

ATTENDANCE, GRADES AND LEARNING IN THE MICROECONOMIC PRINCIPLES CLASS

John J. Bethune, Barton College

ABSTRACT

This paper explores the relationship between attendance and learning in the microeconomic principles course. Using pre and post testing to measure learning, attendance, as well as several other factors are studied as possible explanatory variables as to how well students perform in microeconomics classes where attendance was voluntary. The outcome suggests that attendance did not significantly affect learning but was an important factor with respect to the grades students earned in the course. The strongest predictor of both student learning and student grades was prior academic success, as measured by the students' current GPA.

INTRODUCTION

How important is class attendance to student success in a college course? Many institutions, especially the smaller ones that emphasize personal attention, view it as valuable enough to maintain mandatory attendance policies. Prior research also indicates that attendance is positively associated with student success.

This paper addresses the relationship between student success and attendance in the principles of microeconomics offered at a relatively small liberal arts college with students of average ability.

SAMPLE OF PRIOR RESEARCH

In a recent study Chen and Lin cite several researchers in the field of education and psychology that “have generally found that a student’s class attendance has a positive effect on exam performance.” [2008, p. 214] Similar results are also noted with respect to studies of economics principles courses that conclude “the more lectures a student attends, the better overall grade he or she

obtains.” [2008, p. 214] These conclusions reflect the consensus view from the broad array of literature on the subject.

While the literature clearly supports a significant link between attendance and performance in class, a plethora of caveats abound. Romer notes that “Absenteeism is rampant in undergraduate economics courses at major American universities.” [1993, p. 173] Attendance averaged only 67 percent in Romer’s data set. [Though this study is somewhat dated, current research does not indicate that attendance rates have improved.] This might be indicative of the perceived quality of instruction received in what are primarily research institutions. If students perceive that the return on attendance is higher, they may attend more classes. This may imply that smaller class sizes and institutions that emphasize teaching should experience higher rates of attendance.

Further, as noted by Stanca, attendance is not exogenous, especially when it is voluntary, but is a function of “unobservable characteristics, such as ability, effort, and motivation, that are also likely to determine performance.” [2006, p.252] Stanca also goes on the note that test scores may not be a good indication of learning. [2006, p. 263]

Durden and Ellis find that absenteeism does affect achievement in the principles of economics course, but that it is nonlinear and becomes important after a student misses four classes. [1995] The authors do not have an explanation for this “threshold effect,” but note that it might be due to the fact that better students make attending class a priority.

Marburger uses a controlled experiment and concludes that there is “an inverse relationship between absenteeism and student performance” and that it is significant but “does not appear to be substantial.” [2006, p. 154] This study used student performance on specific test questions where the material was covered in the class when the students were absent. In an earlier work Marburger had found that “the mean exam score was significantly affected by absenteeism.” [2001, p.107] He goes on to note that this impact is likely to be institution and instructor specific.

Finally, Armstrong points to conflicting studies to challenge the conventional wisdom that mandatory attendance is positively correlated with learning. [2004] He reasons that students who attend voluntarily should learn more than those required to attend. Those required to attend might assume they have met the class requirements and see no need to learn outside the classroom.

This brief sample of prior research represents what might be found in a more exhaustive review. It also summarizes some issues that will also be addressed in this paper. Previous efforts have focused on attendance in large lecture style class where

adequate sample sizes are easily achieved. This paper will address the importance of attendance in smaller classes, numbering no more than 30 students.

DEFINING LEARNING

Virtually all of the prior studies have used exam scores and course grades to define student success. Such an approach does not take into account the prior knowledge base that students bring to a class. To control for this, I use pre and post testing and define learning as the gains made by the students on the test. The specifics are described below. In economics we are fortunate to have a nationally normed test that can be used for this purpose.

THE DATA

Over the past two academic years six sections of the principles of microeconomics classes were taught by the author at a small liberal arts college that places a strong emphasis on teaching excellence. In each class the *Test of Understanding in College Economics* (TUCE) [2007] was given on the first day (pretest) and used as part of the final examination (posttest). Any student that did not complete both tests was excluded from this study. This resulted in 131 students being included. Attendance using a seating chart was taken on a daily basis. The average number of absences was 3.50, in classes that met for lecture/discussion a total of 36 times. This implies an attendance rate of 90.3 percent that would be considerably higher than the rate used in the prior studies and probably reflects a structural difference between small classes and large lecture classes, or small colleges and large universities.

Additional background information was obtained on each student from the Registrar's Office for overall GPAs and SAT scores. The GPA variable is used as an indicator of prior academic success and the SAT variable is included as a measure of college level preparedness. Since the College uses a plus/minus grading system, final course grades were coded as A = 1, A- = 2, B+ = 3, etc.

ANALYSIS AND RESULTS

To address the question of the importance of attendance to student learning several correlation coefficients were calculated. Defining learning as pretest to

posttest differences by individual students' TUCE scores and calculating a simple correlation results in the following:

$$\begin{aligned}\text{Pearson correlation of Difference and Absences} &= -0.209 \\ \text{P-Value} &= 0.017\end{aligned}$$

Defining the null hypothesis as there being no correlation between absences and learning, it appears we can reject this hypothesis at the 95 percent confidence level (based on the P-Value) and conclude there is a negative and significant relationship between absences and learning.

If we define the null hypothesis as there being no correlation between absences and course grades we get these results:

$$\begin{aligned}\text{Pearson correlation of Absences and Course Grade} &= 0.434 \\ \text{P-Value} &= 0.000\end{aligned}$$

We can reject the null hypothesis at the 99 percent confidence level and conclude there is a significant negative correlation between course absences and course grades (the positive sign is due to the assignment of low values to the higher grades, i. e. A = 1, and high values to the lower grades, i. e. F = 12). It is also notable that the value of the coefficient is more than twice the value of the one calculated for the correlation between absences and student learning.

Since the Durden and Ellis study found that nonlinearity existed, I used two sample t-tests to see if any such effects were present in these data. Dividing the class into two groups several times (those with fewer than 3 absences verses those with 3 or more absences, those with fewer than 4 absences verses those with 4 or more absences, etc.) the greatest disparity in the two groups occurred at a threshold of 4 absences. The results were:

Students who missed 4 or fewer classes average a post test gain of 8.11, while those with 5 or more absences averaged a gain of only 5.16. The T-Value and P-Value both indicate that the different means are significant.

Two-sample T for Difference				
ab lt 5	N	Mean	StDev	SE Mean
0	37	5.16	4.96	0.82
1	94	8.11	5.08	0.52
Difference = mu (0) - mu (1) Estimate for difference: -2.944 95% CI for difference: (-4.878, -1.010) T-Test of difference = 0 (vs not =): T-Value = -3.04 P-Value = 0.003 DF = 67				

A threshold of 4 absences was also the most significant determinant for performance on the course grade. The results were

Two-sample T for Course Grade				
ab lt 5	N	Mean	StDev	SE Mean
0	37	7.54	3.24	0.53
1	94	4.79	2.69	0.28
Difference = mu (0) - mu (1) Estimate for difference: 2.753 95% CI for difference: (1.551, 3.955) T-Test of difference = 0 (vs not =): T-Value = 4.59 P-Value = 0.000 DF = 56				

Both the T-Value and the P-Value indicate that the difference between the means is significant. Students with 4 or fewer absences received an average grade of 4.79 (B to B-) and students that missed 5 or more classes average a grade of 7.54 (C to C+). The results were not as significant when the threshold for absences was altered in either direction, leading to the conclusion that, in this instance, students missing 4 or fewer classes performed significantly better in terms of their overall course grade. This was the same threshold value found in the Durden and Ellis study.

To further examine relationships and feedback affects the following correlations were run:

	Difference Absences	SAT	GPA	Course G	Gender
Absences	-0.209	0.017			
SAT	0.365	-0.110			
	0.000	0.210			
GPA	0.470	-0.506	0.498		
	0.000	0.000	0.000		
Course G	-0.597	0.434	-0.528	-0.749	
	0.000	0.000	0.000	0.000	
Gender	-0.177	0.069	-0.136	0.011	0.140
	0.044	0.433	0.121	0.901	0.111
Cell Contents: Pearson correlation P-Value					

The calculations indicated that such factors as the students' SAT scores and GPAs are strongly correlated with both their gains on the TUCE and their course grades. The students' gender did not show a strong significant relationship to any variable. The SAT score does not correlate significantly with student absenteeism, but there is a significant negative association with absenteeism and GPA.

Since simple correlation does not offer any insight for explanatory power, regression analysis was performed on the data. Including some of the above p potentially explanatory variables yields the following results:

Regression Analysis: Difference versus SAT, GPA, Absences				
The regression equation is				
Difference = - 7.41 + 0.00683 SAT + 0.0297 GPA + 0.011 Absences				
Predictor	Coef	SE Coef	t	P
Constant	-7.414	3.161	-2.35	0.021
SAT	0.006834	0.003582	1.91	0.059
GPA	0.029666	0.007996	3.71	0.000
Absences	0.0110	0.1474	0.07	0.941
S = 4.573 R-Sq = 24.4% R-Sq(adj) = 22.6%				

With respect to gains from pretest to posttest score, absences and SAT score show no significant contribution. The dominate explanatory variable is GPA. Given the value of the adjusted R-Square there would appear to be other influences not being captured by this model.

The results are essentially the same in a step-wise regression analysis:

Stepwise Regression: Difference versus Absences, SAT, GPA		
Alpha-to-Enter: 0.15 Alpha-to-Remove: 0.15		
Response is Differen on 3 predictors, with N = 131		
Step	1	2
Constant	-2.407	-7.342
GPA	0.0360	0.0294
T-Value	6.05	4.33
P-Value	0.000	0.000
SAT		0.0069
T-Value		1.97
P-Value		0.052
S		4.61
R-Sq	22.13	24.41
R-Sq(adj)	21.52	23.23
C-p	3.8	2.0

The GPA variable remains strong with the SAT score offering some explanatory power. Note absences did not contribute at a significant enough level to be included in the equation.

For performance in the course (course grade), the results were:

Regression Analysis: Course Grade versus SAT, GPA, Absences				
The regression equation is Course Grade = 17.5 - 0.00539 SAT - 0.0263 GPA + 0.114 Absences				
Predictor	Coef	SE Coef	t	P
Constant	17.489	1.367	12.79	0.000
SAT	-0.005390	0.001549	-3.48	0.001
GPA	-0.026251	0.003458	-7.59	0.000
Absences	0.11371	0.06376	1.78	0.077
S = 1.978 R-Sq = 60.3% R-Sq(adj) = 59.3%				

As with pretest and posttest difference, there is no indication that absences have a significant effect on course grade, and GPA dominates the equation. An interesting difference is that the SAT offers some explanatory power with respect to course grade (that it did not with the learning proxy). The adjusted R-Square indicates that the equation is offering a fuller explanation of what determines a student's grade in the course.

The stepwise results were:

Stepwise Regression: Course Grade versus Absences, SAT, GPA			
Alpha-to-Enter: 0.15 Alpha-to-Remove: 0.15 Response is Course G on 3 predictors, with N = 131			
Step	1	2	3
Constant	14.76	18.24	17.49
GPA	-0.0342	-0.0295	-0.0263
t-Value	-12.83	-9.93	-7.59
P-Value	0.000	0.000	0.000
SAT		-0.0049	-0.0054
t-Value		-3.17	-3.48
P-Value		0.002	0.001

Stepwise Regression: Course Grade versus Absences, SAT, GPA			
Alpha-to-Enter: 0.15 Alpha-to-Remove: 0.15 Response is Course G on 3 predictors, with N = 131			
Step	1	2	3
Absences			0.114
t-Value			1.78
P-Value			0.077
S	2.06	1.99	1.98
R-Sq	56.06	59.27	60.26
R-Sq(adj)	55.72	58.63	59.32
C-p	13.4	5.2	4.0

In this instance, the GPA and SAT variable remain significant, as was the case in the prior model, and absences do contribute enough to warrant inclusion, unlike the step-wise regression with difference as the dependence variable.

To examine whether absenteeism is related to GPA and SAT the following regression was run:

Regression Analysis: Absences versus SAT, GPA				
The regression equation is Absences = 6.64 + 0.00462 SAT - 0.0284 GPA				
Predictor	Coef	SE Coef	t	P
Constant	6.637	1.802	3.68	0.000
SAT	0.004620	0.002108	2.19	0.030
GPA	-0.028417	0.004083	-6.96	0.000
S = 2.742 R-Sq = 28.3% R-Sq(adj) = 27.2%				

It is clear, as was suggested by the correlation coefficients, that absenteeism has a strong negative association with GPA (the higher the GPA, the fewer the absences). However, it is interesting to see that SAT has a positive and somewhat significant association, perhaps indicating that students with higher SAT scores see less of a reason to come to class.

SUMMARY AND INTERPRETATION OF RESULTS

This paper has addressed an array of results that are derived from a data set developed from my Principles of Microeconomics classes over the last two years. Some observations:

- 1) While the literature suggests that absenteeism is rampant in economics classes at American universities, this is not the case for principles of microeconomics classes at my College. Future collaborative projects with colleagues at other small liberal arts colleges will determine whether this fact might be generalized to show a deeper contrast with the larger universities.
- 2) Absenteeism has a significant correlation with learning. That is, higher rates of absences correlate with lower levels of performance from pre to post test results (the learning proxy).
- 3) Absenteeism is even more highly correlated with the grades students receive in the course.
- 4) This paper further confirms the threshold effect identified by Durden and Ellis that suggests that students missing more than 4 classes as a group do significantly less well than those students that miss 4 or fewer classes. This implies the existence of nonlinearity between absenteeism and course grades. This paper found this to be true both for course grades and the learning proxy.
- 5) Student GPA and SAT scores were significantly correlated with both learning and course grade. SAT scores did not correlate significantly with absenteeism, but GPA was strongly associated with absenteeism, with students earning higher GPAs also being more likely to attend class.
- 6) The regressions that used the learning proxy (difference) as the dependent variable did not reveal any explanatory power with respect to absenteeism, and only some significance to SAT scores. GPA was a strong explanatory independent variable, though the value of the adjusted R-Square indicated that it was not a strongly predictive model.

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- 7) When the course grade was the dependent variable, both GPA and SAT scores carried significant explanatory power. Absenteeism did have a stronger relationship to course grade (compared to learning), but it was the weakest of the three independent variables used in the model.
 - 8) When SAT and GPA were regressed on absences there was a strong negative relationship with GPA, indicating that students that make good grades generally come to class. The positive and significant relationship of SAT to absences indicates that students that might have been (predicatively) better prepared academically to enter college are less likely to attend class.

While this paper cannot conclude that attendance is not important to classroom learning, it does weaken the case made in prior studies. Since course grades reflect more on overall class performance, it is reasonable to expect attendance matters, and this study supports this supposition. For future studies, including a measure of learning that involves pre and post testing might yield different results than those that only used course grades as indicators of success in the classroom.

REFERENCES

- Armstrong, J. S. (2004). Would Mandatory Attendance be Effective for Economics Classes? *General Economics and Teaching*, 0412018, EconWPA. Retrieved February, 20, 2010, from <http://ideas.repec.org/p/wpa/wuwpgt/0412018.html>
- Chen, J. & T. Lin (2008). Class Attendance and Exam Performance: A Randomized Experiment. *Journal of Economic Education*, 39(3), 213-227.
- Durden, C. & V. Ellis (2008). The Effects of Attendance on Student Learning in Principles of Economics. *American Economic Review*, 85(2), 343-46.
- Marburger, R. (2001). Class Absenteeism and Undergraduate Exam Performance. *Journal of Economic Education*, 32(2), 99-110.
- Marburger, R. (2006). Does Mandatory Attendance Improve Student Performance?. *Journal of Economic Education*, 37(2), 148-55.
- Romer, D. (1993). Do Students Go to Class? Should They?. *Journal of Economic Perspectives*, 7(3), 167-74.

Stanca, L. (2006). The Effects of Attendance on Academic Performance: Panel Data Evidence for Introductory Microeconomics. *Journal of Economic Education* 37(4), 251-66.

Walstad, W., M. Watts and K. Rebeck (2007). *Test of Understanding in College Economics*. (Fourth Edition). New York, NY: National Council on Economic Education.

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