Computer Literacy Requirements and Student Performance in Business Communications

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ABSTRACT. This study investigated whether completion of course prerequisites improves student performance in business communications. Regression analysis indicates that the freshman writing requirement improves course performance, whereas the computer literacy prerequisite has no effect. Students who complete the lower-division accounting course, though it is not a prerequisite, earn better grades in business communications. In addition, the study found that gender and class schedule have no effect on student outcomes.

Prerequisites are standard in college curriculums and establish the preconditions for course enrollment. Prerequisites may include specific courses, academic status, and tests of preparedness. Such prerequisites perform two distinct yet related functions. First, they can be used as a filter that prevents program continuation. Second, they can serve as a measure of course preparedness. As a filter, prerequisites may improve course performance by eliminating weak students. As a measure of preparedness, valid prerequisites should increase the likelihood for success.

As preparation, prerequisites signal the set of entering skills that are required for successful course completion. With the movement toward increased program assessment, the effect of prerequisites on student outcomes becomes increasingly important. Currently, the State of California mandates validation and reevaluation of community college course prerequisites.[1] We used regression techniques in this research to determine whether a computer literacy requirement improves student performance in the business communications course.

Numerous studies have analyzed the effects of quantitative prerequisites on course performance. Analysis of student performance in introductory economics dominates the literature. For example, Anderson, Benjamin, and Fuss (1994) found that a high school calculus course was significant in predicting performance in basic economics. Cohn, Cohn, Hult, Balch, and Bradley (1998) also found math skills were important but questioned math as a prerequisite, arguing that evidence from other courses or SAT performance could suffice. Ely and Hittle (1990) found that performance in business finance was improved by completion of accounting courses and was not influenced by mathematical background. Most of the remaining studies investigated how course or individual characteristics affect student success. For example, Henebry (1997) considered the importance of class schedule and found that students were more likely to pass a financial management course if it met more than once a week. Horvath, Beaudin, and Wright (1992) investigated gender differences in course persistence and found that female students were less likely to persist in the introductory economics course sequence.

Method

Sample

The sample for this project was from a large, public university in Southern California. California State University at Northridge (CSUN) has over 26,000 students, about 5,000 of whom major in business. This project analyzed course outcomes for students enrolled in Analysis of Communications for Business (Office Systems and Business Education—OSBE 205) during the fall 1997 semester. This course is a typical sophomore business communications class encompassing 3 semester units and designed to increase students' writing, presentation, and information-gathering skills. Approximately 750 students enroll into OSBE 205 each semester.

In 1996, the college of business moved this course from the junior to the sophomore level and imposed a computer literacy prerequisite. This requirement reflects the growing use of the Internet and computer software in business communications courses nationwide. It is designed to ensure electronic

and computer competency prior to entering the communications course. Coursework or examination satisfies the Business Computer Literacy Requirement (BCLR). The course substitution is a basic computer science class and a lab on business-specific software. The alternative examination tests students' basic computer knowledge and their ability to use standard software in word processing, spreadsheets, and databases.

OSBE 205 is required for a number of junior and senior level business courses. About 75% to 80% of CSUN students are community college transfers who take business communications during their first semester of enrollment. Because the BCLR was recently imposed as a prerequisite and few students satisfy the requirement outside CSUN, the Department does not prohibit enrollment for lack of the BCLR. However, the Department informs students of this prerequisite and urges them to acquire the necessary computer skills.

The analysis sample was selected from 748 students who enrolled in OSBE 205 during the fall 1997 semester. Twenty-six sections of the course were offered, with an average enrollment of 29 students per section. To ensure an even distribution of sampled students over the range of sections offered, every fifth student on the official class rosters was selected.[2] Data were collected on student characteristics prior to entering this course, whereas the grade in OSBE 205 was collected at the semester's end. The resulting sample size was 150 students.

Based on readily available data, the sample appears to represent the total sample of 748 enrolled students. For example, the overall grade point average earned in OSBE 205 was 2.22 (SD = 1.08, n = 748), and the selected sample average grades were 2.38 (SD = 1.05, n = 144).

Six students were removed from the selected sample. One student was an inter-system transfer who lacked information on previous courses. The remaining 5 students withdrew from the course. Students withdraw from courses for reasons that range from family crises to changes in work schedules, and we had no means of collecting this information. However, there are no significant differences between the characteristics of the students who withdrew and the analysis sample.[3]

Procedure

An ordered probit model was estimated to determine whether students who satisfy the business computer literacy requirement obtain higher grades in the business communications class. The specification for the model was as follows:

$$OSBE205^* = \hat{a}'x + \varepsilon,$$
$$\varepsilon \sim N[0,1]$$

where OSBE205* is the unobserved continuous grade scale that underlies the students' course grades and x is the vector of explanatory variables. The letter grades were coded so that F = 0, D = 1, C = 2, B = 3, and A = 4. These observed grades were related to the unobserved grading scale in the following manner:

$$OSBE205 = 0 \text{ if } OSBE205^* \le 0,$$
$$OSBE205 = 1 \text{ if } 0 < OSBE205^* \le \mu_1,$$
$$OSBE205 = 2 \text{ if } \mu_1 < OSBE205^* \le \mu_2,$$
$$OSBE205 = 3 \text{ if } \mu_2 < OSBE205^* \le \mu_3,$$
$$OSBE205 = 4 \text{ if } \mu_3 \le OSBE205^*.$$

The μs are threshold parameters that provide the ranking in the model and were estimated with the beta coefficients.

The estimation results (μ and β) allowed a calculation of the conditional probability that a student would receive a particular letter grade given her characteristics (x). The probabilities for each of the five letter grades were as follows:

$$Prob(OSBE205 = 0) = \Phi(-\beta'x),$$
$$Prob(OSBE205 = 1) = \Phi(\mu_1 - \beta'x) - \Phi(-\beta'x),$$
$$Prob(OSBE205 = 2) = \Phi(\mu_2 - \beta'x) - \Phi(\mu_1 - \beta'x),$$
$$Prob(OSBE205 = 3) = \Phi(\mu_3 - \beta'x) - \Phi(\mu_2 - \beta'x),$$
$$Prob(OSBE205 = 4) = 1 - \Phi(\mu_3 - \beta'x),$$

where ϕ is the cumulative standard normal distribution.

We assumed that student performance in the business communications course is influenced by personal characteristics, past achievement in college courses, transfer status, OSBE 205 classroom environment, and completion of course prerequisites and business classes. Information regarding the students' age and gender was included in the regression. College grade point average and total units completed represented past achievement in college courses. The OSBE 205 class environment was described by the average grade in the student's section and whether the class met during the day or evening. The freshman composition grade and completion of the computer literacy requirement indicate fulfillment of the two prerequisites for business communications. Completion of the business math and lower-division accounting courses with a grade of C or better was also included in the regression.[4] This information is summarized in Table 1. The regression results are reported in Tables 2 through 4.[5]

The regression results indicate that completion of the business computer literacy requirement (BCLR) did not improve student performance in the business communications course. The coefficient of BCLR was positive, yet statistically insignificant. This result is not surprising, given the modest computer requirements of students enrolled in CSUN's business communications class. The writing and presentation assignments require basic knowledge of word processing software. Students are not obligated to use spreadsheet or presentation software in their coursework. Further, students use Websites solely for the purpose of downloading class syllabi or notes. They do not design or develop Web pages. Thus, the computer literacy requirement should only be important for business communications courses that incorporate more advanced computer technology into class assignments.

Although the focus of this research was the impact of the computer literacy requirement on student performance in business communications, there were some other noteworthy results. First, older and more experienced college students were expected to obtain higher grades in OSBE 205. However, neither age nor completed units had a positive influence on student success in business communications.

Gender was included in the regression because some studies have found that male gender is a significant predictor of student success in economics

TABLE 1. Variable Definitions and Descriptive Statistics (N = 144)

Variable	Definition	Descriptive statistics	
OSBE 205	Grade in business communications	2.38	(1.05)
Age	Student's age in years	25.16	(5.90)
Male	Indicates the student is a male	55.6	
GPA	Current college grade point average	2.82	(0.49)
Total units	Number of completed college credit hours	80.68	(21.57)
Transfer	Student transfer to CSUN with at least 55 college units	76.4	
Section	Average grade in the student's OSBE 205 section	2.20	(0.50)
Day	Student enrolled into an OSBE 205 daytime class	66.7	
BCLR	Student satisfied the business computer literacy requirement	37.5	
Eng 155	Student's grade in the English composition class	2.85	(0.91)
Dumacct	Student passed lower-division accounting with a C or better	66.7	
Dummath	Student passed the business math course with a C or better	78.5	

Note. Standard deviation is in parentheses next to the mean. Otherwise, the statistics are percentages.

TABLE 2. Ordered Probit Analysis of OSBE 205 Grade (Dependent Variable = OSBE 205 Grade)

Variable	Coefficient	*SE*	*t* ratio	Mean of X
Constant	–3.942	1.053	–3.744	
Age	–0.010	0.018	–0.545	25.16
Male	–0.212	0.213	–0.998	0.56
GPA	1.148	0.261	4.397	2.82
Total units	0.000	0.005	–0.091	80.68
Transfer	–0.302	0.289	–1.045	0.76
Section	1.011	0.221	4.571	2.20
Day	0.089	0.258	0.345	0.67
BCLR	0.178	0.249	0.718	0.38
Eng 155	0.197	0.123	1.603	2.85
Dumacct	0.378	0.232	1.630	0.67
Dummath	–0.051	0.241	–0.213	0.78
MU(1)	0.484	0.144	3.371	
MU(2)	1.687	0.187	9.030	
MU(3)	3.453	0.279	12.368	
Sample size		144		
Log likelihood (Ln)		–162.87		
Restricted Ln		–199.70		
χ^2		73.66		

(see, for example, Anderson, Benjamin, & Fuss, 1994). Our results suggest that males and females earn similar grades in business communications.

Students with higher college grade point averages (GPA) earned better grades in business communications. The coefficient on GPA was large, positive, and statistically significant. Moreover, the marginal effects indicate that holding a higher GPA reduces the probability of receiving a C, D, or F, while substantially increasing the probability of receiving an A or B in OSBE 205. This finding is consistent with previous pedagogical research in business and economics (Brasfield, Harrison, & McCoy, 1993; Von Allmen, 1996) and confirms that previous success is a good indicator of future success in college courses.[6]

TABLE 3. Actual Versus Predicted Grades From the Regression Analysis

OSBE 205 grade	Actual frequency	Predicted probability
0	0.090	0.037
1	0.076	0.060
2	0.312	0.364
3	0.409	0.491
4	0.111	0.048

The regression also accounts for the presence of transfer students in the business communications course. CSUN admits large numbers of transfer students from community colleges each semester, and 76% of the analysis sample were such students. The results indicate that transfer and continuing students earn similar grades.

Students enrolled in business communications sections with higher average class grades received better grades. This result may reflect learning spillover effects or instructor grading biases (Brasfield, McCoy, & Milkman, 1992).

Daytime sections of the business communications course were distinguished from evening sections. Student achievement may vary across class schedules if the student population differs between day and evening classes (Akpom & Hullur, 1994). Further, class length and student feedback may differ across day and evening sections, which affects student outcomes (Henebry, 1997). Our results indicate that students enrolled in day and evening classes earn comparable grades.

The remaining three variables in the regression accounted for student preparation. Freshman composition (English 155) is a prerequisite for business communications. Higher grades in freshman composition should reflect improved writing skills (or greater ability) and therefore greater success in business communications. Our results suggest that students with higher grades in English 155 receive higher grades in OSBE 205. This result is encouraging because 76% of the sample completed freshman composition at another institution. This result may reflect a degree of consisten-

TABLE 4. Marginal Effects of the Regressors

Variable	OSBE 205 grade				
	Equals 0	Equals 1	Equals 2	Equals 3	Equals 4
Age	0.001	0.001	0.002	–0.003	–0.001
Male	0.017	0.019	0.048	–0.063	–0.021
GPA	–0.093	–0.103	–0.260	0.342	0.114
Total units	0.000	0.000	0.000	0.000	0.000
Tranfer	0.025	0.027	0.068	–0.090	–0.030
Section	–0.082	–0.091	–0.229	0.301	0.101
Day	–0.007	–0.008	–0.020	0.027	0.009
BCLR	–0.015	–0.016	–0.040	0.053	0.018
Eng 155	–0.016	–0.018	–0.045	0.059	0.020
Dumacct	–0.031	–0.034	–0.085	0.112	0.038
Dummath	0.004	0.005	0.012	–0.015	–0.005

cy in freshman composition grading across institutions.

Students who had passed the lower-division accounting class with a grade of C or better were more likely to succeed in business communications. The marginal effects indicate that students who have met the business accounting requirement are 15% more likely to receive an A or B in OSBE 205 than students who have not met the requirement. This result is interesting because accounting was, at one time, a prerequisite for students to enroll in courses designed to satisfy the BCLR. Perhaps, business communication requires knowledge of basic concepts taught in accounting. Alternatively, students who have completed accounting prior to business communications may be highly motivated or able, and therefore, more likely to succeed in any class, including OSBE 205.[7]

Finally, completion of the business math proficiency requirement did not affect student performance in business communications. The coefficient on the math dummy variable was small, negative, and statistically insignificant.

Conclusion

In this study, we employed regression techniques to determine whether a computer literacy prerequisite improved student performance in business communications. The results indicate that students who fulfill the requirement earn grades similar to those of students who do not. This suggests that the business communications course does not use enough computer technology to warrant placing a computer literacy constraint on students. Perhaps students who lack the computer requirement delay completion of the prerequisite because they already possess the necessary skills. Alternatively, faculty may use class time to review the requisite skills. This study cannot distinguish between these alternatives. Regardless, the computer prerequisite should be removed from OSBE 205 until more advanced technology is incorporated into the course.

The significant performance effect of an accounting course on business communications suggests lines for further inquiry. What specifically are the characteristics of accounting that improve business communication performance? Are the students more highly motivated and therefore more successful in the course? Does accounting provide a common language that improves communication? Those questions are beyond the scope of this study.

The evidence presented is for one course at one university. However, it does call into question the general nature of course prerequisites. It is no longer sufficient for faculty to assert that a prerequisite level of preparedness is needed. Concerns over student progress and program outcomes require an assessment of the impact of prerequisites on subsequent courses.

NOTES

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1. California Code of Regulations § 55201.

2. Because data were collected by hand from 3 or 4 different sources, it was too costly to examine the entire set of students.

3. Further, of the 748 enrolled students, 3.2% withdrew from OSBE 205, whereas 3.3% withdrew from our selected sample.

4. Actual grades for Accounting and Calculus were not used because 25% of the students had not taken those courses prior to the start of the 1997 fall semester.

5. The estimated coefficients of the explanatory variables in an ordered probit regression are not the marginal effects normally interpreted in a linear regression model. If we let P_j represent the probability of receiving a j grade (e.g., j = 0 is an F) then calculation of the marginal effects is as follows:

$$\partial P_j/\partial x_i = [f\mu_{j-1} - \beta' x_i) - f\mu_j - \beta' x_i)] \times \beta,$$

where f is the standard normal density. It is clear that the marginal effects will vary with the values of x. Table 4 contains the marginal effects calculated at the means of the regressors (x). It is worth noting that the marginal effects are multiples of the coefficient vector. Thus, the magnitudes of the marginal effects are likely to be very different from the beta coefficients. See Greene (1993, pp. 672–676) for a discussion of this regression technique.

6. The data do not contain student SAT or ACT scores. Thus, college GPA was our best measure of student ability.

7. Our results suggest that completion of accounting improves performance in business communications after controlling for student grades. There was a *small* positive relationship between student GPA and completion of the accounting course. The average GPA for students who completed accounting was 2.88 ($SD = 0.51$, $n = 96$), and the average GPA for the remaining students was 2.68 ($SD = 0.43$, $n = 48$). The regression holds GPA constant when comparing student performance in business communications. Thus, completion of accounting had a separate and positive influence on success in business communications, apart from student grades.

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