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## GLM ANOVA

```
>Warning # 2004. Command name: SUBTITLE  
>The subtitle given exceeds 60 characters in length. The first 60 characters  
>will be used.
```

## GLM ANOVA

Importing dataset for GLM ANOVA: G3 by studytime, school, an

## GLM ANOVA: Dataset Check

GLM ANOVA: Dataset Check  
 Frequency checks for fixed factors

## Frequencies

[GLMANOVAData] D:\DATA ANALYSIS\E ANOVA Family\GLM ANOVA\SPSS\_Output\sav\GLM-ANOVA-data.sav

### Statistics

		studytime	school	sex
N	Valid	649	649	649
	Missing	0	0	0

## Frequency Table

### studytime

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	212	32.7	32.7	32.7
	2.00	305	47.0	47.0	79.7
	3.00	97	14.9	14.9	94.6
	4.00	35	5.4	5.4	100.0
	Total	649	100.0	100.0	

### school

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	GP	423	65.2	65.2	65.2
	MS	226	34.8	34.8	100.0
	Total	649	100.0	100.0	

### sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	383	59.0	59.0	59.0
	M	266	41.0	41.0	100.0
	Total	649	100.0	100.0	

## GLM ANOVA: Descriptive Statistics

GLM ANOVA: Descriptive Statistics  
 Mean G3 by studytime, school, and sex

**Means**

**Case Processing Summary**

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
G3 * studytime	649	100.0%	0	0.0%	649	100.0%

**Report**

G3

studytime	N	Mean	Std. Deviation	Median	Minimum	Maximum
1.00	212	10.8443	3.21862	11.0000	.00	18.00
2.00	305	12.0918	3.24313	12.0000	.00	19.00
3.00	97	13.2268	2.50210	13.0000	8.00	18.00
4.00	35	13.0571	3.03841	13.0000	6.00	19.00
Total	649	11.9060	3.23066	12.0000	.00	19.00

**Means**

**Case Processing Summary**

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
G3 * school	649	100.0%	0	0.0%	649	100.0%

**Report**

G3

school	N	Mean	Std. Deviation	Median	Minimum	Maximum
GP	423	12.5768	2.62564	13.0000	.00	19.00
MS	226	10.6504	3.83399	11.0000	.00	19.00
Total	649	11.9060	3.23066	12.0000	.00	19.00

**Means**

GLM ANOVA: Descriptive Statistics  
 Mean G3 by studytime, school, and sex

**Case Processing Summary**

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
G3 * sex	649	100.0%	0	0.0%	649	100.0%

**Report**

G3						
sex	N	Mean	Std. Deviation	Median	Minimum	Maximum
F	383	12.2533	3.12415	12.0000	.00	19.00
M	266	11.4060	3.32069	11.0000	.00	19.00
Total	649	11.9060	3.23066	12.0000	.00	19.00

## GLM ANOVA: Main Effects Model

```
>Warning # 2004. Command name: SUBTITLE  
>The subtitle given exceeds 60 characters in length. The first 60 characters  
>will be used.
```

GLM ANOVA: Main Effects Model  
 Dependent variable G3; fixed factors studytime, school, and

## General Linear Model

### Between-Subjects Factors

		Value Label	N
studytime	1.00	Studytime 1	212
	2.00	Studytime 2	305
	3.00	Studytime 3	97
	4.00	Studytime 4	35
school	GP		423
	MS		226
sex	F		383
	M		266

### Descriptive Statistics

Dependent Variable: G3

studytime	school	sex	Mean	Std. Deviation	N
1.00	GP	F	12.1429	2.32244	42
		M	11.1948	2.92466	77
		Total	11.5294	2.75504	119
	MS	F	10.3404	3.23887	47
		M	9.5870	3.85040	46
		Total	9.9677	3.55531	93
	Total	F	11.1910	2.96907	89
		M	10.5935	3.37745	123
		Total	10.8443	3.21862	212
2.00	GP	F	12.9040	2.15311	125
		M	12.4691	2.85082	81
		Total	12.7330	2.45378	206
	MS	F	10.9863	4.25406	73
		M	10.1154	3.92252	26
		Total	10.7576	4.16764	99
	Total	F	12.1970	3.22374	198
		M	11.8972	3.28500	107
		Total	12.0918	3.24313	305

GLM ANOVA: Main Effects Model  
 Dependent variable G3; fixed factors studytime, school, and

**Descriptive Statistics**

Dependent Variable: G3

studytime	school	sex	Mean	Std. Deviation	N
3.00	GP	F	13.5283	2.35832	53
		M	13.6667	1.90973	18
		Total	13.5634	2.24074	71
	MS	F	12.1364	2.96480	22
		M	13.2500	3.20156	4
		Total	12.3077	2.96337	26
	Total	F	13.1200	2.60955	75
		M	13.5909	2.10801	22
		Total	13.2268	2.50210	97
4.00	GP	F	14.2353	2.94808	17
		M	12.0000	1.94365	10
		Total	13.4074	2.80466	27
	MS	F	14.0000	2.94392	4
		M	9.7500	3.30404	4
		Total	11.8750	3.68152	8
	Total	F	14.1905	2.87435	21
		M	11.3571	2.49945	14
		Total	13.0571	3.03841	35
Total	GP	F	13.0042	2.34430	237
		M	12.0323	2.86055	186
		Total	12.5768	2.62564	423
	MS	F	11.0342	3.78821	146
		M	9.9500	3.84148	80
		Total	10.6504	3.83399	226
	Total	F	12.2533	3.12415	383
		M	11.4060	3.32069	266
		Total	11.9060	3.23066	649

GLM ANOVA: Main Effects Model  
 Dependent variable G3; fixed factors studytime, school, and

**Levene's Test of Equality of Error Variances<sup>a</sup>**

Dependent Variable: G3

F	df1	df2	Sig.
2.148	15	633	.007

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + studytime + school + sex

**Tests of Between-Subjects Effects**

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	954.269 <sup>a</sup>	5	190.854	21.126	.000	.141
Intercept	43022.688	1	43022.688	4762.197	.000	.881
studytime	248.869	3	82.956	9.182	.000	.041
school	458.124	1	458.124	50.710	.000	.073
sex	66.429	1	66.429	7.353	.007	.011
Error	5808.997	643	9.034			
Total	98761.000	649				
Corrected Total	6763.267	648				

a. R Squared = .141 (Adjusted R Squared = .134)

GLM ANOVA: Main Effects Model  
 Dependent variable G3; fixed factors studytime, school, and

**Parameter Estimates**

Dependent Variable: G3

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	11.265	.571	19.741	.000	10.144	12.386
[studytime=1.00]	-1.713	.553	-3.096	.002	-2.800	-.627
[studytime=2.00]	-.826	.537	-1.539	.124	-1.881	.228
[studytime=3.00]	.123	.594	.207	.836	-1.044	1.290
[studytime=4.00]	0 <sup>a</sup>	.	.	.	.	.
[school=GP]	1.795	.252	7.121	.000	1.300	2.291
[school=MS]	0 <sup>a</sup>	.	.	.	.	.
[sex=F]	.678	.250	2.712	.007	.187	1.170
[sex=M]	0 <sup>a</sup>	.	.	.	.	.

**Parameter Estimates**

Dependent Variable: G3

Parameter	Partial Eta Squared
Intercept	.377
[studytime=1.00]	.015
[studytime=2.00]	.004
[studytime=3.00]	.000
[studytime=4.00]	.
[school=GP]	.073
[school=MS]	.
[sex=F]	.011
[sex=M]	.

a. This parameter is set to zero because it is redundant.

GLM ANOVA: Estimated Marginal Means for Studytime

**General Linear Model**

**Between-Subjects Factors**

		Value Label	N
studytime	1.00	Studytime 1	212
	2.00	Studytime 2	305
	3.00	Studytime 3	97
	4.00	Studytime 4	35
school	GP		423
	MS		226
sex	F		383
	M		266

**Descriptive Statistics**

Dependent Variable: G3

studytime	school	sex	Mean	Std. Deviation	N
1.00	GP	F	12.1429	2.32244	42
		M	11.1948	2.92466	77
		Total	11.5294	2.75504	119
	MS	F	10.3404	3.23887	47
		M	9.5870	3.85040	46
		Total	9.9677	3.55531	93
	Total	F	11.1910	2.96907	89
		M	10.5935	3.37745	123
		Total	10.8443	3.21862	212
2.00	GP	F	12.9040	2.15311	125
		M	12.4691	2.85082	81
		Total	12.7330	2.45378	206
	MS	F	10.9863	4.25406	73
		M	10.1154	3.92252	26
		Total	10.7576	4.16764	99
	Total	F	12.1970	3.22374	198
		M	11.8972	3.28500	107
		Total	12.0918	3.24313	305

GLM ANOVA: Estimated Marginal Means for Studytime

**Descriptive Statistics**

Dependent Variable: G3

studytime	school	sex	Mean	Std. Deviation	N
3.00	GP	F	13.5283	2.35832	53
		M	13.6667	1.90973	18
		Total	13.5634	2.24074	71
	MS	F	12.1364	2.96480	22
		M	13.2500	3.20156	4
		Total	12.3077	2.96337	26
	Total	F	13.1200	2.60955	75
		M	13.5909	2.10801	22
		Total	13.2268	2.50210	97
4.00	GP	F	14.2353	2.94808	17
		M	12.0000	1.94365	10
		Total	13.4074	2.80466	27
	MS	F	14.0000	2.94392	4
		M	9.7500	3.30404	4
		Total	11.8750	3.68152	8
	Total	F	14.1905	2.87435	21
		M	11.3571	2.49945	14
		Total	13.0571	3.03841	35
Total	GP	F	13.0042	2.34430	237
		M	12.0323	2.86055	186
		Total	12.5768	2.62564	423
	MS	F	11.0342	3.78821	146
		M	9.9500	3.84148	80
		Total	10.6504	3.83399	226
	Total	F	12.2533	3.12415	383
		M	11.4060	3.32069	266
		Total	11.9060	3.23066	649

GLM ANOVA: Estimated Marginal Means for Studytime

**Tests of Between-Subjects Effects**

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	954.269 <sup>a</sup>	5	190.854	21.126	.000	.141
Intercept	43022.688	1	43022.688	4762.197	.000	.881
studytime	248.869	3	82.956	9.182	.000	.041
school	458.124	1	458.124	50.710	.000	.073
sex	66.429	1	66.429	7.353	.007	.011
Error	5808.997	643	9.034			
Total	98761.000	649				
Corrected Total	6763.267	648				

a. R Squared = .141 (Adjusted R Squared = .134)

**Estimated Marginal Means**

**1. Weekly study time group**

**Estimates**

Dependent Variable: G3

Weekly study time group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1.00	10.789	.208	10.381	11.197
2.00	11.676	.183	11.317	12.034
3.00	12.625	.320	11.997	13.253
4.00	12.502	.514	11.493	13.511

GLM ANOVA: Estimated Marginal Means for Studytime

**Pairwise Comparisons**

Dependent Variable: G3

(I) Weekly study time group	(J) Weekly study time group	Mean Difference (I-J)	Std. Error	Sig. <sup>b</sup>
1.00	2.00	-.887 <sup>*</sup>	.277	.001
	3.00	-1.836 <sup>*</sup>	.383	.000
	4.00	-1.713 <sup>*</sup>	.553	.002
2.00	1.00	.887 <sup>*</sup>	.277	.001
	3.00	-.949 <sup>*</sup>	.352	.007
	4.00	-.826	.537	.124
3.00	1.00	1.836 <sup>*</sup>	.383	.000
	2.00	.949 <sup>*</sup>	.352	.007
	4.00	.123	.594	.836
4.00	1.00	1.713 <sup>*</sup>	.553	.002
	2.00	.826	.537	.124
	3.00	-.123	.594	.836

**Pairwise Comparisons**

Dependent Variable: G3

(I) Weekly study time group	(J) Weekly study time group	95% Confidence Interval for Difference <sup>b</sup>	
		Lower Bound	Upper Bound
1.00	2.00	-1.431	-.343
	3.00	-2.588	-1.085
	4.00	-2.800	-.627
2.00	1.00	.343	1.431
	3.00	-1.641	-.258
	4.00	-1.881	.228
3.00	1.00	1.085	2.588
	2.00	.258	1.641
	4.00	-1.044	1.290
4.00	1.00	.627	2.800
	2.00	-.228	1.881
	3.00	-1.290	1.044

## GLM ANOVA: Estimated Marginal Means for Studytime

Based on estimated marginal means

\*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

### Univariate Tests

Dependent Variable: G3

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	248.869	3	82.956	9.182	.000	.041
Error	5808.997	643	9.034			

The F tests the effect of Weekly study time group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

## 2. School fixed factor

### Estimates

Dependent Variable: G3

School fixed factor	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
GP	12.796	.182	12.439	13.152
MS	11.000	.241	10.526	11.474

### Pairwise Comparisons

Dependent Variable: G3

(I) School fixed factor	(J) School fixed factor	Mean Difference (I-J)	Std. Error	Sig. <sup>b</sup>	95% Confidence Interval
					Lower Bound
GP	MS	1.795 <sup>*</sup>	.252	.000	1.300
MS	GP	-1.795 <sup>*</sup>	.252	.000	-2.291

GLM ANOVA: Estimated Marginal Means for Studytime

**Pairwise Comparisons**

Dependent Variable: G3

(I) School fixed factor	(J) School fixed factor	95% Confidence Interval for <sup>b</sup> .. Upper Bound
GP	MS	2.291
MS	GP	-1.300

Based on estimated marginal means

\*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

**Univariate Tests**

Dependent Variable: G3

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	458.124	1	458.124	50.710	.000	.073
Error	5808.997	643	9.034			

The F tests the effect of School fixed factor. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

**3. Sex fixed factor**

**Estimates**

Dependent Variable: G3

Sex fixed factor	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
F	12.237	.192	11.859	12.615
M	11.559	.232	11.103	12.014

GLM ANOVA: Estimated Marginal Means for Studytime

**Pairwise Comparisons**

Dependent Variable: G3

(I) Sex fixed factor	(J) Sex fixed factor	Mean Difference (I-J)	Std. Error	Sig. <sup>b</sup>	95% Confidence Interval for <sup>b</sup> ... Lower Bound
F	M	.678 <sup>*</sup>	.250	.007	.187
M	F	-.678 <sup>*</sup>	.250	.007	-1.170

**Pairwise Comparisons**

Dependent Variable: G3

(I) Sex fixed factor	(J) Sex fixed factor	95% Confidence Interval for <sup>b</sup> ... Upper Bound
F	M	1.170
M	F	-.187

Based on estimated marginal means

\*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

**Univariate Tests**

Dependent Variable: G3

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	66.429	1	66.429	7.353	.007	.011
Error	5808.997	643	9.034			

The F tests the effect of Sex fixed factor. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

GLM ANOVA: Studytime by School Interaction Context

GLM ANOVA: Studytime by School Interaction Context  
 This model checks whether studytime effects differ by school

## General Linear Model

### Between-Subjects Factors

		Value Label	N
studytime	1.00	Studytime 1	212
	2.00	Studytime 2	305
	3.00	Studytime 3	97
	4.00	Studytime 4	35
school	GP		423
	MS		226
sex	F		383
	M		266

### Descriptive Statistics

Dependent Variable: G3

studytime	school	sex	Mean	Std. Deviation	N
1.00	GP	F	12.1429	2.32244	42
		M	11.1948	2.92466	77
		Total	11.5294	2.75504	119
	MS	F	10.3404	3.23887	47
		M	9.5870	3.85040	46
		Total	9.9677	3.55531	93
	Total	F	11.1910	2.96907	89
		M	10.5935	3.37745	123
		Total	10.8443	3.21862	212
2.00	GP	F	12.9040	2.15311	125
		M	12.4691	2.85082	81
		Total	12.7330	2.45378	206
	MS	F	10.9863	4.25406	73
		M	10.1154	3.92252	26
		Total	10.7576	4.16764	99
	Total	F	12.1970	3.22374	198
		M	11.8972	3.28500	107
		Total	12.0918	3.24313	305

GLM ANOVA: Studytime by School Interaction Context  
 This model checks whether studytime effects differ by school

**Descriptive Statistics**

Dependent Variable: G3

studytime	school	sex	Mean	Std. Deviation	N
3.00	GP	F	13.5283	2.35832	53
		M	13.6667	1.90973	18
		Total	13.5634	2.24074	71
	MS	F	12.1364	2.96480	22
		M	13.2500	3.20156	4
		Total	12.3077	2.96337	26
	Total	F	13.1200	2.60955	75
		M	13.5909	2.10801	22
		Total	13.2268	2.50210	97
4.00	GP	F	14.2353	2.94808	17
		M	12.0000	1.94365	10
		Total	13.4074	2.80466	27
	MS	F	14.0000	2.94392	4
		M	9.7500	3.30404	4
		Total	11.8750	3.68152	8
	Total	F	14.1905	2.87435	21
		M	11.3571	2.49945	14
		Total	13.0571	3.03841	35
Total	GP	F	13.0042	2.34430	237
		M	12.0323	2.86055	186
		Total	12.5768	2.62564	423
	MS	F	11.0342	3.78821	146
		M	9.9500	3.84148	80
		Total	10.6504	3.83399	226
	Total	F	12.2533	3.12415	383
		M	11.4060	3.32069	266
		Total	11.9060	3.23066	649

GLM ANOVA: Studytime by School Interaction Context  
 This model checks whether studytime effects differ by school

### Tests of Between-Subjects Effects

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	964.986 <sup>a</sup>	8	120.623	13.314	.000	.143
Intercept	35823.450	1	35823.450	3954.104	.000	.861
studytime	239.739	3	79.913	8.821	.000	.040
school	169.485	1	169.485	18.707	.000	.028
sex	67.163	1	67.163	7.413	.007	.011
studytime * school	10.716	3	3.572	.394	.757	.002
Error	5798.281	640	9.060			
Total	98761.000	649				
Corrected Total	6763.267	648				

a. R Squared = .143 (Adjusted R Squared = .132)

### Estimated Marginal Means

#### Weekly study time group \* School fixed factor

Dependent Variable: G3

Weekly study time group	School fixed factor	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1.00	GP	11.630	.278	11.083	12.177
	MS	9.964	.312	9.351	10.577
2.00	GP	12.660	.211	12.245	13.075
	MS	10.595	.308	9.990	11.201
3.00	GP	13.395	.363	12.683	14.107
	MS	12.071	.597	10.900	13.243
4.00	GP	13.319	.580	12.180	14.458
	MS	11.875	1.064	9.785	13.965

GLM ANOVA: Save Predicted Values and Residuals

**General Linear Model**

**Between-Subjects Factors**

		Value Label	N
studytime	1.00	Studytime 1	212
	2.00	Studytime 2	305
	3.00	Studytime 3	97
	4.00	Studytime 4	35
school	GP		423
	MS		226
sex	F		383
	M		266

**Tests of Between-Subjects Effects**

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	954.269 <sup>a</sup>	5	190.854	21.126	.000
Intercept	43022.688	1	43022.688	4762.197	.000
studytime	248.869	3	82.956	9.182	.000
school	458.124	1	458.124	50.710	.000
sex	66.429	1	66.429	7.353	.007
Error	5808.997	643	9.034		
Total	98761.000	649			
Corrected Total	6763.267	648			

a. R Squared = .141 (Adjusted R Squared = .134)

GLM ANOVA: Boxplot of G3 by Studytime

Explore

Weekly study time group

Case Processing Summary

	studytime	Valid		Cases Missing		Total	
		N	Percent	N	Percent	N	Percent
G3	1.00	212	100.0%	0	0.0%	212	100.0%
	2.00	305	100.0%	0	0.0%	305	100.0%
	3.00	97	100.0%	0	0.0%	97	100.0%
	4.00	35	100.0%	0	0.0%	35	100.0%

Descriptives

studytime		Statistic	Std. Error		
G3	1.00	Mean	10.8443	.22106	
		95% Confidence Interval for Mean	Lower Bound	10.4086	
			Upper Bound	11.2801	
		5% Trimmed Mean	11.0419		
		Median	11.0000		
		Variance	10.360		
		Std. Deviation	3.21862		
		Minimum	.00		
		Maximum	18.00		
		Range	18.00		
		Interquartile Range	3.00		
		Skewness	-1.078	.167	
		Kurtosis	3.117	.333	
		2.00	2.00	Mean	12.0918
95% Confidence Interval for Mean	Lower Bound			11.7264	
	Upper Bound			12.4572	
5% Trimmed Mean	12.2505				
Median	12.0000				
Variance	10.518				
Std. Deviation	3.24313				
Minimum	.00				

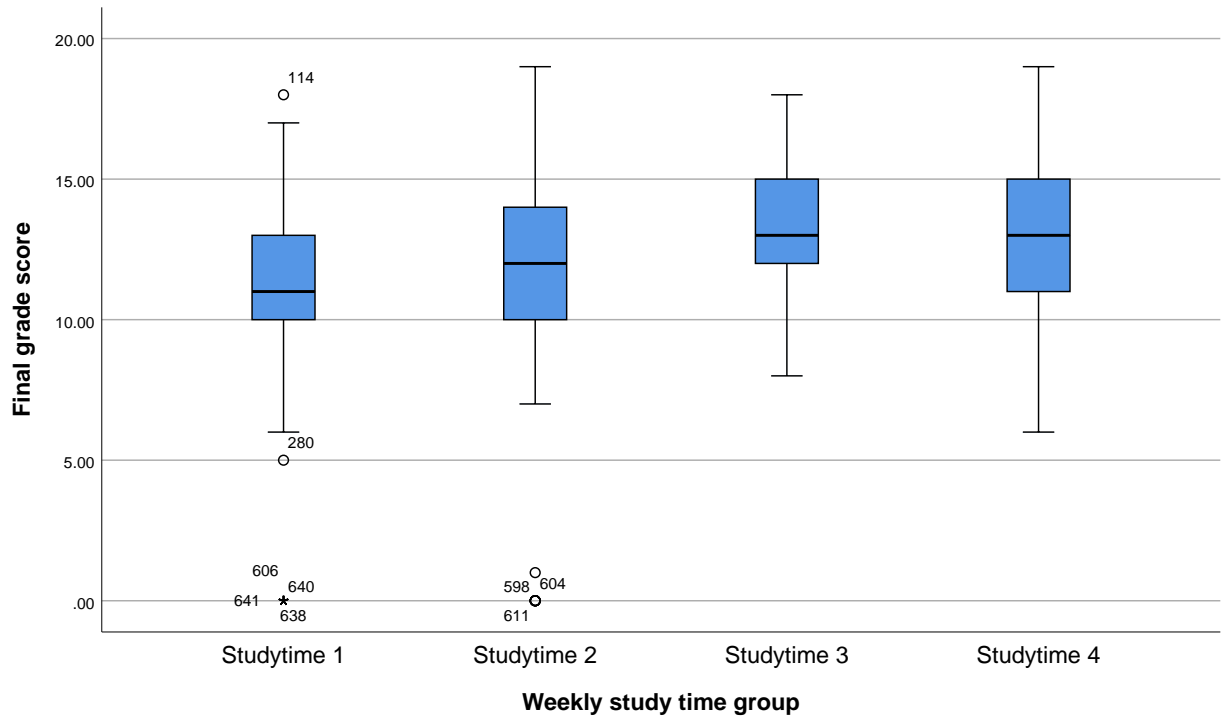
GLM ANOVA: Boxplot of G3 by Studytime

**Descriptives**

studytime		Statistic	Std. Error	
3.00	Maximum	19.00		
	Range	19.00		
	Interquartile Range	4.00		
	Skewness	-1.028	.140	
	Kurtosis	3.044	.278	
	Mean	13.2268	.25405	
	95% Confidence Interval for Mean	Lower Bound	12.7225	
		Upper Bound	13.7311	
	5% Trimmed Mean	13.2732		
	Median	13.0000		
	Variance	6.261		
	Std. Deviation	2.50210		
	Minimum	8.00		
	Maximum	18.00		
	Range	10.00		
Interquartile Range	3.50			
Skewness	-.190	.245		
Kurtosis	-.502	.485		
4.00	Mean	13.0571	.51358	
	95% Confidence Interval for Mean	Lower Bound	12.0134	
		Upper Bound	14.1009	
	5% Trimmed Mean	13.0714		
	Median	13.0000		
	Variance	9.232		
	Std. Deviation	3.03841		
	Minimum	6.00		
	Maximum	19.00		
	Range	13.00		
	Interquartile Range	4.00		
	Skewness	.209	.398	
	Kurtosis	-.339	.778	

**Final grade score**

GLM ANOVA: Boxplot of G3 by Studytime



GLM ANOVA: Boxplot of G3 by School

Explore

Warnings

Text: school Command: EXAMINE  
 This procedure cannot use string variables longer than 8 bytes.  
 The values will be truncated.

---

School fixed factor

Case Processing Summary

	school	Valid		Cases Missing		Total	
		N	Percent	N	Percent	N	Percent
G3	GP	423	100.0%	0	0.0%	423	100.0%
	MS	226	100.0%	0	0.0%	226	100.0%

Descriptives

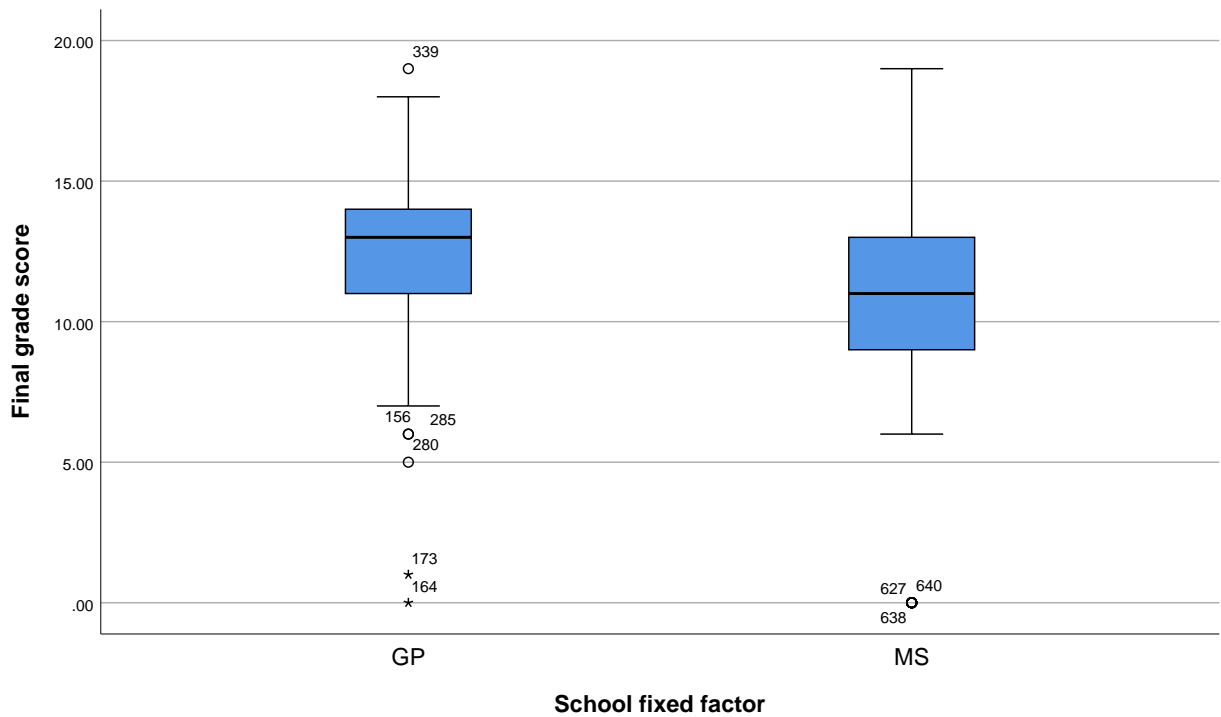
school		Statistic	Std. Error	
G3	GP	Mean	12.5768	.12766
		95% Confidence Interval for Mean	Lower Bound	12.3259
		Upper Bound	12.8278	
	5% Trimmed Mean		12.6221	
	Median		13.0000	
	Variance		6.894	
	Std. Deviation		2.62564	
	Minimum		.00	
	Maximum		19.00	
	Range		19.00	
	Interquartile Range		3.00	
	Skewness		-.336	.119
	Kurtosis		1.388	.237
MS	Mean		10.6504	.25503
		95% Confidence Interval for Mean	Lower Bound	10.1479
		Upper Bound	11.1530	
	5% Trimmed Mean		10.8500	
	Median		11.0000	

GLM ANOVA: Boxplot of G3 by School

**Descriptives**

school	Statistic	Std. Error
Variance	14.699	
Std. Deviation	3.83399	
Minimum	.00	
Maximum	19.00	
Range	19.00	
Interquartile Range	4.00	
Skewness	-.828	.162
Kurtosis	1.778	.322

**Final grade score**



## GLM ANOVA: Residual Diagnostics

GLM ANOVA: Residual Diagnostics  
Histogram and normal probability plot of residuals

Explore

Case Processing Summary

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
RES_1	649	100.0%	0	0.0%	649	100.0%

Descriptives

		Statistic	Std. Error
RES_1	Mean	.0000	.11753
	95% Confidence Interval for Mean	Lower Bound Upper Bound	
		-.2308 .2308	
	5% Trimmed Mean	.1039	
	Median	-.1171	
	Variance	8.965	
	Std. Deviation	2.99408	
	Minimum	-11.35	
	Maximum	8.56	
	Range	19.91	
	Interquartile Range	3.42	
	Skewness	-.680	.096
	Kurtosis	2.314	.192

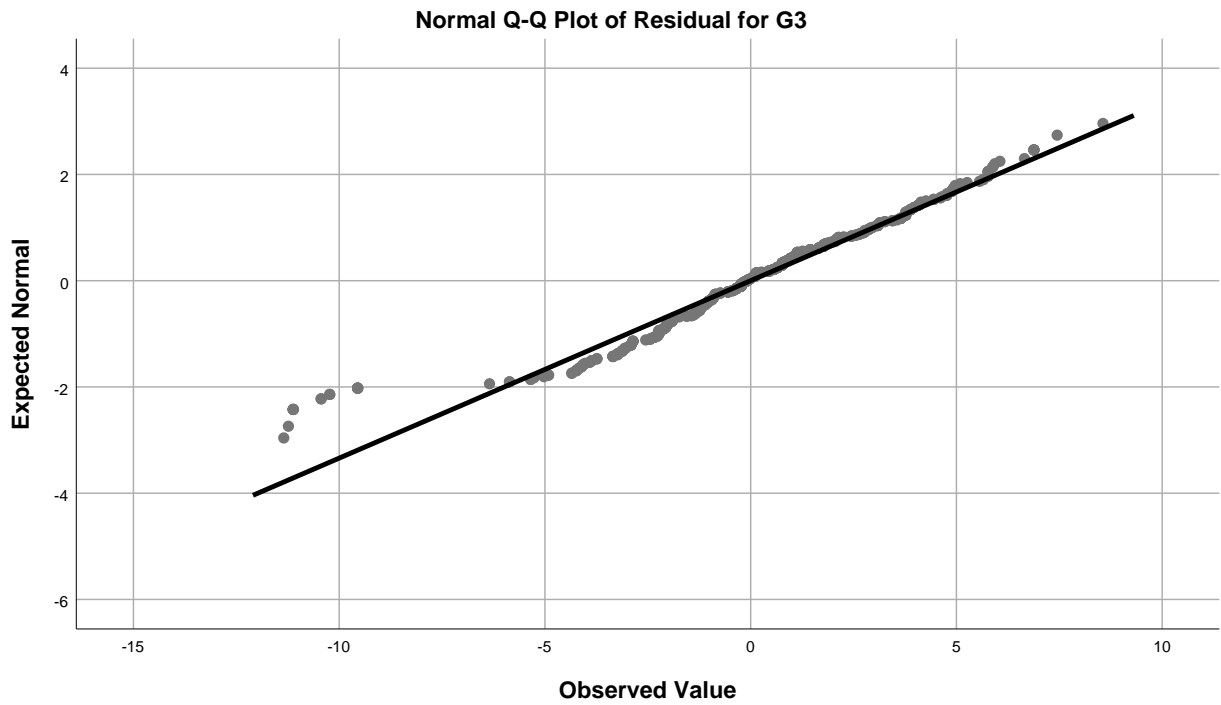
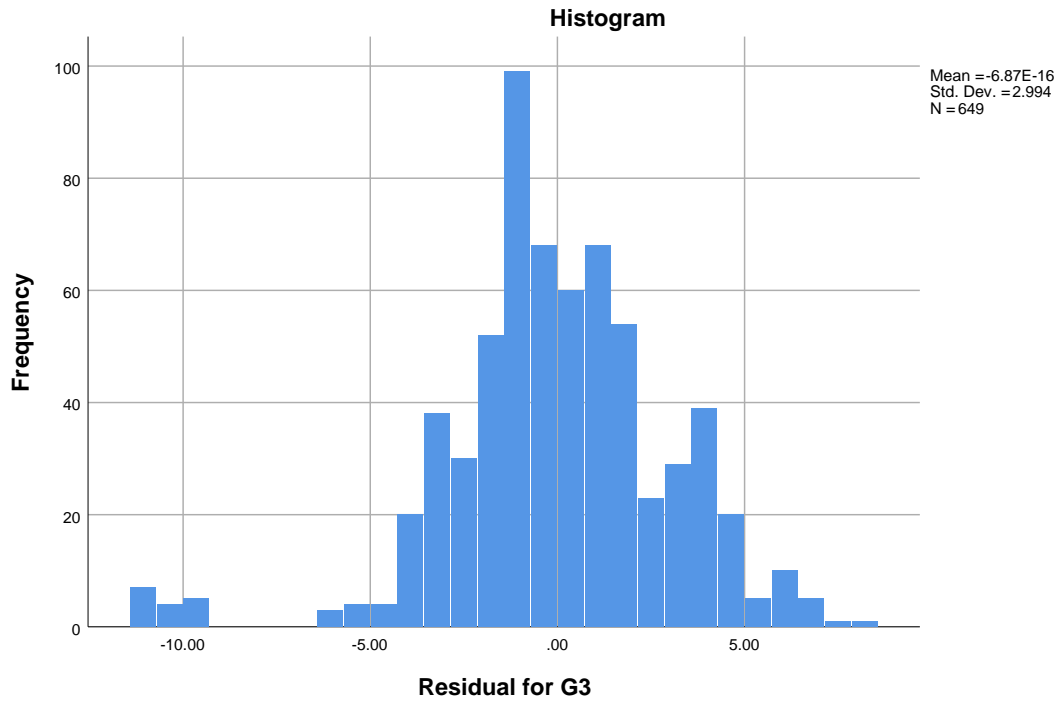
Tests of Normality

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
RES_1	.080	649	.000	.951	649	.000

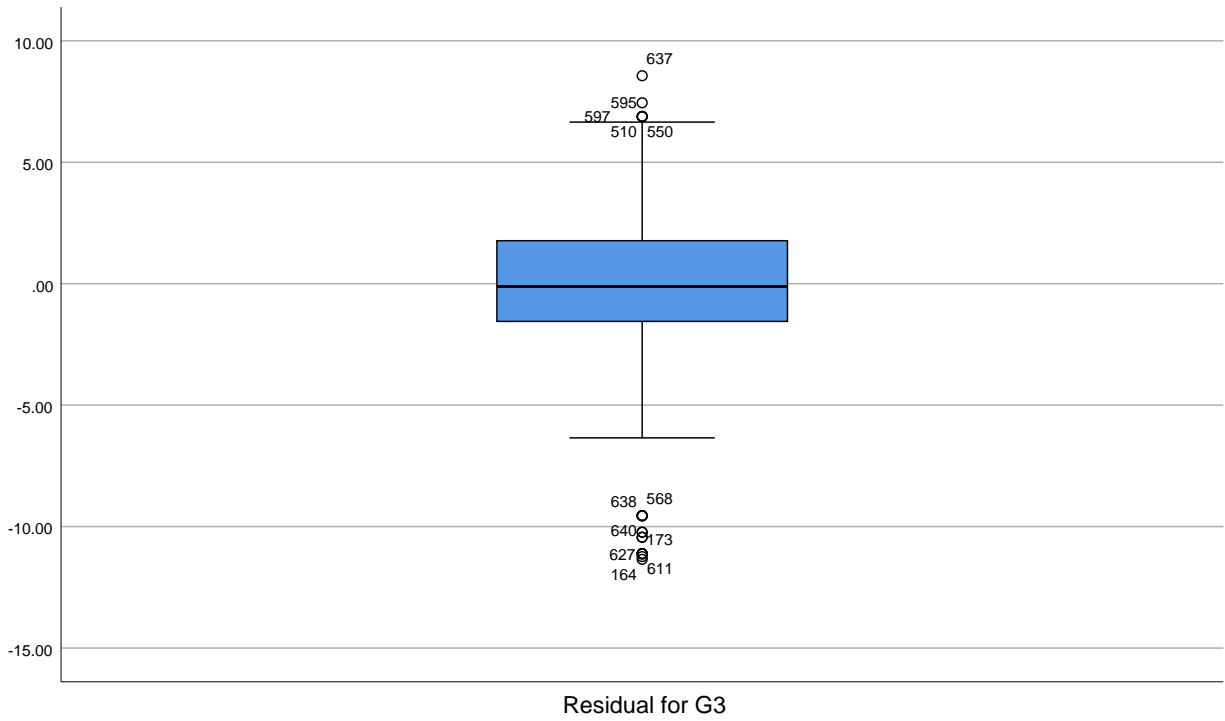
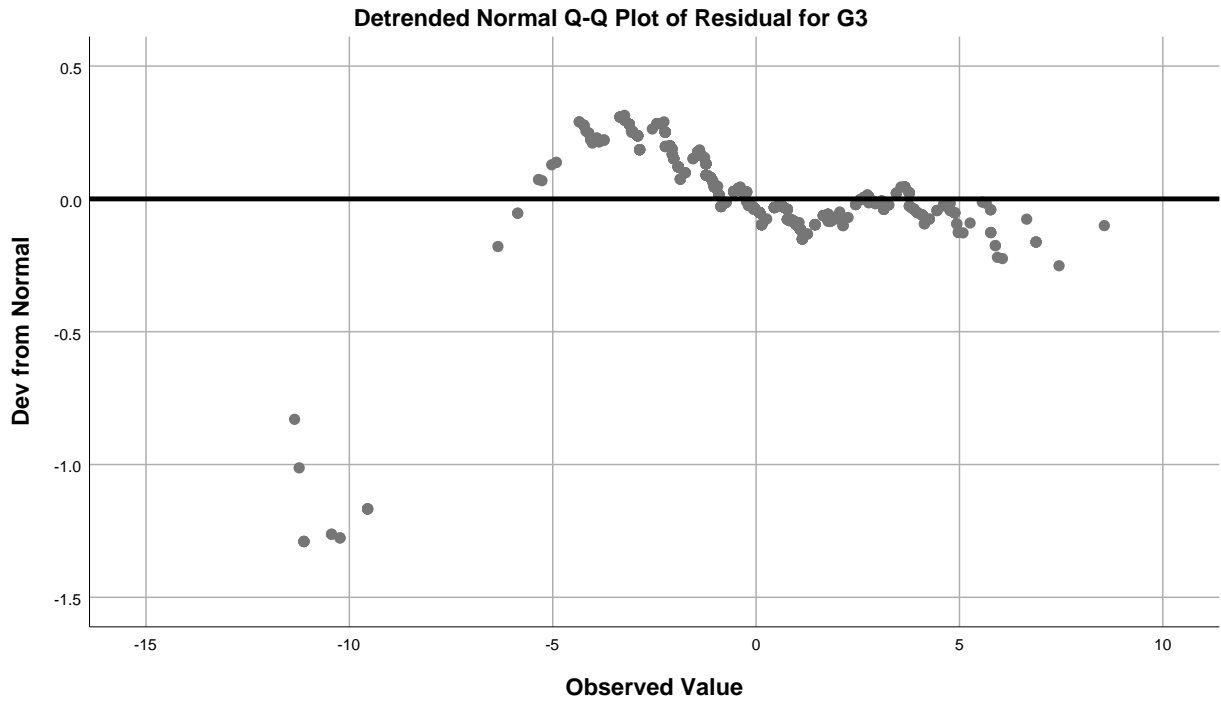
a. Lilliefors Significance Correction

Residual for G3

GLM ANOVA: Residual Diagnostics  
Histogram and normal probability plot of residuals

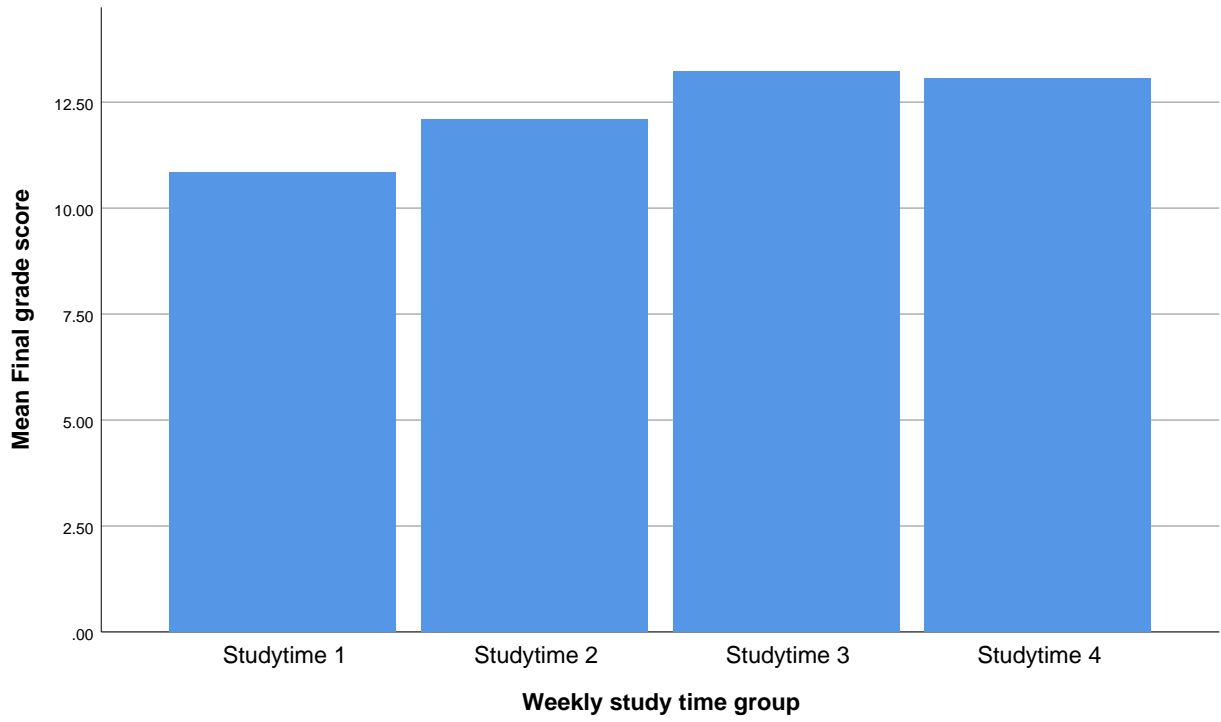


GLM ANOVA: Residual Diagnostics  
Histogram and normal probability plot of residuals



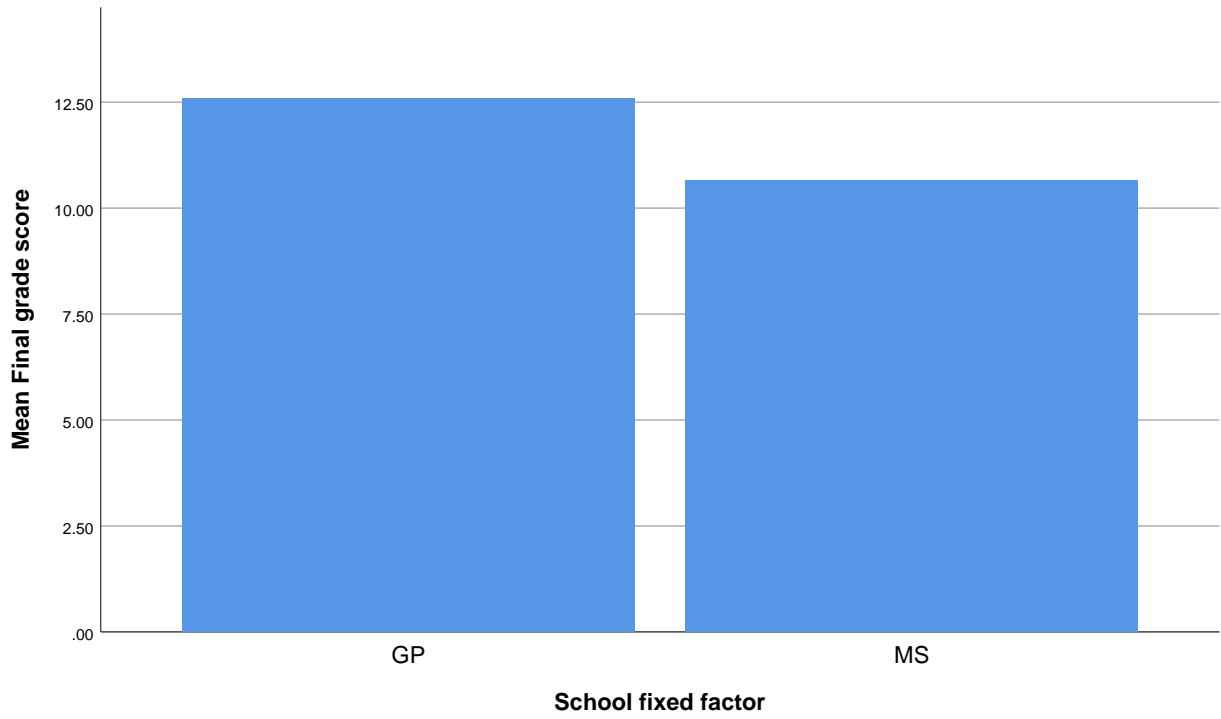
GLM ANOVA: Means Bar Chart by Studytime

**Graph**



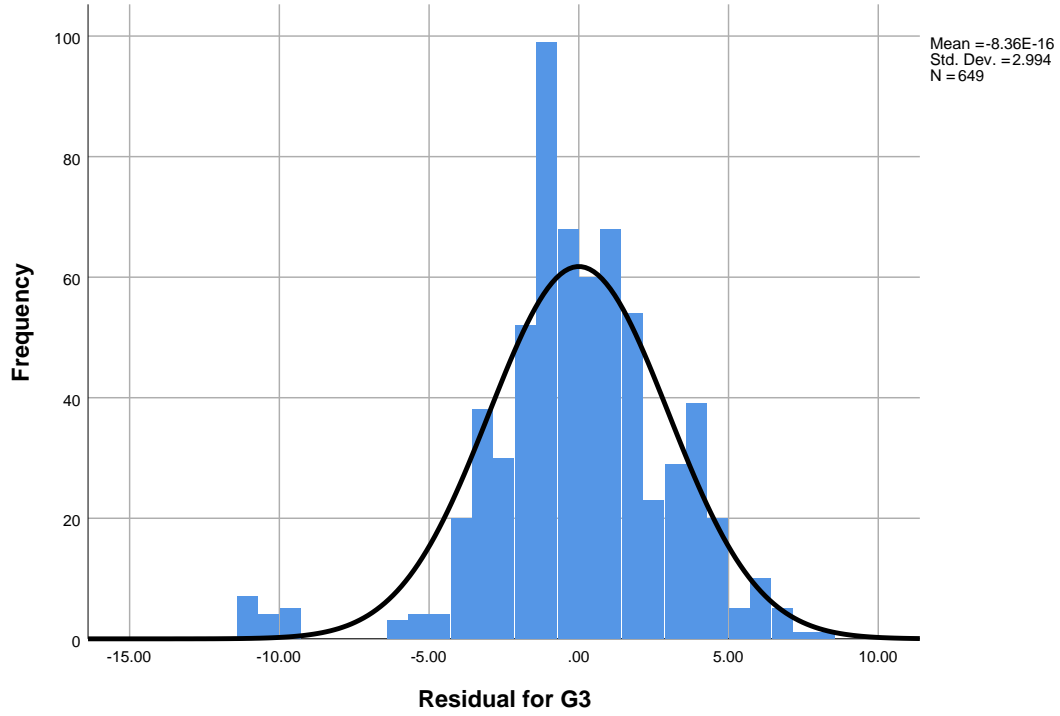
GLM ANOVA: Means Bar Chart by School

**Graph**



# GLM ANOVA: Residual Histogram

## Graph



# GLM ANOVA: Residuals Versus Predicted Values

## Graph

