



UNIVERSITY OF
ARKANSAS

Department of Mathematical Sciences

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

FY 22 (Fall 2021, Spring 2022)

Data

Data were collected on all students enrolled in MATH 1203 College Algebra for the fall semester of 2021 and spring semester of 2022. 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.

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, 2628 students 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

Students were significantly more likely to answer each of the ten items correctly in the post-test than the pre-test. All items have an effect size of at least 0.7, indicating the effect of the course on the difference in scores for all items is likely meaningful. The effect size was medium for one item and large for nine items.

MATH 1203 FY22 (Fall 21-Spring 22)						
Question Number	Learning Objectives	t	p-value	Cohen's d	Pre-Test Percentage Correct	Post-Test Percentage Correct
1	LO1, LO4	40.3	<0.0001	0.8	15.7%	60.7%
2	LO2, LO3	39.2	<0.0001	0.8	43.6%	86.6%
3	LO1, LO4	42.9	<0.0001	0.8	18.9%	67.9%
4	LO4, LO5	48.8	<0.0001	1.0	17.6%	71.4%
5	LO2, LO3, LO5	69.9	<0.0001	1.4	5.7%	74.0%
6	LO4	34.4	<0.0001	0.7	25.9%	63.6%
7	LO1, LO3	62.4	<0.0001	1.3	10.3%	73.6%
8	LO1, LO4	51.6	<0.0001	1.1	6.9%	59.0%
9	LO2, LO5	39.0	<0.0001	0.8	11.8%	52.3%
10	LO1, LO4	38.7	<0.0001	0.8	15.0%	54.0%

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