequent math course.

Algebra Institution	Terms between Math Courses	Total	% of Institution	Pass Rate
CSU	1 Term	14,567	65%	75%
	2-3 Terms	6,495	29%	70%
	4-6 Terms	981	4%	69%
	7-9 terms	152	1%	66%
	More than 9 terms	95	0%	77%
	Total	22,290	100%	73%
FRCC	1 Term	224	15%	77%
	2-3 Terms	556	36%	71%
	4-6 Terms	404	26%	71%
	7-9 terms	209	14%	67%
	More than 9 terms	147	10%	59%
	Total	1,540	100%	70%
Percentage point difference	1 Term		-51	2
	2-3 Terms		7	1
	4-6 Terms		22	2
	7-9 terms		13	2
	More than 9 terms		9	-18
	Total		0	-3

65% of CSU students take their subsequent math course the very next semester following their foundational course. Only 15% of FRCC students are as prompt; however, their pass rate is two percentage points higher than comparable CSU students. Once the elapsed time was controlled

for, FRCC students had higher pass rates in every group except those who waited more than three years between courses. The overall lower pass rate of FRCC students is explained by their propensity to take longer breaks before their next math course.

Variation in Level of Subsequent Math Course

Another factor in the difference between pass rates between these two populations is the actual course they were taking. The three top courses taken, MAT124, 125, and 141, comprise 73% of the CSU students and 63% of the FRCC students. The pass rates for just these three courses are identical, 78%.

Pass Rates by Course							Pass Rate Percentage Point Difference
	CSU			FRCC			
Subsequent CSU Course	Enrolled	% of Total Enrolled	Pass Rate	Enrolled	% of Total Enrolled	Pass Rate	
124	6,413	29%	72%	18	1%	33%	-39
125	4,474	20%	76%	426	28%	78%	2
141	5,358	24%	85%	522	34%	79%	-7
Total	**16,245**	**73%**	**78%**	**966**	**63%**	**78%**	**0**

Only when all the other courses are included does the FRCC pass rate drop to three percentage points below CSU students. A larger proportion of FRCC students take upper level courses which have lower pass rates overall.

Pass Rates by Course							Pass Rate Percentage Point Difference
	CSU			FRCC			
Subsequent CSU Course	Enrolled	% of Total Enrolled	Pass Rate	Enrolled	% of Total Enrolled	Pass Rate	
117-121	1,893	8%	51%	6	0%	67%	16
124	6,413	29%	72%	18	1%	33%	-39
125	4,474	20%	76%	426	28%	78%	2
126-139	1,723	8%	62%	174	11%	51%	-12
141	5,358	24%	85%	522	34%	79%	-7
150-499	2,429	11%	66%	394	26%	60%	-7
Total	**22,290**	**100%**	**73%**	**1,540**	**100%**	**70%**	**-3**

Conclusion

The descriptive analysis indicates that fewer FRCC transfer students to CSU enroll in higher level math at CSU than CSU native students (34% v. 80%). For those students who do enroll in a higher level math course at CSU, the pass rates are 70% and 73% for FRCC and CSU native students respectively. Pass rates for both groups are detrimentally impacted by the time lapse between the foundational math and the subsequent math course. However, FRCC transferring students tend to have longer elapsed time between their courses. Once the lag time is controlled for, FRCC students have higher pass rates than CSU native students (77% v. 75% for those who take their next course the following term). Transferring students may need to be made more

aware of the importance of decreasing the time lapse between math courses as every delay has a strong negative effect on their success.

I would like to thank Dr. Laura Jensen for her generosity in providing the data for this analysis. This collaborative work exemplifies the collaborative efforts of both institutions to help ensure student success. If there are additional questions, please contact me at kim.wallace@frontrange.edu.