Write-Up 1

An inferential statistics instructor is interested in testing the effects of three different instructional methods on statistics self-efficacy. The three instructional methods are:

1. online only course
2. lecture based course
3. hybrid course

The hybrid course consists of learning the material through an online mechanism and then meeting for weekly discussion and activities related to the material. The instructor collected the data with the help of a seasoned researcher. Graduate students at James Madison University registered in inferential statistics courses were asked if they would like to volunteer for the study. Students who volunteered were randomly assigned to one of three instructional methods.

The instructional methods were carefully developed to provide equivalent content with the only difference being the presentation of the material. The instructor was specifically interested in the students' statistical self-efficacy. To measure current statistics self-efficacy the researcher proposed using the CSSE. The CSSE was developed as a measure of students' *current* self-efficacy for performing basic statistics tasks (Finney & Schraw, 2003). Students responded to the 14 items with a Likert-type, 1-6 response scale where 1 represented "no confidence at all" to perform the task and 6 represented "complete confidence" to perform the task. Scores have the potential to range from 14 to 84 with higher scores indicating a higher degree of current statistics self-efficacy. The instructor assessed self-efficacy three times during the semester – the first day of class (PreS), the middle of the semester (MidS), and at the end of the semester (PostS).

Please use your assigned dataset. You will be using this dataset throughout the rest of the semester so please refer to your assigned dataset only.

Part 1: Organizing the data

1. Open the dataset using SPSS and click on Variable View.
2. You will note that none of the variables are formatted. Here we are going to change various properties of the variables in the dataset. Please make the following changes:

Variable Name	Label	Values	Measure
ID			
Age			Scale
Program		1 = "Online" 2 = "Lecture" 3 = Hybrid"	Nominal
Gender		1 = "Male" 2 = "Female"	Nominal
PreS	Self-Efficacy Pre-Score		Scale
MidS	Self-Efficacy Mid-Score		Scale
PostS	Self-Efficacy Post-Score		Scale

Part 2: Describe the demographic characteristics of our sample.

1. What is the sample size?

$$n = 120$$

2. We have information about the participant's *gender*. Provide the frequency and percent for each *gender*.

	Frequency	Percent
Male	60	50.0
Female	60	50.0

3. Each participant provided their age.
   a. Compute, report, and interpret three measures of central tendency for the *age* variable.

      $$Mean: 25.13$$

      The average age of the sample is 25.13.

      $$Median: 25$$

      The middle age is 25; i.e. 50% of the sample is greater than 25 years old.

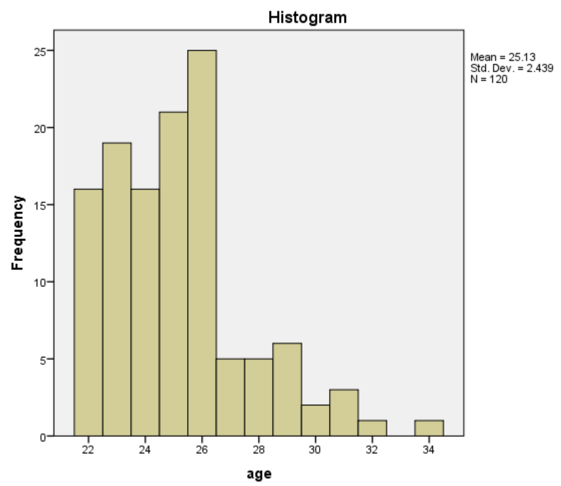
      $$Mode: 26$$

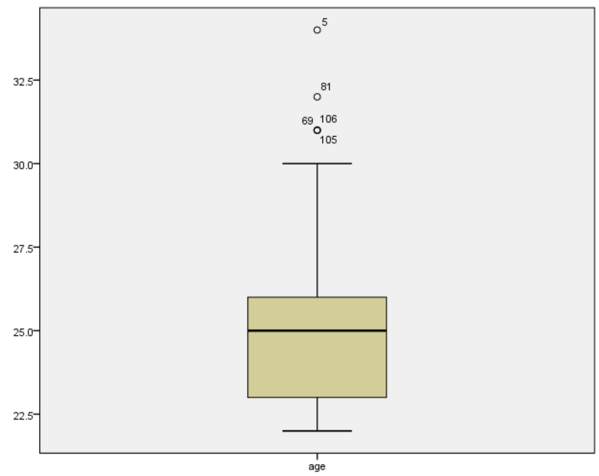
      The most common age is 26 years old.

   b. When reporting the mean, be sure to always report the standard deviation. What is the standard deviation of *age* for this group of participants? Interpret the standard deviation in everyday language.

      Standard Deviation: 2.439. The average age of the sample is 25.13 years old with a typical deviation from the mean of 2.439 years old.

   c. Provide a histogram and box-plot for the for the *age* variable. Does *age* appear to be normally distributed? How did you determine your answer? Are there outliers? How did you determine your answer? [Consider using the Rule of thumb for Skewness and Kurtosis].





Skewness: .984; Std Error: .221

$$\frac{.984}{.221} = 4.45$$

Kurtosis: 1.118; Std Error: .438

$$\frac{1.118}{.438} = 2.55$$

Both are greater than 1.96 in absolute value indicating we do not have a normal distribution. Furthermore, the histogram indicates positive skew (Skew =.984). There are 5 outliers present based on the Boxplot.

4. Why did we compute and report the frequency/percent for gender, whereas we reported the mean/standard deviation for *age*?

   Gender is a categorical variable (on the nominal scale) therefore we use frequencies and percentages as summary statistics. Age is a quantitative variable (on the ratio scale) – therefore we use the mean and standard deviation as descriptive statistics.

5. Write up your findings as a brief "participants" section of an APA-style paper. (Note: If you are unfamiliar with the parts of an APA-style paper, consult the *Publication Manual of the American Psychological Association, 6th Edition.*) Include an APA-style table.

   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.

Table 1
Gender distribution for the sample

	f	%
Male	60	50
Female	60	50
Total	120	

Part 3: Report descriptive statistics for our variables.

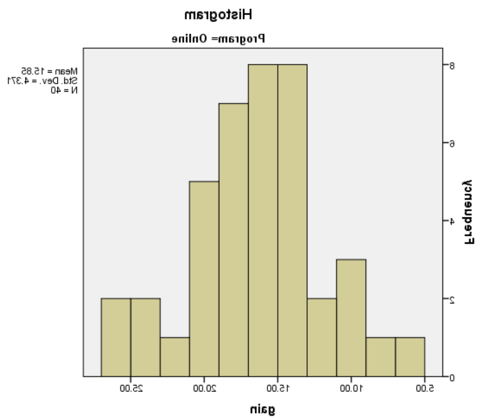
1. Compute a new variable called *gain* that is the difference between Self-efficacy post-score and self-efficacy pre-score score (i.e. *gain = PostS-PreS*).

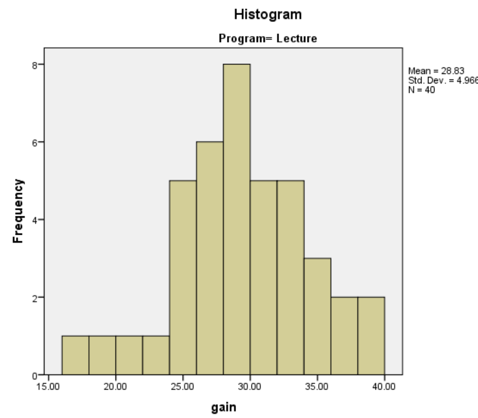
2. Compute and interpret descriptive statistics (group size, mean, standard deviation, skew, kurtosis, minimum and maximum score) for the *gain* variable by instructional program. Report the findings in an APA-style table. (Hint: you should have three means, three standard deviations, etc. -mean *gain* score for the online group, mean *gain* score for the lecture group, and mean *gain* score for the hybrid group).

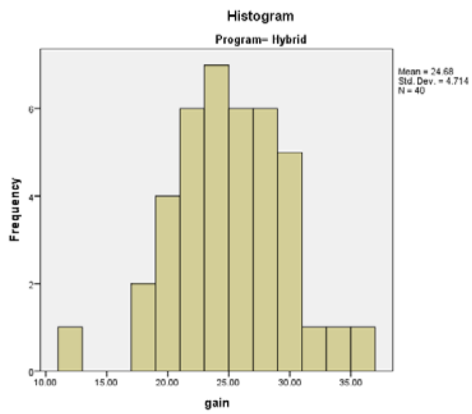
Table 1
Descriptive statistics for gain score by program type

Program	N	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
Online	40	6.00	25.00	15.8500	4.37094	.035	.090
Lecture	40	17.00	39.00	28.8250	4.96597	-.238	.207
Hybrid	40	12.00	36.00	24.6750	4.71434	-.067	.541

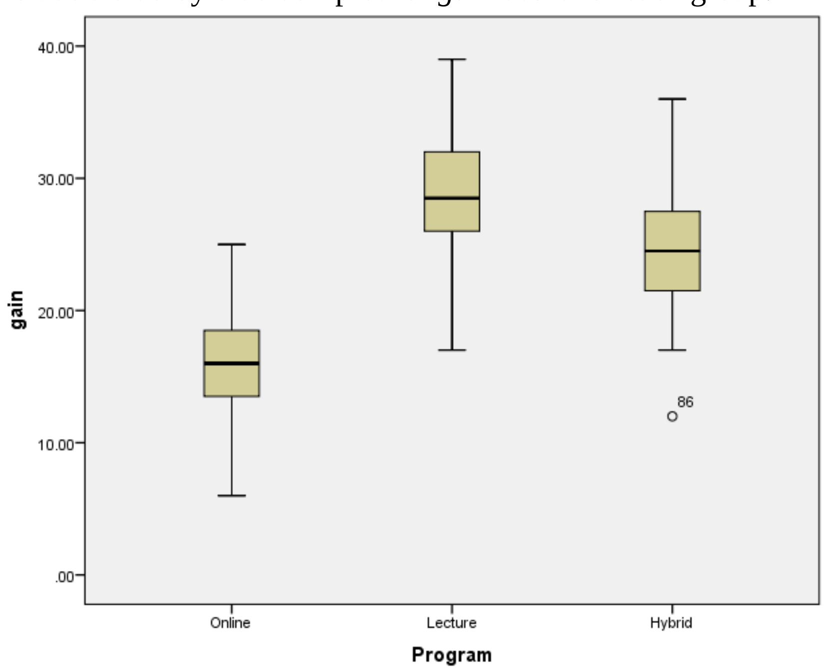
3. Include a frequency histogram of the *gain* score for each group.







4. Include a side-by-side box-plot for *gain* score for each group.



5. Are there any outliers of *gain* score for any group that you examined? How did you determine this?
   Yes- based on the side-by-side box plot there is one outlier for the Hybrid group.

SAVE this dataset overwriting the current dataset! This will be the file you work with for the remainder of the semester.

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.

Two research questions were addressed in this report: 1) Whether students' self-efficacy changed from the beginning to the end of the semester and 2) whether there was a difference in statistics self-efficacy gain over the course of the semester between males and females. The Type I error rate is set to be .05.

Table 1 presents descriptive statistics for Pre-Score and post-Score self-efficacy results by gender. It appears that there is a significant gain from pre-test to post-test across genders. There does not seem to be a significant difference of gain scores between males and females.

A repeated-measures *t*-test was used to investigate whether students' statistic self-efficacy changed from beginning to the end of the semester. All assumptions were satisfied. The repeated-measures *t*-test showed a significant mean difference between post-test and pre-test statistics self-efficacy scores ($M = 23.117, SD = 7.152$), $t(119) = 35.409, p < .001, d = 3.23$.

An independent-measures *t*-test was conducted to test whether there was a difference in mean gain statistics self-efficacy scores between males and females. All assumptions were satisfied. The independent-samples *t*-test showed there was no significant difference in statistics self-efficacy sores between males ($M = 23.7, SD = 7.4$) and females ($M = 22.53, SD = 6.9$), $t(118) = .893, p = .374$.

In summary, the posttest statistics self-efficacy scores were higher than pre-test statistics self-efficacy scores however there was no significant difference in statistics self-efficacy gain between males and females.

Table 1

Descriptive Statistics of Pre- and Post-test Statistics Self-Efficacy Scores by Gender

Work Place	Scores	N	Minimum	Maximum	Mean	SD
Male	pretest	60	41	59	49.78	3.365
	posttest	60	61	84	73.48	6.779
Female	pretest	60	39	53	45.27	3.064
	posttest	60	53	80	67.8	6.62

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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 purpose of the current study was to 1) investigate the correlations among students pre-test, mid-test, and post-test scores on the CSSE and 2) find the regression line use to predict posttest scores from pretest scores. The Type I error rate is set to be .05.

Figures 1, 2, and 3 present the scatterplots between students' pre-test score and mid-test score, pre-test score and post-test score, and mid-test score and post-test score on the CSSE, respectively. All scatterplots show a positive linear relationship among the three variables. The relationship between mid-score and post-score appears to be the strongest.

Table 1 presents Pear correlation coefficients among the three variables. As shown in the scatterplots, all the correlations are positive and significant($p < .01$).

A simple linear regression was performed to predict posttest CSSE from pretest CSSE. The estimate linear equation is: $\hat{Y} = 44.557 + .549X$ where X and Y represent the variables of pretest and posttest scores, respectively. More specifically, the regression slope is .549, suggesting that when there is one point increase in pre-test CSSE, the post test will be predicted to increase by .549 points. The intercept of the regression line is 44.557, the expected score on the posttest when the pretest is zero. The coefficient of determination was .088, indicating that 8.8% of the variance of Post-test CSSE can be explained by pretest CSSE. There was a significant prediction of posttest statistics self-efficacy by pretest self-efficacy, $t(118) = 3.378, p = .001$.

Table 1

Intercorrelations among Graduate Students' Pretest, mid-test, and Posttest CSSE scores

	1	2	3
1. Pre-test	-		
2. Mid-test	.344 **	-	
3. Post-test	.297 **	.712 **	-

** *p<.01*

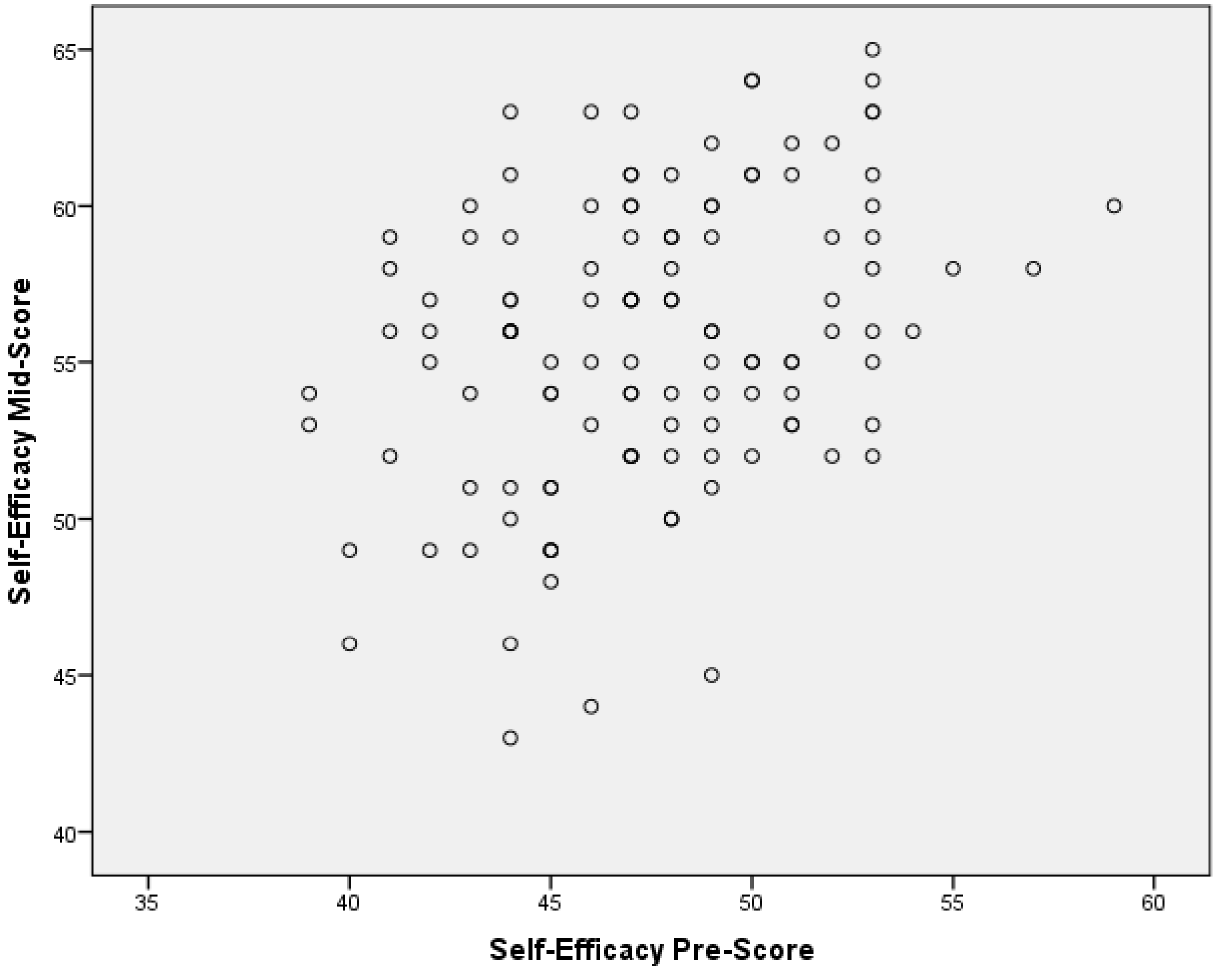

Figure 1. Scatterplot between Pre-test and Mid-test CSSE

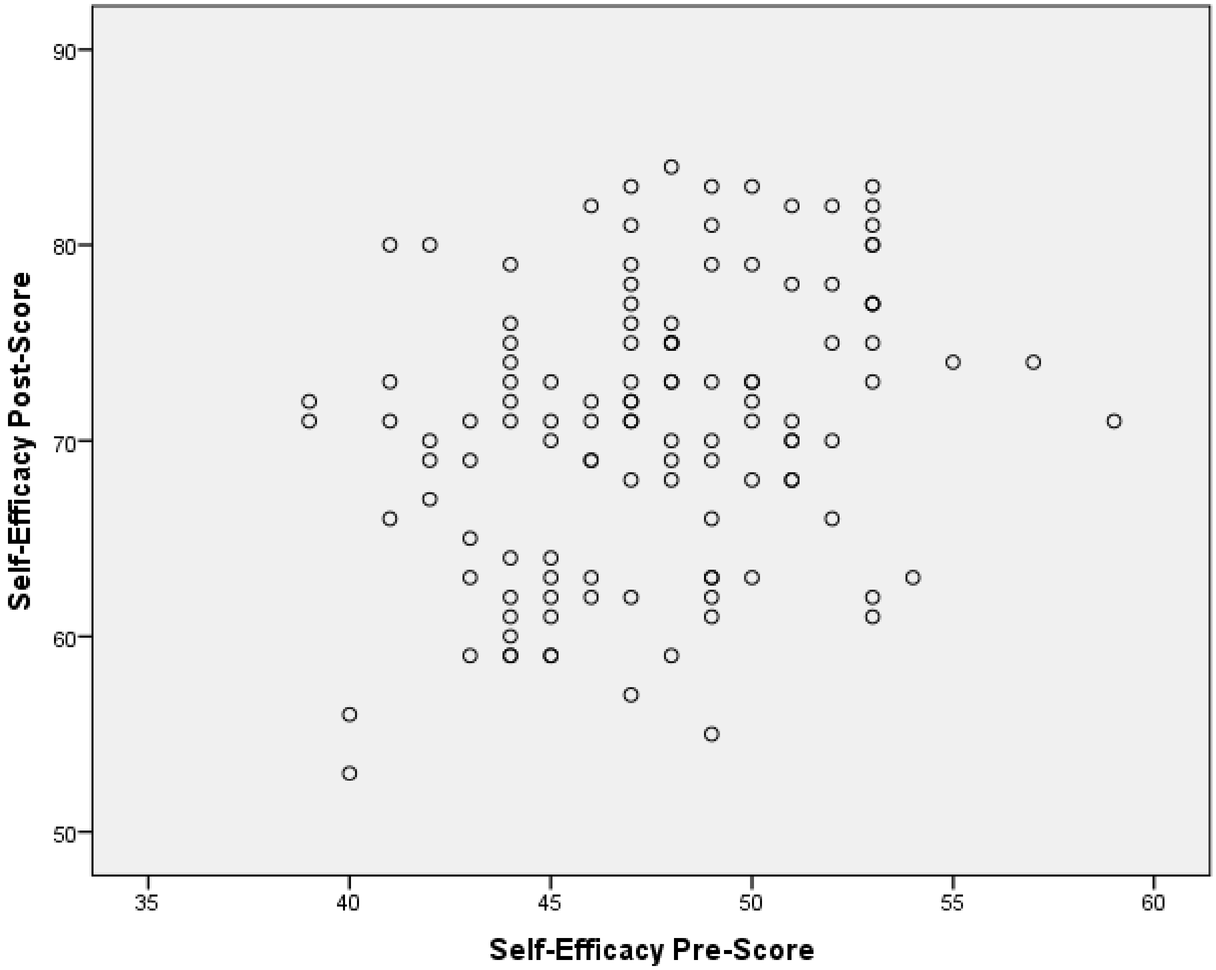

Figure 2. Scatterplot between Pre-test and Posttest CSSE

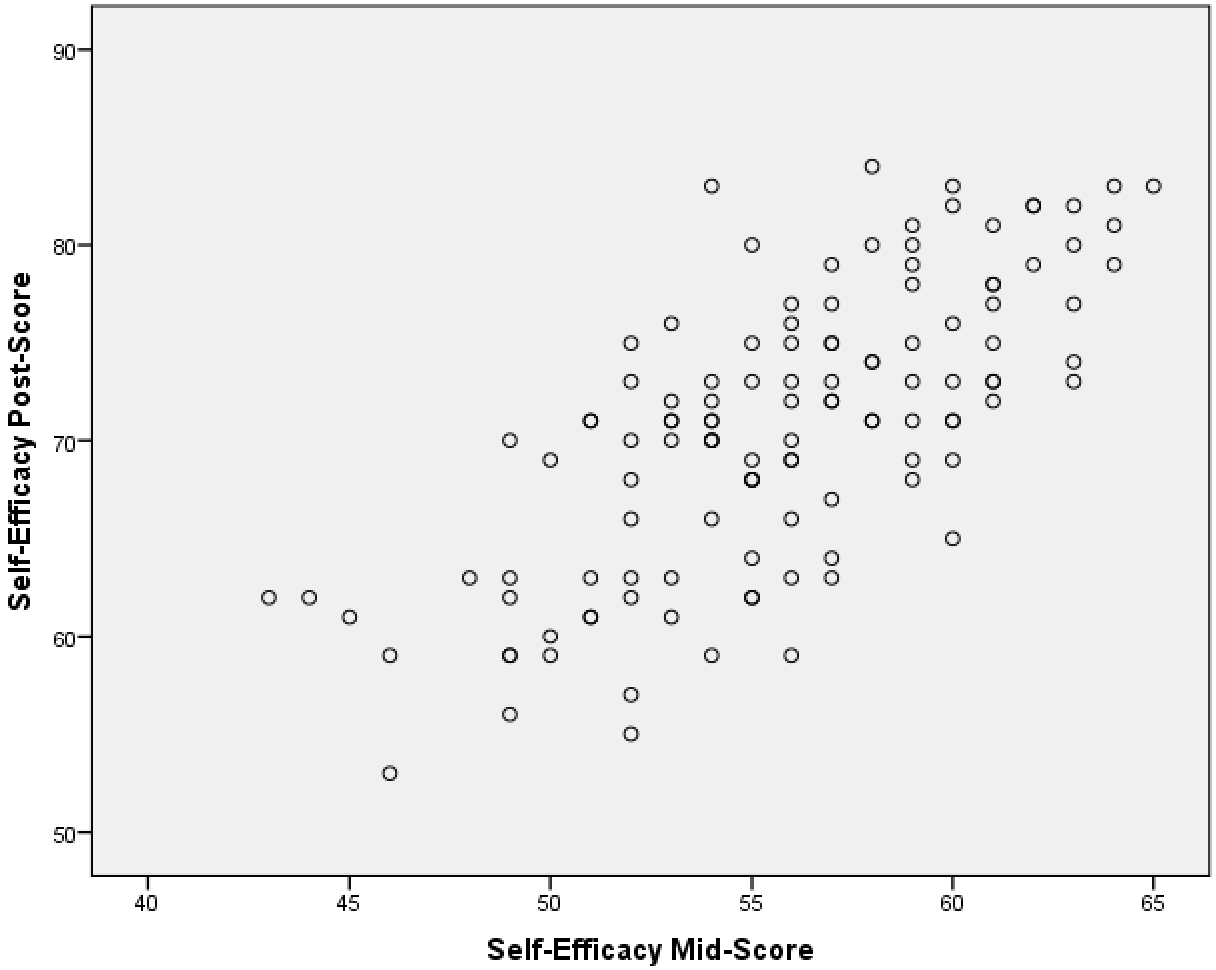

Figure 3. Scatterplot between Mid-test and Posttest CSSE