Journal of Multidisciplinary Engineering Science and Technology (JMEST)
ISSN: 2458-9403
Vol. 8 Issue 12, December - 2021

The Performance Of University Students And High School Factors. Statistical Analyses And ANCOVA

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Abstract-- It is widely accepted that one of the main factors determining the success of first-year university students is the quality of studies in pre-university education, especially in high school. Considering the importance of the problem and aiming for better performance and results, the Albanian education system has undergone several reforms since 1990. Reforms have changed many aspects of the system, including primary, secondary, and high school curricula, courses and programs, textbooks, final exams, etc. All these reforms and changes have affected our Universities, and are reflected in the results of students. It has been evidenced for a long time that the performance and results of first-year students at the University are much poorer compared to their performance and results at the high school and there is still no sign of an official and serious analysis and evaluation of the factors that influence this significant difference. The purpose of this study is to analyze the results of students in the first year of the bachelor of the Polytechnic University of Tirana, Faculty of Electrical Engineering in the Calculus program. The differences will be assessed by applying statistical analysis, t-test, ANOVA, and ANCOVA.

Keywords: performance, teaching, test, ANCOVA, hypothesis, statistics

I. INTRODUCTION

The social and economic development and future of any country are closely linked to the performance and quality of the educational system, its Institutions, and the pupils and students, which will define the future and the progress of the country.

The student's performance and achievement play an important role in the future graduates, who will become engineers, geologists, economists, teachers, and will be responsible for the economic and social development of the country. Measuring and evaluating students 'academic performance, which means measuring and evaluating the schools, the universities, and the education system itself, has been under considerable attention in many academic researchers and studies because the factors that affect students' performance are the factors that affect and determine society itself. The impact of inside and outside factors on university students' performance and achievement has been analyzed by a large number of studies and researches.

Betts and Morell (1999) analyzed the performance of college students using a sample of 5,000 graduates at the University of San Diego, California. The study concluded that students' backgrounds (family, type of school, teachers, traditions) strongly influenced their grade point average (GPA). In particular, they found that high school performance had a significant impact on the achievement of university students. In scaling and measuring the effect of high school quality on university student achievement, they found that the level of experience of high school teachers had a positive impact on their university grades. They also concluded that the teacher-student connection and the teacher's educational level had a positive effect on the success of university students, but not statistically significant [1].

In his study, Cohn et al., (2004) analyzed the impact of the SAT test (math, advanced math, physics, chemistry, biology) and other factors such as the average of high school results, class size, school type, and tradition, and the school's national ranking was on the average grade of students at the University of South Carolina.

They concluded that the inclusion of extracurricular test results such as SAT math, in applying for scholarships and admission to colleges and universities was beneficial as it served as an incentive for higher success and could increase the probability of success. They also found differences in student outcomes depending on race and gender [2].

Philippe Cyrenne and Alan Chan (2007) in their study compared the results of students in the first year of the University of Winnipeg with the results in previous high schools. In their paper, they analyzed the collected data from high schools and universities for the same students, during the years 1997-2002. By analyzing the model created with students' data, they could predict students' likelihood of success based on their performance in high school, including other parameters such as the type of high school education, the teacher influence, the tradition, etc., [3].

Elisa Birch and Paul Miller (2010), in their paper, have examined the impact of attending different types of schools, private or public schools on the results of first-year university students. They concluded that private school students had lower grades at university than public school students. The main factors of measuring the difference between the students' university grades enrolled from public and private schools were the university entrance exams [4].

Hazari, Z., et.al, (2007) used a hierarchical linear model to determine the factors of high school physics preparation (content, pedagogy, motivation) that affect and predict the student's performance in introductory university physics. In their study, they considered important factors that affect the performance of university students such as long-written problems, cumulative tests/quizzes, father's encouragement, and family's belief that science leads to a better career, but the math preparation factor was the strongest of university physics performance [5].

Felisoni, D. D., & Godoi, A. S. (2018) tested the relationship between the daily average time the students spend using their smartphones and their school grades [6]. They collected accurate data from 43 business school students using a proper smartphone application. As a result, they found a strong negative regression between average time and respective school grades. Each 100 min time spent per day on a smartphone corresponded to a reduction of 6 points in the student's position at the school's ranking, in a range from 0 to 100.

Asif, R., et. al., (2017), used data mining methods to study high school and university students' performance. They used the grades of the students in high school and the first two years of university with the purpose to understand a pattern of students' achievement and predict personal progress. They classified the student's achievement into two main groups; the low and high achieving students. The conclusion was that the students tend to remain in the same kind of groups, the high marks students stay in the high marks group and the low marks students remain in the low marks groups. By focusing on several significant courses that are the most significant indicators of students' achievement they could provide timely warning and support to the low achieving students, and advice and opportunities to the high performing students [7].

Bal-Taştan et., al. (2018) analyzed the impacts of teachers on students' academic achievement in science education in high school. They tested two hypotheses; gender difference and national difference. The study concluded that gender difference was not significant in affecting the students' achievement but nationality difference was significant in terms of students' academic achievement in science education [8].

Millea, M., et al. al., (2018), in their study analyzed several factors such as attendance, attention, demographic attributes, and academic preparation of students as important factors to evaluate student performance and success. Individual students' data were analyzed, including average class size, study time spent, level of attention in the classroom, motivation, and performance in general education courses. Probit regression models showed that the higher graduation rate was higher for academically prepared students and was positively influenced by the prospect of receiving grants or scholarships. On the other hand, these rates were not influenced significantly by sex or race. This work suggested that universities could achieve higher graduation rates by investing in scholarships, smaller classes, and financial aid [9].

Gjana A. & Kosova R., (2021) have analyzed and compared the online teaching process with the traditional teaching because the Albanian education system for the last two years was forced to perform online due to the Covid 2019 pandemic. They concluded that although the online process has obvious advantages because it provides fast and valuable online courses, materials, presentations, and more frequent communication between students and lecturers, it does not produce significantly better student results and grades. They emphasized that a combination of both methods, traditional and virtual, can be more useful and effective for the teaching and learning process, using the advantages of each method. The students recognized the benefits of technology in the education process as an instructional medium, but it can't replace the whole traditional class because the educational system is much more than transmitting information and knowledge, it needs and always will need the face to face communication and interaction [10].

II. MATERIALS AND METHODS

The success of college and university students depends on many factors which can be classified into three large categories: institutional factors, student attributes, and financial considerations. Institutional factors include student/faculty reports, student life programs and services, and specific academic programs such as college preparation, honors courses, or first-year experience classes.

Tinto (2006) suggested that such institutional factors encourage student persistence. Institutional funding distributions and resources in all functional categories indicate a university's priorities and can have a significant impact on student outcomes [11].

Hamrick, Schuh, and Shelley (2004) found that teaching and library expenses affect positively the students' graduation rates [12].

Likewise, Ryan (2008) confirmed that academic and teaching expenses improved graduation rates [13].

Involvement and engagement have been identified as the keys to student success in college. Students who feel connected to their academic endeavors are

more likely to succeed (Allen, & al., 2021) [14]. The attention and the commitment to the quality of the classroom experience are for the students an academic condition that promotes success and progress.

Another group of factors that affect college and university student success includes individual attributes, such as behaviors, motivation, academic preparation, demographic factors, and family characteristics, such as the level of educations of the parents and siblings. Students who are more academically prepared, not surprisingly, are more successful in college, (Nayir et. al, 2017) [15].

Flore et. al., (2018) studied the influence of gender stereotypes on mathematics test scores of Dutch high school students. In their study, they investigated the overall effect among female high school students of theoretical factors such as gender identification, math anxiety, and test difficulty [16].

Models and statistical analyses

Regression (linear regression and other types of regressions) and analysis of variance and covariance, ANOVA, and ANCOVA are probably the most frequently applied statistical analyses methods. They are used extensively in many areas of research, such as sociology, biology, medicine, education, anthropology, political science, as well as in industry, economy, and commerce.

One reason for the frequent applications of regression and analysis of variance (ANOVA) is that they are very suitable for many different types of study design and different types of experiments. Both regression and ANOVA procedures apply to all the types of produced data, experimental, quasi-experimental, and non-experimental data.

Regression allows examination of the relationships among an unlimited number of independent variables and a dependent variable and can calculate the values of one variable from the values of one or more other variables. Similarly, the ANOVA has no restriction on the number of groups or conditions that are to be compared, while factorial ANOVA allows analysis of the impact of several independent variables or factors on a dependent variable.

Another reason for ANOVA's popularity is that it is well suited to most effect conceptions by testing for differences between means. The analysis of covariance (ANCOVA) is known as the statistical technique that combines regression and ANOVA.

Although ANCOVA was originally developed by Fisher to increase the precision of experimental analysis, ANCOVA is applied most frequently in quasi-experimental research because, unlike experimental research, the topics investigated are most likely to involve variables that, for practical reasons, cannot be controlled directly. In these situations, the statistical control provided by ANCOVA has a particular value.

Analysis of variance, ANOVA is used to test the hypothesis of whether there is a difference between two or more means. The t-test can be used also to test whether there is a significant difference between two means, but in cases of comparison of more than two means, the t-test can create problems, in the case of three or more means, this method will lead to a large increase in the error of the first type.

More are the groups to be compared; larger will be the error of the first type. Analysis of variance can be successfully used to compare more than two means without increasing the level of error of the first type.

In the analysis of variance, hypothesis Ho expresses in the form that all population means are the same,

$H_o: \mu_1 = \mu_2 = . \mu_n$ all means are equal,

$H_a: \mu_i \neq \mu_j, i \neq j,$

The analysis of covariance, ANCOVA can be considered as an extension of ANOVA by including in this statistical analysis a covariate. The covariance analysis is a combination of analysis of variance and regression analysis. Like the ANOVA, the ANCOVA is a statistical technique that is used to determine whether there is a significant difference between two or more independent (unrelated) groups on a dependent variable.

The difference between these two techniques is that while ANOVA searches for differences in the group means, the ANCOVA looks for differences in adjusted means (i.e., adjusted for the covariate).

As a result, ANCOVA has more benefits compared to ANOVA, because it allows us to "statistically control" for a third variable, which is believed to affect the experimental results, which can be some hospital patients' treatment, a new teaching method in high school, or any other between intervention, that affects the results of post-test.

This third variable, which is included in the ANOVA analysis, is called covariate. First, the regression procedure is applied, then the method of normal variance analysis on the corrected values. In this way, a correction is made for the linear relationship between the dependent variable and the covariate. At the end of this, the variance error is reduced and differences between groups can be detected given the other differences between the data.

Covariance analysis is a very useful and powerful statistical method in cases where its assumptions are met. Some of the assumptions are:

The dependent variable and covariate variable(s) should be measured on a continuous scale, (interval, or ratio). Examples of such variables are time, test scores, heights or weight, and so forth.

The independent variable should consist of two or more categorical, independent groups. Examples of such variables are gender (male and female), physical

activity level (high activity, medium, low activity, position (worker, manager, administrative), etc.

There should be no relationship between the observations in each group or between the groups themselves, meaning there must be different participants in each group with no participant being in more than one group.

There should be no significant outliers. The outliers of the data have a negative effect on the ANCOVA, reducing the validity of the results. Fortunately, the outliers can be detected and eliminated using the SPSS software.

The residuals should be approximately normally distributed for each category of the independent variable. The normality test can be conducted by using the SPSS tests of normality.

The homogeneity of variances also must be accomplished. This can be tested using Levene's test for the homogeneity of variances in SPSS.

The variances of the groups must be equal, in other words, the homogeneity of variances must be ensured for the test.

The covariate should be linearly related to the dependent variable at each level of the independent variable. This assumption can be tested in SPSS Statistics by plotting a grouped scatterplot of the dependent variable and independent variable. The homogeneity of regression slopes meaning no interaction between the covariate and the independent variable should be assured, too.

III. THE CASE STUDY

Regarding the performance of students in Albanian universities and especially in the first year, several factors have been considered. Some of the main factors that determine the performance of university students are;

Gender; boys, girls;

type of school; general high school, professional;

school performance, ranking, tradition, history, teachers' commitment, reputation.

students; IQ, personal skills, commitment, background, study time spent, motivation

family; economic level, culture, parental commitment, and help,

curricula and programs; textbooks, content, definitions and proofs, logical and teaching methods, independent work, class and homework, projects, and assignments.

Unfortunately, there are no official data and archives about the results of students in our universities, especially in the first year to compare them with their previous results in high schools, although this is becoming a big problem for the Albanian education system. Universities are complaining about the decreasing quality of the high school students, on the other side, the first-year students have their discontents, too, about the difficulty of the courses, the programs, and the difficulties to adapt to the new life.

Another main reason for the decline in performance during the first year in university is also the different methods of teaching and learning.

The variables that will be analyzed in this article are the results of the state Matura of the high school students and their grades, (points) in the first year at the university, in the Calculus course. The course of Calculus has been chosen because its content is very similar to the mathematical program of three-year high school in Albania.

The average grade of high school mathematics course, the Matura test grade, and the advanced mathematics grades are three results that indicate the level of student success in mathematics. All these results together are presented in a single grade, which is the independent variable in our statistical analysis test, whereas the grade (points) of the Calculus course in the first year of University is the dependent variable.

A class of 80 students of Calculus course was chosen from the first-year Bachelor of Electrical Engineering program, in the Faculty of Electrical Engineering. The class contains 50 boys and 30 girls.

The content of the Calculus course was chosen because it is the most familiar to the high school students; the syllabus contains the definition of functions, and properties, the definition of limit, the definition of derivatives, and applications, integrals, definitions, properties, and applications, etc.

With the test scores of Matura and Calculus, the Descriptive statistics table is constructed using Office, Excel 2016, table 1.

The histograms of the Matura results, the Calculus, and groups 1, 2 (girls, boys) are constructed, using SPSS, 24. The test of normality (Kolmogorov-Smirnov and Shapiro-Wilk) was conducted using SPSS, for Matura test data and Calculus test data, table 2.

The test of normality was also conducted for the Matura and Calculus test scores for both groups, group 1 (girls) and group 2 (boys), table 3.

The normality tests are accompanied by the histograms of the data and respective Q-Q plots, figure 1-6. The results show that the Matura and Calculus data are not normally distributed, ($p=.000<.05$).

In addition, the data from Calculus tests, groups 1, 2 are not normally distributed, ($p=.000$, $p=.006<.05$), whereas the Matura data scores (groups 1, 2) are normally distributed, ($p=.092>.05$, $p= .081 >.05$).

We will consider the data approximately normal to continue with the statistical analyses.

Table 1. Descriptive Statistics of Matura and Calculus test scores, (Excel 2016)

Matura math test	Stats	Calculus test	Stats
Mean	77.65	Mean	39.012
Standard Error	0.628	Standard Error	1.2449
Median	77	Median	36
Mode	77	Mode	39
Standard Deviation	5.625	Standard Deviation	11.134
Sample Variance	31.648	Sample Variance	123.987
Kurtosis	-0.435	Kurtosis	2.723
Skewness	0.611	Skewness	1.6951
Range	23	Range	49
Minimum	69	Minimum	26
Maximum	92	Maximum	75
Sum	6212	Sum	3121
Count	80	Count	80
Confidence Level(95.0%)	1.251	Confidence Level(95.0%)	2.477

Table 2. Test of normality, Matura, Calculus scores.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Matura	.147	80	.000	.923	80	.000
Calculus	.200	80	.000	.875	80	.000

a. Lilliefors Significance Correction

Table 3. Tests of Normality, Matura & Calculus, groups 1,2.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Matura group1	.148	30	.092	.905	30	.011
Calculus group 1	.265	30	.000	.809	30	.000
Matura group 2	.150	30	.081	.937	30	.074
Calculus group 2	.192	30	.006	.897	30	.007

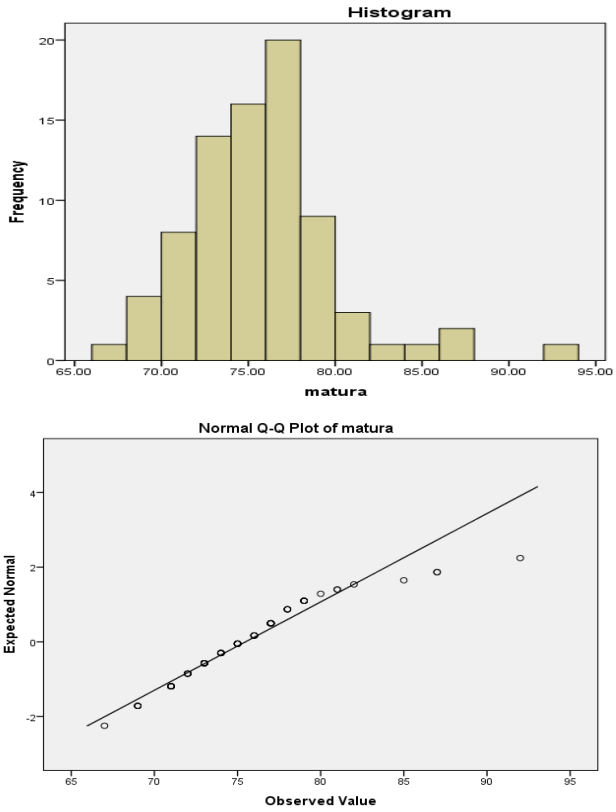

Figure 1. Matura scores, the Histogram, and Q-Q plot of normality

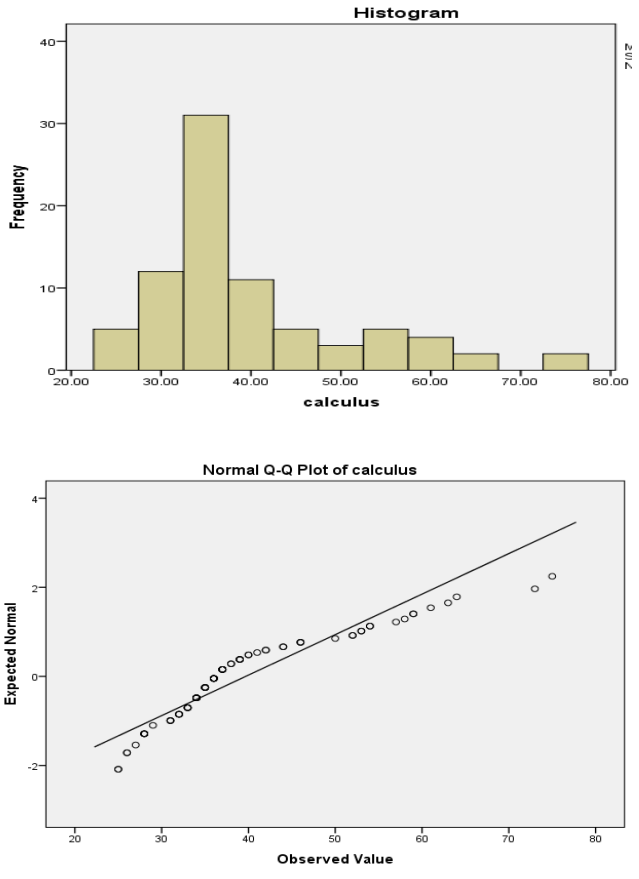

Figure 2. Calculus scores, the Histogram, and Q-Q Plot of normality

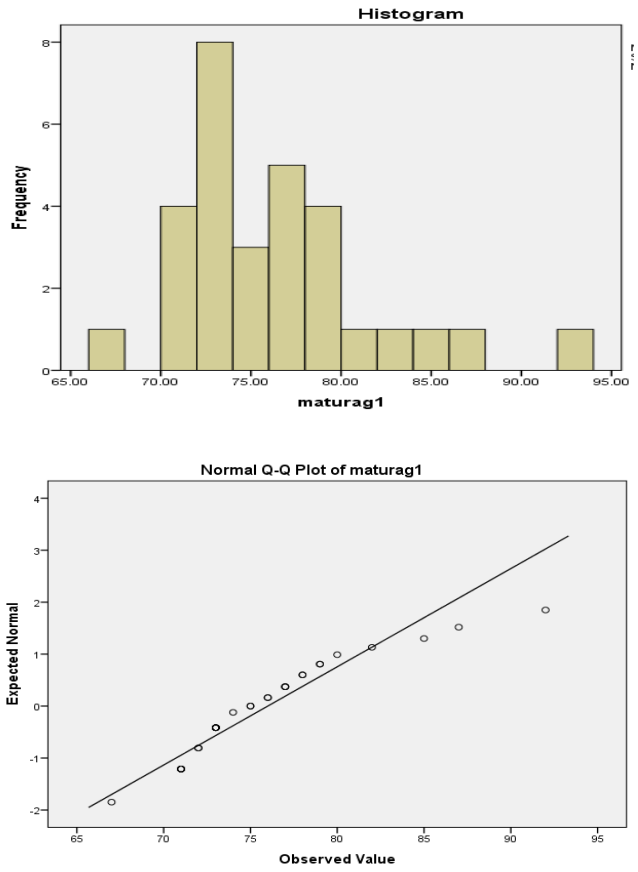

Figure 3. Matura scores, group 1, the Histogram and Q- Q Plot of normality

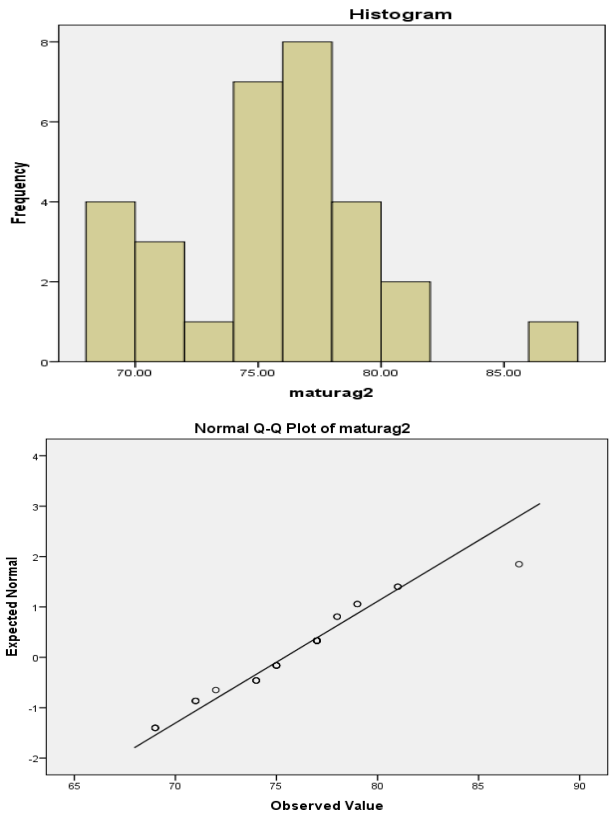

Figure 4. Matura scores, group 2, Histogram and Q- Q Plot of normality

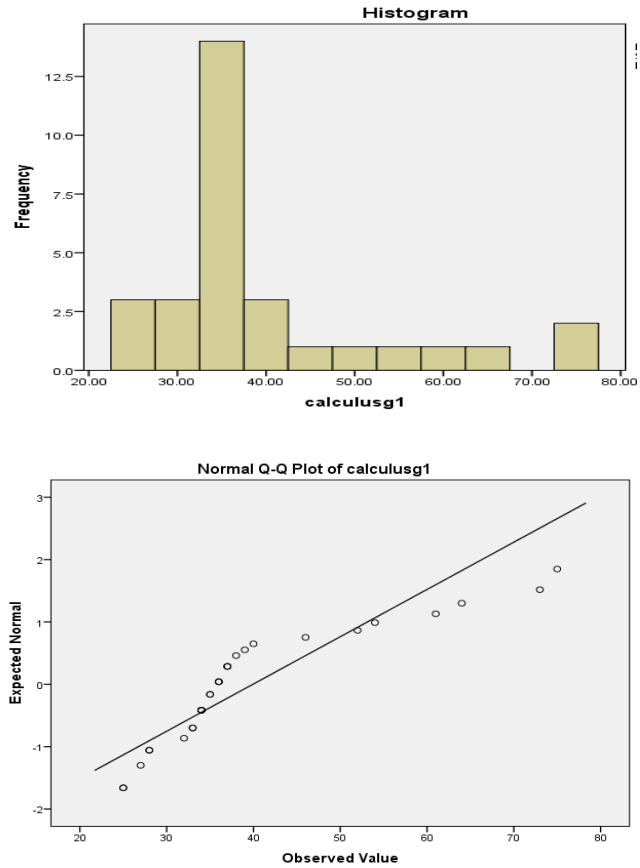

Figure 5. Calculus scores, group 1, Histogram and Q- Q Plot of normality

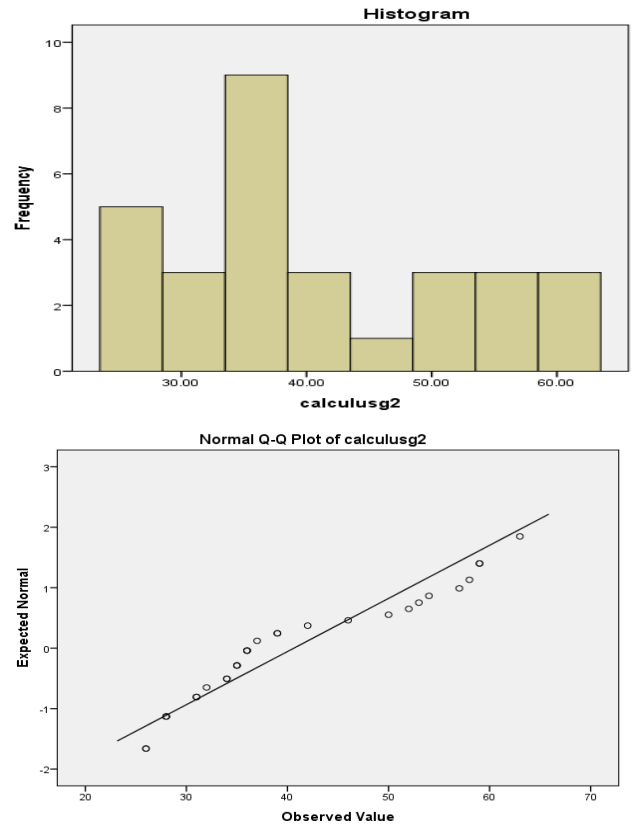

Figure 6. Calculus scores, group 2, Histogram and Q- Q Plot of normality

IV. RESULTS AND DISCUSSION

Several Hypotheses are to be verified:

The Matura test scores mean of groups 1 and 2 are equal, meaning there is no difference between boys and girl results in the Matura test.

The Calculus test scores means of groups 1 and 2 are equal, meaning there is no difference between boys' and girls' results in the Calculus test.

The means of Matura test scores and Calculus test scores are equal, meaning there is no difference between students' results in the two tests, considered as independent variables.

The means of Matura test scores and Calculus test scores are equal, meaning there is no difference between students' results in the two tests, considering the Matura results as covariates.

The level of significance is p=.05. The Hypothesis is verified with a t-test for independent variables and ANCOVA for the covariates, using SPSS 24.

About the Hypothesis:

Ho: The Matura test scores means of groups 1 and 2 are equal, meaning there is no difference between boys and girl results in the Matura test.

Ha: The Matura test scores means of groups 1 and 2 are not equal.

The SPSS Independent- samples T-Test, is used and the conclusion is;

the means of the Matura test scores, (group 1= girls, group 2= boys) are equal (p=.393>p=.05, for equal variances assumed, and p=.442>sig. =.05 for equal variances not assumed).

Because the p=.041<sig.=.05 (equal variances assumed), it is recommended to use the equal variances not assumed results for the interpretation of the results, table 4.

About the hypothesis:

Ho: The Calculus test scores means of groups 1 and 2 are equal, meaning there is no difference between boys and girl results in the Matura test.

Ha: The Matura test scores means of groups 1 and 2 are not equal.

The SPSS Independent- samples T-Test, is used and the conclusion is;

The means of the Calculus test scores, (group 1= girls, group 2= boys) are equal (p=.878>.05, for equal variances assumed, and p=.887>.05 for equal variances not assumed).

Because of the p-value, (p=.207>.05, equal variances assumed), it is recommended to use the equal variances assumed results for the interpretation of the results, table 5.

About the hypothesis:

Ho: The means of Matura test scores and Calculus test scores are equal, meaning there is no difference between students' Matura and Calculus tests scores.

Ha: The means of Matura test scores and Calculus test scores are not equal.

The level of significance is sig. = .05.

The SPSS paired- samples T-Test, is used and the conclusion is;

the means of the Calculus test scores, (group 1= girls, group 2= boys) are not equal (p=.000<.05, table 6.

About the Hypothesis:

Ho: The means of Calculus test scores for groups 1 (girls), group 2(boys) are equal, meaning there is no difference between students' results in the two tests, considering the Matura results as covariates.

Ha: The means of Calculus test scores for groups 1 (girls), group 2(boys) are not equal.

The recommended test is ANCOVA because the Calculus test scores are affected by the results of the Matura test, table 9, 10. The significance level is .05.

The ANCOVA statistical analysis is used and the conclusion is:

Levene's Test of Equality of Error Variances, (p=.151> .05), meaning that the homogeneity of the groups' variances is assured, table 7.

At the table Tests of Between-Subjects Effects, the dependent variable (Calculus test score) is the same as the slope of the covariate, (Matura test score). The value of p at the raw “group Matura” is (p= .484> .05), meaning that the Ho hypothesis “the slopes are equal” is not rejected.

Levene's test of equality shows (p=.151>.05), meaning that the homogeneity of variances is assured.

The Groups *Matura, (p=.484>.05), meaning that regression lines slopes are equal.

And, the most important statistical test and results of ANCOVA is that there is a significant difference between the results of Matura test scores and the results of the Calculus test scores, (the raw Matura, p= .000< .05), table 8.

Table 4. The independent-samples T-Test, SPSS

Group Statistics, Matura test scores, groups 1(girls),2(boys)					
	Groups	N	Mean	Std. Deviation	Std. Error Mean
Matura	1	30	76.00	5.292	.966
	2	50	75.16	3.454	.489

Independent Samples Test, Matura, group 1=Girls, group 2= Boys.										
		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
Mat.	Equal variances assumed	4.313	.041	.860	78	.393	.840	.977	-1.106	2.786
	Equal variances not assumed			.776	44.024	.442	.840	1.083	-1.342	3.022

Table 5. comparing the results of Calculus test scores, group 1= girls, group 2= boys

Group Statistics, Calculus test scores, group 1,2.					
	Groups	N	Mean	Std. Deviation	Std. Error Mean
Calculus	1	30	39.93	13.196	2.409
	2	50	39.54	9.584	1.355

Independent Samples Test, Calculus, group 1=Girls, group 2= Boys.										
		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
Calc.	Equal variances assumed	1.619	.207	.154	78	.878	.393	2.555	-4.694	5.481
	Equal variances not assumed			.142	47.447	.887	.393	2.764	-5.166	5.953

Table 6. Paired samples Statistics T-test, Matura, and Calculus test scores

Paired Samples Statistics, Matura- Calculus.					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Matura	75.4750	80	4.22463	.47233
	Calculus	39.6875	80	10.99666	1.22946

Paired Samples Test, Matura- Calculus.									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Matura - Calculus	35.78750	9.18404	1.02681	33.74369	37.83131	34.853	79	.000

Univariate Analysis of Variance

Table 7. Levene's test of equality

Levene's Test of Equality of Error Variances			
Dependent Variable: Calculus			
F	df1	df2	Sig.
2.098	1	78	.151

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]
a. Design: Intercept + grupi + Matura + grupi * Matura

Table 8. ANCOVA test

Tests of Between-Subjects Effects					
Dependent Variable: Calculus					
Source	Type III Sum of squares	df	Mean Square	F	Sig.
Corrected Model	3333.457[a]	3	1111.152	13.577	.000
Intercept	1457.774	1	1457.774	17.813	.000
groups	37.590	1	37.590	.459	.500
Matura	3321.199	1	3321.199	40.582	.000
groups * Matura	40.445	1	40.445	.494	.484
Error	6219.731	76	81.839		
Total	135561.000	80			
Corrected Total	9553.188	79			

a. R Squared = .349 (Adjusted R Squared = .323)

V. CONCLUSIONS

- Comparative analyzes have been performed to verify whether there are any significant differences in students' academic achievement in terms of gender and national factors, or other factors, due to the seriousness of the problem in many countries. The results have shown that the academic achievements of high school and university students did not differ concerning gender; some studies have shown that there are differences concerning national factors or other factors.
- The performance of the high school and university students needs a much more complete and comprehensive study because of the complexity and the seriousness of the problem. There are a lot of data to collect and classify and many factors to estimate and measure.
- Several considerable factors affect the students' performance in high school and university;

Some of the main factors are; personal skills, commitment, attention, family background, type of school, motivations, purpose, etc.

- The performance of students in Albanian universities should be at the center of attention of the country's educational system and Institutions, because of the significant importance of the students, and university performance and quality.
- There is no significant difference between groups of boys and girls, girls being slightly better than boys are in high school and university studies. However, in general, there is a significant difference between student performance in high schools and universities.
- A database of student performance should be created in all the levels of the education system, for study, analyzing the problems, trends, and conclusions, etc.
- Albanian universities in turn have to face the problem of low world ranking which is also part of the general problem and should get involved in the process of improving pre-university performance and quality, especially in high school.
- Improving the performance and quality of Albanian universities would strengthen their impact on the middle and high schools, through graduated teachers, projects, and collaborations, as well as conducting periodic qualifications for teachers.
- The performance of students in Albanian universities is affected by many factors; one of the main factors is the performance of students in high schools.
- The yearly ranking of middle and high schools by the Ministry of Education should include the results of their students in college or university and should be considered as part of their success or failure.
- The main reason for the almost drastic decline in student performance at university is the lack of preparation during high school and one of the main factors that have caused this are the frequent changes caused by reforms, which have weakened the system, the curricula, the textbooks, and have deepened the gap between high school and university.
- High schools teachers should use more real "university methods" in the teaching process, difficult homework problems solved by searching the Internet, real research projects, and use more contents and

materials from the first-year courses at the university where it can be possible.

- The course of Mathematics should be considered more than a common course because it is an important factor of students' education and should be considered as such in our educational system.

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