Table of Contents:

Abstract

The DEL608 Project Session Long Project (SLP) will evaluate and investigate the problem why parents were concerned about the overall performance of the ABC high school. This study will review and discuss logical sequence of ideas served by SPSS testing methods to gain knowledge and provide sustainable resolutions to the problem. It will also identify any other potential problems that may be encountered during the study. There are five different modules that will discuss and explain the process of implementing SPSS procedures to ensure we obtain accurate statistical analysis. Each module will be subdivided into parts that explain the research question, provide hypotheses, type of test run, analyze the test results and report the analysis. The purpose of this study is to address parents' concerns and provide statistical findings.

Module 1 – Part I: This section will examine the variables and note their levels of measurement:

	Variable Name	Variable Label	Values	Level of Measurement (LoM)
1	Faculty Tenure	Faculty Tenure	Non Tenured = 0 Tenured = 1	Nominal-dichotomous
2	Faculty	Faculty	1= Adam 2= Brenda 3= Charles 4= Debra 5= Eve 6= Frank	Nominal
3	Studid	Student ID	None	Nominal
4	Studgen	Student Gender	0= male 1= Female	Nominal-dichotomous
5	ACT	ACT Score	0-36	Scale
6	Schedule	AM/PM Schedule	0= PM Class 1=AM Class	Nominal-dichotomous
7	Studeth	Student Ethnicity	1= Blue 2= Green 3= Purple	Nominal

Part II: This section will use SPSS to run and examine data descriptive and report the findings**.** It will also use descriptive and explore: n (%); M= (SD); CI 95% of mean; does distribution confirm to normal or not and calculates skewness: Below are the five questions of descriptive statistics on how students performed in their ACT test across:

1. **RQ 1:** How did the students perform in the ACT test across the gender?

- The male sample had a N (%) = 1666 (52.1%), M= 25.17 (SD 3.991), the CI 95% of mean is 24.98, 25.37, the sample has a skewness of .126 and standard error is = .060 (.126/.060)= 2.1 is less than 3.3 so distribution is conform to "normal.

- The female sample had a N (%) = 1534 (47.9%), M= 25.16 (SD 3.912), the CI 95% of mean is 24.97, 25.36, the sample has a skewness of .102 and standard error is = .062 (.102/.062)= 1.645 is less than 3.3 so distribution is conform to "normal.

Refers to the table below for the gender total sample:

Descriptive Statistics

Gender	N (%)	M (SD)	95% CI of mean	Distribution conforms to normal Y/N
Male	1666 (52.1%)	25.17 (SD 3.991)	24.98, 25.37	Y
Female	1534 (47.9%)	25.16 (SD 3.912)	24.97, 25.36	Y
Total	3200 (100%)	25.17 (SD 3.953)	25.03, 25.31	Y

2. **RQ 2:** How did the students perform in the ACT test across the faculty?

- The Adam sample had a N (%) = 452 (14.1%), M= 24.62 (SD 2.900), the CI 95% of mean is 24.35, 24.89, the sample has a skewness of .966 and standard error is = .115 (.966/.115)= 8.4 is more than 3.3 so distribution does not conform to "normal.

- The Brenda sample had a N (%) = 434 (13.6%), M= 25.01 (SD 3.699), the CI 95% of mean is 24.66, 25.36, the sample has a skewness of .265 and standard error is = .117 (.265/.117)= 2.265 is less than 3.3 so distribution is conform to "normal.

- The Charles sample had a N (%) = 624 (19.5%), M= 25.84 (SD 3.884), the CI 95% of mean is 25.53, 26.15, the sample has a skewness of .120 and standard error is = .098 (.120/.098) = 1.224 is less than 3.3 so distribution is conform to "normal.

- The Debra sample had a N (%) = 708 (22.1%), M= 25.64 (SD 3.565), the CI 95% of mean is 25.37, 25.90, the sample has a skewness of .115 and standard error is = .092 (.115/.092)= 1.25 is less than 3.3 so distribution is conform to "normal.

- The Eve sample had a N (%) = 524 (16.4%), M= 25.99 (SD 4.644), the CI 95% of mean is 25.59, 26.39, the sample has a skewness of .128 and standard error is = .107 (.128/.107)= 1.196 is less than 3.3 so distribution is conform to "normal.

- The Frank sample had a N (%) = 458 (14.3%), M= 23.29 (SD 4.198), the CI 95% of mean is 22.90, 23.68, the sample has a skewness of .719 and standard error is = .114 (.719/.114)= 6.307 is more than 3.3 so distribution does not conform to "normal.

Refers to the table below for the Faculty total sample:

Descriptive Statistics

Faculty	N (%)	M (SD)	95% CI of mean	Distribution conforms to normal Y/N
Adam	452 (14.1%)	24.62 (SD 2.900)	24.35, 24.89	N
Brenda	434 (13.6%)	25.01 (SD 3.699)	24.66, 25.36	Y
Charles	624 (19.5%)	25.84 (SD 3.884)	25.53, 26.15	Y
Debra	708 (22.1%)	25.64 (SD 3.565)	25.37, 25.90	Y
Eve	524 (16.4%)	25.99 (SD 4.644)	25.59, 26.39	Y
Frank	458 (14.3%)	23.29 (SD 4.198)	22.90, 23.68	N
Total	3200 (100%)	25.17 (SD 3.953)	25.03, 25.31	Y

3. **RQ 3:** How did the students perform in the ACT test across the AM/PM schedule?

- The PM Class sample had a N (%) = 1470 (45.9%), M= 22.72 (SD 3.542), the CI 95% of mean is 22.54, 22.90, the sample has a skewness of .205 and standard error is = .064 (.205/.064)= 3.203 is less than 3.3 so distribution is conform to "normal.

- The AM Class sample had a N (%) = 1730 (54.1%), M= 27.25 (SD 2.972), the CI 95% of mean is 27.11, 27.39, the sample has a skewness of .808 and standard error is = .059 (.808/.059)= 13.694 is more than 3.3 so distribution does not conform to "normal.

Refers to the table below for the AM/PM Schedule total sample:

Descriptive Statistics

AM/PM Schedule	N (%)	M (SD)	95% CI of mean	Distribution conforms to normal Y/N
PM Class	1470 (45.9%)	22.72 (SD 3.542)	22.54, 22.90	Y
AM Class	1730 (54.1%)	27.25 (SD 2.972)	27.11, 27.39	N
Total	3200 (100%)	25.17 (SD 3.953)	25.03, 25.31	Y

4. **RQ 4:** How did the students perform in the ACT tests across the ethnicity?

- The Blue sample had a N (%) = 1184 (37%), M= 25.06 (SD 4.298), the CI 95% of mean is 24.81, 25.30, the sample has a skewness of .279 and standard error is = .071 (.279/.071)= 3.93 is more than 3.3 so distribution does not conform to "normal.

- The Green sample had a N (%) = 992 (31%), M= 25.43 (SD 3.399), the CI 95% of mean is 25.22, 25.64, the sample has a skewness of .029 and standard error is = .078 (.029/.078)= .372 is less 3.3 so distribution is conform to "normal.

- The Purple sample had a N (%) = 1024 (32%), M= 25.05 (SD 4.026), the CI 95% of mean is 24.80, 25.29, the sample has a skewness of .282 and standard error is = .076 (.282/.076)= 3.711 is more than 3.3 so distribution does not conform to "normal.

Refers to the table below for the Ethnicity total sample:

Descriptive Statistics

Student Ethnicity	N (%)	M (SD/)	95% CI of mean	Distribution conforms to normal Y/N
Blue	1184 (37%)	25.06 (SD 4.298)	24.81, 25.30	N
Green	992 (31%)	25.43 (SD 3.399)	25.22, 25.64	Y
Purple	1024 (32%)	25.05 (SD 4.026)	24.80, 25.29	N
Total	3200 (100%)	25.17 (SD 3.953)	25.03, 25.31	Y

5. **RQ 5:** How did the students perform in the ACT tests across the faculty tenure?

- The Non Tenured sample had a N (%) = 1060 (33.1%), M= 25.49 (SD 3.830), the CI 95% of mean is 25.26, 25.72, the sample has a skewness of .006 and standard error is = .075 (.006/.075)= .08 is less than 3.3 so distribution is conform to "normal.

- The Tenured sample had a N (%) = 2140 (66.9%), M= 25.01 (SD 4.003), the CI 95% of

mean is 24.84, 25.18, the sample has a skewness of .042 and standard error is = .053 (.042/.053)= .792 is less than 3.3 so distribution is conform to "normal.

Refers to the table below for the Faculty Tenure total sample:

Descriptive Statistics

Faculty Tenure	N (%)	M (SD)	95% CI of mean	Distribution conforms to normal Y/N
Non Tenured	1060 (33.1%)	25.49 (SD 3.830)	25.26, 25.72	Y
Tenured	2140 (66.9%)	25.01 (SD 4.003)	24.84, 25.18	Y
Total	3200 (100%)	25.17 (SD 3.953)	25.03, 25.31	Y

Module 2 SLP: Part III: This section will define five research questions and hypotheses and also decide on the appropriate statistical test.

Research Question	Hypotheses	Independent Variable(s) *LoM*	Dependent Variable *LoM*	Statistical Analysis
RQ1: Is there a difference between students' ACT scores across gender?	**$H1_{null}$:** There is no statistical significant difference between Students' ACT scores across gender. **$H1_{alt}$:** There is a statistical significant difference between Students' ACT scores across gender.	• StudGen *Nominal-Dichotomous*	• StudAct *Continuous*	Independent-Samples t-test
RQ2: Is there a difference between students' ACT scores across faculty?	$H2_{null}$: There is no statistical significant difference between students' ACT scores across faculty. **$H2_{alt}$:** There is a statistical significant difference between students' ACT scores across faculty.	• Faculty *Nominal*	• StudAct *Continuous*	One way ANOVA + post hoc
RQ3: Is there a difference in act scores across faculty and ethnicity?	**$H3_{null}$:** There is no statistical significant difference in act scores across faculty and ethnicity.	• Studeth *Nominal* • faculty	• StudAct *Continuous*	Two way ANOVA

	$H3_{alt}$: There is a statistical significant difference in act scores across faculty and ethnicity.	*Nominal*		
RQ4: Are the faculty influences independence of the ethnicity of the student backgrounds?	**$H4_{null}$:** There are no statistical significant faculty influences of independent of the ethnicity of the student backgrounds. **$H4_{alt}$:** There are statistical significant faculty influences of independent of the ethnicity of the student backgrounds.	• Studeth *Nominal*	• Faculty *Nominal*	Chi Square
RQ5: Is there a difference between students ACT scores across ethnicity?	**$H5_{null}$:** There is no statistical significant difference between students ACT scores across ethnicity. **$H5_{alt}$:** There is a statistical significant difference between students ACT scores across ethnicity.	• Studeth *Nominal*	• ACT *Continuous*	One way ANOVA + post hoc

Module 3 SLP: Part IVa: Will use SPSS to run the Independent Sample T-test and report the finding.

Part I: Independent-Samples t-test: This section one will write a research question and report hypothesis for the Independent-Samples T-test statistical to determine if there was a significant difference between students' ACT scores across gender.

1. **RQ1:** Is there a difference between students' ACT scores across gender?

   - **$H1_{null}$:** There is no statistical significant difference between Students' ACT scores across gender.

   - **$H1_{alt}$:** There is a statistical significant difference between Students' ACT scores across gender.

   First Table: Provides group statistics of ACT scores across gender:

Group Statistics

	Student Gender	N	Mean	Std. Deviation	Std. Error Mean
ACT Score	male	1666	25.17	3.991	.098
	female	1534	25.16	3.912	.100

Second Table: Provides Independent Samples Test

Independent Samples Test

		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
ACT Score	Equal variances assumed	.299	.584	.075	3198	.940	.010	.140	-.264	.285
	Equal variances not assumed			.075	3185.562	.940	.010	.140	-.264	.285

Reporting Statistics – t test

An Independent Samples T-test failed to reveal a statistical significant difference between students' ACT scores across gender: Male (M = 25.17, SD = 3.991 and Female (M = 25.16, SD = 3.912, with t (3198) = .075, p = .940, non significant (p=>.05), cannot Reject Hnull.

Module 4: Part IVb: Will use SPSS to run One-way and Two-Way ANOVA tests and examine the results. It will also run the LSD post hoc analysis if the results are to be significant**.**

One-Way ANOVA: Will use SPSS to run One-Way ANOVA to determine if there was a significant difference between students ACT scores across ethnicity.

2. **RQ2:** Is there a difference between students ACT scores across ethnicity?

- **$H2_{null}$:** There is no statistical significant difference between students ACT scores across ethnicity.

- **$H2_{alt}$:** There is a statistical significant difference between students ACT scores across ethnicity.

One Way ANOVA – SPSS Output I

The first table provides descriptive of each student ethnicity: Sample size – N; mean – M; Standard Deviation – SD. ANOVA will compare the means for all possible pairs between the students' ethnicity.

Descriptive

ACT Score

	N (%)	M (SD)	95% CI of mean
Blue	1184, (37%)	25.06, 4.298	24.81, 25.30
Green	992, (31%)	25.43, 3.399	25.22, 25.64
Purple	1024, (32%)	25.05, 4.026	24.80, 25.29
Total	3200 (100%)	25.17, 3.953	25.03, 25.31

One Way ANOVA – SPSS Output II

The second table provides the omnibus (overall) ANOVA results.

ANOVA

ACT Score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	99.035	2	49.517	3.174	.042
Within Groups	49882.502	3197	15.603		
Total	49981.537	3199			

Reporting: A One Way ANOVA was run to examine the difference between students' ACT scores across ethnicity, yielding a statistical significant result with F (2, 3197) = 3.174, p= .042. hence we reject $H_{null.}$

Post Hoc Tests

Multiple Comparisons

Dependent Variable: ACT Score

LSD

(I) Student Ethnicity	(J) Student Ethnicity	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Blue	Green	-.376*	.170	.027	-.71	-.04
	Purple	.010	.169	.953	-.32	.34
Green	Blue	.376*	.170	.027	.04	.71
	Purple	.386*	.176	.029	.04	.73
Purple	Blue	-.010	.169	.953	-.34	.32
	Green	-.386*	.176	.029	-.73	-.04

*. The mean difference is significant at the 0.05 level.

Reporting: LSD - Post Hoc analyses: Significant results for the students' ethnicity: Blue/Green p=.027 sig, Green/Purple P=.29 non sig and Purple/Blue=.953 non sig.

Two-Way ANOVA: Will use SPSS to run Two-Way ANOVA to determine if there a difference in act scores across faculty and ethnicity.

3. **RQ3:** Is there a difference in act scores across faculty and ethnicity?

- **$H3_{null}$:** There is no statistical significant in act scores across faculty and ethnicity.
- **$H3_{alt}$:** There is statistical significant difference in act scores across faculty and ethnicity.

Two-Way ANOVA – SPSS Output I

The first table provides descriptive of each faculty and student ethnicity background: Sample size – N; mean – M; Standard Deviation – SD. Anova will compare the means for all possible pairs between the six faculty members.

Descriptive Statistics

Dependent Variable: ACT Score

Faculty	Student Ethnicity	Mean	Std. Deviation	N
Adam	Blue	23.12	2.108	114
	Green	25.66	1.961	174
	Purple	24.56	3.657	164
	Total	24.62	2.900	452
Brenda	Blue	25.63	6.739	30
	Green	25.27	3.552	196
	Purple	24.67	3.182	208
	Total	25.01	3.699	434
Charles	Blue	25.96	4.135	262
	Green	26.25	2.686	112
	Purple	25.53	4.052	250
	Total	25.84	3.884	624
Debra	Blue	25.45	4.371	226
	Green	26.02	2.864	300
	Purple	25.23	3.448	182
	Total	25.64	3.565	708
Eve	Blue	26.33	4.721	192
	Green	25.13	4.313	176
	Purple	26.54	4.797	156
	Total	25.99	4.644	524
Frank	Blue	24.03	3.966	360
	Green	18.85	1.987	34
	Purple	21.47	4.357	64
	Total	23.29	4.198	458
Total	Blue	25.06	4.298	1184
	Green	25.43	3.399	992
	Purple	25.05	4.026	1024
	Total	25.17	3.953	3200

Two-Way ANOVA – SPSS Output II

The second table provides the omnibus (overall) ANOVA results.

Tests of Between-Subjects Effects

Dependent Variable: ACT Score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4455.291[a]	17	262.076	18.317	.000
Intercept	1249624.341	1	1249624.341	87340.930	.000
FACULTY	3588.085	5	717.617	50.157	.000
STUDETH	106.651	2	53.325	3.727	.024
FACULTY * STUDETH	1797.285	10	179.728	12.562	.000
Error	45526.246	3182	14.307		
Total	2077123.000	3200			
Corrected Total	49981.537	3199			

a. R Squared = .089 (Adjusted R Squared = .084)

Reporting: A Two Way ANOVA was run to examine a difference in act scores across faculty and ethnicity, yielding a statistical significant result with:

- Overall model: F (17, 3182) = 18.317, p< .01 sig.
- The main effect of Faculty: F (5, 3182) = 50.157, p<.01 sig.
- The main effect of Student Ethnicity: F (2, 3182) = 3.727, p = .024 sig.
- Interaction Faculty * Student Ethnicity: F (10, 3182) = 12.562, p<0.01 Sig

Module 5 – Part IVc: Will use SPSS to run Chi square tests to determine whether the faculty influences are independent of the ethnicity of the student backgrounds.

4. **RQ4:** Are the faculty influences independence of the ethnicity of the student backgrounds?

$H4_{null}$: There are no statistical significant faculty influences of independent of the ethnicity of the student backgrounds.

$H4_{alt}$: There are statistical significant faculty influences of independence of the ethnicity of the student backgrounds.

Chi Square – SPSS Outputs I: Observed vs. Expected

Faculty * Student Ethnicity Cross tabulation

			Student Ethnicity			Total
			Blue	Green	Purple	
Faculty	Adam	Count	114	174	164	452
		Expected Count	167.2	140.1	144.6	452.0
	Brenda	Count	30	196	208	434
		Expected Count	160.6	134.5	138.9	434.0
	Charles	Count	262	112	250	624
		Expected Count	230.9	193.4	199.7	624.0

	Debra	Count	226	300	182	708
		Expected Count	262.0	219.5	226.6	708.0
	Eve	Count	192	176	156	524
		Expected Count	193.9	162.4	167.7	524.0
	Frank	Count	360	34	64	458
		Expected Count	169.5	142.0	146.6	458.0
Total		Count	1184	992	1024	3200
		Expected Count	1184.0	992.0	1024.0	3200.0

Chi Square – SPSS Outputs II: Statistic and p value

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	635.632[a]	10	.000
Likelihood Ratio	682.548	10	.000
Linear-by-Linear Association	253.225	1	.000
N of Valid Cases	3200		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 134.54.

Reporting: A chi square test of independence was performed and found that there was a significant influence on the faculties' interactions with students based on their ethnicity backgrounds: X^2 (10, N = 3200) = 635.632, p< .001, significant, we reject Hnull and conclude that variables are dependent.

Conclusion: Part V: Will analyze what was done to address the parents' concerns at ABC high school:

The purpose of this study is to address parents' concerns and provide statistical findings. Based on the case of parent concerns about the ABC high school overall performance, I have approached the resolutions by:

1. Tested all the students at the ABC high school using Independent-Samples T-test statistical to determine if there was a significant difference between students' ACT scores across gender.
2. Performed One-Way ANOVA to determine if there was a significant difference between students ACT scores across ethnicity.
3. Run Two-Way ANOVA to determine if there was a difference in ACT scores across faculty and ethnicity.
4. Performed Chi square tests of independence to determine whether the faculty influences are independent of the ethnicity of the student backgrounds.

After performing the four tests: first – I realize that the Independent-Samples test failed to reveal a statistical significant difference between students ACT scores across gender, Second – The One Way ANOVA was run and revealed a statistical significant difference between students ACT scores across ethnicity; Two – A One Way ANOVA was run to examine the difference between students' ACT scores across ethnicity, yielding a statistical significant result; Third – a Two Way ANOVA was run and found that there was a statistical significant difference in ACT scores across faculty and ethnicity; and Four – A chi square test of independence was performed and found that there was a significant influence on the faculties' interactions with students based on their ethnicity.

The application of performing the SPSS tests was to investigate and analyze the parents' concerns to possibly provide sustainable resolutions. After reviewing the test results, I concluded:

1. There is a difference in the proportion of students from the different ethnicities between faculties. Do the faculties choose the students? Should the school admin system allocate students to teachers per ethnicity? When your RQ is incorrect the interpretation is incorrect!

2. The descriptive tell us that there was small difference in the MEANS between ethnicities: 25.06; 25.43; 25.05; the test tells you whether the difference is stat sig or could have happened by chance. In such a large sample, nearly all results would be sig.
   My question to you – assume you were a teacher in my school and I would see these results; would you be in agreement that I would classify you as being discriminatory against ethnicity group X? or fire you when your students' mean is 1.5% less than the other group?!