

Anatomy of a Classroom: An Exploratory Analysis of Elements Influencing Academic Performance

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Abstract

One valuable contribution that would improve instructor and student understanding and cultivate improved learning is specifically identifying and measuring the relationship between student behavior, both inside and outside the classroom, and subsequent performance as measured by course grade. Prior studies have sought to identify the relationship between student seating preference within the classroom, prior background or training and classroom performance. This research effort contributes and extends this body of knowledge by estimating the relationship between physical seating location within the classroom, class preparedness, students' studying habits, class standing, whether students sought outside assistance, and the students' overall class performance. Ordinary Least Squares (OLS) regression techniques are applied to primary data collected from 88 students enrolled in a Freshman Agricultural Economics course at Washington State University. The results indicate that classroom seating preference, class preparedness and prior math experience influenced student performance in this introductory economics course. Students who sit in the back of the classroom exhibit the lowest performance followed by those who sit at the front and middle. Surprisingly, reviewing the text prior to class and class standing had no impact on grade outcomes. An inverse relationship was identified between frequency of seeking outside assistance and grade performance.

Introduction

After receiving a less than desired grade on an exam, a student will often ask the instructor how he or she can receive a better grade in the future. The student may be advised to sit up front, spend more time on the readings, or to review lecture notes before class. This scenario is repeated so often in classrooms that the value of this type of advice is rarely questioned either by teachers or students. Yet, do these routinely given suggestions affect grades as both teachers and students would expect? The purpose of this study is to address this question by assessing the relative success of these types of recommendations and to provide preliminary analyses of the elements

that affect academic performance. For example, does sitting in the front of the class have the same directional affect on grades for all students or does it impact some students differently based on other study habits?

Previous Research

Previous studies have shown a relationship between where a student sits in a classroom and the student's grade. Generally, students who self-select the front of the classroom are better students overall, earn higher grades, and perform better than those in other seating locations (see, for example, Totusek and Staton-Spicer 1982; Holliman and Anderson 1986). In a recent study, Benedict and Hoag (2004) found that while seating preferences (which may be associated with personality or other individual characteristics) correlate with a student's grades, physical location inside the classroom, regardless of seating preference, was also an important determinant of grades. They found that students who were forced to sit towards the front of the classroom despite a preference for sitting in the back of the room tended to receive higher grades (Benedict and Hoag 2004). This suggests that grades might improve if students were to change where they sit in the room.

Research studies also indicate that prior mathematical training has an effect on classroom performance in economics courses. The level of mathematics studied by a student has a positive relationship with the student's success in the class. For example, having mastered algebra or taken calculus improved students' classroom performance in introductory economics courses (see Ballard and Johnson 2004; Anderson et al., 1994 respectively).

In this research we investigate the relationship between physical location, class preparedness, and grades but adding to previous research we also include students' study habits and whether students sought assistance outside the classroom. We also control for class standing (i.e., freshman, sophomore, etc.) which could affect classroom performance since less experienced students may be at a disadvantage academically (see Bonello et al., 1984).

Methods

The data for this study were collected during Fall

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Table 1. Sample Description by Student Class Standing and Sex (n=88)

	Males	Females	Total
Freshman	23	23	46
Sophomores	7	17	24
Juniors	7	5	12
Seniors	2	2	4
Graduate	0	2	2
Total	39	49	88

Semester of 2000 at Washington State University in a lower-division Agricultural Economics class. Coded confidential surveys were administered to 88 students (39 males and 49 females) of all class standings (freshman to graduate students) (see Table 1 for sample description).

Students were asked questions (Table 2) addressing their study habits (e.g., How many hours a week on average do you study?), class preparedness (e.g., Do you review your notes before class?), outside assistance (e.g., How many times have you contacted the teacher or teaching assistant for help?), and physical location in the classroom (e.g., Where do you sit in the classroom, based on the student's perception of the location?). In addition, final class grades were

variables, as might be anticipated. For example, although there is a modest negative correlation between seating and grades (i.e., those sitting in the back tend to have lower grades than those sitting towards the front; $r = -0.23$) students sitting in the middle of the

classroom had a slightly higher mean grade point average (82%) than those sitting in the front of the classroom (80%). Yet, students sitting in the front or middle fared much better than students who routinely opted to sit in the back of the classroom (73% mean grade point average or GPA). Using OLS regression (see Table 3), students sitting in the front or middle of the class room had significantly higher GPAs when compared to students sitting in the back of the classroom indicating that classroom seating location appears to be related to academic performance.

Clearly, other factors may contribute to grade outcomes. A series of independent variables including study habits (number of hours the students studies per week), physical location (where the student sits in the room), class preparedness (whether the student reviews the text before taking a test, whether the student reviews notes or the text before class, the level of math taken) and outside assistance (whether the student visited the Professor or Teaching Assistant) are

Table 2. Survey Questions and Responses (n=88).

Study Habits	Mean	Minimum	Maximum
How many hours a week on the average do you study?	3.11	1	8
Class Preparedness	Yes	No	Sometimes
Do you have a personal copy of the textbook?	88	0	0
Do you read or review it before class?	19	44	25
Do you use it for studying for tests?	71	5	12
Do you review your notes before class?	24	43	21
	Basic	Medium	Advanced
What level of math have you taken?	46	17	25
Outside Assistance	Mean	Minimum	Maximum
How many times have you contacted the teaching assistant for help?	1.04	0	20
How many times have you contacted the teacher for help?	0.95	0	7
Physical Location	Front	Middle	Back
Where do you sit in the room?	42	24	22

matched with student responses to analyze which elements had the greatest influence on academic performance.

Results and Discussion

Exploratory analysis indicates that several factors affect academic performance including where a student generally sits in the classroom, if notes are reviewed before class, and whether the book is reviewed before an exam. In addition, having taken higher level math courses (algebra or above) is positively associated with academic performance ($r = 0.26$), at least in this introductory economic course. However, the direction of performance is not incrementally linear for all

Table 3. OLS Regression Coefficients Predicting Grades by Seating

Independent Variable	Dependent Variable Grade (in Percent)	
	<i>b</i>	(S.E.)
<i>Seating^z</i>		
Front	0.068**	(0.026)
Middle	0.086**	(0.030)
Constant	0.734	(0.021)
R ²	.101	
N	88	

^z Back is the reference category. Location was based on student's perspective
* $p < 0.10$; ** $p < 0.05$; *** $p < 0.001$

used in these analyses (see Table 4 for description of independent variables). Since other factors are associated with grades such as the sex of the student (e.g., in this sample there is a modest positive correlation between grades and being female; $r = 0.37$) and the class standing of the student (e.g., in this sample higher grades are weakly correlated with whether the

Table 4. Description of Independent Variables

Independent Variable	Description	Transformation
<i>Study Habits</i>		
Hours of Study	Number of hours student studies per week	None
<i>Physical Location</i>		
	Location of student in the classroom	Dummy coded into three categories: Front, Middle, and Back.
<i>Class Preparedness</i>		
Reviews text before test	Always or sometimes reviews text before taking a test.	Dummy coded (1 = yes or sometimes, 0 = no).
Reviews notes before class	Always or sometimes reviews notes before class.	Dummy coded (1 = yes or sometimes, 0 = no).
Reviews text before class	Always or sometimes reviews text before class.	Dummy coded (1 = yes or sometimes, 0 = no).
Math Level	Three categories: Basic, Middle, Advanced	None
<i>Outside Assistance</i>		
	Number of visits to Professor and/or Teaching Assistant	Combined number of visits to Professor or Teaching Assistant
<i>Sex</i>		
	Sex of student	Dummy variables (1 = female, 0 = male)
<i>Class Standing</i>		
	Class level of student	Dummy coded into three categories: Freshman, Sophomore, Junior and above.

student is a lower- or upper-division student; $r = 0.13$) these two variables are included in the model as control variables.

Table 5 presents OLS regression coefficients of grade point average (GPA), as an indicator of grades or academic performance. Physical location in the classroom had a significant effect on GPA, controlling for other factors such as study habits, class preparedness, and outside assistance. Students sitting in the front or middle section of the classroom had significantly higher GPAs than their back-of-the-classroom counterparts. This suggests that where a student sits in the classroom may have a positive or negative

interest in the subject matter, or dedication to learning all of which may also affect grade outcomes.).

Class preparedness is also a significant predictor of academic performance. Students who reviewed the text before an exam and students who had higher levels of math before taking the class had significantly higher GPAs, (probably responding to the prevalent math logic used in economics). Interestingly, neither reviewing notes nor the text before class had any significant effect on grade (GPA) outcomes. In addition, a

student's study habits (the number of hours a student reported studying each week) was not a significant predictor of academic performance.

One of the most startling findings was that as outside assistance increases, GPA actually decreases. Although this may seem counterintuitive (and disheartening for educators), a plausible explanation is that those who come to ask for the most help are also the students who are having the most difficulty in the class. Finally, being female is a significant predictor of higher GPAs while class standing (e.g., freshman, sophomore, etc.) had no effect on GPA.

Table 5. OLS Regression Coefficients Predicting Grades

Independent Variables	Dependent Variable Grade (in Percent)	
	<i>b</i>	(S.E.)
<i>Study Habits</i>		
Hours Study (number of hours per week)	-0.004	(0.006)
<i>Physical Location^z</i>		
Front	0.056**	(0.026)
Middle	0.064**	(0.027)
<i>Class Preparedness</i>		
Reviews text before test	0.097**	(0.045)
Reviews notes before class	0.030	(0.021)
Reviews text before class	-0.034	(0.022)
Math level	0.026**	(0.012)
<i>Outside Assistance (number of visits)</i>		
Female	0.083***	(0.020)
<i>Class Standing^y</i>		
Sophomore	0.005	(0.023)
Junior or above	0.038	(0.025)
Constant	0.577	(0.052)
R ²	0.375	
N	88	

effect on grade outcomes (it is also possible, however, that students self-select classroom location based on other factors such as past academic performance,

both related to classroom performance. In our study, however, we found that reviewing material before a test had a positive effect on a student's grade while

Summary

Although physical location in the classroom and prior math experience both affect grade outcomes, other factors such as class preparedness affected a student's success in this economics class. Knowing which factors have the greatest impact on student performance or the combination of factors can help teachers to be better educators. More important, however, is to learn what educators can do to encourage their students to succeed in the classroom. Similar to previous research, our study showed that classroom seating location and math competency are

receiving outside assistance had less of an effect than would have been anticipated. While more research is needed to gain a better understanding of which factors will most likely help students perform better in the classroom, this study begins to unpack the various elements that effect academic performance, with interesting needs for research on the relationship between class preparedness and academic performance.

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