

## Student Work Sample: One-Way Between-Subjects ANOVA

Please cite as: Leventhal, B. (2018). Introduction to SPSS using Simulation via T tests, regression, and ANOVA. James Madison University.

Several Files are Included in this Grading Criteria.

### **SPSS Solutions Syntax.sps:**

An SPSS syntax file that can be used to generate the results for any given dataset. To obtain the solutions, change the file direct

```
CD 'C:\Users\Student datasets'
```

to the file directory containing the datasets assigned to students. You must also change the file used for analysis in

```
get file 'Sample21.sav'
```

to the file you would like the results for.

### **Sample1.sav; Sample2.sav; Sample3.sav; etc.**

Example student datasets that would be assigned to students.

### **Assignment Solutions:**

The following pages are an example of an expected submission.

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The purpose of the current study was to investigate Statistics Self-Efficacy Scores for James Madison graduate students. CSSE was used to measure of students' *current* self-efficacy for performing basic statistics tasks (Finney & Schraw, 2003). Statistics self-efficacy was measured as a pre-test (prior to taking the course) and a post-test (after taking the course). A total of 120 graduate students participated in the study that were registered in an inferential.

Participants in this study included 120 graduate students from James Madison University. Participants included 60 males and 60 females between the ages of 22 and 34 ( $M = 25.13$ ,  $SD = 2.439$ ). The graduate students in this study were volunteers enrolled in an inferential statistics course.

The current study investigated whether significant mean differences of self-efficacy Post scores existed among the three instructional methods. The type I error rate was set at .05.

Means and standard deviations for the Posttest scores for each instructional method are presented in Table 1. It showed that the group with the lecture style instructional method had the highest mean score, with the highest variability. The box-plots of post-test score among the three groups are presented in Figure 1. It was showed that the score distribution varied among the three groups; and the lecture teaching method had the highest mean score while the online had the lowest mean post-test CSSE score. Based on the descriptive statistics only, the study might reveal that these lecture instructional method resulted in the highest CSSE with hybrid resulting in the second highest CSSE posttest scores.

A one-way between subjects analysis of variance was performed on CSSE posttest scores as a function of instructional method. There were 3 levels of instructional method (online, lecture, hybrid). The assumption of homogeneity of variance was met, Brown-Forsythe

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$F(2,117) = 1.4, p = .251$ . The assumption of normality was met for all types of instructional method except lecture (Table 2). Since ANOVA is robust against violations of normality, especially when the sample size for each group is equal, no correction was made. There are four outliers among the 40 students in the hybrid instructional method. All other assumptions were met.

There was a significant difference on CSSE posttest scores among instructional methods,  $F(2,117) = 115.952, p < .001, \eta^2 = .665$ . A full ANOVA table is presented in Table 3. The effect size, denoted by  $\eta^2$ , indicated that 66.5% of the variance in Posttest CSSE can be explained by teaching method. This showed a large treatment effect.

In order to find the pattern of differences on Posttest CSSE scores among instructional methods, post hoc pairwise comparison were performed using the Scheffé adjustment. The participants in the lecture program ( $M = 76.90, SD = 4.431$ ) had significantly higher CSSE posttest scores than those in the online program ( $M = 62.75, SD = 4.354$ ),  $p < .001$ . Participants in the hybrid program ( $M = 72.28, SD = 3.909$ ) had significantly higher posttest CSSE scores than individuals in online program  $p < .001$ . Participants in the lecture had significantly higher posttest CSSE scores than those in the hybrid based program,  $p < .001$ .

The omnibus  $F$ -test, by using one-way between subjects analysis of variance, indicates that there is a significant difference on the posttest CSSE scores in graduate students among the three types of instruction. Further investigation on the pattern of differences using post hoc comparisons indicated that there exists significant differences among all instructional methods.

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Table 1.

*The Mean and Standard Deviation of CSSE Posttest scores among the Instructional Methods*

Instructional method	<i>n</i>	<i>M</i>	<i>SD</i>
Online	40	62.75	4.354
Lecture	40	76.90	4.431
Hybrid	40	72.28	3.909

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Table 2.

*Test of Normality of the CSSE Posttest scores for each of the Instructional Methods*

Instructional method	<i>Shapiro-Wilk W</i>	<i>df</i>	<i>p</i>
Online	.969	40	.337
Lecture	.945	40	.050
Hybrid	.969	40	.322

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Table 3.

*The Summary Table Showing the Effect of Instructional Method on Student Happiness*

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Program	4164.517	2	2082.258	115.952	<.001
Error	2101.075	117	17.958		
Total	9265.592	119			

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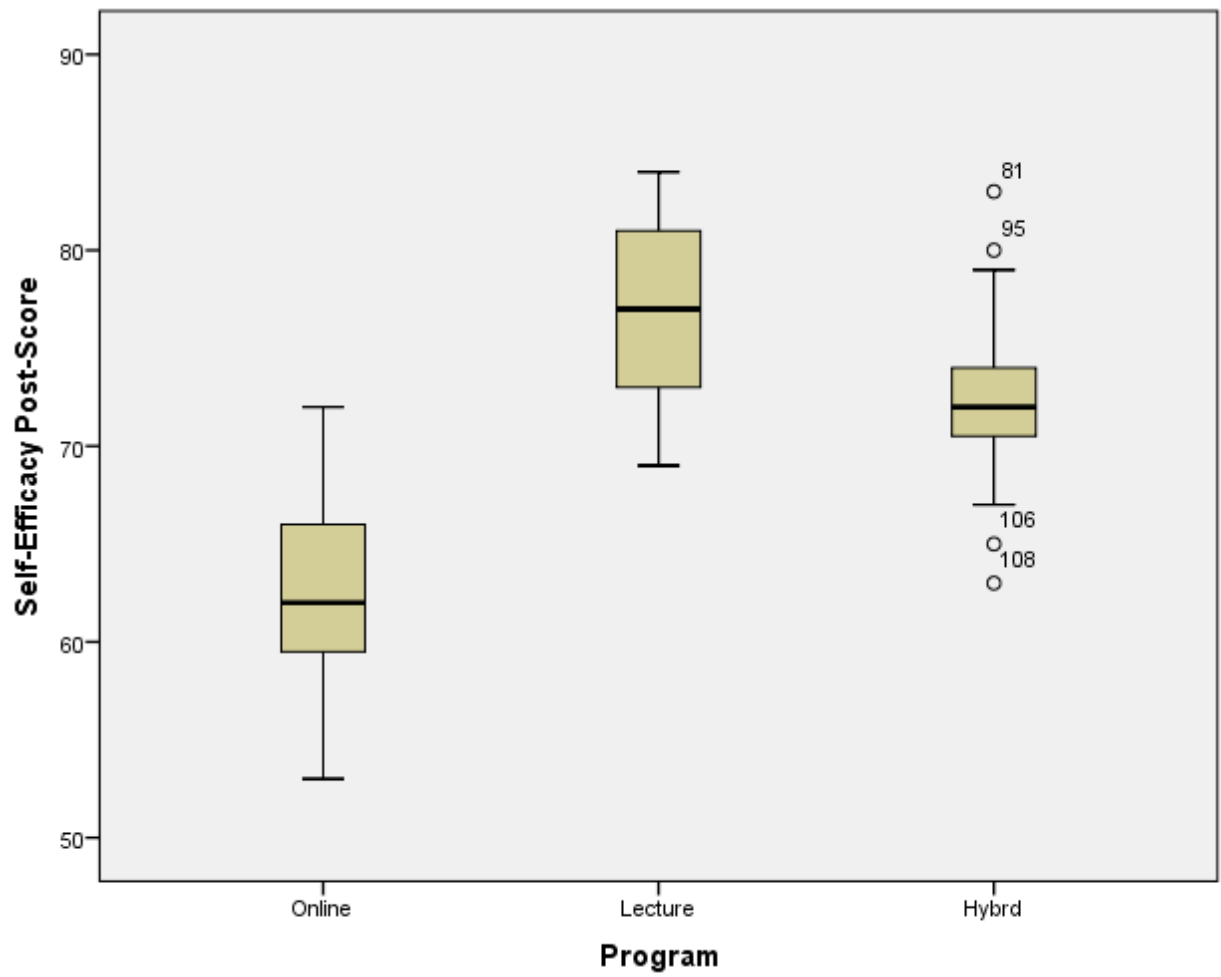


Figure 1. Boxplot of Self-efficacy posttest scores of students in three instructional method groups