Correlation between Absences and Final Grades in a College Course

Bolivar A. Senior
Colorado State University
Fort Collins, Colorado, USA

Individual final grades were statistically correlated to the percentage of sessions that each student was absent in a longitudinal study of a senior level, required course in Financial Management for a baccalaureate degree in Construction Management. Attendance was recorded in four consecutive semesters taught by the author, with an average of 98.5 registered students. Results show an average absenteeism of 24.4% and a strong correlation between the percentage of missed classes and the final grade obtained by students.

Key Words: Undergraduate Education, Class Attendance, Construction Management Education

Introduction

Is the final grade of a student affected by the percentage of missed class sessions? The longitudinal study discussed here addresses this question by comparing the attendance record with the earned final grade of each student in a class taught by the author. The pedagogical and emotional weight carried by the topic of class attendance makes this study relevant to many instructors. If this study showed that final grades were not related to attendance, it would help the view of instructors who oppose requiring attendance as a matter of principle: it would mean that, at least for the case studied here, students attending class did not perform differently from their peers staying home. However, the opposite scenario of this study – showing an association between attendance and final grades – could not be construed as redeeming those instructors requiring attendance, since statistical correlation does not imply a relation of causality between the analyzed variables.

The connection between attendance and academic achievement has been the subject of numerous studies in a wide variety of courses such as Japanese Cculture (Gump, 2005), Economics (Marburger, 2001; Romer, 1993; Durden and Ellis, 1995)), Psychology (Van Blerkom, 1990), and Child Development (Hovell et al., 1979). Academic achievement has been measured by their ability to correctly answer questions in optional quizzes (e.g., Marburger, 2001; Schmidt, 1983, Clump et al., 2003), or directly from their course grades (e.g., Romer, 1993).

While a relatively few studies have failed to find a significant correlation between attendance an academic performance (Berenson et al., 1992; Levine, 1992; Hyde and Flournoy, 1986), the overwhelming majority of them (e.g., Gump, 2005; Clump et al., 2003; Marburger, 2001, and nearly all others referenced here) have found a positive correlation between attendance and academic performance. Romer (1993) found that "a student who attends only a quarter of the lectures on average earns a 1.79 (C-), while a student who attends all of the lectures on average earns a 3.44 (B+)." In his study, Romer found that attendance alone accounted for 31 percent of the variance in performance, which is a small proportion compared to the results of Gump (2005), who found a correlation of -0.861 between absences and grades when Fs were included

in the sample, and up to 0.92 in the study by Clump et al. (2003). In many cases, attendance is one of the variables in a comprehensive model attempting to explain student behavior (Gump, 2005; Devadoss and Folt, 1996; Koppenhaver, 2006). Supplementary variables typically include the student's GPA, whether the class is required or elective, and the student scores in homework and exams.

Class attendance has been measured at about two-thirds of the class by Romer (1993), and between 81% and 59% by Williams and Semb (1979), in their case depending on whether unannounced quizzes were given in different sections of the same course. Van Blerkom (1990) found an average attendance of 87.8%, which varied from 93.1% in the first two weeks of the semester to 82.0% in the last two weeks. Not surprisingly, studies have found that attendance is improved when it is tied to grades (Launius, 1997;, Friedman et al., 2001).

Many of the above studies take a position in favor or against requiring students to attend class. Advocates for having no class attendance policy (e.g., St. Clair, 1999, Stephenson and Deere, 1994) tend to be more vocal than those in favor of one, since these detractors frequently assert moral imperatives that trump any further discussion. In fact, requiring attendance can be a controversial career move, which few instructors are willing to publicly endorse (Senior, 2007). Although this study is neutral about the merits of requiring attendance, the author includes a brief reflection on the importance of this topic in the Conclusions of this paper.

Objective

This paper presents and discusses the results of a study performed over two full academic years. During this period, class attendance was recorded through sign in sheets passed around to the students and the total number of absences was compared to the adjusted final grade obtained by each student. The objective of the study was to find the level of correlation between these two variables (number of absences and final grades), and does not include an analysis of causality between the two.

Background: The course and its students

MC 462, Financial Management for Construction, is a required three-credit course in the Construction Management (CM) baccalaureate degree at Colorado State University. The class meets twice per week in 75-minute sessions. The CM program has experienced an unusually large increase in its number of students, bringing the typical number of students from 89 in fall 2005, the first semester covered by this study, to 106 in spring 2007, the last one included here. Two or three sections were offered in each of those semesters, and the author was the sole instructor for all sections.

Grades were assigned considering homework assignments (45%), two midterms and one final exam (45%), and participation /and attendance (10%). The last semester, spring 2007, included a group project worth 20% of the grade, carved from the proportion for exams and homework (each one contributing 35% instead of 45%). Typically, one half to two thirds of the class earns

grades of A or B, with the remaining fraction earning C, D and F letter grades. Total students at the end of the semester, class grade averages and other baseline information are shown in Table 1.

Table 1: General Sampling Information

Semester	Count (Students)	Sections	Sessions sampled	Pct of sessions sampled	Average Grade
FA05	90	2	15	50.0%	79.8
SP06	96	2	15	50.0%	83.0
FA06	102	3	10	33.3%	82.5
SP07	106	2	14	46.7%	85.4
Average	98.5	2.3	13.5	45.0%	82.8

The course has several challenges affecting attendance. The material is generally dryer than other senior classes for CM students; the course has at least one section offered at 8:00 AM, which has proven to be an early meeting time for many students; the relatively large number of students per section (around 45) makes difficult to develop a personal rapport with the instructor; many students graduate at the end of the semester, and have their mind centered in the after-college life; and most graduating students have multiple job interviews, which impact their class attendance.

Methodology

Attendance was required during each of the four semesters covered by this study. An attendance sheet was passed around and signed by each student. To minimize class disruption, attendance was recorded on random dates, totaling between 33% and 50% of total class meetings, as shown in Table 1. With few exceptions, each student signature was consistent throughout the semester, suggesting that there few attempts of attending students to sign for their absent peers. Attendance and participation accounted for 10% of the total grade. This percentage was in line with the strategy taken by other studies (e.g., Van Blerkom, 1990; Gump, 2005).

Given that attendance was recorded only on a portion of the 30 class meetings in the semester, absences were normalized as a percentage of this total. For example, 3 absences were considered as a 3/15 = 20% absenteeism for the fall 2005, since attendance was recorded in 15 sessions. For fall 2006, with a total of 10 sampled sessions, 3 absences were considered as representing 3/10 = 30% absent time for the semester.

Absences were grouped in five ranges of 20% for their statistical analysis. In the hypothetical case of 16 students missing 0% of sessions, 15 missing 10% and 10 missing 20%, all 41 of them would be considered in the 0% - 20% category for their particular semester. The range size of 20% was required because smaller sizes resulted in categories with very few sample pairs; in fact, as discussed later, the last two categories: >60% to <= 80% and >80% to <=100% were combined into the single range >60% to <=100% to offset the disproportionate effect that the few sample data in these two categories would have otherwise.

Final grades were adjusted to account for the 10% of the total provided to attendance and participation. The grade for this evaluation item was assigned subjectively by the instructor, and was largely related to the student's attendance record. To remove the influence of attendance and participation, the points that it contributed to the final grade were subtracted, and the remainder was divided by 0.90. For example, a final grade of 85.0, of which attendance and participation contributed 7 points, would be adjusted to (85 – 7)/0.90 = 86.7. This adjustment changed each grade by only a few points; however, this is an important correction, since the participation and attendance item would be a self-fulfilling prophecy for this study: less participation and attendance points were given to students with a large number of absences, and therefore, it amplified the effect of attendance over final grades.

The average final grade for each absence percentage range was the simple average of final grades earned by students falling within the considered range.

The statistical analysis concentrated on descriptive statistics and the examination of statistical relations of absenteeism-final grade pairs, including the consistency of observations across the four sampled semesters and the correlation of frequency of absenteeism and final grades. The Statistical Analysis Package in MS Excel (KPK) was used for all computations.

Results

Absences

Attendance was recorded in a total of 54 days out of 120 total class sessions (30 in each semester), for an overall frequency of 45%. The number of class meetings in which attendance was taken varied among semesters, ranging from 10 to 15 with an average of 13.5 days per semester. Table 2 shows sample data and results for attendance in each semester. As shown in the table, the overall average absenteeism was 24.4%.

Table 2: Attendance Tally

Term	Days sampled	Sample size	Number of absences	Possible Absences	Percent absent
FA05	15	89	250	1335	18.7%
SP06	15	96	371	1440	25.8%
FA06	10	103	287	1030	27.9%
SP07	14	106	385	1484	25.9%
All	13.5	97.9	1293	5289	24.4%

Figure 1 shows the overall frequency distribution for the number of absences. The figure shows that the majority of students (51.9%) had an absenteeism of 20% or less. Only 1.5% of students were absent for more than 80% of the times when attendance was taken, and this category was merged with the 60% to 80% into a single one, 60% to 100%.

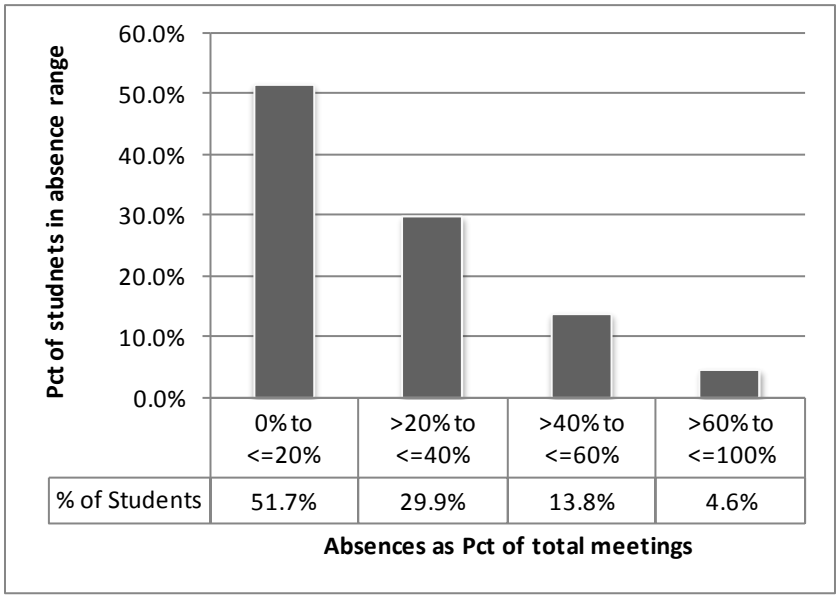


Figure 1: Overall Absence Frequency Distribution

Absence trends

Figure 2 shows the overall grade distribution against the absence tally.

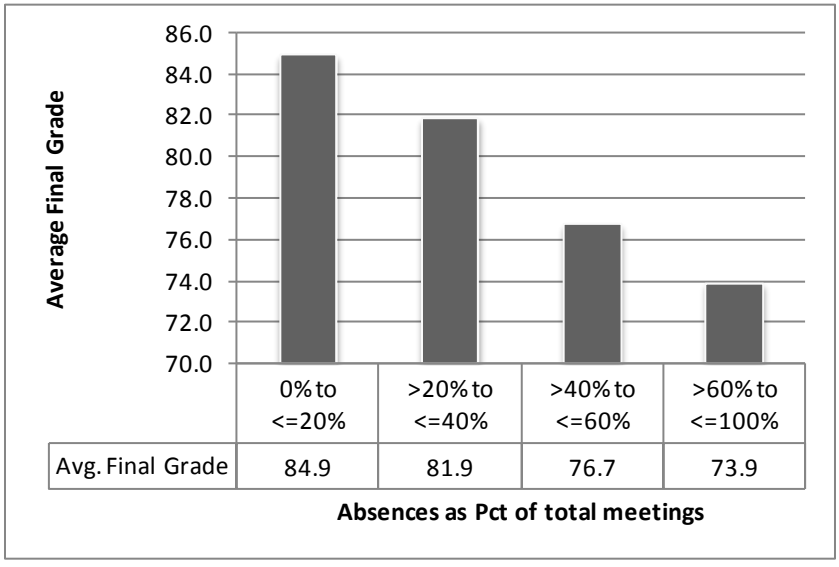


Figure 2: Overall Grade Frequency Distribution

It can be observed that Figure 2 shows a downward trend for grades as the number of absences increases. The consistency of this trend in each semester was tested by an Analysis of Variance (ANOVA) of the sample. The tested null hypothesis was that the sample mean was the same among semesters. At a 95% significance level, and using a grouping size of 20%, the ANOVA failed to prove the null hypothesis. However, on further investigation, an ANOVA with the alternative grouping shown in Table 3 did prove the null hypothesis at a 95% confidence level for the 0 to 40% absence group: Grade trends are consistent among semesters when they are

grouped as 0 to 40% absences. The >40% to 100% group did not show the same consistency, failing to prove the null hypothesis. Table 4 shows the details of the ANOVA. A conjecture of the reasons for the different results between the two groups is included in the Conclusions.

Table 3: Alternative Final Grades Grouping

Term	*0 to <=40%*	*Final Grade*	*>41% to 100%*	*Final Grade*
FA05	79	80.88	7	66.39
SP06	71	85.05	24	72.33
FA06	82	83.79	18	76.4
SP07	87	85.5	17	84.23

Table 4: ANOVA Summary for Alternative Grouping of Final Grades

SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
0 to <=40%	4	319	79.75	44.917		
Grade	4	335.22	83.805	4.3263		
>40% to 100%	4	66	16.5	49.667		
Grade	4	299.35	74.838	56.103		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
0 to <=40%						
Between Groups	32.886	1	32.886	1.3357	0.2917	5.9874
Within Groups	147.73	6	24.621			
Total	180.61	7				
>40% to 100%						
Between Groups	6806.5	1	6806.5	128.71	3E-05	5.9874
Within Groups	317.31	6	52.885			
Total	7123.8	7				

Detailed grade averages

Table 5 shows the distribution of final course grades against the number of recorded absences for each student. This table is relevant in that it summarizes the data used for the regression analysis discussed below.

Table 5: Detailed Grade Average Distribution

% Absences	FA05	SP06	FA06	SP07	All
0% to <=20%	83.24	85.53	85.43	86.01	84.94
>20% to <=40%	74.76	83.38	80.64	85.14	81.87
>40% to <=60%	69.57	72.13	78.06	84.63	76.74
>60% to <=100%	47.30	72.97	75.16	81.10	73.87

Regression Analysis

Figure 3 plots final grades as a function of the number of absences for each individual semester, along with a linear regression analysis. Each graph includes the results of a linear regression analysis, namely the corresponding equation for the least squares line and their respective coefficient of determination (R^2). This coefficient is a measure of the power of the regression model, and in this case varied between 0.768 for spring 2006 and 0.956 for fall 2005. In all cases, there was a negative correlation between grades and absences: the higher the number of absences, the lower the corresponding grade.

Figure 4 shows a line diagram plotting all four semesters and the aggregate data combining all semesters. The combined diagram has an R^2 of 0.987, which is exceptionally high. Figure 5 presents scatter diagrams for the four combined semesters, but grouping absences in ranges of 10% instead of 20%. While the graph for the entire range of 0 to 100% has a low R^2 of 0.366, the range of 0 to 60% exhibits a much better fit with an R^2 of 0.899, consistent with the ANOVA previously discussed. These results are further discussed in the Analysis section below.

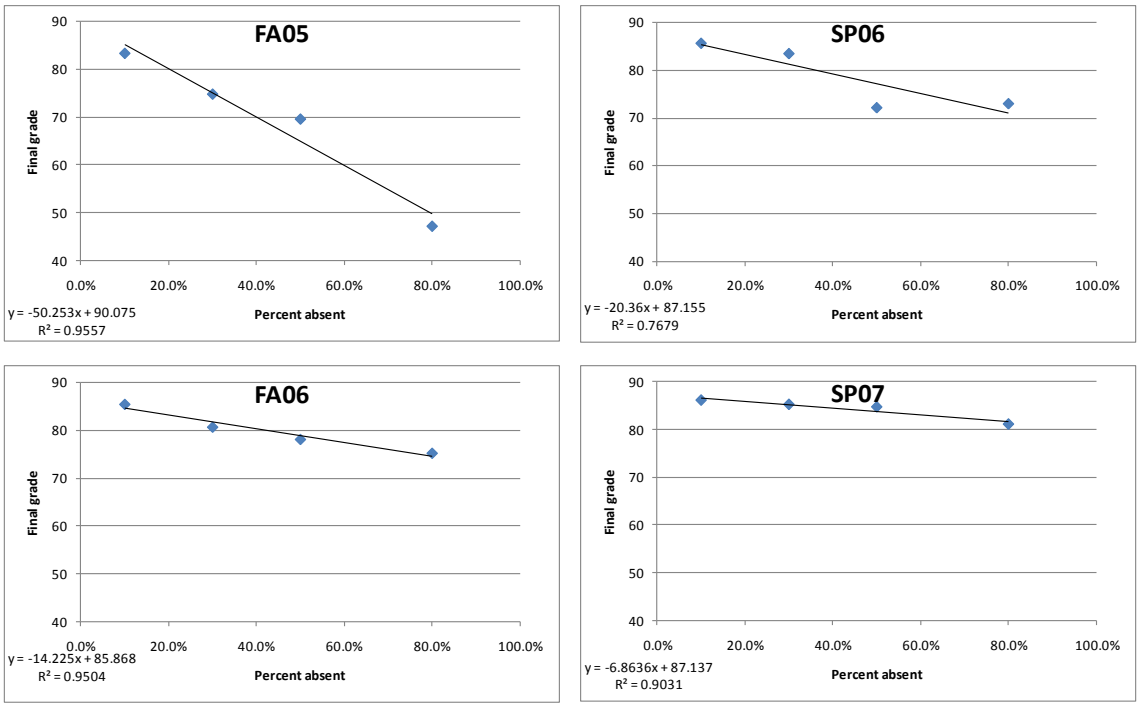
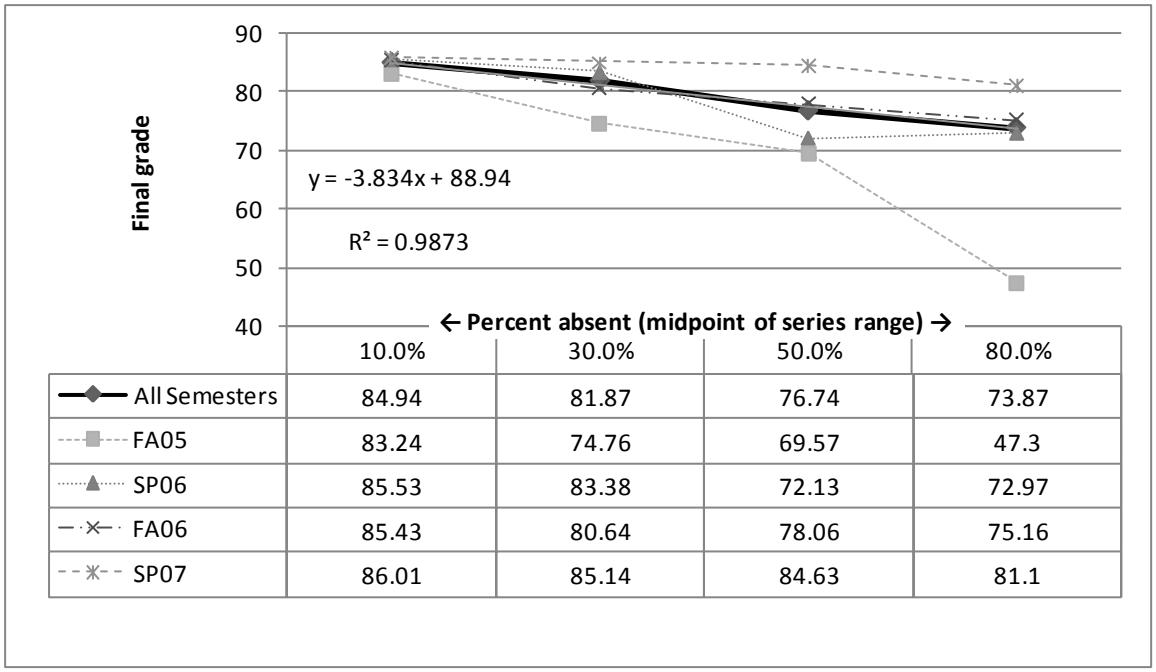


Figure 3: Scatter Diagrams of Absences vs. Final Grades



	10.0%	30.0%	50.0%	80.0%
All Semesters	84.94	81.87	76.74	73.87
FA05	83.24	74.76	69.57	47.3
SP06	85.53	83.38	72.13	72.97
FA06	85.43	80.64	78.06	75.16
SP07	86.01	85.14	84.63	81.1

Figure 4: Combined Plot of Absences vs. Final Grades

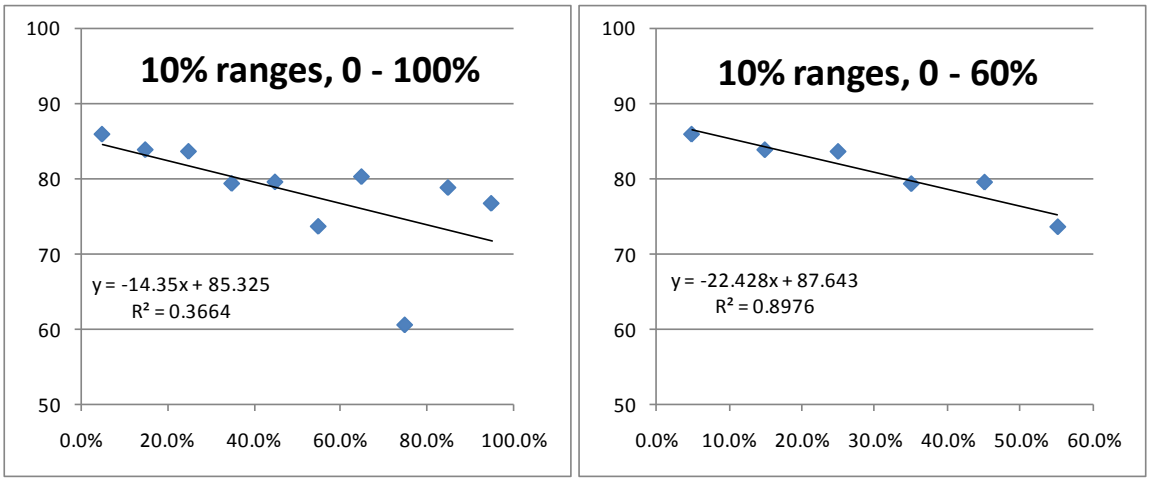


Figure 5: Absences vs. Final Grades for All Semesters Using 10% Ranges

Analysis

The 24.4% absenteeism found here is generally consistent with the results from other studies, especially considering that this factor has a high variability among previous studies: from one third, as reported by Romer (1993), to an 87.8% attendance (12.2% absence) found by Van Blerkom (1990). Since attendance was considered in the final grade, it may have biased the results of this study by lowering the number of absences that a student would have had if absenteeism had no consequences for the final grade.

The ANOVA presented in Table 4 shows that there was consistency from semester to semester in the number of students that missed between 0 and 40% of class sessions. In contrast, students missing more sessions varied to the point that the ANOVA could not prove that they were comparable among semesters. This pattern is consistent with the results of Durden and Ellis (1995) who found that a relatively small number of absences (4 or less in their study) did not affect academic performance significantly. The lack of correlation among semester grades for students with a higher percentage of absences cannot be deduced from inspecting the available data. It can be speculated that since students showing regularly to class tend to have better grades than those with propensity to miss class, the higher-grade students may have more regular habits and discipline than those with lower grades.

The correlation coefficient of 0.987 between absence percentages and grades found in this study when absences are grouped in 20% ranges is exceptionally strong. Such near perfect fit has not been reported in previous research, and merits additional consideration. Again, it is impossible to reach a definitive conclusion from the available data; the original information was checked for errors, and none could be found. A possible problem in this study's methodology was that attendance counted for up to 10% of the final grade, and probably was an incentive for keeping a regular level of attendance – students may have had less tendency to skip more classes than usual without a good reason. Moreover, grades varied within a relatively narrow range, as shown in Table 5.

A potentially important factor to consider in the analysis of the fit between absences and grades is the absence ranges chosen for the analysis. As previously mentioned, the reason for the wide grouping range of 20% was that the small number of absences for the higher percentages resulted in situations where ranges would contain a single pair (absence, final grade) or even none. When the ranges are narrowed to 10%, R^2 falls to a modest 0.366. The effect of the higher absence percentages is evident in the scatter plot in Figure 5; in fact, when the analysis is limited to absences between 0 and 60%, R^2 becomes very high again, with a value of 0.899.

Conclusions

No causality can be inferred from the strong correlation between absences and grades found here. It could be that students more likely to get good grades were also more likely to attend class, or that the instructor's lecturing style favored the physical presence of students. There could be many similar factors affecting both the number of absences and the final grade that a student is likely to get.

The effect of student absenteeism on a class is a contentious and important topic for college instructors. Compulsory class attendance is viewed by some instructors as an infringement on students' right to decide their destiny. Moreover, a frequent reason mulled for advocating against compulsory attendance is the Darwinian nature of students failing to show up to a particular class. Poor instructors are, in this view, weeded out from the system by the dramatic effect of an empty classroom. The opposite perspective in the attendance conundrum is that the college-level instruction experience cannot be replaced by the simple reading of books or leaflets. Students failing to attend class regularly disrupt group projects, and cannot ask questions to clarify doubts

about any particular topic. This view also considers the importance of imbuing students with a level of responsibility. If the benefits of a college education include the simulation of real-life, professional problems, it follows that the responsibility to show up for class is as important as a student's ability to make a project time schedule.

Providing an objective answer to the appropriateness of requiring class attendance may be an impossible quest, since it has many principles and moral issues lurking just under the seemingly simple surface of this topic. However, the more objective question of whether attending class results in a better understanding of its content could and should be answered. The present study, as well as many others, shows that these two academic issues are related. Further studies should begin with the premise that this correlation exists, and proceed to the contentious, but important task of researching whether one is a significant reason explaining the behavior of the other.

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