



UNIVERSITY OF
ARKANSAS

Department of Mathematical Sciences

Pre/Post Analysis of the Change in Learning
Objective Competency of College Algebra Students

FY 18 (Fall 2017, Spring 2018)

Data

Data were collected on all students enrolled in College Algebra (MATH 1203) for the fall semester of 2017 and spring semester of 2018 and College Algebra with Review (MATH 1204) for the fall semester of 2017. During these terms students were given a Pre-Assessment (pre-test) of ten items at the beginning of the semester which were also included in the final exam (post-test) at the end of the semester. These items measured one or more of the following learning objectives:

- (MATH LO 1) Demonstrate an understanding of college-level mathematical concepts and tools.
- (MATH LO 2) Be able to analyze and critique logical arguments.
- (MATH LO 3) Develop models to solve real-life problems.
- (MATH LO 4) Formulate and solve a problem in mathematical terms, using appropriate tools and methods.
- (MATH LO 5) Demonstrate fluency with the language and notation of mathematics.
- (MATH LO 6) Express quantitative and logical ideas with precision.

Courses

- MATH 1203: Three credit hour course which meets three days per week for students scoring at least 23 on the math section of the ACT (or 540 on the SAT math section)
- MATH 1204: Four credit hour course which meets four days per week for students scoring 19-22 on the math section of the ACT (or 460-530 on the SAT math section)

Student Numbers

All students were to be required to take both the pre-test and post-test, though some, due to extenuating or unusual circumstances, did not. In addition, students who withdrew from the course did not take the post-test. In total, 1118 students in College Algebra (1203) and 599 students in College Algebra with Review (MATH 1204) took both the pre-test and the post-test during these semesters.

Analyses

Paired t-tests were conducted on each item of the pre-test/post-test. These results are included in the tables below. This table contains which learning objectives are measured by the items, the t statistic, p-value, Cohen's d effect size, the percentage of students who answered the item correctly in the pre-test, and the percentage of students who answered the item correctly in the post-test. With ten statistical analyses, the overall alpha value is set at 0.05 for the course and $0.05/10 = 0.005$ for each item within the course.

Results

For both courses, students were significantly more likely to answer each of the ten items correctly in the post-test than the pre-test. All items for both courses have an effect size above .2, indicating the effect of the course on the difference in scores is likely meaningful. For MATH 1203, the effect size was small for one item, medium for five items, and large for four items. For 1204, the effect size was small for all ten items.

1203 FY18 (Fall 17-Spring 18)

Question Number	Learning Objectives	t	p-value	Cohen's d	Pre-Test Percentage Correct	Post-Test Percentage Correct
1	LO1, LO4	15.8	<0.0001	0.47	65.8%	89.2%
2	LO2, LO3	18.1	<0.0001	0.54	36.8%	67.3%
3	LO1, LO4	18.4	<0.0001	0.55	25.8%	60.5%
4	LO4, LO5	24.6	<0.0001	0.73	28.3%	71.1%
5	LO2, LO3, LO5	45.3	<0.0001	1.36	11.7%	80.2%
6	LO4	20.5	<0.0001	0.61	12.9%	45.2%
7	LO1, LO3	33.8	<0.0001	1.01	5.8%	59.1%
8	LO1, LO4	17.5	<0.0001	0.52	3.4%	26.5%
9	LO2, LO5	31.9	<0.0001	0.96	23.2%	74.9%
10	LO1, LO4	30.0	<0.0001	0.90	43.4%	90.4%

Note: As suggested by Cohen: d=0.2 is a "small" effect size, d=0.5 "medium", and d=0.8 "large"

1204 FY18 (Fall 17)

Question Number	Learning Objectives	t	p-value	Cohen's d	Pre-Test Percentage Correct	Post-Test Percentage Correct
1	LO1, LO4	9.8	<0.0001	0.40	15.2%	37.6%
2	LO2, LO3	8.6	<0.0001	0.35	14.8%	34.8%
3	LO1, LO4	9.8	<0.0001	0.40	16.6%	38.6%
4	LO4, LO5	6.6	<0.0001	0.27	19.3%	36.0%
5	LO2, LO3, LO5	7.5	<0.0001	0.31	17.3%	36.7%
6	LO4	7.3	<0.0001	0.30	18.0%	35.9%
7	LO1, LO3	9.5	<0.0001	0.39	14.9%	37.2%
8	LO1, LO4	9.5	<0.0001	0.39	14.2%	36.0%
9	LO2, LO5	9.9	<0.0001	0.40	15.5%	38.4%
10	LO1, LO4	9.3	<0.0001	0.38	14.3%	36.5%

Note: As suggested by Cohen: d=0.2 is a "small" effect size, d=0.5 "medium", and d=0.8 "large"