LA Supported Student Outcomes (LASSO) Study

Assessment: FMCE

Institution: Example University

Course: PHYS 1000 001

Instructor: firstName lastName

Semester: Fall 2015

N (course) = 181
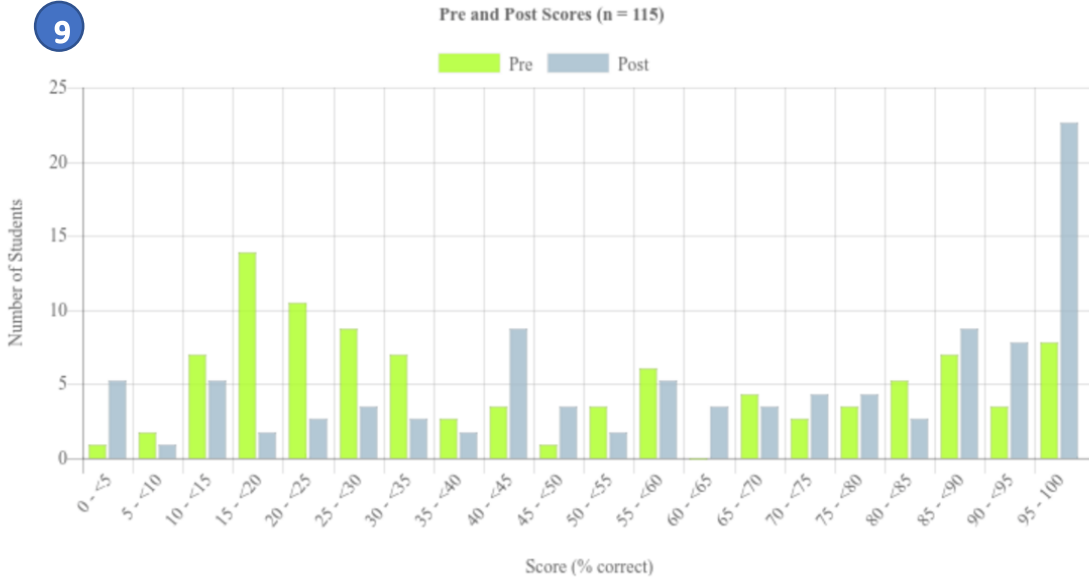
N (pre) = 172 (mean = 45%)

N (post) = 124 (mean = 63%)

N (matched) = 115

Effect Size (d) = 0.52

Learning Gain:

$$\frac{\%post - \%pre}{100\% - \%pre} = 0.33$$

Pre and Post Scores (n = 115)

Effect size (Cohen's d) is a common statistical measure of student improvement. It measures student improvement in units of standard deviations $\frac{\%post - \%pre}{SD_{pooled}}$.

Data for the analysis was cleaned by removing student tests that took under 300s and/or answered less than 80% of the questions.

Interpreting your LASSO report

1. N (course): This is the total number of students who were sent emails from the LASSO system.
2. N(pre): The number of students who completed the pre-course survey. Students are not included in this number (or the N post) if they took less than 5 minutes or answered less than 80% of the questions.
3. N(post): The total number of students who completed the post-course survey.
4. N(matched): The number of students who completed both the pre- and post-course survey.

    > It is common practice in discipline based education research to use matched samples for statistical analyses because these analyses use the relationship between individual's pretest and posttest to maximize their statistical power. An issue that we are investigating is how the amount of data that is missing can skew the results. Participation rates in the published literature range from 60% to 80%. Data from classes with participation rates below 50% may not accurately reflect the outcomes in the course.

5. Mean (pre): This is the classes mean pretest score for all of the students that completed the pretest.
6. Mean (post): This is the classes mean posttest score for all of the students that completed the posttest.
7. Effect Size (d): The effect size is a standard measure of the effect of an intervention. In our experience the common rules of thumb proposed by Cohen do not fit for concept inventory data. We recommend a cutoff of 1.0 as an indicator of effective instruction. Below are two plots that illustrate why we chose 1.0.
8. Learning Gain: Learning gain is also called normalized gain, or Hake's normalized gain. Estimates the proportion of learning that could have occurred in the course and is calculated from the course average scores. A general rule of thumb is that learning gains above 0.30 are an indication of effective teaching practices
9. Histogram of matched pretest and posttest scores. Provides a useful visualization of the shift in students' performance from the pretest to the posttest.

National level data, effect sizes and learning gains

On the next page are two plots of pretest and posttest mean scores for 255 courses drawn from both the LASSO database and the literature. The courses are all first semester physics courses and used either the FMCE or FCI. Figure 1 differentiates between courses by their effect sizes. We made the figures as large as possible so that you can identify where your course would fit into this figure. Courses with effect sizes greater than 1.0 tend to be above average. Figure 2 differentiates between courses by their learning gains. Courses with effect sizes greater than 0.3 tend to be above average.

In the future, we hope to develop these plots for all of the instruments hosted on LASSO and to integrate them into the LASSO reports.
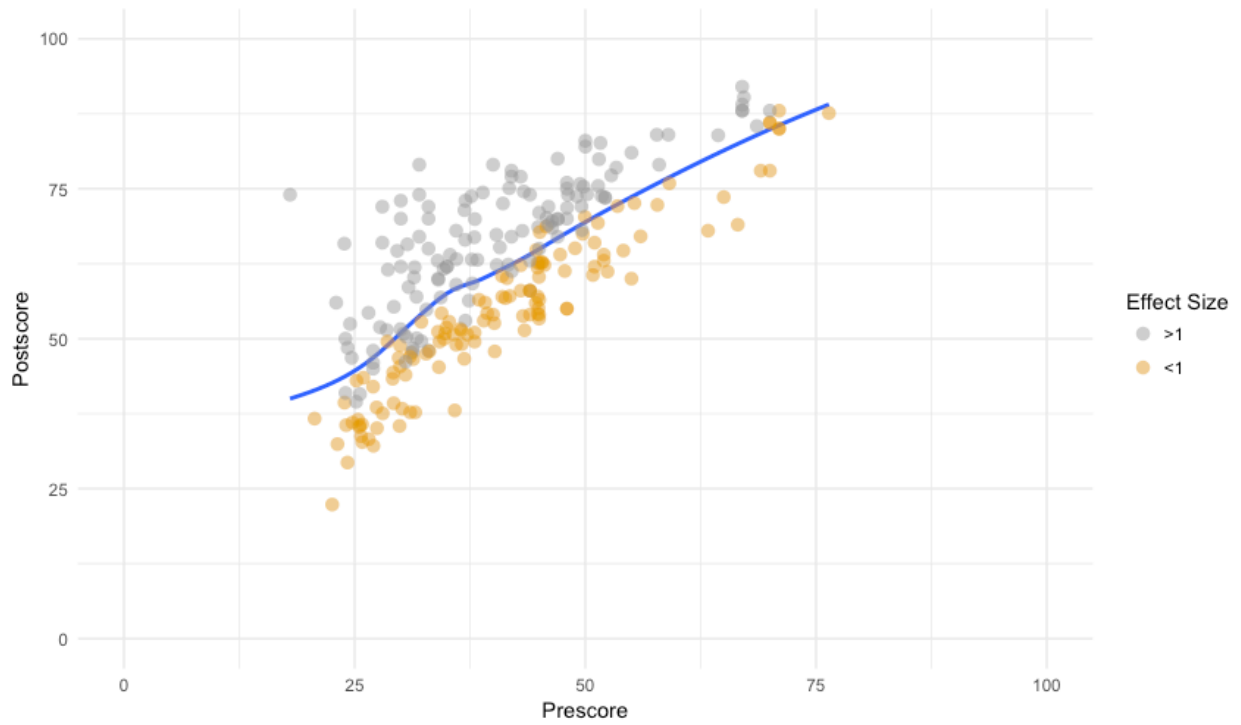
Figure 1. Pretest and posttest scores for 255 intro-physics courses. The line represents a smoothed fit line of the average. The coloring differentiates between effect sizes above and below 1.0.
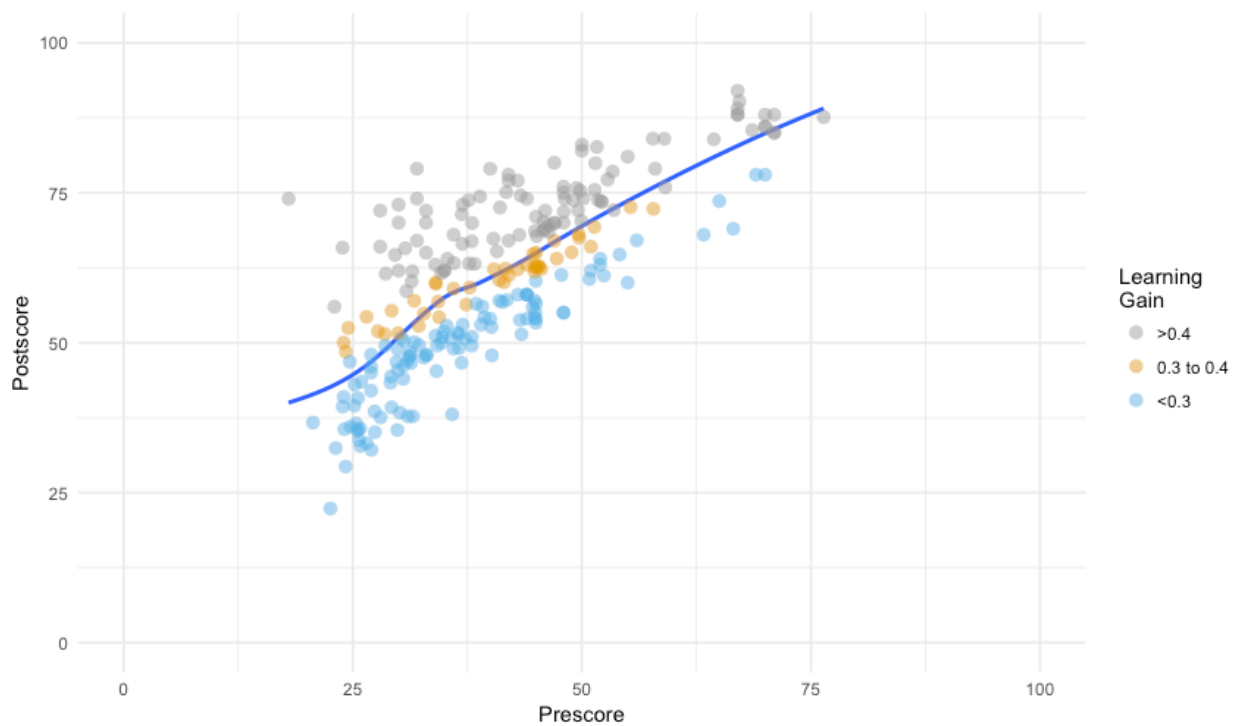

Figure 2. Pretest and posttest scores for 255 intro-physics courses. The line represents a smoothed fit line of the average. The coloring differentiates between learning gains.

Effect size for Changes in Concept Inventories in LASSO Data
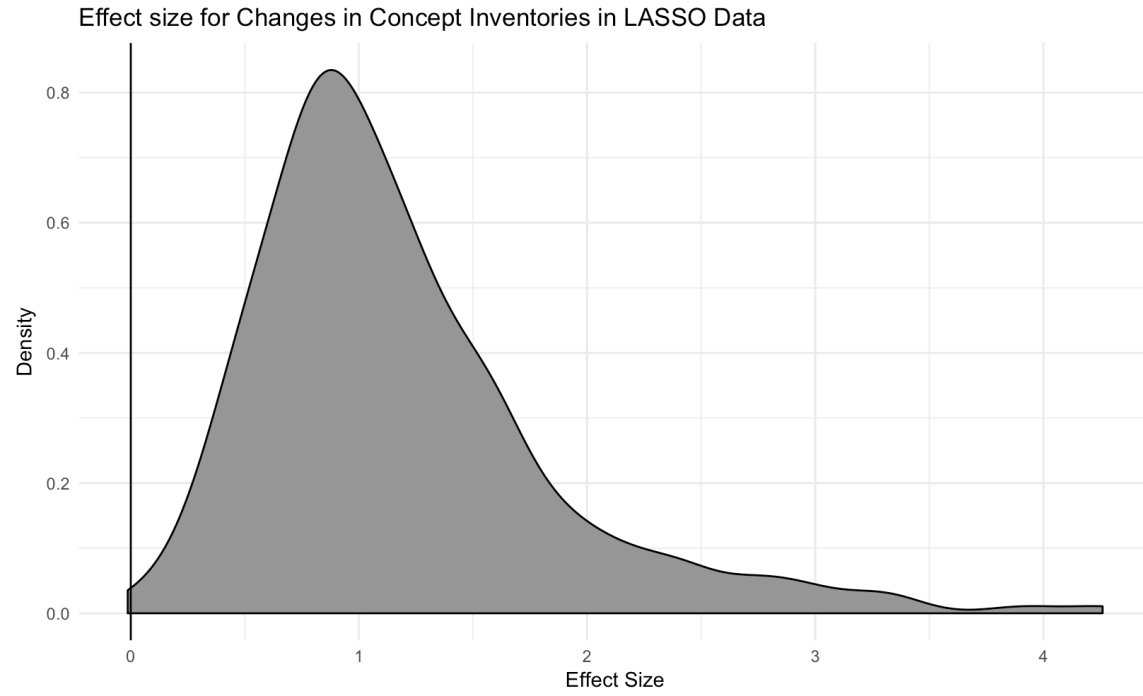
Figure 3. Density plot of effect sizes for the 255 courses. The mean effect size is 1.17 and the median effect size is 1.03.