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PEDAGOGIC STUDIES FOR ENGINEERS IN GREECE

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0. ABSTRACT

This paper deals with the presentation of the Pedagogic Studies for Engineers in Greece The purpose of this paper is the presentation of Pedagogic Technical School of Athens (PATES), curricula.

This paper presents the results of a search that began in PATES of Athens. The dependence of the marks upon: class of students, age of students, sex of students, family condition of students, the members of the family of every students, kind of employment, kind of studies, student postgraduate studies (Master, PhD or Diploma), the number of absences of the students.

1. INTRODUCTION

A lot of times the experts have been trying for improvement of the Greek Education. All attempts had difficulties because most of the related people had difference in their opinions about what had to change. It is acceptable by all people that the improvement of the teacher level will produce a higher educational level [1]. The courses of technical-vocational training are taught by teachers who expect their Engineering or Humanity diploma have and the Pedagogic diploma from PATES. The question is «Who are the critical parameters for the performance of the engineering students who attend Pedagogic Studies?». For this reason, it is researched the correlation between the student performance (the tomorrow teacher of the technical lessons in the Secondary Greek Education) and characteristic parameters of their professional and personal life. I hope this research to be the start of a large research which will be provide a lot of answers for a better Technical Education.

2. PEDAGOGIC STUDIES

Pedagogic studies for engineers in Greece is offered by the Pedagogic Technical School of Athens PATES. The entrance of student to PATES is allowed after a complicated system which provide bonus for teaching experience (6 per year), professional experience (4 per year), knowledge of foreign languages (5 per language), second diploma (15 per diploma), postgraduate studies (30 for Ph.D. and 15 for Master) and performance of first diploma (10 for diploma mark «Sufficient», 20 for diploma mark «Very Good» and 30 for diploma mark «Excellent»). There is a high competition to enter PATES, that leads to excellent quality students [2].

The studies leading to diploma in Pedagogic Study has a duration of only a semester. PATES mission consists of [2-4]:

- cultivation and advancement of Educational Sciences with academic and applied teaching and research.
- granting its graduates with the necessary qualifications for the insurance of the best possible specialisation for their scientific and professional career.
- the contribution to the exaltation of the standard and fulfilment of the increasing educational necessities involving pedagogical issues.
- the contribution to confronting and solving general pedagogical problems.

All the students who have diploma of Engineering follow the same programme . The courses which offered by PATES are [2]:

1. Didactic of Vocational Courses, 3 hour per week,
2. Counselling and Career Guidance, 2 hour per week,
3. Educational Valuation, 3 hour per week,
4. Philosophy of Education, 2 hour per week,
5. Sociology of Education, 2 hour per week,
6. Didactic Methodology, 3 hour per week,
7. Principles and Organisation of Vocational Education, 3 hour per week,
8. Pedagogic and Developmental Psychology, 3 hour per week,
9. Educational Technology, 2 hour per week,
10. Justice and Economy, 2 hour per week, or Personal Computers, 2 hour per week, or Organisation of Laboratories, 2 hour per week.,

Students acquaint themselves with the teaching environment by attending ten courses of 15 minutes at PATES's laboratory, ten courses of 30 minutes at PATES's laboratory and ten courses of 45 minutes at real schools. Every student must teach two 15 minutes courses and a 30 minutes courses at PATES laboratory. Also, every student must teach a 45 minutes course at a real school.

Marks are interpreted as follows: 0 - 4.9 Insufficient, 5.0 - 6.9 Sufficient, 7.0 - 8,9 Very Good, 9.0 - 10 Excellent. The pass grade is 5.0 [2, 3].

3. GREEK SECONDARY EDUCATION SYSTEM

A short description of the Greek system for secondary education is described in order to provide the necessary information. Secondary education in Greece comprises the Gymnasium and Lyceum. The Gymnasium (first cycle of secondary education) lasts three years and is compulsory for all Greeks. The students graduated from the six-year primary education system enter Gymnasium without entrance examinations. On graduation, the students are awarded the Gymnasium Leaving Certificate. Lyceum constitute the second cycle of secondary education. The holders of the Gymnasium Leaving Certificate may enter Lyceum without taking further examinations. This cycle lasts three years and is non-compulsory. The following types of Lyceum generally exist [1, 5]:

a) **General Lyceum.** All students are taught the same subjects during the first two years. The third-year students follow a core programme of general education lasting 10 hours per week and receive 20 hours of specialised instruction in one of the four streams of preparatory subjects designated as streams A, B, C and D. Upon successful completion of their written examinations, they may gain entry into the relevant faculty or department at an institution of higher education. The following subjects are included in each of these four streams: Stream A: Essay, Mathematics, Physics, Chemistry. Stream B: Essay, Physics, Chemistry, Biology. Stream C: Essay, Ancient Greek, History, Latin. Stream D: Essay, Mathematics, History, Economics [1,5].

b) **Technical - Vocational Lyceum (TEL).** Each TEL may consist of a number of specialised departments. These technical vocational Lyceum combine a general education together with

professional training. After their second year, the students may select to continue for obtaining either the Specialised Qualification which will enable them to be employed immediately or the Lyceum Leaving Certificate which will enable them to a continuation of their studies at the level of Higher Education. Streams A, B and D are offered at the TEL and holders of the Lyceum Leaving Certificate may continue their studies at Institutions of Higher Education (Universities and TEI) [1, 5].

c) **Unified Multi-disciplinary Lyceum (EPL).** The EPL were introduced under the provisions of Act 1566/85 and stipulate a three year course of studies. They provide a unified general education and technical-vocational training and offer all students the possibility of a balanced development of their potential and the cultivation of their interests and skills so that they can participate in the production process and the economic development of the country. In the first year, all students are taught the same subjects, although they are free to follow elective courses in their spare time. In the second year, an EPL is split into study cycles and in the third year it is split into branches. All students are taught core subjects during these years, along with the corresponding cycle and branch subjects. The cycles lay the foundations and provide a preparatory instruction for higher education. The branches enable the students to:

- continue their studies at institutions of higher education (AEI and TEI) by including the preparatory subjects corresponding to each stream in their curriculum being followed.
- exercise their profession (via prevocational training branches) obtain a specialised diploma after studying for one extra year in a specialised department open to graduates of these schools.
- The graduates of all branches are awarded the Lyceum Leaving Certificate. The stream branches A, B and D at the EPL particularly reflect Greece's need to promote research and knowledge in both the scientific and technological sectors [1, 5].

d) **Classical Lyceum.** There are a few classical Lyceum which aim to promote studies of the classics.

e) **Special Types of Lyceum.** A number of specialised Lyceum also exist such as the **Lyceum for Religious** studies that operate under the provisions of a Presidential Decree, **Lyceum for Athletics** and **Lyceum for Music**. These Lyceum may be introduced in several cities in the country and cover the educational needs of persons living in a wider geographical area.

The courses of technical-vocational training are taught by teachers who expect their Engineering or Humanity diploma have and the Pedagogic diploma from PATES [1].

4. STATISTICAL INFORMATION

The lows of statistics are the basic scientific tools that were used for the collection and the processing of the data. This research is only for educational use. The collection of data is begun by randomise methodology [6]. Our sample was the 62.5 % of the all PATES student, of first semester, of last year (1998).

The average is a simple arithmetic average, which is defined as:

$$\overline{y} = \frac{1}{n} \cdot \sum_{i=1}^{n} y_i$$

where n is the number of data points

The standard deviation from the mean describes the scatter of the data set around the average. Higher standard deviation means more scatter. It is diffident as:

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n} \left(y_i - \bar{y} \right)^2}{n - 1}}$$

5. CORRELATION

In order to explain correctly the answers of students are summarised in tables and figures. There are the following correlation's:

1. The correlation between Class and student performance (Table 1, Fig.1).
2. The correlation between student age and performance, (Table 2, Fig.2).
3. The correlation between student sex and performance, (Table 3, Fig.3).
4. The correlation between student family and performance, (Table 4, Fig. 4).
5. The correlation between members of family and student performance, (Table 5, Fig.5).
6. The correlation between student profession and performance, (Table 6, Fig.6).
7. The correlation between student speciality and performance, (Table 7, Fig.7).
8. The correlation between student postgraduates and performance, (Table 8, Fig.8).
9. The correlation between student absences and performance, (Table 9, Fig.9).

CLASS	01-50	51-60	61-70	71-80	81-90	91-100	Total	AVERAGE VALUE	Deviation
AT-1	0,0	3,3	6,7	20,0	36,7	33,3	62,5	**84,50**	1,91
AT-2	5,6	5,6	11,1	5,6	55,6	16,7	37,5	**78,56**	4,60
TOTAL	2,1	4,2	8,3	14,6	43,8	27,1	100	**82,27**	2,14

Table 1. The correlation between Class and student performance.

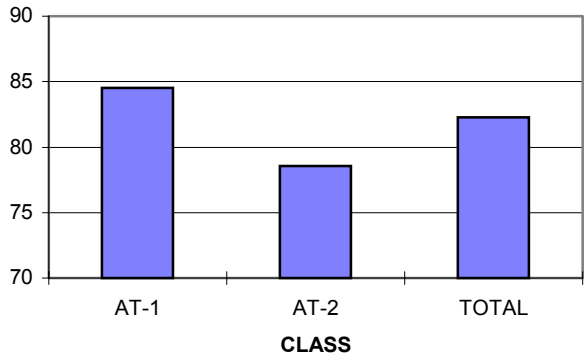

Fig. 1. Average value of student performance versus Class.

It is shown that the student performance of class AT-1 is better than that of AT-2. 90% per cent of the AT-1 students have performance that exceeds 70. At the AT-2 class 77.8% have performance that exceeds 70. For this reason the average value of AT-1 class is higher than that of AT-2 and the standard deviation of AT-1 is smaller than that of AT-2.

AGE	01-50	51-60	61-70	71-80	81-90	91-100	Total	Average Value	Deviation
LESS THAN 26	0,0	0,0	0,0	0,0	60,0	40,0	10,4	**89,50**	**2,19**
27-31	0,0	0,0	6,3	18,8	31,3	43,8	33,3	**86,75**	**2,32**
32-36	5,3	5,3	5,3	21,1	42,1	21,1	39,6	**78,92**	**4,37**
37-41	0,0	12,5	25,0	0,0	62,5	0,0	16,7	**76,75**	**4,12**
TOTAL	2,1	4,2	8,3	14,6	43,8	27,1	100	**82,27**	**2,14**

Table 2. The correlation between student age and performance.

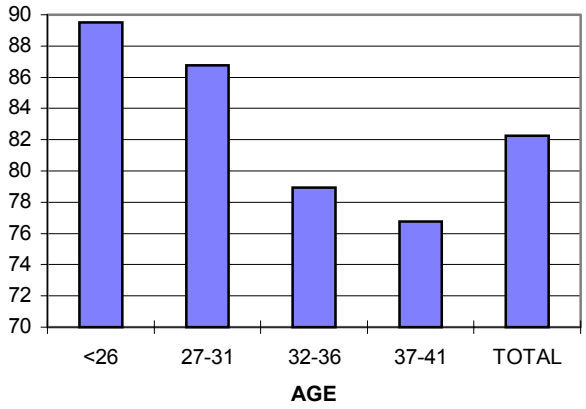

Fig. 2. Average value of student performance versus student age.

It is shown that the age is one of the most important factor of student performance. All the students who are under 26 years old have performance that exceeds 80. 93.7% of students who have age from 27 until 31 have performance that exceeds 70. 84.1% of students who have age from 32 until 36 have performance that exceeds 70. 62.5% of students who have age from 37 until 41 have performance that exceeds 70. The groups with younger students have higher average performance and smaller standard deviation of performance than the groups with older students

SEX	01-50	51-60	61-70	71-80	81-90	91-100	Total	Average Value	Deviation
MALE	4,0	8,0	4,0	24,0	40,0	20,0	52.1	**78,90**	**3,54**
FEMALE	0,0	0,0	13,0	4,3	47,8	34,8	47.9	**85,93**	**1,99**
TOTAL	2,1	4,2	8,3	14,6	43,8	27,1	100	**82,27**	**2,14**

Table 3. The correlation between student sex and performance.

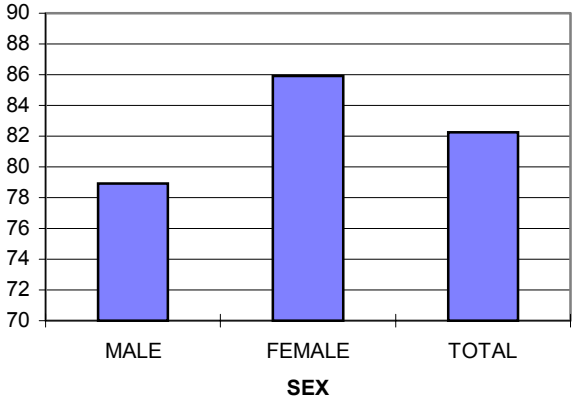

Fig. 3. Average value of student performance versus student sex.

It is shown that the student performance of women are better than the men. 84% per cent of men have performance that exceeds 70. 87% per cent of women have performance that exceeds 70. The standard deviation of women performance is smaller (two times) than that of men. For this reasons the average performance of women is higher than that of men.

FAMILY STATE	01-50	51-60	61-70	71-80	81-90	91-100	Total	Average Value	Deviation
SINGLE	0,0	0,0	13,6	18,2	50,0	18,2	45,8	**82,77**	**1,95**
MARRIED	4,3	8,7	4,3	13,0	34,8	34,8	47,9	**80,93**	**4,00**
DIVORCE	0,0	0,0	0,0	0,0	66,7	33,3	6,3	**88,83**	**2,72**
TOTAL	2,1	4,2	8,3	14,6	43,8	27,1	100	**82,27**	**2,14**

Table 4. The correlation between student family and performance.

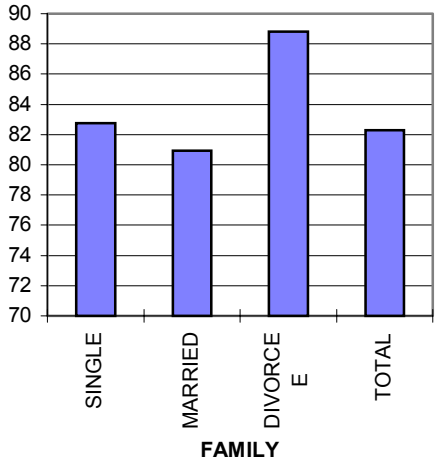

Fig. 4. Average value of student performance versus student family.

86.4% of the single students have performance that exceeds 70. 82.6% of students who have age from 27 until 31 have performance that exceeds 70. 84.1% of students who are married have performance that exceeds 70. All the divorcee students have performance that exceeds 70. The groups with single and divorcee students have higher average performance and smaller standard deviation of performance then the groups with the married students. It is very difficult for everyone to be good both school and family.

NUMBER OF CHILDREN	01-50	51-60	61-70	71-80	81-90	91-100	Total	Average Value	Deviation
NO CHILDREN	0,0	0,0	9,1	18,2	48,5	24,2	68,8	**84,29**	**1,53**
ONE	11,1	22,2	0,0	11,1	22,2	33,3	18,8	**72,72**	**8,86**
TWO	0,0	0,0	0,0	0,0	60,0	40,0	10,4	**89,50**	**2,19**
THREE	0,0	0,0	100,0	0,0	0,0	0,0	2,1	**65,50**	**0,00**
TOTAL	2,1	4,2	8,3	14,6	43,8	27,1	100	**82,27**	**2,14**

Table 5. The correlation between members of family and student performance.

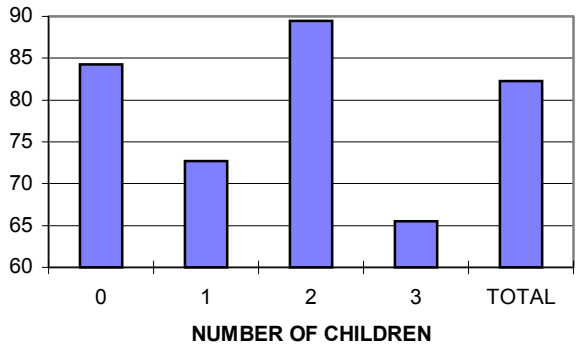

Fig. 5. Average value of student performance versus number of children.

It is shown that the number of children of the student is a very important factor of student performance. 91% of the students who have not children have performance that exceeds 70. 66.7% of students who have one children have performance that exceeds 70. All of students who have two children have performance that exceeds 80. The groups with single and divorcee students have higher average performance and smaller standard deviation of performance then the groups with the married students. It is very difficult for every body to be good both school and family. It is excepted, the statistical paradox, the students who have two children they exceed 80. This is probably explained by the little student's number which belongs in this category.

PROFESSION	01-50	51-60	61-70	71-80	81-90	91-100	Total	Average Value	Deviation
UNEMPLOYED	0,0	0,0	0,0	33,3	0,0	66,7	6,3	**88,83**	**5,44**
BUSINESSMAN	5,9	0,0	11,8	23,5	29,4	29,4	35,4	**79,32**	**4,81**
PUBLIC SERVANT	0,0	6,7	0,0	13,3	66,7	13,3	31,3	**83,50**	**2,35**
PRIVATE SERVANT	0,0	10,0	10,0	0,0	40,0	40,0	20,8	**84,50**	**4,11**
TEACHER	0,0	0,0	33,3	0,0	66,7	0,0	6,3	**78,83**	**5,44**
TOTAL	2,1	4,2	8,3	14,6	43,8	27,1	100	**82,27**	**2,14**

Table 6. The correlation between student profession and performance.

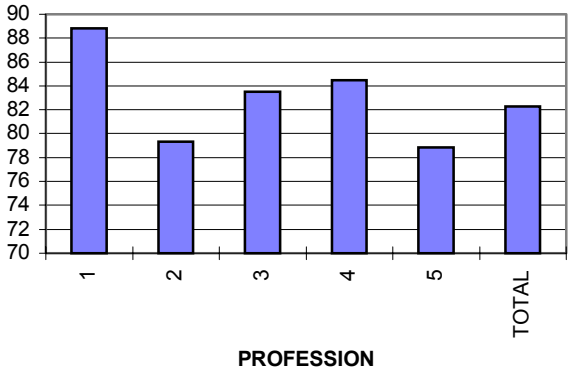

Fig. 6. Average value of student performance versus student profession.

In this research, there are five categories of professions. The first one is the unemployed. The second one is the businessman. The third one is the public servant. The fourth one is the private servant. And the last one is the teachers. It is shown that the profession of the student of PATES is a very important factor of student performance. All the unemployed students (category 1) have performance that exceeds 70. 93.3% of the students who are public servants (category 3) have performance that exceeds 70. 82.3% of the students who are Businessman (category 2) have performance that exceeds 70. 80% of the students who work as private servant (category 4) have performance that exceeds 70. 66.7% of the students who their employment are teachers (category 5) have performance that exceeds 70. The categories of unemployment and public servant students had better performance as they had enough spare time to study because their job. Teachers (category 5) have low performance. This statistical paradox is probably explained by the bid deviation little student's number which belongs in this category.

SPECIALITY	01-50	51-60	61-70	71-80	81-90	91-100	Total	Average Value	Deviation
AGRICULTURAL ENGINEER	14,3	0,0	0,0	14,3	57,1	14,3	14,6	**74,79**	**10,12**
ARCHITECT	0,0	0,0	33,3	0,0	33,3	33.3	6,2	**81,67**	**12,6**
CIVIL ENGINEER	0,0	0,0	0,0	0,0	83,3	16,7	12,5	**87,17**	**1,52**
COMPUTER ENGINEER	0,0	0,0	0,0	25,0	33,3	41,7	25,0	**87,17**	**2,31**
DENTIST	0,0	0,0	33,3	0,0	33,3	33,3	6,3	**82,17**	**7,20**
ECONOMIST	0,0	0,0	0,0	0,0	66,7	33,3	6,3	**88,83**	**2,72**
ELECTRICAL ENGINEER	0,0	0,0	33,3	33,3	0,0	33,3	6,3	**78,83**	**7,20**
MECHANICAL ENGINEER	0,0	25,0	0,0	50,0	0,0	25,0	8,3	**75,50**	**7,07**
SOCIOLOGIST	0,0	0,0	33,3	33,3	33,3	0,0	6,2	**78,30**	**6,23**
OTHER	0,0	25,0	0,0	0,0	50,0	25,0	8,3	**80,50**	**9,81**
TOTAL	2,1	4,2	8,3	14,6	43,8	27,1	100	**82,27**	**2,14**

Table 7. The correlation between student speciality and performance.

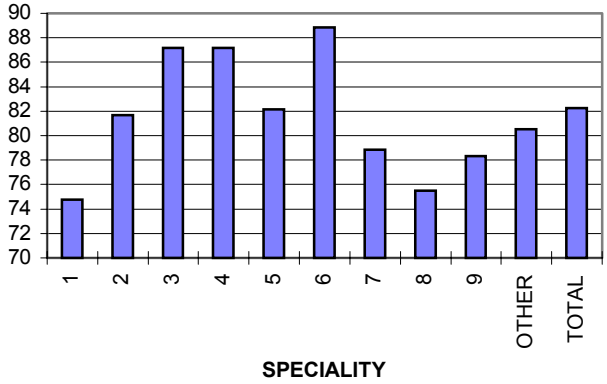

Fig. 7. Average value of student performance versus student speciality.

In this research, there are ten categories of specialities. The first one is the Agricultural Engineer, 74.79 of this category have performance that exceeds 70. The second one is the Architect, 81.67 of this category have performance that exceeds 70. The third one is the Civil Engineer, 87.17 of this category have performance that exceeds 70. The fourth one is the Computer Engineer, 87.17 of this category have performance that exceeds 70. The fifth one is the Dentist, 82.17 of this category have performance that exceeds 70. The sixth one is the Economist, 88.83 of this category have performance that exceeds 70. The seventh one is the Electrical Engineer, 78.83 of this category have performance that exceeds 70. The eighth one is the Mechanical Engineer, 75.50 of this category have performance

that exceeds 70. The ninth one is the Sociologist, 78.30 of this category have performance that exceeds 70. And the last one is all the others specialities, 80.50 of this category have performance that exceeds 70. It is shown that the profession of the student of PA.TE.S is an important factor of student performance.

POSTGRADUATE STUDIES	01-50	51-60	61-70	71-80	81-90	91-100	Total	Average Value	Deviation
YES	5,0	0,0	5,0	15,0	50,0	25,0	41,7	**81,75**	**4,04**
NO	0,0	7,1	10,7	14,3	39,3	28,6	58,3	**82,64**	**2,25**
TOTAL	2,1	4,2	8,3	14,6	43,8	27,1	100	**82,27**	**2,14**

Table 8. The correlation between student postgraduates and performance.

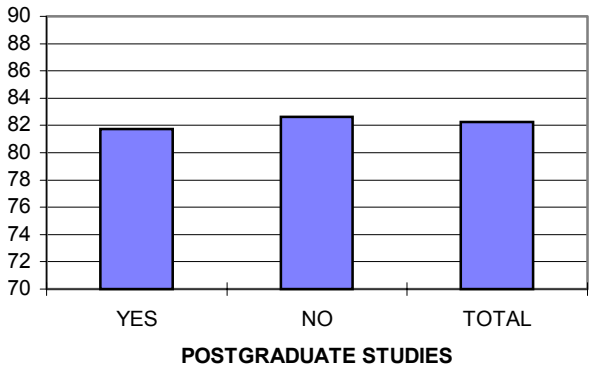

Fig. 8. Average value of student performance versus student postgraduates.

It is shown that the average student performance of the students who have not a Master o Ph.D. is better than that of student who have Master or Ph.D. But 90% of the Master or Ph.D. students have performance that exceeds 70. 82.2% of student who have not Master or Ph.D. have performance that exceeds 70. The standard deviation of performance of the students who have Master o Ph.D. is two times bigger than the students who have not a Master o Ph.D. The postgraduate students result higher performance in order to prove their useful contribution to the critical thought of the students

ABSENCES	01-50	51-60	61-70	71-80	81-90	91-100	Total	Average Value	Deviation
0	0,0	0,0	7,1	0,0	50,0	42,9	29,2	**88,36**	**2,13**
1-4	4,3	0,0	4,3	26,1	47,8	17,4	47,9	**80,50**	**3,49**
5-8	0,0	16,7	0,0	0,0	50,0	33,3	12,5	**83,83**	**5,49**
DON'T REMEMBER	0,0	25,0	50,0	25,0	0,0	0,0	10,4	**71,40**	**3,54**
TOTAL	2,1	4,2	8,3	14,6	43,8	27,1	100	**82,27**	**2,14**

Table 9. The correlation between student absences and performance.

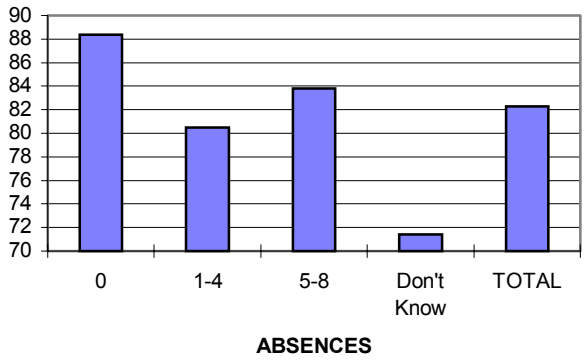

Fig. 9. Average value of student performance versus student absences.

It is shown that the number of the absences is one of the most important factor of student performance. 92.9% the students who have not absences have performance that exceeds 80. 91.4% of students who have from 1 until 4 absences have performance that exceeds 70. 83.3% of students who have from 5 until 8 absences have performance that exceeds 70. 75% of students who have more than 8 absences or they didn't remember the exactly number of their absences have performance that exceeds 70. The groups with small number of absences students have higher average performance and smaller standard deviation of performance than the groups with greater one.

6. CONCLUSIONS

The results of the above mentioned research were based on a first class Statistical Analysis. They have great interest for the education experts.

First of all, the average performance of the Highest Education graduates is very high 82.27 ±2.14, it is higher of 80 when the top value is 100. This success means that the examined subjects where taught in the best way.

Then, some correlation's and divisions for the students were made in order to extract useful sub-conclusions.

- The AT-1 class had better performance than AT-2 class. It is explained by the studies structure and the way of thinking that AT-1 class students had during their basics studies (Engineering Studies) . So the meaning of «Counselling and Career Guidance» became closer to technical background people.
- The younger students have better performance than the other because there is less time distance from their Universities Studies.
- The female students have better performance than the male students performance probably (it is only my opinion) because these were more diligent than the male ones.
- The single and divorcee students because of their less family obligations, found easier to spent more time in order to study and prepare their subjects and they succeed better performance.
- In the same way, the children as members of the student's family cause more obligations and the result is less performance.
- In the category of unemployment students they had better performance if they had enough spare time to study because their job
- The best performance belongs to Civil Engineers, Computer Engineers and Economist.
- The postgraduate students result higher performance in order to prove their useful contribution to the critical thought of the students
- The number of student absences is a critical parameter for the students' performance as the presence of student is very important for the apprehension of the subject.

Finally, the best student will be young (under 26 years old), single, female, unemployed, with postgraduate studies and with no absences.

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