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On Student Comprehension For There Year Courses In Mathematics Department

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Abstract

In this paper, we present the significant difference between the level of student comprehension for these year courses and for all student of mathematical department,college of science, Kufa university .Moreover to find out the effect of scientific, personality,ability of evaluation and ability of communication To have the goal ,we used some statistical methods like experimental design,correlation and regression analysis.

1-Introduction

We present in this study the significant difference between for there year courses and for all student of mathematical department in College of Science ,Kufa University .And find the effect of scientific ,personality ,ability of evaluation and ability of communication.

First we present the theoretical part about statistical methods like experimental design, correlation and regression analysis. In experimental design, we present the significant difference the level of student comprehension between all courses in each stage in mathematical department and then find the best from this courses.

In regression analysis ,we find the effect of scientific,personality,ability of evaluation and ability of communication in student comprehension. But in correlation,we present the positive correlation between all variable like scientific,personality,ability of evalution and ability of communication.

Finally,we used statistical program,that is statistical to have the goal.

2-Material and Method

1-2 Linear Regression

The statistical procedure for finding this best fitting line is called the method of least squares and the line is called the regression line. The formal derivation of this procedure, which requires differential calculus, is presented in advanced statistical texts.

First, it is necessary to introduce some useful new notation:

1- (X_i, Y_i) =ith pair of observations

$$2-\sum_{i=1}^{n}(X_i-\overline{X})(Y_i-\overline{Y})=\sum XY-\frac{(\sum X)(\sum Y)}{n}=\sum xy$$

$$3-\sum_{i=1}^{n}(Y_i-\overline{Y})^2=\sum Y^2-\frac{(\sum Y)^2}{n}=\sum y^2$$

$$4-\sum_{i=1}^{n}(X_i-\overline{X})^2=\sum X^2-\frac{(\sum X)^2}{n}=\sum x^2$$

The sample regression line is written $\hat{Y}=\hat{\beta}_0+\hat{\beta}_1 X$ where the least squares estimates $\hat{\beta}_0 and \hat{\beta}_1 are$ $\hat{\beta}_1=\frac{\sum xy}{\sum x^2} and \hat{\beta}_0=\overline{Y}-\hat{\beta}_1\overline{X}$

The values $\hat{\beta}_0 and \hat{\beta}_1$ are calculated from a sample of observations from the entire population of interest and are estimates of the"true" population values" β_0 and β_1 .As was the case with $\overline{Y}$ and s,the values $\hat{\beta}_0 and \hat{\beta}_1$ are subject to sampling variation and therefore may vary from sample to sample.the value $\hat{Y}$ obtained for a given X is the predicted mean of the population of all possible Y values that could occur at the given value X. Just as there is a sample standard deviation associated with each $\overline{Y}$,there is a standard deviation associated with the regression line and $\hat{Y}$ This quantity, denoted by

$s_{y,x}$ to signify regression ,is called the standard error of the estimate it is given by

$$s_{y.x} = \sqrt{SSE/(n-2)}$$

Where n is the number of pairs of observations and SSE(sum of squares for error)Is defined as

$$SSE = \sum (Y - \hat{Y})^2$$

The quantity $s_{y,x}$ is seen to be analogous to the standard deviation computed . It measures the "average" deviation of the observed values(Y)from the values($\hat{Y}$)predicted by the regression line. Although we will not test hypotheses or compute confidence intervals for an estimate $\hat{Y}$, the standard error (S.E.) for $\hat{Y}$ at a given X value would be.

$$S.E.(\hat{Y}) = s_{y.x}\sqrt{\frac{1}{n} + (X - \overline{X})^2 / \sum x^2}$$

We find $SSE = \sum (Y - \hat{Y})^2$

Fortunately, there is a computationally equivalent formula for SSE which is both more convenient to use and gives an insight into the geometric meaning of the regression line.This form is $SSE = \sum y^2 - \hat{\beta}_1 \sum xy$

The variation about the regression line,as measured by SSE,is strictly less than the Y variation,as measured by $\sum y^2$,whenever $\hat{\beta}_1 \neq 0$.Consequently,whenever there is a linear relationship between X and Y we can compute a standard error based on this relationship

which is smaller than the simple standard error based on Y values alone. There is clearly no relationship between X and Y.It is for this reason that the sample regression line must be evaluated to determine if it adequately describes the relationship between the variables X and Y.This may be accomplished by testing the null hypothesis that the true slope β_1 of the population regression line is equal to zero.

The most important inference to be made concerns the "true" value of the slope, β_1 of the population line. If the true population β_1 is zero, then the value of Yin on way depends on the value of X.In other words, indicates that no linear relationship exists between X and Y. It is first necessary to determine the standard error of $\hat{\beta}_1 is \frac{s_{y.x}}{\sqrt{\sum x^2}}$

2-2 Correlation Coefficient

Often in statistical analysis it is desirable to determine the strength of the relationship between the variables under study.The most widely used measure of this degree of

association between Y and X is provided by r, the coefficient of correlation.The formula for r is . $$r = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}$$

The values of r lie in the interval $-1 \le r \le +1$ with a "large" value of r(either positive or negative)indicating a strong relationship between X and Y.A negative value of r indicates that high X values are associated with low Y values,or,low X values associated with high Y values .A positive r,on the other hand, indicates that high values of X are associated with high values of Yand low values of x are associated with low values of Y.

A further explanation of r may be seen by comparing it with $\hat{\beta}_1$,the slope of the regression line.In the formulas for r and $\hat{\beta}_1$, numerators are identical (the denominators for both will always be positive); therefore, r and $\hat{\beta}_1$ and will have the same sign.When the slope of the line is negative,the correlation is also negative thus indicating a negative ,or inverse relationship between Y and X. Similarly, a positive slope and a positive correlation indicatea direct relationship between variables.Further,if an exact positive relationship exists between Y and X (i.e.,all points lie exactly on the regression line), then the value of r is +1.An exact negative relationship will yield an r of -1.

When $\hat{\beta}_1 = 0$,r=0 and hence no linear relationship between Y and X is indicated.As was the case with $\hat{\beta}_1$,the value r is the sample estimate of a true true population correlation value denoted by ρ and is subject to sampling variation. It is of interest therefore to test the hypothesis that the true population correlation equals zero.A value of $\rho = 0$ indicates that there is no linear association between the variables under study. The test statistic for testing $H_0 : \rho = 0$ is

$$t = r\sqrt{\frac{n-2}{1-r^2}}$$, n-2 degrees of freedom

A significant r indicates that the Y values are meaningfully related to the X values. A simpler method for testing $\rho = 0$ is by comparing the value of r with values in Table(Critical values of the correlation coefficient for different levels of significance).If the absolute value of r exceeds the tabulated value, then r is said to be significant at the given α level In the interpretation of both the regression line and the correlation coefficient, there are several important precautions that must be considered.

The first of these is that the relationship between variables must be linear. A slope(β_1) or correlation coefficient (ρ) equal to zero does not imply that no relationship exists between the variables.It simply implies that there is no linear relationship between the variables. The second precaution that must be exercised in the interpretation of linear regression and correlation concerns the danger of making inferences beyond the range of actual observations upon which the analysis is based.

The third precaution that must be considered is that correlation does not necessarily mean causation .A significant correlation indicates that the two variables X and Y tend to be associated.Except for highly controlled studies in which all extraneous factors have been removed,it is impssible to determine which variable influences which ,or even whether either of the variables is influencing the other directly.Often,a third variable may be affecting the relationship and "causing" both X and Y to vary together.

3-2 Design of Experiments

1- 3-2 Completely Random Design

The completely random design(CRD).In this design,experimental units are simply chosen at random from the population to which inferences are to be made. The total sample is randomly divided into groups and the different treatments or conditions under study are then applied to the groups, one treatment or condition to a group.If the treatments differ from each other then the various treatment groups will have different mean values at the end of the experiment.

For the completely random design the general method is the analysis of variance.The process of using the ANOVA (analysis of variance)is best learned by studying examples. In a completely randomized design there are k treatments, each of which is assigned at random to a group of experimental units.The null hypothesis is whether the treatment means are all equal.Symbolically, $H_0 : \mu_1 = \mu_2 = ... = \mu_k$ which is tested to see whether the treatment groups are really subsamples from the same population (H_0 true) or whether they samples from different populations(H_0 false).

In a completely randomized design each experimental unit has an equal and independent chance of receiving any one of the treatments.The basic assumption underlying this design is that the observed values in any one group represent a random sample of all possible values of all experimental units under that particular treatment.Further,we assume that the responses are normally distributed about the treatment mean and that the variation among observations treated alike is identical for all treatments. Calculations from analysis of variance techniques are customarily displayed in an ANOVA table.Definitions and computing formulas for the terms shown are discussed below.

Table 1: ANOVA for the completely randomized design

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F
Among treatments	k-1	SST	MST=SST/(k-1)	MST/MSE
Within treatments	N-k	SSE	MSE=SSE/(N-k)	
Total	N-1	SS		

The total sum of squares(SS) is the total of the squared deviations of the observations from overall mean of the data.It is simply the numerator in the familiar formula for calculating the variance of allthe observations considered as a single group.Symbolically,

$$SS_{Total} = \sum_{all} Y^2 - \frac{(\sum_{all} Y)^2}{N}$$

where $N=n_1+n_2+n_3+\ldots+n_k$, ,k=number of treatments

For convenience of calculations, the term $\frac{(\sum_{all} Y)^2}{N}$

Is given a special name.It is called the correction factor and is used in several calculations.Since the within treatments variation is the variation associated with observations treated alike,it is the variation associated with experimental or random error.As would be expected,to obtain a numerical value for this within group variation, we obtain a measure of the variation within each treatment group and combine these variance contributions to form a pooled estimate. Recall from the pooled t situation that the pooled variance estimate was

$$s_p^2 = \frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}$$

where $s_1^2 and s_2^2$ were the variances of two samples.For the k sample case the logical extension to obtain the pooled estimate of within group variation is

$$s_w^2 = \frac{(n_1-1)s_1^2 + (n_2-1)s_2^2 + \ldots + (n_k-1)s_k^2}{n_1+n_2+\ldots+n_k-k}$$

This may be rewritten $s_w^2 = \frac{SSE}{N-k} = MSE$ (mean square error)

since $n_1+n_2+\ldots+n_k = N$,the total number of observations.This formula is genrally not used for computations unless it is desired to have available the standard error for each treatment group.The computational formula for SSE is given by

$$SS_{Within} = SSE = \sum_{all} Y^2 - \sum_{i=1}^{k} \frac{(T_i)^2}{n_i}$$

The final source of variation to be calculated is the among treatments variation (the failure of the k treatment means to be alike).The computational formula is given by

$$SS_{Among} = SST = \sum_{i=1}^{k} \frac{(T_i)^2}{n_i} - CF$$

A final calculational short –cut may be developed by utilizing the relationship

$SS_{Total} = SS_{Within} + SS_{Among}$ =SSE+SST

In practice,SSE is rarely computed directly.Rather it is obtained by subtraction,that is,

$$SSE = SS_{Total} - SST$$

The general procedure for computing the mean square column for the ANOVA is to compute first the sum of squares and enter in the ANAVA table; then compute the degrees of freedom and enter in the table.Finally to compute the mean square by dividing the degrees of freedom into the sum of squares.

$$MST = \frac{SST}{k-1} \quad \text{and} \quad MSE = \frac{SSE}{N-k}$$

The test of the significance of differences among means is accomplished by computing the ratio of the estimate of σ^2 based on between variation (MST) to the estimate based on within variation(MSE).This ratio is called an F statistic.The larger this ratio ,the greater the difference between the two values and the less likely the null hypothesis is true.

Therefore, for large F,we reject H_0 and conclude that the means of the treatment groups significantly different; the groups are not drawn from the same population.Symbolically,

$$F = \frac{MST}{MSE}$$

If the null hypothesis is true and $\mu_A = \mu_B = \mu_C = \mu_D$,then MST and MSE are both estimates of the common variance σ^2 of the population .To determine if the calculated F value is large enough to warrant rejection of H_0 we use Table(F distribution) to locate the tabulated critical value, F_α.The degrees of freedom associated with F are γ_1 and γ_2 where

γ_1 = df associated with numerator (MST)

γ_2 =df associated with denominator (MSE)

The degrees of freedom associated with the numerator (γ_1) determines the appropriate column in the table; the denominator degrees of freedom(γ_2) determines the appropriate row.

2-3-2 Factorial Experiment

we have the experiment like

A	B	Y_{ijk}				Y
a_1	b_1	Y_{111}	Y_{112}	Y_{113}	Y_{114}	$Y_{11.}$
	b_2	Y_{121}	Y_{122}	Y_{123}	Y_{124}	$Y_{12.}$
a_2	b_1	Y_{211}	Y_{212}	Y_{213}	Y_{214}	$Y_{21.}$
	b_2	Y_{221}	Y_{222}	Y_{223}	Y_{224}	$Y_{22.}$
						$Y_{..}$

First step:

$CF = \frac{(Y_{..})^2}{rab}$, $SST = \sum Y_{ijk}^2 - CF$, $SS(A) = \frac{\sum Y_{i..}^2}{br} - CF$, $SSt = \frac{\sum Y_{ij}^2}{r} - C$,

SSe=SST-SSt

Second step: Constract (A×B) table

a \ b	b_1	b_2	Y
a_1	$Y_{11.}$	$Y_{12.}$	$Y_{1..}$
a_2	$Y_{21.}$	$Y_{22.}$	$Y_{2..}$
$Y_{j.}$	$Y_{.1.}$	$Y_{.2.}$	$Y_{..}$

, SSAB= SSt – SSA – SSB $SSB = \frac{\sum Y_{j.}^2}{ar} - CF$

Third step: Construct ANOVA table

Table 2:ANOVA for the Factorial Experiment

s.o.v	df	SS	MS	F	F_{table}
Treatment	(ab-1)	SSt	SSt/(ab-1)	MSt/MSe	$f_{\alpha,dft,dfe}$
A	(a-1)	SSA	SSA/(a-1)	MSA/MSe	$f_{\alpha,dfA,dfe}$
B	(b-1)	SSB	SSB/(b-1)	MSB/MSe	$f_{\alpha,dfB,dfe}$
AB	(a-1)(b-1)	SSAB	SSAB/(a-1)(b-1)	MSAB/MSe	$f_{\alpha,dfAB,dfe}$
Error	ab(r-1)	SSe	SSe/ab(r-1)		
Total	rab-1	SST			

3-3-2 Duncan Range Test:

The information required to apply this test to a set of data is as follows:

1-The mean

2- The standard error of the mean $S_{\bar{x}}$

3-The degrees of freedom on which the error mean square is based.The standard error of the mean is derived from the error mean square; that is

$S_{\bar{x}} = \sqrt{\frac{s^2}{r}}$ where s^2=the mean square for error and r= the number of replications.

4-3-2 Least Significant Difference Test (LSD):

In this test, the difference between any two means is declared significant at some desired point,usually the 5 per cent level of significance, when it exceeds the value derived from: $ts_{\bar{x}}\sqrt{2}$

In the other words, the LSD test utilizes the standard error of a difference between two means, $\sqrt{2S_{\bar{x}}}$, which serves as the least significant difference between two means when multiplied by the tabulated values of "t" at either the 5 per cent or 1 per cent levels of significance.This test is applicable only when the F-test for the homogeneity of the means in the experiment is significant.

3-The Result and Discussion

1-3-Linear Regression

1-1-3 First Stage

Table 3: Calculus

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .79515122 R^2 =.63226546 Adjusted R^2 =.49854381 F(4,11)= 4.7282 p<.018 26 Std.Error of estimate: .75387					
N=16	BETA	St.Err. of BETA	B	St.Err. of B	t(11)	p-level
Intercpt			4.900301	5.349970	.91595	.379336
Personality x_1	.580407	.276876	.877493	.418597	2.09627	.059986
Scientifically x_2	-.062842	.286127	-.082193	.374236	-.21963	.830183
Connection x_3	-.498641	.209303	-.599782	.251757	-2.38238	.036348
Evaluation x_4	.190998	.336450	.142741	.251443	.56769	.581649

$\hat{Y}$=4.900301+0.877493 x_1-0.082193 x_2 -0.599782 x_3 +0.142741 x_4

There exist significant difference between variables,

Table 4: Foundation of Mathematics

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .70944254 R^2 =.50330871 Adjusted R^2 =.32269370 F(4,11)= 2.7866 p<.08028 Std.Error of estimate: 2.3374					
N=16	BETA	St.Err.of BETA	B	St.Err. of B	t(11)	p-level
Intercpt			2.399426	2.032682	1.18042	.262728
Personality x_1	-.278517	.264932	-.093053	.088514	-1.05127	.315680
Scientifically x_2	-.484462	.394542	-.517606	.421535	-1.22791	.245108
Connection x_3	.363616	.606996	.327194	.546196	.59904	.561279
Evaluation x_4	.636563	.465529	.670881	.490626	1.36740	.198791

$\hat{Y}$=2.399426-0.093053 x_1 -0.517606 x_2 +0.327194 x_3 +0.670881 x_4
There exist significant difference between variables x_1 ,x_2 ,x_4

Table 5: Linear Algebra I

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .61636682 R^2 =.37990805 Adjusted R^2 =.15442007 F(4,11)= 1.6848 p<.22305 Std.Error of estimate: 1.9252					
N=16	BETA	St.Err.of BETA	B	St.Err. of B	t(11)	p-level
Intercpt			4.342661	6.247706	.69508	.501424
Personality x_1	.047570	.722151	.074233	1.126922	.06587	.948661
Scientifically x_2	1.062851	.934662	.898822	.790417	1.13715	.279640
Connection x_3	-.754770	.535227	-.731825	.518956	-1.41019	.186130
Evaluation x_4	.091831	.287170	.111002	.347121	.31978	.755127

$\hat{Y}$=4.342661+ 0.74233 x_1+0.898822 x_2 -0.731825 x_3 +0.111002 x_4
There exist significant in x_2.

Table 6 : General Physics

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .73373907 R^2 =.53837302 Adjusted R^2 =.37050866 F(4,11)=3.2072 p<.05642 Std.Error of estimate: 2.0170					
N=16	BETA	St.Err.of BETA	B	St.Err. of B	t(11)	p-level
Intercpt			.24023	2.489126	.09651	.924850
Personality x_1	.81001	.401552	1.21620	.602911	2.01721	.068745
Scientifically x_2	.48805	.568690	.58271	.678996	.85819	.409097
Connection x_3	-1.33377	.578295	-1.45239	.629725	-2.30639	.041562
Evaluation x_4	.49812	.468232	.48575	.456605	1.06384	.310197

$\hat{Y}$=0.24023 + 1.2162 x_1 +0.58271 x_2 -1.45239 x_3 +0.48575 x_4
There exist significant different between some variable like x_1,x_3,x_4

Table 7: computers

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .54628748 R^2 =.29843001 Adjusted R^2 =.04331365 F(4,11)=1.1698 p<.37603 Std.Error of estimate: 1.3467					
N=16	BETA	St.Err.of BETA	B	St.Err. of B	t(11)	p-level
Intercpt			8.310100	1.663374	4.99593	.000405
Personality x_1	-.675218	.430883	-.364193	.232405	-1.56706	.145398
Scientifically x_2	.035114	.330761	.025736	.242425	.10616	.917367
Connection x_3	1.085462	.630661	.659920	.383418	1.72115	.113190
Evaluation x_4	-.417650	.523779	-.274669	.344466	-.79738	.442104

$\hat{Y}$=8.310100-0.364193 x_1 + 0.025736 x_2 +0.65992 x_3 -0.274669 x_4
There exist significant between x_1 ,x_3

Table 8: English

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .47532676 R^2 =.22593552 Adjusted R^2 = ------ F(4,11)=.80268 p<.54832 Std.Error of estimate: .64639					
N=16	BETA	St.Err.of BETA	B	St.Err. of B	t(11)	p-level
Intercpt			5.883375	3.328292	1.767686	.104804
Personality x_1	.095895	.270247	.058531	.164950	.354842	.729418
Scientifically x_2	.130625	.336864	.114334	.294853	.387766	.705587
Connection x_3	.208684	.392891	.146792	.276365	.531151	.605873
Evaluation x_4	.195304	.423120	.070359	.152430	.461580	.653377

$\hat{Y}$=5.883375 +0.058531 x_1 +0.114334 x_2 +0.146792 x_3 +0.070359 x_4
Not significant difference between variables

Table 9: Human Rights

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .96954541 R^2 =.94001830 Adjusted R^2 =.91820677 F(4,11)=43.097 p<.00000 Std.Error of estimate: .80130					
N=16	BETA	St.Err.of BETA	B	St.Err. of B	t(11)	p-level
Intercpt			-2.35932	1.527691	-1.54437	.150765
Personality x_1	-.397012	.216759	-.42295	.230921	-1.83158	.094206
Scientifically x_2	.293750	.162591	.55488	.307128	1.80669	.098214
Connection x_3	-.105422	.358605	-.12716	.432536	-.29398	.774248
Evaluation x_4	1.195337	.193167	1.24813	.201698	6.18811	.000068

$\hat{Y}$= -2.35932 – 0.42295 x_1 +0.55488 x_2-0.12716 x_3 +1.24813 x_4
There exist significant difference between some variable like x_1,x_2,x_4

2-1-3-Second Stage

Table 10: Advanced Calculus

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .66833597 R^2 =.44667297 Adjusted R^2 =.32371141 F(4,18)=3.6326 p<.02441 Std.Error of estimate: 1.4841					
N=23	BETA	St.Err.of BETA	B	St.Err. of B	t(18)	p-level
Intercpt			3.46112	1.24527	2.7794	.01237
Personality x_1	-.32203	.23691	-.26326	.19367	-1.3593	.19083
Scientifically x_2	.01129	.25960	.00870	.20010	.0435	.96579
Connection x_3	.44374	.29517	.38388	.25535	1.5034	.15009
Evaluation x_4	.42544	.30971	.40982	.29834	1.3736	.18642

$\hat{Y}$=3.46112 -0.26326 x_1 +0.00870 x_2+0.38388 x_3+0.40982 x_4
There exist significant deference in x_1, x_3 ,x_4

Table 11: Linear AlgebraII

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .75913894 R^2 =.57629194 Adjusted R^2 =.48213459 F(4,18)=6.1205 p<.00272 Std.Error of estimate: 1.4170					
N= 23	BETA	St.Err.of BETA	B	St.Err. of B	t(18)	p-level
Intercpt			-.283878	1.497877	-.189520	.851806
Personality x_1	-.194176	.317763	-.174263	.285177	-.611070	.548793
Scientifically x_2	.451409	.225444	.571050	.285196	2.002310	.060552
Connection x_3	.533568	.258258	.519714	.251552	2.066030	.053526
Evaluation x_4	.110531	.242288	.112916	.247515	.456199	.653703

$\hat{Y}$= -0.283878 -0.174263 x_1 +0.57105 x_2 +0.519714 x_3 + 0.112916 x_4
There exist significant different in x_2 , x_3

Table 12: Probability and Statistics

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .91697110 R^2 =.84083600 Adjusted R^2 =.80546622 F(4,18)=23.773 p<.00000 Std.Error of estimate: 1.0885					
N= 23	BETA	St.Err.of BETA	B	St.Err. of B	t(18)	p-level
Intercpt			.315994	.694348	.455094	.654483
Personality x_1	-.011412	.139654	-.009588	.117335	-.081714	.935776
Scientifically x_2	-.054116	.132917	-.051968	.127642	-.407139	.688707
Connection x_3	.759879	.140620	.660274	.122187	5.403792	.000039
Evaluation x_4	.273014	.129938	.311598	.148301	2.101119	.049981

$\hat{Y}$= 0.315994 -0.009588 x_1 -0.051968 x_2 +0.660274 x_3 +0.311598 x_4
There exist significant difference in x_3 ,x_4

Table 13: Differential Equations

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .83630073 R^2 =.69939891 Adjusted R^2 =.63259867 F(4,18)=10.470 p<.00015 Std.Error of estimate: .89532					
N= 23	BETA	St.Err.of BETA	B	St.Err. of B	t(18)	p-level
Intercpt			.132886	1.582499	.08397	.934005
Personality x_1	-.349679	.201540	-.358558	.206657	-1.73504	.099823
Scientifically x_2	.799151	.205998	.741599	.191163	3.87941	.001099
Connection x_3	.309088	.144439	.345415	.161414	2.13993	.046309
Evaluation x_4	.196178	.145449	.226801	.168154	1.34877	.194137

$\hat{Y}$=0.132886 +0.206657 x_1 +0.191163 x_2 +0.161414 x_3 +0.168154 x_4
There exist significant difference in all variable

Table 14: Computers

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .92965996 R^2 =.86426764 Adjusted R^2 =.83410489 F(4,18)=28.653 p<.00000 Std.Error of estimate: .79546					
N= 23	BETA	St.Err.of BETA	B	St.Err. of B	t(18)	p-level
Intercpt			1.277132	1.730030	.738214	.469901
Personality x_1	-.071417	.097477	-.092120	.125734	-.732660	.473200
Scientifically x_2	-.108434	.118689	-.179539	.196519	-.913598	.373004
Connection x_3	.958168	.118136	.976032	.120339	8.110691	.000000
Evaluation x_4	.094565	.096684	.172206	.176065	.978082	.340997

$\hat{Y}$=1.277132 -0.092120 x_1 -0.179539 x_2 +0.976032 x_3 +0.172206 x_4
There exist significant difference in x_3

Table 15: Democratic and Freedom

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .94462445 R^2 =.89231535 Adjusted R^2 =.86838543 F(4,18)=37.289 p<.00000 Std.Error of estimate: .86069					
N= 23	BETA	St.Err.of BETA	B	St.Err. of B	t(18)	p-level
Intercpt			-.094120	.730230	-.128891	.898873
Personality x_1	.257904	.198436	.217294	.167190	1.299680	.210110
Scientifically x_2	.631863	.133769	.677395	.143408	4.723538	.000169
Connection x_3	.037757	.217449	.033081	.190520	.173637	.864088
Evaluation x_4	.077329	.172434	.068914	.153670	.448456	.659175

$\hat{Y}$= -0.09412 + 0.217294 x_1 +0.677395 x_2 +0.033081 x_3 + 0.68914 x_4
There exist significant difference in x_1 ,x_2

3-1-3- Third stage

Table 16: Mathematical Analysis

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .63739402 R^2 =.40627114 Adjusted R^2 =.20836152 F(4,12)=2.0528 p<.15059 Std.Error of estimate: 1.0461					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			.820134	2.688448	.305059	.765548
Personality x_1	.259674	.287115	.204207	.225786	.904425	.383568
Scientifically x_2	-.038910	.286030	-.032230	.236927	-.136034	.894050
Connection x_3	.625396	.328871	.597448	.314175	1.901643	.081492
Evaluation x_4	-.001677	.330260	-.001020	.200911	-.005077	.996032

$\hat{Y}$=0.820134 + 0.204207 x_1 -0.032230 x_2 +0.597448 x_3 -0.001020 x_4
There exist significant difference in x_3

Table 17: Numerical Analysis

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .87452082 R^2 =.76478666 Adjusted R^2 =.68638221 F(4,12)=9.7544 p<.00095 Std.Error of estimate: 1.0749					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			4.446973	2.666341	1.66782	.121215
Personality x_1	-.195671	.174153	-.187951	.167283	-1.12356	.283176
Scientifically x_2	-.024296	.144371	-.036749	.218362	-.16829	.869157
Connection x_3	.150006	.336918	.105182	.236242	.44523	.664080
Evaluation x_4	.745259	.336880	.609109	.275336	2.21224	.047091

$\hat{Y}$=4.446973 -0.187951 x_1 -0.036749 x_2 +0.105182 x_3 +0.609109 x_4
There exist significant difference in x_1 ,x_4

Table 18: Operation Research

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .68435883 R^2 =.46834700 Adjusted R^2 =.29112934 F(4,12)=2.6428 p<.08604 Std.Error of estimate: 1.6240					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			2.918298	1.290035	2.262185	.043041
Personality x_1	-.100527	.331817	-.057642	.190263	-.302960	.767108
Scientifically x_2	.257378	.472492	.198580	.364553	.544724	.595922
Connection x_3	.504196	.350910	.414137	.288231	1.436822	.176326
Evaluation x_4	.028329	.333167	.017395	.204579	.085029	.933641

$\hat{Y}$ =2.918298 -0.057642 x_1 +0.198580 x_2 +0.414137 x_3 +0.017395 x_4
There exist significant difference in x_3

Table 19: Theory of Differential Equation

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .84634149 R^2 =.71629393 Adjusted R^2 =.62172523 F(4,12)=7.5743 p<.00276 Std.Error of estimate: 1.4385					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			-.972098	1.520931	-.639147	.534738
Personality x_1	.088760	.163292	.068314	.125677	.543567	.596693
Scientifically x_2	.449471	.195896	.352302	.153547	2.294430	.040605
Connection x_3	.246333	.155700	.202864	.128225	1.582098	.139612
Evaluation x_4	.418902	.189717	.379817	.172016	2.208037	.047447

$\hat{Y}$= -0.972098 +0.068314 x_1 +0.352302 x_2 +0.202864 x_3 +0.379817 x_4

There exist significant difference in x_2 ,x_3 , x_4

Table 20: Abstract Algebra

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .86473883 R^2 =.74777325 Adjusted R^2 =.66369767 F(4,12)=8.8941 p<.00141 Std.Error of estimate: 1.2048					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			1.514603	2.555551	.592672	.564403
Personality x_1	.005750	.158242	.008510	.234193	.036337	.971611
Scientifically x_2	-.149893	.222592	-.214368	.318338	-.673396	.513456
Connection x_3	.547646	.198889	.365478	.132731	2.753525	.017488
Evaluation x_4	.492068	.272959	.557072	.309018	1.802716	.096585

$\hat{Y}$=1.514603 +0.008510 x_1 -0.214368 x_2 +0.365478 x_3 +0.557072 x_4

There exist significant difference in x_3,x_4

Table 21: Computers

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .89207711 R^2 =.79580156 Adjusted R^2 =.72773542 F(4,12)=11.692 p<.00042 Std.Error of estimate: .49623					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			5.648710	1.897063	2.97761	.011537
Personality x_1	-.030495	.200231	-.033325	.218809	-.15230	.881481
Scientifically x_2	.002117	.284268	.000900	.120811	.00745	.994179
Connection x_3	1.191049	.292939	.597348	.146918	4.06586	.001565
Evaluation x_4	-.395254	.228385	-.168351	.097276	-1.73065	.109121

$\hat{Y}$=5.648710 -0.033325 x_1 +0.000900 x_2 +0.597348 x_3 -0.168351 x_4
There exist significant difference in x_3 ,x_4

4-1-3– Fourth Stage

Table 22: Topology

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .72376181 R^2 =.52383116 Adjusted R^2 =.36510822 F(4,12)=3.3003 p<.04829 Std.Error of estimate: 1.4429					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			.183937	3.409753	.053944	.957867
Personality x_1	.314766	.327679	.316187	.329158	.960592	.355714
Scientifically x_2	-.012411	.374920	-.021260	.642221	-.033104	.974136
Connection x_3	.446304	.336844	.526072	.397049	1.324956	.209862
Evaluation x_4	.034239	,327759	.036756	.351857	.104463	.918527

$\hat{Y}$=0.183937 +0.316187 x_1 -0.021260 x_2 +0.526072 x_3 +0.036756 x_4
There exist significant difference in x_3

Table 23: Complex Analysis

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .88970708 R^2 =.79157869 Adjusted R^2 =.72210492 F(4,12)=11.394 p<.00047 Std.Error of estimate: .96422					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			-2.17639	1.622206	-1.34162	.204556
Personality x_1	.510122	.282165	.67097	.371135	1.80788	.095738
Scientifically x_2	-.403430	.290708	-.47808	.344501	-1.38775	.190442
Connection x_3	.592253	.234904	.65325	.259096	2.52125	.026847
Evaluation x_4	.285409	.170792	.31313	.187382	1.67109	.120557

$\hat{Y}$= -2.17639 +0.67097 x_1 -0.47808 x_2+0.65325 x_3 +0.31313 x_4
There exist significant difference in all variable.

Table 24: Functional Analysis

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .73955840 R^2 =.54694663 Adjusted R^2 =.39592884 F(4,12)=3.6217 p<.03703 Std.Error of estimate: 1.3495					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			.626249	2.020723	.309913	.761943
Personality x_1	.056205	.314574	.061540	.344431	.178670	.861178
Scientifically x_2	-.040969	.311451	-.042006	.319337	-.131542	.897526
Connection x_3	.124653	.327540	.134341	.352995	.380574	.710171
Evaluation x_4	.646305	.254409	.599827	.236114	2.540414	.025919

$\hat{Y}$=0.626249 +0.061540 x_1 -0.042006 x_2 +0.134341 x_3 +0.599827 x_4
There exist significant difference in x_4

Table 25: Topological Entropy

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .83510172 R^2 =.69739489 Adjusted R^2 =.59652652 F(4,12)=6.9139 p<.00398 Std.Error of estimate: 1.3241					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			.260684	1.215069	.214542	.833727
Personality x_1	-.225311	.317834	-.209895	.296088	-.708895	.491932
Scientifically x_2	.559908	.339628	.567151	.344022	1.648590	.125145
Connection x_3	.403491	.252747	.382107	.239352	1.596421	.136378
Evaluation x_4	.148043	.237488	.116890	.187513	.623371	.544708

$\hat{Y}$= 0.260684 -0.209895 x_1 +0.567151 x_2 +0.382107 x_3 +0.116890 x_4
There exist significant difference in x_2 ,x_3

Table 26: Computers

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .74445425 R^2 =.55421214 Adjusted R^2 =.40561618 F(4,12)=3.7297 p<.03395 Std.Error of estimate: 1.7125					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			-1.03502	2.478862	-.417540	.683657
Personality x_1	.209067	.283645	.23795	.322828	.737074	.475242
Scientifically x_2	.220965	.323891	.31750	.465391	.682221	.508054
Connection x_3	.376143	.456787	.49025	.595356	.823452	.426314
Evaluation x_4	.019149	.309416	.02456	.396802	.061888	.951671

$\hat{Y}$= -1.03502 +0.23795 x_1 +0.31750 x_2 +0.49025 x_3 +0.02456 x_4
Not exist significant difference in variable

Table 27: History and Philosophy

STAT. MULTIPLE REGRESS.	Regression Summary for Dependent Variable:Y R= .95139510 R^2 =.90515264 Adjusted R^2 =.87353685 F(4,12)=28.630 p<.00000 Std.Error of estimate: .52552					
N= 17	BETA	St.Err.of BETA	B	St.Err. of B	t(12)	p-level
Intercpt			.747013	1.673278	.44644	.663231
Personality x_1	-.258366	.153343	-.324739	.192737	-1.68488	.117818
Scientifically x_2	-.049752	.201411	-.084077	.340365	-.24702	.809068
Connection x_3	1.221691	.187196	1.442613	.221047	6.52628	.000028
Evaluation x_4	-.118560	.238990	-.140330	.282872	-.49609	.628793

$\hat{Y}$= 0.747013 -0.324739 x_1 -0.084077 x_2 +1.442613 x_3 -0.140330 x_4
There exist significant difference in x_3.

2-3 Correlations

1-2-3 First Stage

Table 28: Calculus

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	-.138128	.093600	.535861	.644763
Scientifically x_2	-.138128	1.000000	.428010	.557017	-.250046
Connection x_3	.093600	.428010	1.000000	.429635	-.389152
Evaluation x_4	.535861	.557017	.429635	1.000000	.252778
Understanding Y	.644763	-.250046	-.389152	.252778	1.000000

There exist positive correlation between (x_1 and x_4) , (x_2 and x_4)

Table 29: Foundation of Mathematics

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	-.159304	-.279517	.042195	-.276117
Scientifically x_2	-.159304	1.000000	.838243	.711901	.317875
Connection x_3	-.279517	.838243	1.000000	.841069	.570763
Evaluation x_4	.042195	.711901	.841069	1.000000	.585748
Understanding Y	-.276117	.317875	.570763	.585748	1.000000

There exist strong positive correlation between (x_2 and x_3) ,(x_2 and x_4) ,(x_3 and x_4)

Table 30: Linear AlgebraI

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.938325	.753658	.372954	.510280
Scientifically x_2	.938325	1.000000	.859714	.415883	.496792
Connection x_3	.753658	.859714	1.000000	.548130	.245165
Evaluation x_4	.372954	.415883	.548130	1.000000	.137882
Understanding Y	.510280	.496792	.245165	.137882	1.000000

There exist strong positive correlation between (x_1 and x_2) , (x_1 and x_3) ,(x_2 and x_3)

Table 31: General Physics

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.850686	.750554	.630602	.538238
Scientifically x_2	.850686	1.000000	.885209	.810741	.400298
Connection x_3	.750554	.885209	1.000000	.891415	.150246
Evaluation x_4	.630602	.810741	.891415	1.000000	.215656
Understanding Y	.538238	.400298	.150246	.215656	1.000000

There exist strong positive correlation between (x_1 and x_3),(x_2 and x_3) ,(x_2 and x_1) , (x_2 and x_4) ,(x_3 and x_4)

Table 32: Computers

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.397929	.791325	.751538	-.116172
Scientifically x_2	.397929	1.000000	.625792	.523332	.227129
Connection x_3	.791325	.625792	1.000000	.869958	.209780
Evaluation x_4	.751538	.523332	.869958	1.000000	.037580
Understanding Y	-.116172	.227129	.209780	.037580	1.000000

There exist positive correlation between (x_1 and x_3) ,(x_1 and x_4) ,(x_3 and x_4),(x_2 and x_3).

Table 33: English

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	-.056237	-.036155	.078696	.096374
Scientifically x_2	-.056237	1.000000	.518476	.597456	.350115
Connection x_3	-.036155	.518476	1.000000	.725542	.414644
Evaluation x_4	.078696	.597456	.725542	1.000000	.432302
Understanding Y	.096374	.350115	.414644	.432302	1.000000

There exist positive correlation between (x_3 and x_4) only.

Table 34: Human Rights

STAT. MULTIPLE REGRESS.	Correlations				
Variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.777607	.939854	.831336	.726057
Scientifically x_2	.777607	1.000000	.836863	.603023	.617623
Connection x_3	.939854	.836863	1.000000	.887751	.828436
Evaluation x_4	.831336	.603023	.887751	1.000000	.948837
Understanding Y	.726057	.617623	.828436	.948837	1.000000

There exist strong positive correlation between (x_1 and x_3) ,(x_1 and x_4),(x_1 and x_2), (x_2 and x_3),(x_3 and x_4).

2-2-3 Second Stage

Table 35: Advanced Calculus

STAT. MULTIPLE REGRESS.	Correlations				
Variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.597598	.603794	.606856	.210821
Scientifically x_2	.597598	1.000000	.647378	.693819	.401287
Connection x_3	.603794	.647378	1.000000	.781265	.588987
Evaluation x_4	.606856	.693819	.781265	1.000000	.584521
Understanding Y	.210821	.401287	.588987	.584521	1.000000

There exist positive correlation between (x_3 and x_4) only.

Table 36: Linear AlgebraII

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.720420	.747170	.715882	.608821
Scientifically x_2	.720420	1.000000	.449669	.470958	.603505
Connection x_3	.747170	.449669	1.000000	.730312	.672193
Evaluation x_4	.715882	.470958	.730312	1.000000	.573790
Understanding Y	.608821	.603505	.672193	.573790	1.000000

There exist positive correlation between (x_1 and x_2),(x_1 and x_3),(x_1 and x_4),(x_3 and x_4)

Table 37: Probability and Statistics

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.652383	.652594	.582447	.608193
Scientifically x_2	.652383	1.000000	.606739	.557972	.551822
Connection x_3	.652594	.606739	1.000000	.641947	.894858
Evaluation x_4	.582447	.557972	.641947	1.000000	.723974
Understanding Y	.608193	.551822	.894858	.723974	1.000000

There exist weakness positive correlation between all variable

Table 38: Differential Equations

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.757618	.253261	.366159	.405884
Scientifically x_2	.757618	1.000000	.364470	.348867	.715321
Connection x_3	.253261	.364470	1.000000	.358101	.582046
Evaluation x_4	.366159	.348867	.358101	1.000000	.457622
Understanding Y	.405884	.715321	.582046	.457622	1.000000

There exist positive correlation between (x_1 and x_2) only.

Table 39: Computers

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.452593	.247808	.113186	.127651
Scientifically x_2	.452593	1.000000	.604732	.232776	.460691
Connection x_3	.247808	.604732	1.000000	.437314	.916251
Evaluation x_4	.113186	.232776	.437314	1.000000	.480261
Understanding Y	.127651	.460691	.916251	.480261	1.000000

Not correlation between variables.

Table 40: Democratic and Freedom

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.772268	.905899	.868964	.847271
Scientifically x_2	.772268	1.000000	.811000	.729967	.918102
Connection x_3	.905899	.811000	1.000000	.875675	.851548
Evaluation x_4	.868964	.729967	.875675	1.000000	.795740
Understanding Y	.847271	.918102	.851548	.795740	1.000000

There exist strong positive correlation between (x_1 and x_2),(x_1 and x_3),(x_1 and x_4),(x_2 and x_3)
(x_2 and x_4),(x_3 and x_4)

3-2-3 Third Stage

Table 41: Mathematical Analysis

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.590762	-.103897	.124689	.171502
Scientifically x_2	.590762	1.000000	.134692	.274737	.198271
Connection x_3	-.103897	.134692	1.000000	.707897	.591989
Evaluation x_4	.124689	.274737	.707897	1.000000	.462727
Understanding Y	.171502	.198271	.591989	.462727	1.000000

There exist strong positive correlation between (x_3 and x_4) only.

Table 42: Numerical Analysis

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	-.056547	-.124353	.184123	-.075732
Scientifically x_2	-.056547	1.000000	-.138654	-.061686	-.080003
Connection x_3	-.124353	-.138654	1.000000	.857342	.816648
Evaluation x_4	.184123	-.061686	.857342	1.000000	.839336
Understanding Y	-.075732	-.080003	.816648	.839336	1.000000

There exist strong positive correlation between (x_3 and x_4) only.

Table 43: Operation Research

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.758037	.473770	.529876	.348458
Scientifically x_2	.758037	1.000000	.755853	.740144	.583239
Connection x_3	.473770	.755853	1.000000	.710196	.671227
Evaluation x_4	.529876	.740144	.710196	1.000000	.523636
Understanding Y	.348458	.583239	.671227	.523636	1.000000

There exist positive correlation between (x_1 and x_2),(x_2 and x_3) ,(x_2 and x_4),(x_3 and x_4)

Table 44: Theory of Differential Equations

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.229872	-.025132	-.074567	.154654
Scientifically x_2	.229872	1.000000	.145325	.548297	.735355
Connection x_3	-.025132	.145325	1.000000	.096348	.349782
Evaluation x_4	-.074567	.548297	.096348	1.000000	.682460
Understanding Y	.154654	.735355	.349782	.682460	1.000000

Not correlation between all variables.

Table 45: Abstract Algebra

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.227160	.374373	.345370	.346670
Scientifically x_2	.227160	1.000000	.310552	.733682	.382507
Connection x_3	.374373	.310552	1.000000	.628101	.812317
Evaluation x_4	.345370	.733682	.628101	1.000000	.728057
Understanding Y	.346670	.382507	.812317	.728057	1.000000

There exist positive correlation between (x_2 and x_4).

Table 46: Computers

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.645660	.191600	.166502	.133266
Scientifically x_2	.645660	1.000000	.722617	.590141	.609844
Connection x_3	.191600	.722617	1.000000	.820602	.862389
Evaluation x_4	.166502	.590141	.820602	1.000000	.578295
Understanding Y	.133266	.609844	.862389	.578295	1.000000

There exist positive correlation between (x_2 and x_3),(x_3 and x_4)

4-2-3 Fourth Stage

Table 47: Topology

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.754247	.722113	.678213	.650908
Scientifically x_2	.754247	1.000000	.758299	.762771	.589548
Connection x_3	.722113	.758299	1.000000	.709303	.688474
Evaluation x_4	.678213	.762771	.709303	1.000000	.554815
Understanding Y	.650908	.589548	.688474	.554815	1.000000

There exist positive correlation between (x_1 and x_2),(x_1 and x_3),(x_2 and x_3),(x_2 and x_4), (x_3 and x_4)

Table 48: Complex Analysis

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.861564	.785965	.615287	.803639
Scientifically x_2	.861564	1.000000	.805795	.601497	.684979
Connection x_3	.785965	.805795	1.000000	.474741	.803604
Evaluation x_4	.615287	.601497	.474741	1.000000	.637785
Understanding Y	.803639	.684979	.803604	.637785	1.000000

There exist positive correlation between (x_1 and x_2),(x_1 and x_3),(x_2 and x_3)

Table 49: Functional Analysis

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.748880	.676344	.400273	.368531
Scientifically x_2	.748880	1.000000	.669741	.434016	.365114
Connection x_3	.676344	.669741	1.000000	.642821	.550687
Evaluation x_4	.400273	.434016	.642821	1.000000	.731151
Understanding Y	.368531	.365114	.550687	.731151	1.000000

There exist positive correlation between (x_1 and x_2).

Table 50: Topological Entropy

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.843840	.685913	.719989	.630511
Scientifically x_2	.843840	1.000000	.766916	.685431	.780699
Connection x_3	.685910	.766916	1.000000	.618674	.769940
Evaluation x_4	.719989	.685431	.618674	1.000000	.619230
Understanding Y	.630511	.780699	.769940	.619230	1.000000

There exist positive correlation between (x_1 and x_2),(x_1 and x_4),(x_2 and x_3)

Table 51: Computers

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality x_1	Scientifically x_2	Connection x_3	Evaluation x_4	Understanding Y
Personality x_1	1.000000	.631238	.698592	.406768	.619108
Scientifically x_2	.631238	1.000000	.796830	.583562	.663833
Connection x_3	.698592	.796830	1.000000	.762242	.712863
Evaluation x_4	.406768	.583562	.762242	1.000000	.519849
Understanding Y	.619108	.663833	.712863	.519849	1.000000

There exist positive correlation between (x_2 and x_3),(x_3 and x_4)

Table 52: History and Philosophy of Mathematics

STAT. MULTIPLE REGRESS.	Correlations				
variable	Personality	scientifically	connection	evaluation	understanding
personality	1.000000	.686555	.694618	.621119	.482445
scientifically	.686555	1.000000	.564382	.828363	.364154
connection	.694618	.564382	1.000000	.790590	.920413
evaluation	.621119	.828363	.790590	1.000000	.645608
understanding	.482445	.364154	.920413	.645608	1.000000

There exist positive correlation between (x_2 and x_4),(x_3 and x_4)

3-3 Design of Experiments

1-3-3 Completely Random Design

1-1-3-3 First stage

Table 53:significant different between courses.

The order	calculus	Foundation of math.	Linear Algebra I	General physics	computers	English	rights
1	7	8	8	9	5	9	6
2	6	0	8	5	10	10	10
3	9	4	7	9	10	9	8
4	9	0	5	5	0	10	4
5	8	6	8	5	9	10	8
6	9	6	8	10	10	10	10
7	7	0	8	5	8	9	3
8	9	8	10	10	9	9	10
9	9	7	10	8	8	8	10
10	8	4	7	7	10	10	2
11	9	6	8	9	7	10	10
12	8	8	8	7	9	10	10
13	9	5	8	7	8	9	9
14	8	6	6	8	9	10	10
15	7	2	1	0	10	10	10
16	8	6	8	7	10	10	10
Total	130	76	118	111	132	148	130

Table 54: ANOVA for significant different between courses

S.O.V.	d.f.	SS	MS	F	F-Table
Tret.	6	196.6	32.76	5.59	2.17
Error	105	616.15	5.86		

Table 55 : Result of Dankn test

The order of the best material	The result
English	SIg.*
Computers	SIg.
Calculus+rights	SIg.
Linear algebra I	/
General physics	/
Foundation of mathematics	/

2-1-3-3 Second stage

Table 56: significant different between courses

The order	Advanced calculus	Linear algebra II	Probability and statistics	Differential equations	computers	Democratic freedom
1	7	2	2	9	7	8
2	9	9	4	9	9	10
3	9	9	5	7	6	10
4	6	8	5	9	10	10
5	6	7	3	9	10	10
6	5	9	5	9	10	10
7	3	8	5	10	3	10
8	9	3	5	9	9	10
9	7	6	10	10	10	9
10	7	6	2	5	8	8
11	5	5	0	6	7	10
12	5	6	4	8	5	6
13	8	7	4	8	9	7
14	8	3	6	5	9	4
15	10	8	9	10	10	9
16	5	6	5	7	8	9
17	5	6	4	7	7	9
18	5	6	4	7	7	8
19	8	3	3	8	9	0
20	8	6	5	9	8	8
21	6	7	0	7	5	7
22	5	6	0	7	5	7
23	5	6	2	9	8	7
Total	151	142	92	184	169	186

Table 57: ANOVA for significant different between courses

S.O.V.	d.f.	SS	MS	F	F-Table
Tret.	5	267.22	53.444	10.12	2.21
Error	132	697.98	5.28		

Table 58:Result of Dankn test.

The order of the best material	The result
Democratic and freedom	Sig.**
Differential equations	Sig.*
Computers	Sig.*
Advanced calculus	Sig.
Linear algebra II	Sig.
Probability and statistics	/

3-1-3-3 Third stage

Table 59: significant different between courses

The order	Mathematical analysis	Numerical analysis	Operation research	Theory of diff. eq.	Abstract algebra	Computers
1	7	7	6	8	8	9
2	8	8	8	9	10	10
3	8	8	8	8	9	8
4	9	7	7	5	5	10
5	7	9	10	8	5	10
6	6	8	7	4	5	8
7	6	8	8	7	7	9
8	8	2	1	2	10	7
9	9	8	9	5	7	9
10	9	10	6	8	3	10
11	7	10	6	0	8	9
12	8	10	7	5	8	10
13	8	9	7	7	5	10
14	7	9	6	7	0	10
15	5	6	7	5	6	8
16	6	7	6	5	9	9
17	8	9	5	5	5	10
Total	126	135	114	98	110	156

Table 60: ANOVA for significant different between courses

S.O.V.	d.f.	SS	MS	F	F-Table
Tret.	5	124.52	24.9	7.17	2.29
Error	96	333.34	3.47		

Table 61:Result of Dankn test

The order of the best material	The result
Computers	Sig.**
Numerical analysis	Sig.
Mathematical analysis	Sig.
Operation research	/
Abstract algebra	/
Theory of differential equations	/

4-1-3-3 fourth stage

Table 62: significant different between courses

The order	topology	Complex analysis	Functional analysis	Topological entropy	computers	History and philosophy
1	8	10	7	6	9	9
2	7	9	7	6	8	9
3	4	4	4	5	6	8
4	10	7	5	0	0	10
5	8	7	7	5	6	10
6	9	8	9	5	7	10
7	5	5	6	5	8	10
8	9	8	7	5	6	10
9	7	7	8	7	8	9
10	10	9	9	9	9	10
11	9	10	8	9	7	10
12	8	7	6	8	7	9
13	8	9	6	6	10	6
14	9	10	7	5	6	5
15	5	7	2	7	8	9
16	10	9	7	5	8	10
17	7	5	6	4	5	8
Total	133	131	111	97	118	152

Table 63: ANOVA of significant different between courses

S.O.V.	d.f.	SS	MS	F	F-Table
Tret.	5	109.35	21.87	3.899	2.29
Error	96	304.94	3.17		

Table 64:Result of Dankn test

The order of the best material	The result
History and philosophy of math.	Sig. **
Topology	Sig.
Complex analysis	Sig.
Computers	/
Functional analysis	/
Topological entropy	/

2-3-3 Factorial Experiment

1-2-3-3 first stage

Table 65: significant different between courses

Calculus		Foundation of math.		Linear algebra I		Computers	
Personality	Scientifically	Personality	Scientifically	Personality	Scientifically	Personality	Scientifically
10	10	7	6	9	8	9	7
10	10	9	9	8	7	2	10
10	10	10	8	10	10	9	7
10	9	9	5	9	8	7	8
10	10	7	6	10	10	5	6
10	10	10	6	10	9	10	9
10	10	8	6	10	9	9	8
10	10	7	5	10	10	8	9
10	10	9	9	10	10	10	10
8	10	0	0	10	10	6	6
10	10	10	10	10	10	7	10
9	9	8	8	9	8	7	8
10	7	10	3	5	0	3	3
10	9	6	5	10	9	10	8
8	10	5	10	10	10	10	10
10	9	7	8	8	9	10	8

Table 66: ANOVA of significant different between courses

S.O.V.	d.f.	SS	MS	F	F-Table
Rep.	15	169.38	11.29	7.14	1.75
A	3	125.31	41.77	26.4	2.68
B	1	5.28	5.28	3.3	3.92
AB	3	140.13	46.7	29.5	2.68
Error	120	190.78	1.58		

Table 67: Result of LSD test.

The material	scientifically	personality	The mean
Calculus	9.68	9.56	9.62
Foundation of Math.	7.62	6.5	7.06
Linear algebra I	9.25	8.56	8.90
Computers	7.62	7.93	7.77
The least sig.	0.739		
The mean	8.54	8.13	
The least sig.	1.4		
best	calculus	linear algebra I	foundation of math	computers

2-2-3-3 second stage

Table 68: significant different between courses

Advanced calculus		Linear algebra II		Probability and statistics		Differential equations		Computers	
Persona Lity	Scientifi cally	Persona lity	Scientifi cally	Persona lity	Scientifi cally	Persona lity	Scientifi cally	Persona lity	Scientifi cally
6	8	8	8	2	7	9	10	8	9
8	9	9	9	4	6	9	8	9	9
5	10	8	7	7	6	8	9	8	10
10	10	9	8	8	6	10	9	9	10
4	7	8	8	6	5	7	9	7	6
10	9	10	9	8	3	10	9	10	9
8	8	4	5	3	5	7	8	9	7
8	7	2	4	3	5	4	3	3	8
5	10	8	8	6	8	7	8	7	9
5	5	7	6	6	7	9	9	10	10
5	4	7	5	6	7	9	9	10	10
8	10	8	7	0	0	10	10	10	10
7	10	7	5	8	9	10	10	8	10
3	10	8	9	9	10	8	10	9	10
8	9	7	7	8	9	10	10	8	10
6	6	7	6	8	5	9	7	9	8
6	9	8	7	7	7	9	9	8	9
6	9	8	7	7	7	9	8	8	9
8	9	2	4	2	4	8	9	9	9
6	10	8	8	7	8	10	10	9	9
6	6	4	7	10	7	9	8	7	7
7	8	4	8	1	3	9	8	8	9
0	0	5	5	0	0	7	6	7	7

Table 69: ANOVA of significant different between courses

S.O.V.	d.f.	SS	MS	F	F-Table
Rep.	22	349.35	15.87	3.59	1.52
A	4	281.94	70.48	15.9	2.37
B	1	15.65	15.65	3.54	3.84
AB	4	319.02	79.75	18.04	2.37
Error	220	974.29	4.42		

Table 70:Result of LSD test

The material	scientifically	Personality	The mean		
Advanced calculus	6.30	7.95	7.12		
Linear algebra II	6.78	6.82	6.8		
Probability and statistics	5.47	5.82	5.64		
Differential equations	8.56	8.52	8.54		
computers	8.26	8.86	8.56		
The least sig.	0.934				
The mean	7.07	7.59			
The least sig.	1.75				
Best	computers	Differential equations	advanced calculus	linear algebra II	probability and statistics

3-2-3-3 Third stage

Table 71: Significant different between courses

Mathematical analysis		Numerical analysis		Operation research		Theory of diff.equations		Abstract algebra		computers	
Personality	Scientifically	Personality	Scientifically	Personality	Scientifically	Personality	Scientifically	Personality	Scientifically	Personality	Scientifically
10	8	10	10	10	7	7	8	10	10	10	9
6	9	4	10	3	5	2	10	5	10	7	5
7	8	10	7	7	6	8	7	10	10	10	10
10	10	10	8	10	9	10	10	10	10	10	9
10	10	10	10	10	6	5	4	10	10	10	10
9	8	9	9	8	9	7	10	10	10	9	8
10	7	5	10	10	9	10	6	10	6	10	10
10	9	5	9	6	6	7	8	8	6	9	9
6	6	8	8	8	9	8	7	7	8	10	10
10	10	10	10	10	10	10	7	10	10	10	10
10	10	10	7	10	6	10	2	10	9	10	7
10	10	10	10	10	10	4	9	10	10	10	10
9	9	10	10	0	5	10	5	10	10	9	9
10	10	8	10	0	0	0	1	10	10	2	3
8	6	8	7	7	6	2	4	9	7	8	6
9	8	9	9	8	9	9	9	9	9	10	10
7	7	7	7	6	7	10	10	10	10	9	9

Table 72: ANOVA for significant different between courses

S.O.V.	d.f.	SS	MS	F	F-Table
Rep.	16	280.29	17.5	5.9	1.57
A	5	153.218	30.64	10.35	2.21
B	1	1.257	1.257	0.4	3.84
AB	5	159.394	31.87	10.76	2.21
Error	192	569.47	2.96		

Table 73:Result of LSD test

The material	scientifically	personality	The mean
Mathematical analysis	8.88 8.41	8.52 8.88	8.7 8.64
Numerical analysis	7.23 7	7 6.88	7.11 6.94
Operation research	9.29 9	9.11 9.47	9.2 9.23
Theory of diff.equations			
Abstract algebra			
Computers			
The least sig.	0.84		
The mean	8.30	8.31	
The least sig.	1.51		

Best	computers	abstract algebra	mathematical analysis	numerical analysis	operation research	theory of differential equations

4-2-3-3 fourth stage

Table 74: significant different between courses

topology		Complex analysis		Functional analysis		Topological entropy		computers		History and philosophy of math.	
Personality	Scientifically	Personality	Scientifically	Personality	Scientifically	Personality	Scientifically	Personality	Scientifically	Personality	Scientifically
10	10	10	10	10	10	10	9	10	10	10	10
9	9	10	9	8	8	6	7	8	9	10	10
3	7	7	7	7	7	5	5	7	7	8	8
10	10	7	7	5	4	3	3	4	5	10	10
10	10	10	9	10	9	5	6	7	6	10	10
10	10	9	10	10	7	6	7	10	10	10	10
10	10	8	7	8	6	10	9	10	7	8	10
10	10	10	10	9	7	5	5	5	6	10	10
7	9	9	8	8	8	6	6	8	8	10	10
10	10	10	10	10	10	10	10	10	9	10	10
10	10	10	9	10	9	10	10	10	8	10	8
9	8	7	7	7	7	8	8	6	8	10	10
8	10	10	10	8	8	8	8	7	8	6	8
10	10	10	8	10	7	10	7	10	7	10	10
9	9	9	10	10	8	9	10	9	6	10	10
10	10	10	10	9	10	8	5	8	8	10	10
8	7	6	5	6	5	7	6	6	5	8	8

Table 75: ANOVA for significant different between courses

S.O.V.	d.f.	SS	MS	F	F-Table
Rep.	16	231.08	14.4	19.2	1.57
A	5	127.47	25.49	33.9	2.21
B	1	3.32	3.32	4.4	3.84
AB	5	138.94	27.78	37.04	2.21
Error	192	144.61	.75		

Table 76: Result of LSD test

The material	scientifically	personality	The mean
Topology	9	9.35	9.17
Complex analysis	8.94	8.58	8.76
Functional analysis	8.52	7.64	8.08
Topological entropy	7.41	7.11	7.27
Computers	7.94	7.47	7.7
History and philosophy of math.	9.41	9.5	9.46
The least sig.	0.42		
The mean	8.536	8.275	
The least sig.	0.765		

Best	History and philosophy of math	topology	complex analysis	functional analysis	computers	topological entropy

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هديل سليم الكتبي انعام رزاق

قسم الرياضيات– كلية العلوم– جامعة الكوفه

الملخص

في هذا البحث تم تقديم الفروق المعنوية بين مستويات استيعاب طلبة قسم الرياضيات لموادهم الدراسية المختلفة ولكل مرحلة من مراحل قسم الرياضيات بكلية العلوم جامعة الكوفة. فضلا عن إيجاد تأثير المتغيرات الأربعة (المستوى العلمي للتدريس ،شخصيته،قدرته على التقييم ،وقدرته على التوصيل) في تحسين مستوى الاستيعاب . لتحقيق هدف البحث تم استخدام طرق إحصائية مناسبة ،تصميم تجارب،ارتباط وانحدار .