Evaluation of Factors Influencing Student Class Attendance and Performance

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I. Introduction

A colleague of ours recently quipped that more than two-thirds of the students in his undergraduate classes did not show up that day because of the home-coming weekend holidays. Such tales are not uncommon for professors who teach undergraduate classes. As elaborated by White (1992), some undergraduate students in this era of modern society seem to place greater emphasis on non-academic activities such as jobs, sports, and other social activities than on academics, which results in higher absenteeism rates. Thus, not surprisingly, absenteeism among students in undergraduate classes is a major concern for professors. For instance, Brauer purports that absences "create a "dead", tiresome, unpleasant classroom environment that makes [other students who come to classes] feel uncomfortable and the professor irritable."

White (1992) noted that absenteeism disturbs the dynamic teaching-learning environment and adversely affects the overall "well-being of classes." Absenteeism can also put additional demand on teachers' time by causing them to reteach materials either in the class or office hours that are meant for clarifying doubts and answering questions rather than repeating the subject covered in the class. Educators at higher education institutions -- realizing the severity of absenteeism in undergraduate classes -- undertake such prescriptions as improving the quality of teaching, encouraging innovative teaching methods, using better equipped classrooms, etc., to increase class attendance (also see Broder, 1994).

Several studies have examined student learning in economics classes. These studies developed models to investigate the relationship between student inputs and course-related variables and learning in economics. These course related variables include effort (Wetzel), aptitude (Saunders), course textbook (Spinelli and O'Toole), and instructor quality (Ramsett et al.). A rather exhaustive analysis of studies on teaching college economics was compiled by

Siegfried and Fels. Regarding student effort and its relation to class performance, they concluded that a student's aptitude was the most important determinant of learning. Wetzel, Potter and O'Toole investigated the influence of teaching and learning styles on the attitudes and achievements of economics students. They found that a congruence of independent teaching and learning styles aided student achievement and that a dependent teaching style was negatively related to achievement.[1] The relationship between student performance in economics classes and instructor performance as measured by student evaluations of teachers (SETs) was analyzed by Gramlich and Greenlee. They observed only a slight positive relationship between the SETs and student final grades.

Highsmith and Baumol reported the results of a series of studies done on teaching of economics at the pre-college level. Their findings showed that students with no absences were found to have higher grades by .20 to .33 points (on a 4-point scale) compared with their peers who were absent more often. In a recent and prominent study, Romer (1993) used single equation estimation to examine the relationship between attendance and students' grades. His results indicated that class attendance was an important determinant of student grades; more specifically, 31 percent of the variation in students' grades were explained by class attendance. He estimated that a student who attended only a quarter of the lectures on average earned a C-grade, while a student who attended all of the lectures earned a B+.

Though student learning in general economics has been examined by several studies (see Siegfried and Fels), this topic has received scant attention in agricultural economics. Noteworthy exceptions are: an inquiry by Martin examined the relationship between course prerequisites and undergraduate performance in agricultural economics. Martin concluded that students with high grade point averages and a solid background in statistics and mathematics

were more successful in his agricultural price analysis course. A recent study by White (1992) found that in his agricultural policy courses, requiring and rewarding attendance improved class attendances, and student absenteeism lowered the grades.

The purpose of this study is to determine the effects of various student characteristics (such as aptitude, age, gender, motivation, and financial support), teacher attributes (such as teaching style and having won a teaching award), and course features (such as attendance requirement, class project, class days, class time) on students' class attendance and grades in agricultural economics courses.

II. Survey and Data

For this study, we selected four universities ranging in size from medium to very large in terms of students enrollments. These four schools, which had student enrollments of, approximately, 11,500, 17,000, 35,000, and 50,000 in 1993, represent a broad spectrum of land grant universities in the United States. We selected these schools partly because the professors whom we contacted were willing to assist us in collecting the massive amount of information (explained below) needed for this research. Furthermore, we were restrained from a random sampling because the data collection required a constant and grueling effort by the professors throughout a semester, and we felt that we simply could not impose such an enormous task on instructors at other universities by sending out questionnaires randomly. However, we feel that the universities we selected are a representative sample of the U.S. universities that offer agricultural economics/agribusiness curricula. We also believe that results using data from other universities would lend support to those we obtained in this study.

Table 1 succinctly summarizes the various classes and the number of students we surveyed. The data were collected during the 1994 spring semester from twelve classes and

instructors, and about 400 students. Each class was given a survey which consisted of three parts:

Part a) had a questionnaire for each instructor for 1) taking attendance in each class period, 2) keeping track of problem set submissions, 3) ranking the motivation of the students[2], and 4) noting exam, problem set, and project paper scores, and final grade for each student in the class.

Part b) of the survey collected information from each student on 1) gender, 2) age, 3) college year (i.e., freshman, sophomore, junior, or senior), 4) cumulative GPA at the beginning of the semester, 5) hours worked at jobs, 6) source and percentage of financial support for education, 7) hours spent per week on studying, doing homework and preparing for the class, 8) desire to be on the Dean's list, and 9) whether or not the student had been on the Dean's list previously.

Part c) of the survey collected information from each instructor on 1) attendance requirement, 2) use of attendance in grading, 3) lecture format (primarily lecture oriented, seminar oriented, both lecture and seminar type, or lecture with ample opportunities for student participation and discussion), 4) class project or paper requirement, 5) the dates of midterm and final exams, 6) teaching awards won by the teachers, 7) class days, 8) class time, 9) dates of long holidays such as spring break, 10) whether the course is meant primarily for agricultural economics majors, 11) textbook usage i.e., whether the textbook is followed very closely, closely, or not closely, and 12) whether the course is primarily meant for freshmen, sophomores, juniors, or seniors.

A student's performance is measured as the total score from exams, quizzes,

assignments, papers, etc., he or she secured in the class. Since the maximum total score a student can earn varies among courses and for interpretational convenience, the total score of each student in every course is converted to a 4-point numeric and continuous grading scale. Based on this conversion, a grade point of 3.84 and above on the numerical scale corresponds to a letter grade of A; 3.64 to 3.83 A-; 3.44 to 3.63 a B+; so on down to 1.84 to 2.03 is a D-; and less than 1.84 is an F. The correspondence between the numerical grade and letter grade is primarily based on the relationship the teachers, whom we surveyed, established between the numerical total score and the grade in their courses. Only the numeric and continuous 4-point grade scale is used in the regression analysis, while the letter grade is employed mainly for supplementing the results discussion.

Based on the above cross sectional survey information, we constructed several continuous and binary variables for qualitative analysis and empirical estimations. These variables are listed in Table 2, which also provide a basis for interpreting results and deriving policy implications.

As evident from tables 1 and 2, and the above information on the survey, the classes we surveyed range, judging from agricultural economics class sizes, from small (16 students) to relatively large (61 students). Also, the classes cover several common fields in agricultural economics: Marketing, farm management, natural resources, land economics, agribusiness, and price analysis. In addition, a good mixture of sophomore-, junior-, and senior-level courses are included. We could not collect data from freshmen-level courses because the most commonly offered course for freshmen in agricultural economics is, "Introduction to Agricultural Economics/Agribusiness," which was either not offered or the instructors teaching this course at the four universities where we collected the information, could not be contacted.

Table 3 summarizes the average attendance rates and grades for various categories of students. The first row indicates that on average students in agricultural economics courses attend about 89 percent of their classes. This attendance rate is significantly higher than the 67 percent attendance rate observed by Romer (1993) in general economics courses, but comparable to the 83 percent noted by White (1992) in his agricultural policy courses. The large difference in attendance rates between general economics and agricultural economics classes could be explained by the following factors. First, class sizes in agricultural economics are relatively smaller than those in general economics. It is not uncommon in general economics to have classes of up to 200 or more students, particularly in the introductory principles courses. In contrast, large agricultural economics classes may have at most 70 to 80 students, and most classes, particularly at the junior and senior level, may have only 20-30 students. Because of the smaller class size, student-teacher interaction is more prevalent in agricultural economics classes than in general economics classes. Students may feel their absence is more conspicuous in smaller classes and, consequently, tend to come to classes relatively regularly. This conclusion is also evident from Romer's survey in which smaller classes had higher attendance rates.

Second, agricultural economics courses are generally taken by a relatively homogeneous group of students specializing in agricultural economics, where as general economics courses, particularly introductory courses, are taken by a diversified group of students from other disciplines who may be less enthusiastic than students majoring in economics. Consequently, it is not surprising that attendance is higher in agricultural economics courses than in general economics courses. Third, in contrast to students in general economics classes, particularly introductory classes which are taken primarily by freshmen, most of the students taking

agricultural economics classes are sophomores, juniors, and seniors, who tend to attend classes more often than freshmen. Fourth, some of the courses we surveyed required attendance either directly by taking attendance and reducing points for missing classes beyond a few class periods or indirectly by giving quizzes and making students submit a write-up of missed classes. In the economics courses Romer surveyed, attendance was optional. Fifth, there exists a difference in the number of class periods used for counting attendance in the two studies. That is, the attendance rate reported in this study is based on attendance counts throughout the semester, whereas Romer's study took attendance only "a few weeks before the end of the semester". However, it is not clear that the attendance rate would be any different in general economics classes if attendance were counted throughout the semester.

The first row of Table 3 also indicates that a typical student studying agricultural economics earns a grade of 3.14, which is equivalent to a letter grade of B. The remaining rows of this table provide a diagnosis of the overall attendance rates and grades for various categories. Among sophomores, juniors, and seniors, attendance rates do not differ much, but they are higher than those for freshmen. However, we want to be cautious in concluding that sophomores, juniors and seniors have lower absenteeism than freshmen, because only 11 freshmen participated in the survey. Senior students obtained better grades than sophomores and juniors. Data on gender shows that both female and male students had about the same absenteeism rates; however, female students scored slightly better than male students. An important point to note is that only about one-fourth of the students in agricultural economics courses are female.

Students in junior-level courses had a 5 percent higher attendance rate than students in sophomore- and senior-level courses. But, students in senior-level courses had better grades

than junior- and sophomore-level courses. Not surprisingly, grades in senior-level courses are similar to those obtained by seniors because mostly seniors take the senior-level courses. It is interesting to note that in our study, large classes have slightly better attendance rates than small and medium size classes, though grades in large classes are slightly lower than those in small and medium size classes.

Universities I and II, which are the two smaller universities, had about the same attendance rate, whereas the two larger universities (III and IV) had about the same attendance rate which was roughly 8 point higher than that in the smaller universities. There is no significant relationship between the attendance rates and grades across the universities.

III. Model and Results

This section presents empirical results of individual effects of various explanatory variables on class attendance and performance using simple regressions and joint effects using multiple regression.

Simple Regression Results

To ascertain the individual effects of various variables on class attendance and grades, the following regressions were run:

$$\text{CATTEND} = a_i + b_i X_i + u$$

$$\text{GRADE} = c_j + d_j X_j + v$$

where CATTEND is the percentage of classes attended; GRADE is the student grade on a 4-point scale; X_i and X_j are various explanatory variables listed in Table 2; u and v are random disturbance terms. In the interest of brevity, only the results of selected regressions are presented in Table 4. Most of the explanatory variables that appear in the models reported in Table 4 are significant at the 1 percent level. The following provides only brief discussion of

results reported in Table 4; more elaborate discussion is deferred to the multiple regression results reported in Table 5.

One of the key variables that this research focused on was class attendance and its relation to student performance. Class attendance has a strong influence on grades as evident from the point estimate with a large t-statistic of 15.52. This result corroborates the findings of Romer (1993). The estimates of intercept and slope coefficients at 0.54 and 0.029, respectively, imply that students who attended classes 25, 50, 75, and 100 percent of the time on average earn a grade of 1.27 (F), 1.99 (D), 2.72 (C), 3.45 (B+). These results imply that, ceteris paribus, for a student to earn a B grade, he or she has to attend more than three quarters of the classes. On the other hand, if a student attends less than half of the classes, he or she is likely to fail the course. The estimated R^2 (not reported) implies that 38 percent of the variation in grades are explained by class attendance.

Motivation plays an important role in influencing attendance and grades. The point estimate in the attendance equation indicates that a ten point increase in motivation leads to an increase in the percentage of classes attended by 3.74. The point estimate in the class performance equation implies that, everything else equal, a well motivated student, say, with 100 percent motivation earns a grade of A- (3.74), and a student with a motivation ranking of 50 percent only earns a C (2.70).

Statistically significant and strong positive relationships between prior GPA (PGPA) and attendance and grades provide evidence that students who have done well in their previous classes attend class more often and get higher grades than students who have done poorly in previous classes. The estimate implies that an increase in prior GPA by one point raises the class attendance percentage by 8.28 points and the grade in the current course by 0.67 points.

The next three sets of models -- PARFIN, SELFFIN, and SCHOLAR -- capture the effects of the source of financial support for students' education. The percentage of financial support from parents (PARFIN), not surprisingly, has a negative effect on class attendance, implying that students who receive a higher portion of the financial support from their parents tend to miss class more often and place less emphasis on education. A possible reason for this result is that students who receive support from their families may not value the money they receive very highly, and consequently, tend to miss classes more frequently and earn lower grades. On the other hand, students who support themselves through work and loans (SELFFIN) to go to schools seem to know the value of their money, realize the importance of going to school, and take their education more seriously. Consequently, these students do go to classes on a regular basis and get better grades as evidenced by a positive relationship between self financing of education and class attendance and grades. Similarly, students who get financial support from scholarships (SCHOLAR) also attend class more regularly and get higher grades, again indicating that better students go to classes more often and place greater emphasis on education. It is not surprising that both SCHOLAR and PGPA have positive effects on attendance and grades since students with higher grade points tend get scholarships.

Professors who have good teaching skills and have won teaching awards (AWARD) seem to provide an impetus for students to go to classes, learn more, and get better grades. This result clearly provides evidence supporting the conventional wisdom that students are eager to attend classes taught by teachers who are eloquent, skilled, and proficient in the subject matter, and students tend to miss (may even avoid taking classes) taught by monotonous, less skilled, and boring lecturers. It is not uncommon for some students to seek word-of-mouth inputs from other students about the teaching expertise of certain professors

before registering for classes.

The positive influence of the variable TEXTBOOK on attendance and grades signifies that if teachers do not follow the textbook very closely, students realize that it is important to go to class; because, if they do not go to class, they will miss out on materials covered in the lecture. Thus, they end up attending classes more often than otherwise, which results in greater learning of the subject and better grades. On the other hand, if teachers follow the textbook closely, students may think that even if they miss class they can read the materials from the book. This gives an opportunity for students to slack off and not go to class, and thus, procrastinate in their studies by thinking that they can read the textbook, possibly even at a later date. But when it comes time to prepare for the exam they may not have enough time to study; in addition, it may take considerably more time to assimilate the materials in the textbook since they missed the classes, and consequently, they do poorly in the exams.

The next two set of equations indicate that a desire to be on the dean's list (DDEAN) and actually having been on the dean's list (DEANL), which implicitly reflect student motivation and past performance of the students, not surprisingly have positive effects on attendance and grades.

The number of hours studied (HSTUDIED) has a positive effect on attendance, implying that hard working students tend to go to classes. The attendance requirement variable (ATREQ) has a positive effect on attendance, though it is only marginally significant. This result shows that encouraging students to come to classes, either through penalizing them by reducing scores or by asking students to submit a write-up of missed classes, does seem to increase class attendance.

The positive and significant effect of the variable LECTURE on grades indicates that if teachers provide ample opportunities for students to participate in class discussion rather than give monotonous lectures, students tend to get better grades. This result stems from the fact that students learn more if they can express their views and thinking -- which stimulates their interest in the subject matter. If the course requires a class project or paper (PROJECT), students seem to get better grades. This result could be explained by three factors: first, some, if not all, students would prefer and do better if the grade is based on exams and a paper rather than on exams only;[3] second, some students are simply tired of taking too many exams and consequently may get bored and slack off from studying; and, third, students learn by working on the project paper.

Age has a positive effect on the grade earned, signifying that as students become more mature they work harder, focus more on education, and get better grades. The positive and significant effect of the variable TIME reveals that if classes are held during "prime" class hours, i.e., between 10:00 a.m. and 3:00 p.m., students get better grades because they go to classes more often during these hours and learn more than those classes which are held at other hours.

The coefficient estimates of SOCOURSE and JCOURSE reveal that class attendance is higher in the junior-level courses than in the sophomore-level courses, which implies that as students progress through their college years, they become more mature and responsible, and tend to go to classes more often. However, students in senior-level courses (SCOURSE) have higher absenteeism rates, because perhaps many of the students in these courses are seniors who think they have the privilege to miss class since they are close to graduation. Some senior students indicated that they missed classes because they had to go to job interviews during

spring semester. The last two equations of class performance indicate that seniors seem to get better grades than juniors (and also sophomores, not reported), even though seniors are absent from classes more often than juniors.

Multiple Regression Results

After ascertaining the individual effects of various variables on class attendance and grades, additional regressions were run to study the joint effects of certain important explanatory variables. The model specifications for the multiple regressions are:

$$\text{CATTEND} = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \ldots + \alpha_k X_k + \epsilon$$

$$\text{GRADE} = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \ldots + \beta_j Z_j + \xi$$

where Xs and Z_s are explanatory variables, and ϵ and ξ are random disturbance terms.

Since some variables measure the same factor, (for example, desire to be on the dean's list (DDEAN), having been on the dean's list (DEANL), motivation (MOTIVA), and prior GPA (PGPA) all directly or indirectly measure student's aptitude) multicollinearity problems arise if we include several variables in the regression. To remedy this problem, the stepwise procedure was used for initial model selections. Variables that were significant in these initial models were considered for the final regressions. The results of these estimations for class attendance and performance are reported in Table 5.

Class Attendance Model

In the class attendance equation, the estimated coefficients of most of the variables are significant at the 1 percent level. SELFFIN and TIME are significant at the 5 percent and 10 percent levels, respectively. All the variables that entered this regression equation have positive coefficients estimates with the exception of SOCOURSE which has a negative coefficient estimate. The statistical fit as measured by the R^2 indicates that 53 percent of the

variation in class attendance is explained by the independent variables included in this equation. As expected, several of the variables which had significant effects in the basic regressions also play important roles in affecting class attendance in the multiple regression. Since forcing the regression equation through the origin would bias the coefficient estimates, an intercept term was added to the regression. The coefficient estimate of 53.94 for the intercept is significant at the 1 percent level, which measures the average class attendance of all students after accounting for the variation explained by the other regressors.

As in the single variable estimation, motivation has a strong positive effect on student attendance. Comparison of point estimates and the t-statistics in the multiple and basic regressions show that the inclusion of other variables does not significantly diminish the influence of motivation on attendance. The estimated coefficient of prior GPA in this multiple regression, though not as large as in the single-variable estimation, does indicate that students who have done better in previous classes tend to attend classes more frequently. The estimated regression coefficient of PGPA is statistically significant at the 1 percent level. Thus, both motivation and prior GPA tell the expected story that better and more motivated students go to classes more frequently. Students who support themselves financially while pursuing their education seem to be responsible students as is evident from the positive relationship between the variable SELFFIN and class attendance.

Not surprisingly, whether or not the instructor "required" class attendance strongly influences students' coming to classes. Everything else equal, classes that required attendance had 12.7 percent higher attendance than those that did not require it. This result corroborates White's (1992) suggestion that policies that require and/or reward attendance should result in greater attendance.

Professors who have won teaching awards tend to attract a higher percentage of students in their classes. More specifically, classes taught by teachers with teaching awards had almost a 9 percent higher attendance rate than those taught by instructors with no teaching award. This result is probably one of the most important findings because a good teacher can make a significant difference by not only increasing class attendance but also by stimulating students to understand the subject matter and at times helping to devise the course of some students' education. It is not uncommon for students to select a particular major because they had the opportunity of taking classes with an excellent teacher in that field. On a higher note, a teacher as a mentor may even chart the course of life of certain students, which is evident from stories where past students attribute their professional success to a certain outstanding teacher.

An interesting observation was made regarding days of the week upon which a class was taught. Students seem to prefer classes held on Monday, Wednesday and Friday (MWF), as classes taught on these days of the week had better attendance than those held on Tuesdays and Thursdays (TTh). More specifically, MWF classes attracted on average 6.1 percent more students than TTh classes. The rationale for this result is that students prefer a shorter lecture (50 minutes) three times per week, over a longer lecture (1 hour and 15 minutes) given twice a week. The time of the class also had an impact on attendance. This comes as no surprise to those who have taught a 7:30 a.m. class! The percentage of students attending class was higher for those classes held during "prime time", i.e., between the hours of 10:00 a.m. and 3:00 p.m. A colleague of ours alluded to us with empathy that he teaches one class at 7:30 a.m. and another class at 4:30 p.m., and in both classes attendance is rarely above 50 percent.

Another interesting result, as found in the simple regressions, is observed for course level. The percentage of students attending class is lower in sophomore-level courses and

higher in junior-level courses. This may be a function of both maturity and course rigor. As students become upperclassmen, they realize that class attendance is important. In addition, as course work becomes more difficult, it is likely that a larger percentage of students will attend class -- as not all information is now "found in the book," and the explanation of material and insightful discussion by professors becomes very useful.

Class Performance Model

The multiple regression estimation of class performance (GRADE) shows that most of the variables have significant positive coefficient estimates, except HWORKED and HSTUDIED which have significant negative coefficient estimates. The statistical fit as measured by the R^2 indicates that 72 percent of the variation in class attendance is explained by the independent variables included in this equation.

As in the single-variable estimation, the class attendance variable (CATTEND) is ysignificant with a relatively large t-statistic. Thus, this result from the multiple regression decisively demonstrates that after controlling for other measurable influences, (particularly by including variables such as MOTIVA and PGPA for eliminating some of the motivational and aptitude differences across students), the more the classes attended, the better the grade students secured.[4] The estimated coefficient of 0.012 implies that, after accounting for other factors, a student who attends all the classes is likely to get on average a 0.6 point higher grade, which corresponds to an increase (counting plus and minus grades) of four letter grades (i.e., from C+ to B+ or B to A) than a student who attends only half of the classes.

Motivation is also a significant factor in students' earning better grades. The point estimate shows that an increase in students' motivation by 30 points, for example from 50 to 80 percent, raises students' numeric grade by 0.39, which corresponds to a jump of approximately

three letter grades. Similar to the findings of Martin and Romer (1993), past performance as measured by the students' prior GPA was a strong predictor of the grade they received in the surveyed courses. The estimated regression coefficient for PGPA is statistically significant at the 1 percent level. The point estimate implies that after controlling for the effect of other variables a one point increase in the PGPA raises the grade point in the current course by 0.34.

The number of hours worked on jobs outside of class work made a negative contribution to students' class performance, as indicated by the negative sign of the coefficient estimate for the variable HWORKED. Students who are strained with a financial burden try to work at odd jobs to make ends meet, i.e., to pay for college tuition, housing, and daily living expenses, while going to school. While some jobs may be related to students' studies, most jobs are remotely pertinent to their class work. Consequently, students who are working while going to school have tight time schedules and may not find enough time to devote to their studies, which results in poor performance in class. It is not uncommon for students to drop out of school, because, due to a lack of financial support, they could not fit their work schedule with their study schedule or vice versa. This result also has policy implications at the national level. For instance, the new government program, Americorps, supports students financially to get their education in return for one or two years of community services after completing their degrees. Such programs may help students remain in school and get their college education without having to bear the financial stress.

A somewhat surprising, but not totally unexpected, result is that the number of hours a student spent in studying has a negative effect on grades. The rationale for this result is that poorer students and students who do not understand the material in class may feel the need to study more. These students may not be efficient with their study time and end up spending

more time in trying to comprehend the subject matter. Thus, these students get lower grades regardless of the amount of time devoted to studying.

As in the single-variable estimation, students get better grades if their professors did not follow textbooks closely. Specifically, given other factors, a student's grade point increases by an average of 0.23 if the textbook is not followed closely. This may be due to additional insight provided by the professor, but not covered in the textbook. Also, if the textbook is followed closely, students may not be attentive in class because they feel that they can read it from the book. Thus, it provides opportunities for students to skip class and to procrastinate their studies, but when it comes to exam time they may not have enough time, among other things, to read the book. If teachers do not follow the textbooks closely, students force themselves to pay attention to the class lectures, attempt to take good notes, and in the process learn the subject matter, which result in their getting good grades.

The positive sign for the variable LECTURE suggests that congruence of this teaching style aids in students class performance. That is, learning takes place more successfully in classes which have lecture formats with ample opportunities for class participation, compared to a "primarily lecture oriented class." This is similar to the results reported by Wetzel, Potter and O'Toole, where they found that a dependent teaching style (defined as a highly organized lecture with organized notes taking and where the course content is formal and explicit) was negatively related to students' performance. The positive sign of the estimated coefficient for the variable PROJECT signifies the prowess of class projects in students' getting higher grades.

Finally, the variable GENDER was not significant both in the simple and multiple regressions, implying that attendance and performance are about the same among male and female students.

V. Discussion and Conclusions

The purpose of this research was to analyze the effect of student behavior, teacher attributes, and course characteristics on class attendance and performance. Several factors play significant roles in influencing attendance and grades. Some notable factors, among others, are motivation, prior GPA, self financing by students, hours worked on jobs, quality of teaching, and nature of class lectures. This study provided strong empirical evidence of the positive influence of class attendance on student performance similar to that found by Romer (1993). Also, the strong and positive relationship between PGPA and class attendance and performance is one of the most revealing results, which underscores that, as Martin propounded, PGPA is an important predictor of an undergraduate students' innate skills and abilities through class attendance, note taking, comprehension, and study habits.

Since there is a significant relation between absenteeism and class performance as confirmed by the current study, as well as by White (1992) and Romer (1993), the question naturally arises as to what measures should be taken to increase attendance. We provide some suggestions to this effect.

First, there is no substitute for good teaching when it comes to increasing class attendance. However, as Broder (1994) has highlighted, university professors, unlike primary and secondary teachers, do not receive formal training on teaching. Elmore also notes that "while professors spend most of their graduate education preparing to conduct research, their only preparation for teaching is their own, largely unexamined, experience as students."

Furthermore, because of the increased emphasis on publication-oriented research, agricultural economics faculty put lower value on teaching than on research (Connor). When a department makes a hiring decision of a young faculty member, most often it is based on the

number of publications and the potential to publish than on teaching experience and potential teaching skill (White, 1982). In addition, productive researchers generally get higher pay raises than good teachers. Consequently, there is less incentive among professors to take active roles in instruction because good teaching is not adequately rewarded and is under appreciated (Broder and Taylor; Broder, 1994). At the other end of the spectrum, a bad (unproductive) researcher gets fired but a bad teacher may only get noticed, (may not even be reprimanded) and even that too rarely. We are not aware of professors being fired for not doing a good job of teaching. Thus, there seems to be more scrutiny in evaluating research performance than teaching performance. Consequently, the variability of the benefits/costs of research output are wider (ranging from prominence to firing) with a higher mean, whereas the variability of the benefits/costs of teaching output has a narrow band with a lower mean.

A department has to evaluate whether a teacher is doing an adequate job in providing teaching services to students. If not, measures should be taken to require minimum teaching standards and improve the teaching skills. We realize, as elaborated by Broder and Taylor, that evaluating teaching performance is a difficult task. However, more careful preparation of student evaluation of teaching (SET) forms, incorporating peers' assessment and inputs, and instituting teaching portfolios can help to alleviate some of the problems associated with measuring the instructor's performance.

Second, right in the first class period of the semester/quarter, instructors should emphasize the importance of coming to class and taking an active part in the class discussion and should extol the significance and benefits of attendance. Students should be made aware of the empirical relationship between class attendance and performance and asked to make a rational decision. It is important to advise students that in making the decision to attend or cut

class they should not only consider the short-run benefits and costs as in maximizing utility in a static model, but rather they should take into account long-run benefits and costs as in maximizing utility in a dynamic framework. That is, students should be reminded that the possible consequences of missing classes may be to forgo certain long-run benefits --such as finding a better job (also see, Romer, 1994).

Third, Romer (1993, 1994) *proposed* experimenting with mandatory attendance. White (1992) conducted such an experiment in his agricultural policy course at the University of Georgia. His study included a class (control group) with no restriction on absenteeism and another class where a student with more than five unexcused absences was required to withdraw from the class and five points of the course grade was devoted to attendance. White found that the control group had an average absenteeism rate of 7.5 percent, while the second group had only 3 percent. Interestingly, 68 percent of the students White surveyed indicated that attendance should be required. From his findings White concludes that "it appears to be appropriate to require attendance and/or reward attendance. These policies should result in greater attendance than the individual would otherwise choose ..."

Based on these findings, we provide the following general and specific suggestions, some of which are used by the instructors whom we surveyed, to combat absenteeism.

a) create a learning environment which provokes critical thinking and stimulates cognitive skills among students and provides an opportunity for students to ask questions and express their views.

b) avoid negative teaching methods that rely on fear, intimidation, and anxiety. Treat students like equal partners in the educational experience.

c) maintain a file for each student to keep track of student's performance. Keep a photo

of the student in the file with the consent of the student. This helps the instructor to remember student's name and recognize him/her, which extends what Broder (1994) calls the "contract" beyond the class period and makes the student realize the enthusiasm of the teacher. Maintaining a file may also come in handy for later references, for example, if a student asks for a recommendation letter after a year or two.

d) employ more humor in the classroom without offending students. Humor can be powerful communicating and teaching tool if used appropriately (Broder, 1994). It is not uncommon for some students to come to a certain professor's class to hear what new jokes he or she will tell for that day.

e) eliminate any distruptions and negative commotions caused by students who carry on conversations with other students or read newspapers or other course materials during the lecture.

f) avoid scheduling classes in the early morning or late afternoon hours, particularly for core or required courses.

g) give short quizzes at the beginning of every class period.

h) take attendance in every class but it has no bearing on grades, except in marginal cases where attendance can be used as a deciding factor. Even in large agricultural economics classes, taking attendance is feasible because they are not as big as classes in introductory economics, physics or chemistry.

i) allocate a certain percentage of the total score (for example five percent) for attendance to reward or penalize students. A student who attends all the classes will get this full allocation, and a student who misses classes frequently will lose this attendance score.

j) require students to submit an assignment consisting of a write-up of the missed class material.

k) provide an incentive to students for participating in class discussion, perhaps giving a small number of points (for example, 0.5 percent of the total grade) for answering some critical question during the lecture.

l) avoid following the textbook closely, particularly if students can read and understand the book by themselves. Provide additional insights and real world examples.

The basic notion behind the above suggestions is to increase attendance by rewarding or penalizing students in order to benefit them through better learning. We want to be cautious in recommending the above policies in that they should be used on a selective basis as they fit the nature of a course. We also want to refrain from prescribing a mandatory attendance requirement in which a student may be forced out of the course if he or she misses beyond a certain minimum number of class periods. Two reasons, among others, we consider in not imposing mandatory attendance are: First, the student is a "customer" who pays for teaching services through tuition fees. A student may feel that he or she is entitled to stay in the course, particularly if he or she is performing satisfactorily in the class. Moreover, if such a customer is not interested in receiving that service, why force it on him/her! Secondly, even after taking some of the above measures, if a student is regularly missing the class, how attentive is the student going to be in the class if one forces him or her to come to class? As a captive audience, these students may bring negative externalities into the class because of their resentfulness and inattentiveness. Finally, it should be emphasized that if a student is really uninterested in education and unreceptive to counselling, no amount of advice and prescription from instructors is going to be of much help. The then problem becomes one that is outside

the domain of the teacher.

If students are unwilling to attend class, they are not fully participating in the teaching-learning process. Students who miss class may copy lecture notes of students who attended classes, but this often results in students not understanding the material, rather just memorizing (White, 1992). Thus, students who fail to attend class may not comprehend the lecture notes, which hinders their learning.

Broder (1985) observes that less than four percent of the articles in agricultural economics journals deal with teaching-related research. We feel that research on student behavior and learning should receive more emphasis in the agricultural economics profession. Results obtained as in this study on undergraduate students will be useful to Agricultural Economics Departments administering graduate programs because undergraduate agricultural economics majors make up a significant portion of the students entering graduate programs. Subject matter learned and cognitive skills acquired in undergraduate classes are the solid building blocks for graduate studies. In an era of renewed emphasis on teaching, student recruitment and retention, as observed by Connor, the results found in this study will be useful to professors and administrators in the Agricultural Economics Departments across the nation.

Most of the findings that emerge are those that one might have expected and those that professors who teach undergraduate agricultural economics courses widely believe to prevail. Thus, though this study did not deliver many surprises, we conclude, as Highsmith and Baumol propounded, that, by and large, the results are consistent with common-sense expectations and previous findings in student learning.

Endnotes

1. According to Wetzel, Potter, and O'Toole a dependent teaching style is one where classes are primarily lecture-oriented, whereas an independent teaching style allows more latitude for students in learning the materials through class room discussion and interaction.

2. In ranking motivation, instructors were asked to consider factors such as student's interest in the course, participation in the class, interest in learning the subject matter, timeliness of problem set submissions, promptness in coming to the class, etc.

3. Class projects give the opportunity for some students to partially avoid the exam anxiety.

4. It is worth noting that, as Romer elaborated, inclusion of prior GPA in the regression may cause under-estimation of the effect of attendance on performance. This is because PGPA, which partly depends on attendances in previous classes, captures some of the effects of attendance on performance.

Table 1. Survey Information on Classes, Course Levels, and Number of Students.

Universities[a]	Courses	Level	Number of students
I	Farm and Ranch Management	Sophomore	28
	Agricultural Markets and Prices	Sophomore	43
	Farm & Natural Resource Appraisal	Junior/Senior	26
	Land Resource Economics	Senior	16
	Agricultural Price Analysis	Senior	16
II	Farm and Ranch Management	Sophomore/Junior	47
	Advanced Agricultural Marketing	Junior/Senior	26
	Legal Problems in Agriculture	Junior	18
III	Farm Management	Junior	53
	Agribusiness Management	Sophomore/Junior	61
	Agri. and Food Business strategy	Senior	40
IV	Farm Management	Junior	26

[a]Due to the sensitive nature of using student grade, GPA, and personal information for the analysis, the names of participating universities are not disclosed to preserve complete anonymity of the students.

Table 2. Variable Names and Definitions

Names	Definitions
CATTEND	Percentage of classes attended by each student
GRADE	Numerical grade (on a four-point scale) obtained by each student
MOTIVA*	Motivation of each student as ranked by instructors on a scale of 1 to 10
PGPA	Prior GPA before the beginning of 1994 Spring Semester
AGE	Age of each student
HWORKED	Hours worked per week on jobs outside of class
HSTUDIED	Hours spent per week in studying, doing homework, and preparing for the course
PARFIN	Percentage of financial support received from parents
SELFFIN	Percentage of financial support provided by student through work, loans, etc.
SCHOLAR	Percentage of financial support received from scholarships
GENDER	Sex of student
ATREQ	Whether a course requires attendance or not
ATGRAD	Whether attendance is used in grading or not
AWARD	Whether the instructor won a teaching award or not
TEXTBOOK	Whether the textbook is followed very closely, closely, or not closely
LECTURE	Whether the class is lecture-oriented or lecture with student participation
PROJECT	Whether the class requires a project paper or not
DAY	Whether the classes are held Monday-Wednesday-Friday or Tuesday-Thursday
TIME	Class time
DDEAN	Desire to be on the Dean's List
DEANL	Whether the student was previously on the Dean's list or not
FRESHMEN	Whether student is a freshmen
SOPHOMOR	Whether student is a sophomore
JUNIOR	Whether student is a junior
SENIOR	Whether student is a senior
SOCOURSE	The course is primarily meant for sophomore students
JCOURSE	The course is primarily meant for junior students
SCOURSE	The course is primarily meant for senior students

Note: The variable CATTEND, GRADE, MOTIVA, PGPA, AGE, HWORKED, HSTUDIED, PARFIN, SELFFIN, and SCHOLAR have observations for each student, and thus are continuous. All other variables are class-specific in that they have the same value for all students in that class; thus, they are binary variables taking a value of either 1 or 0.

*In the empirical analysis the variable MOTIVA was rescaled on a scale of 1 to 100 for the ease of interpretation of the results.

Table 3. Average Class Attendance Rates and Grades in Agricultural Economics Classes

	Number of Students	Attendance Rate	Numerical Grade
All Courses	400	89.38(12.72)	3.14(0.60)
College Year[a]			
Freshmen	11	83.31(21.34)	2.83(0.95)
Sophomores	84	90.12(11.45)	3.07(0.64)
Juniors	137	89.75(14.29)	3.06(0.69)
Seniors	163	89.17(11.06)	3.26(0.45)
Gender			
Female	106	90.17(12.56)	3.25(0.60)
Male	294	89.10(12.79)	3.11(0.60)
Course Level			
Sophomore Level	71	86.73(13.90)	3.04(0.63)
Junior Level	231	91.41(11.16)	3.10(0.59)
Senior Level	98	86.54(14.43)	3.32(0.58)
Class Sizes[b]			
Small	50	86.03(14.16)	3.19(0.60)
Medium	106	86.08(15.70)	3.18(0.65)
Large	244	91.51(10.36)	3.12(0.59)
University			
I	129	86.19(13.64)	3.21(0.57)
II	91	85.54(14.80)	2.99(0.74)
III	154	93.69(9.56)	3.19(0.56)
IV	26	93.21(6.96)	3.04(0.41)

Notes: The numbers in parenthesis are standard deviations

[a]Total number of students in this category does not add to 400 because there were five graduate students in the sample.

[b]Classes with less than 20 students are classified as small, between 20 and 40 students as medium, and above 40 students as large.

Table 4. Simple Regression Estimations of Class Attendance (CATTEND) and Performance (GRADE) Equations.

Class Attendance Models	Class performance Models
	GRADE = 0.540 + 0.029*CATTEND (3.18) (15.52)
CATTEND = 62.719 + 0.374*MOTIVA (34.38) (15.21)	GRADE = 1.652 + 0.021*MOTIVA (21.70) (20.41)
CATTEND = 66.128 + 8.280*PGPA (22.00) (7.89)	GRADE = 1.260 + 0.671*PGPA (10.55) (16.11)
CATTEND = 91.401 - 0.065*PARFIN (111.46) (-3.80)	GRADE = 3.256 - 0.004*PARFIN (84.25) (-4.49)
CATTEND = 87.576 + 0.037*SELFFIN (83.81) (2.18)	GRADE = 3.067 + 0.002*SELFFIN (61.78) (1.94)
CATTEND = 88.431 + 0.091*SCHOLAR (126.50) (3.13)	GRADE = 3.070 + 0.007*SCHOLAR (94.51) (5.23)
CATTEND = 82.417 + 8.270*AWARD (52.85) (4.87)	GRADE = 3.026 + 0.139*AWARD (39.88) (1.69)
CATTEND = 88.397 + 2.93*TEXTBOOK (113.63) (2.18)	GRADE = 3.068 + 0.225*TEXTBOOK (83.93) (3.57)
CATTEND = 87.620 + 5.739*DDEAN (117.03) (4.25)	GRADE = 2.300 + 0.469*DDEAN (88.47) (7.67)
CATTEND = 87.727 + 6.026*DEANL (119.98) (4.32)	GRADE = 3.006 + 0.501*DEANL (91.18) (7.96)
CATTEND = 85.821 + 0.821*HSTUDIED (86.83) (4.63)	GRADE = 2.992 + 0.236*LECTURE (60.26) (3.81)
CATTEND = 88.790 + 2.354*ATREQ (120.90) (1.61)	GRADE = 3.077 + 0.115*PROJECT (66.27) (1.89)
CATTEND = 89.958 - 3.232*SOCOURSE (128.68) (-1.95)	GRADE = 2.732 + 0.017*AGE (13.98) (2.13)
CATTEND = 86.616 + 4.795*JCOURSE (89.96) (3.78)	GRADE = 2.978 + 0.219*TIME (49.11) (3.15)
CATTEND = 90.309 - 3.774*SCOURSE (124.20) (-2.57)	GRADE = 3.185 - 0.121*JUNIOR (85.83) (-1.90)
	GRADE = 3.062 + 0.201*SENIOR (79.04) (3.313)

Notes: Refer to Table 2. for variable definitions. The values in parentheses are t-statistics. Since these regressions have only one explanatory variable, in addition to the constant term for the intercept, estimated R^2 values are small for most of the equations and hence not reported.

Table 5. Multiple Regression Estimation of Class Attendance (CATTEND) and Performance (GRADE) Equations.

Regressors	Dependent Variables: CATTEND	Dependent Variables: GRADE
CONSTANT	53.939***	0.084
	(9.27)	(0.63)
CATTEND		0.012***
		(6.98)
MOTIVA	0.336***	0.013***
	(12.97)	(11.77)
PGPA	2.827***	0.343***
	(3.10)	(10.23)
SELFFIN	0.030**	
	(2.48)	
HWORKED		-0.003*
		(-1.84)
HSTUDIED		-0.011**
		(-2.24)
ATREQ	12.656***	
	(7.86)	
AWARD	8.585***	
	(5.98)	
DAYS	6.101***	
	(3.74)	
TIME	2.440*	
	(1.82)	
TEXTBOOK		0.231***
		(6.61)
LECTURE		0.082*
		(1.82)
PROJECT		0.091**
		(2.12)
SOCOURSE	-7.033***	
	(-4.13)	
JCOURSE	7.411***	
	(5.66)	
$R^2/\bar{R}^2$	0.53/0.52	0.71/0.71

Notes: The values in parentheses are t-statistics. Significance levels of the coefficients at the 1%, 5%, and 10% levels are denoted by ***, **, and *. Refer to Table 2 for variable definitions

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