Class Attendance, MS Excel® Lab Sessions, and Student Performance in Business Statistics Courses

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Abstract

We study how class attendance and Microsoft Excel® intensive lab sessions impact student performance in business statistics courses. We measure student performance with test scores, and find that while Excel lab sessions unequivocally improve student performance, regular lectures only help students in traditional courses.

Keywords: Attendance, Microsoft Excel ®, Student Performance, Business Statistics

Introduction

As educators, we spend a good deal of time and energy preparing lectures and thinking of the best way to deliver material to our students. Unfortunately, our students do not always show up to hear our lectures. In fact, we - the authors of this paper - regularly have less than fifty percent attendance in our classes, a not too uncommon occurrence in American Colleges (see e.g., Romer 1993).

Absenteeism becomes a problem when student performance suffers, as most of the literature suggests. For example, Lamdin (1996) finds that elementary students who attend class regularly score better in standardize tests, while Romer (1993), Marburger (2001), Clump et al. (2003), Gump (2005), Bisping and Patron (2006), and Rochelle and Dotterweich (2007) find a negative and significant relationship between absenteeism and student performance. An exception to the above mentioned papers is Browne et al. (1998), who do not find a relationship, positive or otherwise, between attendance and performance.

Romer (1993) finds that students in an intermediate macroeconomics class can earn a full letter grade higher in the course by attending lessons regularly, while Marburger (2001) finds that students who skip principles of microeconomics lectures are more likely to miss test questions discussed during classes from which they were absent. Clump et al. (2003) find a similar result in a general psychology course: students who were present during unannounced quizzes perform better in subsequent tests. Gump (2005) also finds a negative and strong correlation between absenteeism and test performance in a general education course, while Patron and Bisping (2006) find a positive correlation between class attendance and exam performance in an introductory business course. Finally, Rochelle and Dotterweich (2007) find that absences negatively influence test performance in business statistics courses.

In this paper we also study the impact of class attendance on student performance. We focus on business statistics courses, but unlike previous studies we look at hybrid courses with optional lectures and compare them with traditional courses in which class attendance is expected.

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Furthermore, we look at the impact of attendance to two different types of lessons: regular lectures and Microsoft Excel ® intensive laboratory sessions.

The rest of the paper is organized as follows. In the next section we describe our data and methodology, followed by our estimations and discussion of results. At last we conclude and discuss possible extensions of this study.

Data and Methodology

We study two business statistics classes from a midsize public university. The two classes met during the spring semester of 2011. Section 1 was a hybrid class. Students in this class met with the instructor once a week. They had videos, narrated Power Point® presentations and practice problems assigned to work on during non-class time. Section 2 was a regular class that met twice a week. Once a week students met with the same instructor from Section 1 for a regular lecture, and once a week they met with a different instructor in a computer lab. The focus of the lab meetings was to teach the same concepts students were learning in the regular lecture but using Microsoft Excel. Students in Section 2 also had access to the same videos, narrated Power Point® presentations, and practice problems that students in Section 1 had access to.

There were 35 students registered in Section 1 and 60 in Section 2. Over 60% of students in each class were male and more than half were White. Both classes had an average GPA of about 2.8. As can be seen in Table 1 the composition of the two classes was fairly similar.

Table 1: Descriptive Statistics

Descriptive Statistics		
	Section 1 (Lecture Only)	Section 2 (Lecture & Excel Lab)
Number of Students Enrolled in the Class	35	60
Percent of Student who are White (Non-Hispanic origin)	60.00%	58.33%
Percent of Male Students in the Class	62.86%	66.67%
Average Age	22.64	22.07
GPA average	2.80	2.81
Average Earned Hours	75.15	74.33
Average Enrolled Hours	13.23	13.32
Average Test Score	76.19	73.91
Test Standard Deviation	20.47	19.14
Test Observations	130.00	223.00
Average Number of Lectures Attended Before Test	1.59	1.23
Average Number of Excel Lab Sessions Attended Before Test	0.00	1.01

We use data from these classes to study how class attendance and the Excel hands-on instruction influence student performance in business statistics courses. We measure performance using test grades. There four tests during the semester, roughly three to four weeks apart. Test data were obtained from instructor records. Since there were 95 students registered in the two classes, if all students had taken all four tests we would have had 380 observations. However, some students missed tests while others dropped the class. As a result we have a total of 353 observations.

We first estimate the relationships between test scores and attendance to lectures and Excel labs using linear models as follows:

$$\text{Test} = \alpha_1 + \alpha_2 \text{ Lectures Attended Before Test} + \varepsilon \quad (1)$$

$$\text{Test} = \beta_1 + \beta_2 \text{ Labs Attended Before Test} + \mu \quad (2)$$

where Lectures Attended Before Test and Labs Attended Before Test measure the number of regular lectures and lab sessions students sat in prior to each test. Attendance was kept by the instructors who ran each session. There were approximately three to four lectures and lab sessions before each exam. As can be seen in Table 1, students in both sections attended an average 1.4 lectures before each test. Students in section 2 also attended an average of 1.4 lab sessions before each test. α_1, α_2, β_1 and β_2 are parameters to be estimated, and ε and μ are error terms.

After determining the relationship between attendance and test scores we include more explanatory variables in our estimations. More specifically, we estimate the following educational production function:

$$\begin{aligned}\text{Test} = {} & \chi_1 + \chi_2 \text{ Age} + \chi_3 \text{ Male} + \chi_4 \text{ White} + \chi_5 \text{ Earned Hours} + \chi_6 \text{ Enrolled Hours} + \chi_7 \text{GPA} \\ & + \chi_8 \text{ Lectures Attended Before Test} + \chi_9 \text{ Lab Sessions Attended Before Test} + \omega\end{aligned} \quad (3)$$

where Age is a numeric variable that measures student age in years. It stands in as a proxy for student maturity; as such, we expect older students to perform better than younger students. GPA is the student cumulative grade point average. We use GPA as a proxy for aptitude and expect students with higher GPAs to score higher on tests. Male is a dummy variable that equals one if the student is male and zero if the student is female. White is a dummy variable if the student is White of non-Hispanic origin and zero otherwise. Gender and race are included in the study mostly for control purposes as is typically done in the literature. Earned Hours denotes the number of credit hours earned by the student prior to the beginning of the semester and Enrolled Hours denotes the number of credit hours the student was currently enrolled in. While we expect students who are further along in their college careers to perform better than students newer to the college experience (all else equal), we do not have a priori expectations about the relationship between current workload and test performance. Although it is possible that students with a heavier load have less time to devote to each course, they might also be the most motivated students. Age, Male, White, GPA, Earned Hours, and Enrolled Hours were obtained from university records. The terms χ_1 through χ_9 are parameters to be estimated and ω is the error term.

We estimate the performance functions using Ordinary Least Squares for each section separately and for the two sections combined. Results from our estimations are provided in the next section.

Results

We estimate equations (1) through (3) using Ordinary Least Squares. Table 2 shows the results for the two classes combined. The first column shows the relationship between test scores and lectures attended. The relationship is positive and very significant. The R square of the first regression shows that Lectures Attended explains about 4% of the variation in test scores. The second column shows that attendance to lab sessions also has a positive and significant effect on exam performance and helps explain 3% of the variation in test scores. When we estimate equation (3), we see that Lectures Attended and Lab Sessions Attended are still significant, although the coefficients and significance levels go down slightly. This is likely the result of correlation between independent variables (see Table 3).

Table 2: Regression Analysis Full Sample

Dependent Variable = Test Score						
	Lectures Attended Only		Lab Sessions Attended Only		Complete Model	
	Coefficient	P Value	Coefficient	P Value	Coefficient	P Value
Constant	70.07	0.00	71.80	0.00	26.95	0.03
Age					-0.14	0.64
Male					4.53	0.04
White					0.43	0.83
Earned Hours					0.06	0.38
Enrolled Hours					-0.37	0.35
GPA					15.22	0.00
Lectures Attended Before Test	3.25	0.00			2.27	0.01
Lab Sessions Attended Before Test			4.35	0.00	3.66	0.00
R Square	0.04		0.03		0.29	
F-statistic	12.75		12.17		10.97	
Probability (F-statistic)	0.00		0.00		0.00	

The complete model reveals that male students score, on average, 4.53 points higher on tests than female students. Also, students with higher GPAs perform higher on tests, as expected. Finally, for each lecture attended before a test, students score 2.27 points higher on tests and for each lab session attended students score 3.66 points higher on tests. Attendance to lectures and lab sessions are both significant at the 1% level.

Table 4 shows the estimation of equations (1) and (3) using only students from Section 1. The first column reveals a positive and significant relationship between Lectures Attended Before Test and test scores. Lectures Attended explains 3% of the variation of test scores. However, the significance of this relationship diminishes to a marginal 12% level when we control for other characteristics such as Age, Male, GPA, etc. As the second column of Table 4 shows only Earned Hours and GPA are statistically significant at traditional levels. However, the relatively low significance of attendance is likely the result of the correlation between Lectures Attended and GPA.

Table 3: Correlation Coefficients (Full Sample)

	Test	Age	Male	White	Earned Hours	Enrolled Hours	GPA	Lectures Attended	Labs Attended
Test	1.00								
Age	0.03	1.00							
p value	0.52	-----							
Male	-0.06	0.03	1.00						
p value	0.23	0.56	-----						
White	-0.02	0.01	0.01	1.00					
p value	0.77	0.88	0.88	-----					
Earned Hours	-0.14	0.26	0.07	-0.04	1.00				
p value	0.01	0.00	0.22	0.49	-----				
Enrolled Hours	0.00	-0.34	0.06	-0.06	-0.16	1.00			
p value	0.96	0.00	0.27	0.26	0.00	-----			
GPA	0.41	0.06	-0.36	-0.01	-0.39	0.03	1.00		
p value	0.00	0.30	0.00	0.84	0.00	0.62	-----		
Lectures Attended	0.21	-0.06	-0.07	-0.10	-0.09	0.08	0.26	1.00	
p value	0.00	0.24	0.18	0.06	0.09	0.12	0.00	-----	
Labs Attended	0.18	0.08	-0.08	-0.07	-0.10	0.11	0.15	-0.08	1.00
p value	0.00	0.14	0.13	0.19	0.06	0.04	0.01	0.14	-----

Finally, Table 5 shows the estimations of equations (1) through (3) using students from Section 2 only. The results are very similar to the full sample estimation. When only Lectures Attended is included in the estimation we can explain 3% of the variation in test scores. When only Lab Sessions Attended is included we can explain 13% of the variation in scores. Finally, both variables remain significant when controlling for age, gender, race, GPA, workload, and experience. More specifically, each lecture attended before the test increases test scores by 2.66 points on average, and each lab session attended increases test scores by 6.99 points on average. GPA and Male are also significant.

Table 4: Regression Analysis Restricted Sample (Section 1 only)

Dependent Variable = Test Score				
	Lectures Attended Only		Complete Model	
	Coefficient	P Value	Coefficient	P Value
Constant	71.88	0.00	6.73	0.81
Age			-0.21	0.76
Male			2.35	0.57
White			5.54	0.17
Earned Hours			0.26	0.02
Enrolled Hours			0.25	0.77
GPA			15.41	0.00
Lectures Attended Before Test	2.56	0.03	1.95	0.12
R Square	0.04		0.22	
F-statistic	4.70		4.72	
Probability (F-statistic)	0.03		0.00	

Table 5: Regression Analysis Restricted Sample (Section 2 only)

Dependent Variable = Test Score						
	Lectures Attended Only		Lab Sessions Attended Only		Complete Model	
	Coefficient	P Value	Coefficient	P Value	Coefficient	P Value
Constant	68.20	0.00	64.69	0.00	27.58	0.05
Age					-0.05	0.87
Male					4.69	0.08
White					-0.47	0.84
Earned Hours					-0.07	0.33
Enrolled Hours					-0.04	0.92
GPA					14.00	0.00
Lectures Attended Before Test	4.40	0.01			2.66	0.06
Lab Sessions Attended Before Test			8.57	0.00	6.97	0.00
R Square	0.03		0.13		0.29	
F-statistic	7.99		33.46		10.97	
Probability (F-statistic)	0.01		0.00		0.00	

Conclusions

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