The Importance of Class Attendance and Cumulative GPA for Academic Success in Industrial Engineering Classes

Suleiman Obeidat, Adnan Bashir, Wisam Abu Jadayil

Abstract—The affect of the attendance percentage, the overall GPA and the number of credit hours the student is enrolled in at specific semester on the grade attained in specific course has been studied. This study has been performed on three courses offered in industrial engineering department at the Hashemite University in Jordan. Study has revealed that the grade attained by a student is strongly affected by the attendance percentage and his overall GPA with a value of R^2 of 52.5%. Another model that has been investigated is the relation between the semester GPA and the attendance percentage, the number of credit hours enrolled in at specific semester, and the overall GPA. This model gave us a strong relationship between the semester GPA and attendance percentage and the overall GPA with a value of R^2 of 76.2%.

Keywords—Attendance in classes, GPA, Industrial Engineering, Grade

I. INTRODUCTION

CLASS attendance is a major issue that most of the academics should take care of because it affects the students' performance in the class and the relation between the instructor and the student. The effect of attendance on the grade attained industrial engineering classes is the subject of this paper. The attendance effect depends on the type of the class. Is that class has some information that needs to be understood directly by the student or just needs to study the subject fro the text book and memorize them. Or is the material of that class is available online as power point slides. Or is attendance affected by the instructor policy the he/she register the attendance and give grades on attendance or not. All of those factors and many others have been studied by many researches, some of them are mentioned here. Student attendance effect on the student's performance in the class is studied in this work for three industrial engineering classes taught by three different instructors. [1] studied the class attendance and gender effects on undergraduate students' achievement in a social studies course. The results indicate that students' level of attendance has a significant influence on their grade in Social Studies course. It was also found that male students got better grades than female students.

Suleiman Obeidat is an assistant professor, Hashemite university, Industrial Engineering Department, P.O. Box 330127, Zarqa 13115, Jordan. Email: sulobeidat@hu.edu.jo

Adnan Bashir is an associate professor, Hashemite university, Industrial Engineering Department, P.O. Box 330127, Zarqa 13115, Jordan. Email: abashir@hu.edu.jo

Wisam Abu Jadayil is an assistant professor, Hashemite university, Industrial Engineering Department, P.O. Box 330127, Zarqa 13115, Jordan. Email: abujadayil@hotmail.com

More [2] in his paper presented correlation between class attendance and performance in a biology course. In his paper, he showed that class attendance by most students in nonmajor science classes is influenced by whether they receive points for attending class or not. In another paper Moore [3] stated that it is very important to check for the first year student's class attendance for their academic performances. Moore et al. [4] found that the students who regularly attend classes have a much greater chance of making high grades than do students who skip lots of classes. They found the relation between the class attendance and course grades in introductory science classes, as $y = 33.1 + 0.55x$, and the correlation coefficient (r) = 0.78, where y is the student's grade and x is the student's attendance percentage. Some other studies found that the attendance is not related to the student's grade, some of those studies were prepared by (Berenson et al. [5] ; Devadoss and Foltz [6]; Hammen & Kelland, [7]; Thompson and Plummer [8]). Some other studies have concluded that mandatory attendance policies could impede learning (Hyde & Flournoy [9]). Some other studies indicated to another effect of the student's attendance such as Marcus et al. [10] who stated that consistent class attendance is effective in increasing the retention of information and overlearning of material. More attendance higher exam scores and better long term retention of material, Cepeda et al. [11], Cull [12], Peladeau et al. [13]. Attendance is important even for online courses, Brooke [14], or despite of the instructor role in the class, Bligh [15]. Dollinger et al. [16], Turner [17], Jones [18], Clump et al. [19], Gump [20], and Newman et al. [21] studied the attendance effect on the overall grade in several classes and several case studies. They stated that there is a positive relationship between the attendance percentage and the achieved grade. Some other researchers studied the effect of giving credit on attendance and the attained grade. Hansen [22] stated that if the instructor put some credit on attendance and Lloyd et al. [23] stated that if the exam questions are based on the material covered in the lecture, the attendance percentage will increase so there will be a strong relationship between the attendance percentage and the grade attained. This attendance can be increased by several procedures, such as by giving credit on attendance, Hovell et al. [24]. It can be concluded from the above literature that some of the researchers found that that there is a positive relationship between the attendance and the performance in the class, and some of them stated that there is no strong relationship. In our work, the attendance and the overall GPA effect on the grade attained in three classes in industrial engineering department

World Academy of Science, Engineering and Technology
International Journal of Humanities and Social Sciences
Vol:6, No:1, 2012

at the Hashemite University in Jordan, will be studied. Those classes are: Metrolgy (four thousand level), Properties of Materials (two thousand level) and Simulation (four thousand level).

II. METHODOLOGY

A sample of 140 students was taken to investigate the factors that affect the student grade in a course or the GPA in certain semester. The proposed variables affecting such grade or GPA were:

- Semester hours: how many credit hours the student is enrolled in at that semester

- GPA: overall GPA for the student so far.

- Percentage of attendance for the classes for certain course.

Minitab 14.0 software is used in the analysis. Multiple linear regressions were utilized to find the relationship between the different independent variables and the dependent ones.

Based on the analysis performed on the data collected in the courses mentioned above, a regression model is obtained between the grade and number of hours the student enrolled in that semester, the overall GPA, and the attendance percentage. The first regression Model is:

Course Grade = - 0.967 - 0.0052 Semester hours + 0.826 GPA + 0.0142 Attendance Percentage

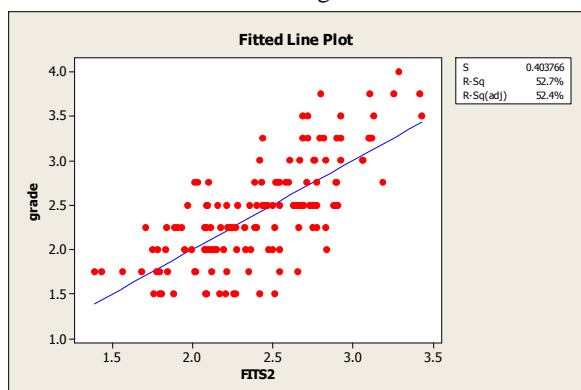This relation is illustrated in fig. 1.

Fig. 1 First model: Course Grade = - 0.967 - 0.0052 Semester hours + 0.826 GPA + 0.0142 Attendance Percentage

This relation can be obtained from Minitab 14.0 as shown in table I.

TABLE I
MINITAB ANALYSIS TO OBTAIN THE REGRESSION MODEL

Predictor	Coef.	SE Coef.	T	P
Constant	-.9673	0.5058	-1.91	0.058
Semester hours	-.00520	0.01740	-0.3	0.765
GPA	0.82611	0.08304	9.95	0.00
Attendance Percentage	0.014208	0.005706	2.49	0.014
S= 0.409018, R-Sq = 52.5%, R –Sq(adj) =51.5%				

It is clearly shown in from table 1 that percentage of attendance and the GPA are significant in the model, while the number of hours that the student is enrolled in a semester is not significant. The analysis of Variance ANOVA is shown in table II.

TABLE II
THE ANALYSIS OF VARIANCE (ANOVA) FOR THE FIRST MODEL

Source	DF	SS	MS	F	P
Regression	3	25.5241	8.5080	50.86	0.000
Residual Error	138	23.0868	0.1673		
Total	141	48.6109			

III. TEST OF SIGNIFYING FOR THE REGRESSION MODEL

We hold this test to examine if a linear relationship exists between the response Y (in this module the Course Grade) and the all mentioned previously variables. This formula generated using multiple linear regression analysis will predict what grade might be obtained by the student when the independent variables are known. The appropriate hypothesis to hold the test is:

Rejecting the null hypothesis means that at least one of the factors (independent variables we suggest) contributes significantly to the model. To prove the significance of our model, we took a significance level of $\alpha=0.05$ to the significance evaluated from the module (p-value = .000)..

IV. MEASURING THE MODEL ADEQUACY

In order to measure the strength of the regression model and that model gives a strong relationship between the dependent variable and independent variables, R2 should be calculated.

The determination factor contributes to the variability in data although we always desire high R2 as possible. We have to note here that high R^2 doesn't mean that the model is perfect.In our model R^2 was 0.525. We can say that the relationship between the variables and the response is not that strong since only 52.5% of the variation in Y can be explained by a linear relationship between the independent variable and the response.

It is assumed in this model that, the errors are normally and independently distributed with mean zero and constant but unknown variance. So it is important to check that our assumptions are valid or not. Fig. 1 illustrates Best Subsets Regression: grade versus Semester hrs, GPA, Attendance P. From fig. 2, it can be noticed from the plot of residuals vs. fitted values that there is no particular pattern between the them, in another word the relation is structureless which means that the variance is constant and no transformation is needed. From the normal probability plot we conclude that most of the points lie near a straight line (45 degree slope), therefore our assumption of the error is NID (0, 1) is valid. Based on the above analysis we conclude that the model is adequate.
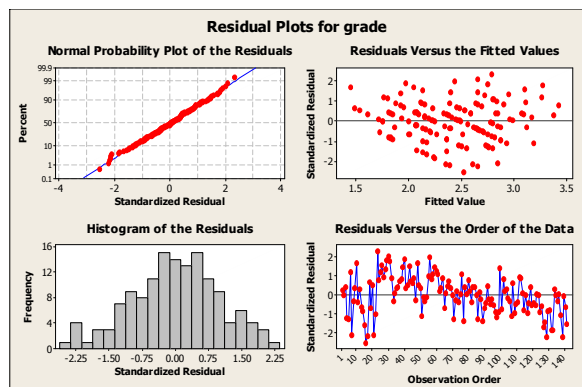
Fig. 2 First model adequacy check

Another relation that we need to understand is the relation between the semester GPA and semester hours that the student is enrolled in, the overall GPA and the attendance percentage. The regression model that explains that relation is:
Semester GPA = - 1.66 - 0.0014 Semester hours + 1.00 GPA + 0.0175 Attendance Percentage
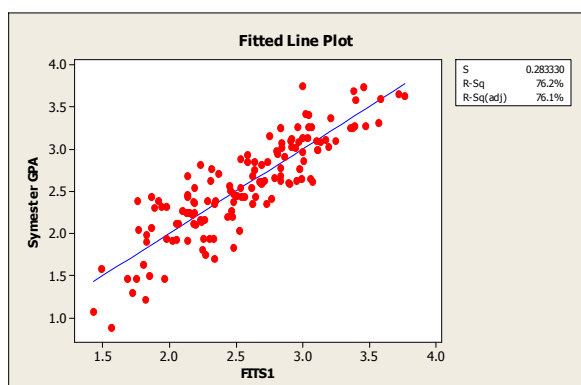
Fig. 3 illustrates the second model.

Fig. 3 Second model: Semester GPA = - 1.66 - 0.0014 Semester hours + 1.00 GPA + 0.0175 Attendance Percentage

The statistical analysis for the second model is shown in table III.

TABLE III
THE STATISTICAL ANALYSIS FOR THE SECOND MODEL

Predictor	Coef.	SE Coef.	T	P
Constatnt	-1.6587	0.4435	-3.74	0.000
Semester hours	-0.00144	0.01292	-.11	0.911
GPA	1.00151	0.05877	17.04	0.000
Attendance Percentage	0.017476	0.004656	3.75	0.000
S = 0.285406	R-Sq = 76.2%	R-Sq(adj) = 75.7%		

The analysis of variance for the second model is shown in table IV.

TABLE IV
THE ANALYSIS OF VARIANCE FOR THE SECOND MODEL

Source	DF	SS	MS	F	P
Regression	3	35.546	11.849	145.46	0.000
Residual Error	136	11.078	0.081		
Total	139	46.624			

It is clearly shown in the second regression model above that percentage of attendance and the GPA are also significant in the mode of semester GPA, while the number of hours that the student enrolled in a semester in is also not significant.

In the second model R^2 is 0.762. it can be concluded that the relationship between the independent variables and the response is not that strong since only 76.2% of the variation in Y can be explained by a linear relationship between the regressors and the response. This is still better than the first regression model for the grade.

It can be concluded also from the analysis of variance for the second model that the regression model is significant due to the fact that the p-value for the model is less than 0.05.
The second model adequacy check is explained in fig. 4. From the normal probability plot we conclude that most of the points lie near a straight line (45 degree slope) therefore, our assumptions of the error is NID (0, 1) is valid and the model is adequate.
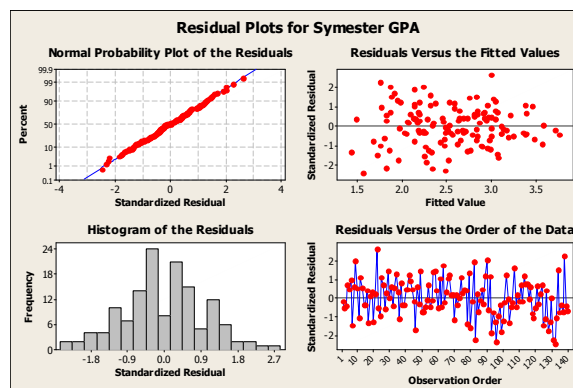

Fig. 4 The second model adequacy check

V. CONCLUSION

Based on the statistical analysis that has been done on the relation between the graded attained by the student and the percentage attendance, overall GPA, and the number of credit hours that the student is enrolled in at that semester it can be concluded that the overall Student's GPA and the attendance percentage are the most significant factors in determining the grade attained in a specific class. May be this is referred to some factors such as the way the instructors present their lectures and most of the exams' questions are from the material presented in the class but not explained in the power point slides that are posted online. Another reason for that may be the way in which the students are admitted in the Jordan Universities. The students apply to all universities and the government determines the high school grades that should each department should accept, and so each department takes the students that are capable to study at that department.

Because of that the overall GPA that the student attain in his university study reflect his ability to get a good grade in the university.

For the second model, the relation between the semester GPA and the attendance percentage, the number of the credit hours that the student has enrolled in at specific semester and the overall GPA has been studied. It is concluded from that model that semester GPA is only affected strongly by two factors; the attendance percentage and overall GPA. The results from the two models give a great indication that attendance has a significant effect on the course grade attained.

REFERENCES

[1] J. O. Ajiboye, and A. Tella. "Class attendance and gender effects on undergraduate students' achievement in a social studies course in Botswana" Essays in Education, 18, pp.1–11, 2006.

[2] R. Moore, " Attendance and performance: How important is it for students to attend class? "Journal of College Science Teaching, 32, pp.367–371, 2003.

[3] R. Moore, " The importance of admissions scores and attendance to first-year performance" Journal of the First-Year Experience and Students in Transition, 18, pp.105–125, 2006.

[4] R. Moore, M. Jensen, J. Hatch, I. Duranczyk, S. Staats, and L. Koch, "Showing up: The importance of class attendance for academic success in introductory science courses". American Biology Teacher, 65, pp. 325–329, 2003.

[5] S. B. Berenson, G. Carter, and K. S. Norwood "The at-risk student in college developmental algebra" .School Science and Mathematics, 92 (2), pp. 55-58. 1992

[6] S. Devadoss, and J. Foltz "Evaluation of factors influencing student class attendance and performance" .American Journal of Agricultural Economics, 78(3), pp. 499-508, 1996.

[7] C. S. Hammen, and J. L. Kelland, " Attendance and grades in a human physiology course". The American Journal of Physiology, 267(6),pp. S105-108, 1994.

[8] M. E. Thompson and B. C. Plummer. " Remedial college freshmen English students: Description and characteristics". Reading Horizons, 19(3), pp. 248-255, 1979.

[9] R. M. Hyde and D. J. Flournoy " A case against mandatory lecture attendance" . Bulletin of the Psychonomic Society, 24, pp.63-64, 1986.

[10] M. Crede. S. G. Roch and U. M. Kieszczynka " Class Attendance in College : A Meta-Analytic Review of the Relationship of Class Attendance With Grades and Student Characteristics". Review of Educational Research. Vol. 80, No. 2, pp. 272–295, 2010

[11] N. J. Cepeda, H. Pashler, E. Vul, J. T. Wixted, and D. Rohrer " Distributed practice in verbal recall tasks: A review and quantitative synthesis". Psychological Bulletin, 132, pp. 354–380, 2006.

[12] W. L. Cull " Untangling the benefits of multiple study opportunities and repeated testing for cued recall". Applied Cognitive Psychology, 14, pp. 215–235, 2000.

[13] N. Peladeau, J. Forget and F. Gagne " Effect of paced and unpaced practice on skill application and retention: How much is enough?" American Educational Research Journal, 40, pp. 769–801, 2003.

[14] S. L. Brooke "Using the case study method to teach online classes: Promoting Socratic dialogue and critical thinking skills". International Journal of Teaching and Learning in Higher Education, 18, pp. 142–149, 2006.

[15] D. Bligh "What's the use of lectures? (5th ed.). San Francisco: Jossey-Bass. 1998

[16] S. J. Dollinger, A. M. Matyja, and J. L. Huber " Which factors best account for academic success: Those which college students can control or those they cannot? "Journal of Research in Personality, 42 (4), pp. 872-885, 2008.

[17] F. H. Turner " A study in the relation of class attendance to scholastic attainment". School and Society (26), pp. 22-24, 1927.

[18] C. H. Jones " Class attendance and college marks". College and Society (116), pp. 444-446, 1931.

[19] M. A. Clump, H. Bauer, and A. Whiteleather " To attend or not to attend: Is this a good question?" Journal of Instructional Psychology (30), pp. 220-224, 2003.

[20] S. E. Gump " The cost of cutting class: Attendance as a predictor of student success". College Teaching (53), pp. 21-26, 2005.

[21] L. Newman-Ford, K. Fitzgibbon, S. Lloyd, and S. Thomas " A large-scale investigation into the relationship between attendance and attainment: A study using an innovative, electronic attendance monitoring system". Studies in Higher Education, 33, pp. 699–717, 1999.

[22] T. L. Hansen "Apositive reinforcement program for controlling student absenteeism". College Student Journal, 24, pp. 307–312, 1990.

[23] K. E. Lloyd, W. K. Garlington, D. Lowry, H. Burgess, H. A. Euler, and W. R. Knowlton "Anote on some reinforcing properties of university lectures". Journal of Applied Behavior Analysis, 5, pp. 151–155, 1972.

[24] M. F. Hovell, R. L. Williams, and G. Semb "Analysis of undergraduates' attendance at class meetings with and without grade-related contingencies: A contrast effect". Journal of Educational Research, 73, pp. 50–53, 1979.