



Research Brief #124

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PAL vs. Non-PAL Math Outcome Comparison

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At the request of the Math Department, the office of Institutional Research, Planning and Institutional Effectiveness examined longitudinal outcome data for students enrolled in Math-060 (PAL and non-PAL Elementary Algebra) and students enrolled in Math-075 (PAL and non-PAL Intermediate Algebra for Statistics) during the Fall 2012 and Fall 2013 semesters. Students in the Fall 2012 cohort were tracked for eight semesters and the Fall 2013 cohort were tracked for six semesters. Specifically, this research is intended to answer the following questions:

- 1.) What percentage of students who enrolled in Math-060 in the Fall 2012 semester enrolled and succeeded in Math-070 and transfer-level math compared to the percentage of students who enrolled in Math-060/070 PAL in the Fall 2012 semester and succeeded in Math-070 PAL and transfer-level math?
- 2.) What percentage of students who enrolled in Math-075 in the Fall 2012 semester enrolled and succeeded in transfer-level math compared to the percentage of students who enrolled in Math-075/140 PAL in the Fall 2012 semester and succeeded in Math-075 PAL and transfer-level math?
- 3.) What percentage of students who enrolled in Math-060 in the Fall 2013 semester enrolled and succeeded in Math-070 and transfer-level math compared to the percentage of students who enrolled in Math-060/070 PAL in the Fall 2013 semester and succeeded in Math-070 PAL and transfer-level math?
- 4.) What percentage of students who enrolled in Math-075 in the Fall 2013 semester enrolled and succeeded in transfer-level math compared to the percentage of students who enrolled in Math-075/140 PAL in the Fall 2013 semester and succeeded in Math-075 PAL and transfer-level math?
- 5.) What are the costs (in time and materials) associated with the student outcomes for each path?

Answers to these questions are intended to help inform planning for the math department.

Results

As seen in Table 1, students who enrolled in Math-060/070 PAL in the Fall 2012 semester not only passed Math-060 PAL at a higher rate than those who enrolled in non-PAL Math-060 (10 percentage points higher, or a 17 percent increase), but also enrolled in and passed Math-070 PAL at a higher rate than non-PAL Math-070 (17 and 14 percentage points higher, respectively). In addition, those who enrolled in and passed Math-060 PAL in Fall 2012 passed a transfer level math course at a higher rate than those in non-PAL Math-060 (8 percentage points higher, or a 29 percent increase). Most notable was that only one student who passed Math-060 PAL did not enroll in Math-070 PAL, resulting in a comparative retention rate of 85 percent (non-PAL Math-060/070) versus 98 percent (Math-060/070 PAL).

Table 1. Math-060 Progression: Fall 2012 Cohort

Fall 2012 Cohort	(N)	Passed (N)	Passed (%)	Enroll Math-070 (N)	Enroll Math-070 (%)	Passed Math-070 (N)	Passed Math-070 (%)	Enroll Transfer (N)	Enroll Transfer (%)	Passed Transfer (N)	Passed Transfer (%)
Math-060	579	337	58%	287	50%	219	38%	187	32%	163	28%
Math-060/070 PAL	75	51	68%	50	67%	39	52%	31	41%	27	36%

Similar results can be seen in Table 2 for the Fall 2013 cohort. Specifically, students who enrolled in Math-060 PAL in the Fall 2013 semester also passed Math-060 at a higher rate than those who enrolled in non-PAL Math-060 (14 percentage points higher, or a 26 percent increase) and also enrolled in and passed Math-070 PAL at a higher rate than non-PAL Math-070 (28 and 31 percentage points higher, respectively). In addition, those who enrolled in and passed Math-060 PAL in Fall 2013 passed a transfer level math course at a higher rate than those in non-PAL Math-060 (22 percentage points higher, or a 110 percent increase). Most notable was that all students who passed Math-060 PAL also enrolled in Math-070, resulting in a comparative retention rate of 72 percent (non-PAL Math-060/070) versus 100 percent (Math-060/070 PAL).

Table 2. Math-060 Progression: Fall 2013 Cohort

Fall 2013 Cohort	(N)	Passed (N)	Passed (%)	Enroll Math-070 (N)	Enroll Math-070 (%)	Passed Math-070 (N)	Passed Math-070 (%)	Enroll Transfer (N)	Enroll Transfer (%)	Passed Transfer (N)	Passed Transfer (%)
Math-060	578	309	53%	224	39%	163	28%	144	25%	117	20%
Math-060/070 PAL	111	74	67%	74	67%	65	59%	56	50%	47	42%

As seen in Table 3, students who enrolled in Math-075 PAL in the Fall 2012 semester not only passed Math-075 PAL at a higher rate than those who enrolled in non-PAL Math-075 (22 percentage points higher, or a 27 percent increase), but also passed a transfer level math course at a higher rate than those in non-PAL Math-075 (35 percentage points higher, or a 103 percent increase).

Table 3. Math-075 Progression: Fall 2012 Cohort

Fall 2012 Cohort	(N)	Passed (N)	Passed (%)	Enroll Transfer (N)	Enroll Transfer (%)	Passed Transfer (N)	Passed Transfer (%)
Math-075	326	195	60%	132	40%	111	34%
Math-075/140 PAL	85	70	82%	69	81%	59	69%

Similar results can be seen in Table 4 for the Fall 2013 cohort. Specifically, students who enrolled in Math-075 PAL in the Fall 2013 semester not only passed Math-075 PAL at a higher rate than those who enrolled in non-PAL Math-075 (19 percentage points higher, or a 29 percent increase), but also passed a transfer level math course at a higher rate than those in non-PAL Math-075 (35 percentage points higher, or an 83 percent increase).

Table 4. Math-075 Progression: Fall 2013 Cohort

Fall 2013 Cohort	(N)	Passed (N)	Passed (%)	Enroll Transfer (N)	Enroll Transfer (%)	Passed Transfer (N)	Passed Transfer (%)
Math-075	394	262	66%	185	47%	164	42%
Math-075/140 PAL	98	83	85%	82	84%	75	77%

As seen in Table 5, students enrolled in the Math-075 PAL pathway have the greatest financial savings. In addition to the financial savings, there is also a savings on time. As a result of enrolling in Math-075 PAL, students save themselves time at COC by completing degree and transfer applicable math courses in only one semester. In addition, Math-075/140 PAL courses use a free online textbook through the Open Learning Initiative (OLI), therefore there is no cost for textbooks, saving students hundreds of dollars.

Table 5. Tuition and Textbook Combined Costs Associated with Course Pathways

Notes:

- 1.) *Math-075 and -140 (PAL and non-PAL) use an "OLI", or Open Learning Initiative, textbook. OLI focuses on improving education and sharing high quality educational materials freely. The textbooks used in these courses are free.
- 2.) Textbook costs are approximate and only for "New" textbooks. There are several options for students to obtain textbooks, including renting new or used textbooks or purchasing used textbooks. Textbook cost information was provided by the College of the Canyons bookstore and the Math Department.

Course Pathways	Tuition and Textbook Costs
Math-060/070 to Transfer Level	\$1004
Math-060/070 PAL to Transfer Level	\$1004
Math-075 to Transfer Level*	\$628
Math-075/140 PAL to Transfer Level*	\$448
Transfer Level Math (Except Math-140)	\$350

Summary of Findings:

Overall, students who enroll in Math-060/070 PAL or Math-075/140 PAL complete transfer-level math at a higher rate compared to students who enroll in non-PAL Math-060/070 or Math-075. See Table 6 for details. In addition to higher success rates, there are financial and time savings for students who complete the Math-075/140 PAL pathway.

Table 6. Course Pathway Summary

Course Pathway	Overall Percentage Completing Transfer Level
Math-060/070 to Transfer Level	24%
Math-060/070 PAL to Transfer Level	40%
Math-075 to Transfer Level	38%
Math-075 to Transfer Level PAL	73%

Recommendations:

- Expand Math-060/070 and Math-075/140 PAL course offerings.
- Expand marketing to students, especially non-STEM students placing into Math-060.

Action Implications

- The department chair, working with the Dean, will recommend that the college schedule the maximum number of PALs that we can reasonable offer based on enrollment and instructor availability.
- The department chair meet with counselors and advisors to review the results of this research brief to further encourage Math 60/70 PAL and Math 75 and Math 75/140.
- Members of the mathematics department, in conjunction with Student Services, Distance Learning and Institutional Research, will create appropriate materials for student to receive in the assessment center to help guide them in course selection.

Methods

To conduct the analysis, data was obtained from the College's grade (USX referential) and 320 enrollment files. Terms included in the analysis were Fall 2012, Spring 2013, Summer 2013, Fall 2013, Spring 2014, Summer 2014, Fall 2014, Winter 2015, Spring 2015, Summer 2015, Fall 2015, Winter 2016, and Spring 2016. To perform the analysis data were analyzed using the Statistical Package for the Social Science (SPSS, 2016) and Microsoft Excel (2013).

Notes:

- 1.) **Cohorts:** defined as the math level (Math-060 non-PAL/Math-060 PAL or Math-075 non-PAL/Math-075 PAL) in which a student was enrolled in either the Fall 2012 or Fall 2013 terms.
- 2.) **Course Success:** defined as the percent of students successful in courses out of total enrolled in courses: Numerator = Number of students (duplicated) with A, B, C, CR/P; Denominator = Number of students (duplicated) with A, B, C, D, F, FW, CR/P, NC/NP, W, I. (This analysis uses the RP Group definition, which facilitates statewide comparisons.)
- 3.) Transfer-level math includes: Math-111 (Finite Math), Math-130 (Elementary Teachers), Math-140 (Introductory Statistics), Math-103 (College Algebra), Math-240 (Math Analysis for Business & Social Science), Math-102 (Trigonometry), Math-104 (Precalculus), and Math-211 (Calculus I).
- 4.) In Fall 2012, 32 students in the non-PAL Math-060 cohort and one student in the Math-060 PAL cohort enrolled in Math-075. In Fall 2013, 42 students in the non-PAL Math-060 cohort and two students in the Math-060 PAL cohort enrolled in Math-075.

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For more detailed information on this research brief, stop by the Institutional Research office located in BONH-224, or call Catherine Parker, Research Analyst at 661.362.5879 or Daylene Meuschke, Dean of Institutional Research, Planning, and Institutional Effectiveness at 661.362.5329.