
The Eurasia Proceedings of Educational & Social Sciences (EPESS), 2015

Volume 2, Pages 101-106

ICEMST 2015: International Conference on Education in Mathematics, Science & Technology

THE EFFECTS OF STUDENTS ATTENDANCE IN THE SUCCESS OF UNDERGRADUATE MATHEMATICAL COURSES-THE CASE OF THE SEE-UNIVERSITY

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ABSTRACT: This study investigates the influence of student's attendance in mathematics lectures and their final examination success. There are two basic objectives in this study: a) to identify the most common reasons of student's attendance/absence in mathematics lectures; and b) to identify the effect of the student's attendance in mathematical courses on their general results.

The population of the study consists of the second year students of two different faculties of the SEE-University, students from the faculty of Business Economics and the faculty of Contemporary Sciences and Technologies. A survey is realized during the academic year 2014/15.

This paper provides results of a survey completed at the beginning of the summer semester and results of the final success in Mathematics.

The results of this survey show that besides the most common reasons of their absence during the lectures/practical hours, as are their family engagements and other part time engagements, there are also some other reasons which are influenced of other different factors. The survey shows that the nature of these other reasons can be classified in different groups such are: the timetable of the lecture/practical hour is not suitable for them; the boring courses; the subject is difficult and they cannot understand, so, there is no reason to take part in it; and also as e reason is mentioned that they simply dislike the subject.

Using the method of logistic regression, we have indicated that student's attendance has a statistically significant impact on their final success in Mathematical courses.

These findings suggest that enhancement of student participation, is a crucial aspect of administration which improves their performance. At the same time, the lecturer should also create a good learning environment, to motivate students and enlarge their interest to the course.

Key words: mathematics lectures, attendance, absence, success, binary logistic regression.

INTRODUCTION

Taking into the consideration the society development, especially the development of the communication recourses as the consequence of the increasing of the electronically services, the students attendance is in the center of interest in a lot of Universities in the world. The development of the new contemporary technologies creates different possibilities of teaching in the way which is not depending of the attendance in the classes. Nevertheless, especially for the subject of mathematics there is a general opinion that the attendance is a very important factor in achieving the objectives of the teaching process. Therefore by this research we want to investigate the influence of this factor in our University. Teaching where the student is in the center of the process is a very important part of the teaching and learning process of cooperation.

It is a very known fact that mathematical and quantitative abilities of the person are very important and crucial factor in achieving a good results in each subject during the studies. But also, good mathematical background helps very much for the future. The chances for the employment, productivity in the life, and other important things in the future life are bigger if one has a good mathematical background.

Because of the reasons mentioned above, there is showing a big attention for the process of learning the subject of mathematics as well as the students performance in this subject. This attention is showing from the side of

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teachers, parents and all the society in general. So, it is of big interest to identify the main factors which influence in students achieving on the subject of mathematics. Identifying these factors, one can find the ways how to help students in improvement and progress in their academic life.

All of us who work with the students have a big concern and we always try to find the answer to the question "why students are missing during the lectures?". This concern is the topic of research studied from a lot of researchers. In the different researches done in this field, there are found a different reasons and also there are given a different explanations why students are missing in the classes. These studies have shown that there are some valuable reasons, and among others they happen as the consequence of everyday's life circumstances.

The literature suggests a lot of possible reasons for the missing of the students during the lectures and practical hours. Some of them are: They are employment, which means another engagement outside the studies, the health reasons, the additional sport activities, not appropriate schedule, the teaching methods used by the teacher, the teacher himself, the subject and its importance, the lack of motivation etc.

Some studies have confirmed that the students attendance is depended from the health factors. If they are fit and feel healthy then it results in better academic achieving (Donka Mirtcheva 2009).

There are also another factors with a considerable influence to the students attendance during the classes. One of the important factors why students do not attend the classes are related with the services given by the University. In this context Joanne (2007) has shown that the attendance is depending from the University services given to the students and she has discovered the so called "A phenomenon of student apathy or poor pedagogy".

In general the studies done in this field suggests that a very important think in order to improve the attendance is increasing and improvement of the pedagogical abilities of the lecturer. Massingham and Herrington (2006) are suggesting the teachers in general that they should be more careful in completing the students requirements. They have shown that the nowadays students are requesting more the lecturing where the student will be on the center of this process.

Lockwood et al. (2006) have analyzed the correlation between the obligatory presence during the classes with the final grades of the students in the subject where the attendance is obligatory. So the question of analysis is does the obligatory attendance improve the students grade? In their research they have found that there exists a very positive and strong statistical correlation between the attendance and the exam results achieved in the case of the students of agricultural sciences.

Purcell (2007) has studied the relation between the attendance during the classes with the students performance achieved on the end of the year. The study has done with the students of the second and third year of the engineering department at the University College Dublin. He has reporting that the average degree of the attendance in this case is 68%. On the other hand, Kirby and McElory (2003) on the research done with the sample of the first year students of the Economic department, have concluded that the average norm of attendance was 47%. Maloney and Lally (1998) have found that there exists a very positive and significant statistical correlation between the attendance during the lectures and the students performance on the final exam. This research is done with the students of the third year of the Economic department of the Galway College University.

Cohen and Johnson (2006) have found a very positive dependence between the attendance and the academic performance. The study was done on the sample of 347 students of the Economic school.

In some recent studies, Spaho & Godolja (2014), Alija (2013) is used the so called binary logistic regression. By this study they try to find the dependence of the regular attendance to the final results achieved in the exams. The study done with the students of Economic department has shown that the regular attendance during the lectures have a significant statistical influence to the final success both on the subject of mathematics and some other subjects.

In general there are a variety of different factors which influence to the attendance in classes and the factors which have a very important role in achieving the academic success. They can be classified as the social-demographical factors such are the age, the gender, the revenues etc; then the psychological factors such are the motivation, the stress, the studying strategy etc; and also there are some other factors such are the schedule of the lectures, the ability of the lecturer, understanding the language of the lecturer, etc.

The purpose of this study is to analyze the influence and the effects of the student attendance on the final success on the subject of mathematics. The study is done with the second year students of the Department of Economic Faculty, and the Faculty of Contemporary Sciences of the SEE-University in Tetovo.

METHODS

As we mentioned above, the population of the study is consisted of the second year students of the Department of Economic Faculty, and the Faculty of Contemporary Sciences of the SEE-University in Tetovo.

The study is realized in two parts: The first part is depend on the survey realized with the 168 students of these two departments. The survey was build mainly on the questions of finding the reasons of their absence during the classes (both the lecture and the practical hours) on the subject of mathematics.

The second part of the study is focused mainly on the application of the logistical regression in order to find the relations between the students attendance during the classes and their performance and achieved success on the subject of mathematics.

We have gathered the data of 168 students concerning their attendance during the classes and their final success achieved in the subject of mathematics. The data were gathered on the end of the semester after ending with the course.

In order to evaluate the effects of the student attendance on their final success on the subject of mathematics, we have used the binary logistical regression. For this purpose in order to compute the results we have used the MedCalc software.

LOGISTIC REGRESSION WITH BINARY RESPONSE

Let Y be a binary response variable, which is coded as 0 or 1, referred to as fail or pass, respectively. Then the logistic regression model is given as follows:

$$\pi(x) = \frac{e^{\beta_0 + \beta_1 x}}{1 + e^{\beta_0 + \beta_1 x}}$$

$\pi(x)$ Represents the conditional mean of Y given x, i.e. $E(Y \setminus x)$. The value of response variable given x can be expressed as $y = \pi(x) + \varepsilon$, ε is the error term. If $y=1$, then $\varepsilon = 1 - \pi(x)$ with probability $\pi(x)$ and if $y = 0$, $\varepsilon = -\pi(x)$ with probability $1 - \pi(x)$. Therefore, ε follows a binomial distribution with mean 0 and variance $\pi(x)[1 - \pi(x)]$. A transformation of $\pi(x)$ which is called logit function is required:

$$g(x) = \ln \left[\frac{\pi(x)}{1 - \pi(x)} \right] = \beta_0 + \beta_1 x$$

The unknown parameters are estimated by the method of maximum likelihood estimation with given likelihood function for $\beta = (\beta_0, \beta_1)$ given as $L(\beta) = \prod_{i=1}^n \pi(x_i)^{y_i} [1 - \pi(x_i)]^{1-y_i}$.

FITTING LOGISTIC MODEL WITH BINARY EXPLANATORY VARIABLES

Let us consider the interpretation of the coefficients for logistic regression model with the case where explanatory variables are at the nominal level of measurement. Assume that X is coded either 0 or 1. Then the difference between logit function when $x=1$ and $x=0$ is given as $g(1) - g(0) = \beta_1$. To interpret this result, a measure of association called odds ratio (OR) is required:

$$OR = \frac{\pi(1) / [1 - \pi(1)]}{\pi(0) / [1 - \pi(0)]} = e^{\beta_1}$$

Odds ratio provides an approximation how much more likely or unlikely it is for the response variable to occur among those with $x = 1$ than among those with $x = 0$. For details, one can see Hosmer and Lemeshow (2000).

RESULTS AND DISCUSSIONS

Concerning the first part of the study, we have got that 72.35% of the students were missed less than 30% of classes, and on the other hand, just 27,65% of the studetns were missed more than 30% of the classes. This is shown on **figure 1**.

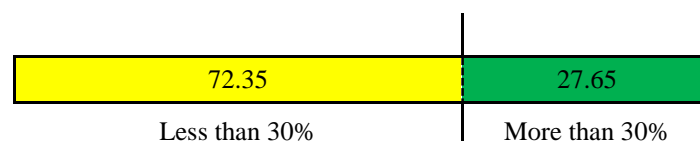


Figure 1. Proportion Of Lectures And Practical Sessins Attend

The reasons for not attending the lectures and the practical hours were of different nature and we have classified them with (1=not usual reason - 3=the most frequent reason). The obtained results show that as the most frequent reasons of not attending the classes are: not appropriate schedule of classes, the social and other free activities of

the students, the difficult course where they don't see a reason why to attend if they do not understand the discussed topics, etc. At the table 1 is given a classification of the most common reasons for missing lectures and practical sessions.

Table 1. Thinking Backs Over Your Time At University So Far What Are The Most Common Reasons For Missing Lectures And Practical Sessions

<i>(3 being the most common reason and 1 being the least common reason)</i>	Percentage Frequencies		
	1	2	3
Engagement in the work out studies	55.23	21.82	22.95
There was only one lecture in a day	49.09	34.42	16.49
There were too many consecutive sessions in the day	47.25	32.00	20.75
The lectures/tutorials were too early or too late in the day	28.26	34.55	37.19
I had problems with transport	52.18	25.45	22.37
The weather conditions were too bad	58.64	26.24	15.12
I was ill	64.36	21.82	13.82
I had appointments with doctors or dentists	68.36	20.00	11.64
I had family commitments	45.45	30.73	23.82
I was on holiday	66.45	21.22	12.33
I was tired	42.36	31.28	26.36
I was engaged in other social or recreational activities	49.23	15.23	35.54
I was suffering from the effects of alcohol	75.23	15.25	9.52
I had already studied the material elsewhere(transfer)	70.91	16.36	12.73
The material covered was too difficult	43.64	32.73	23.63
The subject matter was boring	35.00	32.23	32.77
Lack of motivation	48.89	32.73	18.38
I was not interested in the subject matter	52.73	29.09	18.18
I do not like the lecturer	53.28	27.27	19.45
I was completing other work or assessments	49.09	23.64	27.27

For the second part of the study, we have gathered the data on the end of the semester (after we have finished by lecturing). as we have mentioned previously the data were taken for the course of mathematics. On the **figure 2** we present the general success achieved on the subject of mathematics.

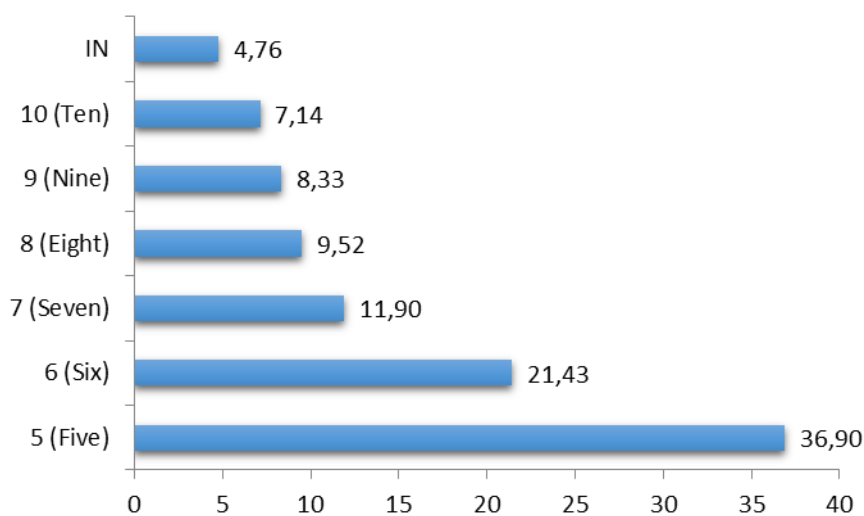


Figure 2. Scores In Mathematics

The main purpose of the study was to analyze the effect of the student attendance during the lectures and the practical sessions on the final results (success) in the subject of mathematics.

For this purpose, in order to apply the logistic regression, as the main variables of our study are taken the student attendance as the dependent variable and the final success of the student as the independent variable. The first

variable is defined as the *dummy independent variable* and it is coded by 0 if the student has missed more than 30% of the classes, and by 1 if he has missed less than 30% of the classes. The second variable is defined as the *dummy dependent variable* and it is coded by 0 if the student doesn't pass the exam, and by 1 if the student has passed the exam.

setting the dialogue table of the program MedCalc for finding the logistical regression, the data for the final success of the students in the subject of mathematics are given in the table2.

Table 2. Estimation Results For Logistic Regression

Dependent Y	Grade
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Method	Enter
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Sample size	168
Cases with Y=0	70 (41.67%)
Cases with Y=1	98 (58.33%)

Overall Model Fit

Null model -2 Log Likelihood	228.209
Full model -2 Log Likelihood	204.360
Chi-square	23.849
DF	1
Significance level	P < 0.0001

Coefficients and Standard Errors

Variable	Coefficient	Std. Error	P
Attendance	1.59768	0.33895	<0.0001
Constant	-2.1630		

Odds Ratios and 95% Confidence Intervals

Variable	Odds ratio	95% CI
Attendance	4.9415	2.5430 to 9.6025

Classification table (cut-off value p=0.5)

Actual group	Predicted group		Percent correct
	0	1	
Y = 0	44	26	62.86 %
Y = 1	25	73	74.49 %
Percent of cases correctly classified			69.64 %

ROC curve analysis

Area under the ROC curve (AUC)	0.687
Standard Error	0.0424
95% Confidence interval	0.611 to 0.756

Using the obtained results from the table 2, one can get the logit model given below:

$$\log it (p) = \ln \frac{p}{1-p} = -2,163 + 1,59768 X_{At}$$

The ratio of the chances (odds ratios) for this variable is $X_{At}=4.94 > 1$. This means that the student who has missed less than 30% of the lectures and practical sessions, has 5 times more chances to get a passing grade (to pass the exam) in the mathematic subject compared with the students who have missed more than 30% of the classes.

The percentage of the predicted cases in our study is 69,64%. This means that 69,64% of the predicted cases fulfill this prediction.

CONCLUSIONS

The subject of mathematics is very important for the students of our University. It is a very useful tool which helps in achieving the objectives in other subjects. The better results in mathematics implies the better success during the studies and their carrier in the future. Therefore it is very important to identify some of the basic factors which influence to the student performance in this subject. Identifying this factors, we can help students in improving of their abilities and progress in the subject of mathematics.

The obtained results have shown that the students attendance in lectures and practical sessions is depended of some factors, where the most frequent are: the reason because of the not appropriate schedule, the other social activities of the students, the difficult and unclear course, etc.

The results obtained from the binary logistical regression have shown that the student attendance in lectures and practical sessions is statistically very important independent variable. The students who have missed less than 30% of the classes, have approximately 5 times better chances to pass the exam of mathematics, versus the students who have missed more than 30% of classes.

Taking into the consideration the results obtained from this research, we give the following suggestion: There should be given a considerable importance to the students attendance during the classes. In order to improve this, it is of big importance participation of each side in this direction, starting from the administration of the University, the family and the lecturer. In order to motivate the students for their active participation on the classes, the lecturers should use different methods and strategies. The active participation will increase their interest for the subject and this will imply in achieving the better results and will improve the students performance in general.

Also, the lecturer should create a good environment for teaching. By this he can motivate the students and increase their interest for the subject. As we have confirmed by this research, as well as the other researches done in this field, there exists a very significant correlation between the attendance and the student performance. It is a very big challenge for the teachers in general, to identify the factors which can increase the attendance and which can affect in the improvement of students achieving in general.

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