

Goodlad, J.I. (1984). *A Place Called School*. New York: McGraw-Hill.

National Commission on Excellence in Education. (1983). *A Nation At Risk*. Washington, D.C.: U.S. Government Printing Office.

Peters, T.J., & Austin, N. (1985). *A Passion For Excellence*. New York: Random House.

Peters, T.J., & Waterman, R.H. Jr. (1982). *In Search of Excellence*. New York: Harper and Row.

Purkey, W.W. (1978). *Inviting School Success*. Belmont, CA: Wadsworth Publishing Co., Inc.

Rosenshine, B., & Furst, N. (1971). "Research on Teacher Performance Criteria." in *Research In Teacher Education*. B.O. Smith (Ed.), (pp. 37-72). Englewood Cliffs, NJ: Prentice Hall.

Rosenthal, R., & Jacobson, L. (1968). *Pygmalion in the Classroom: Teacher Expectations and Pupils' Intellectual Development*. New York: Hold, Rinehart and Winston.

Sizer, T. (1984). *Horace's Compromise: The Dilemma of the American High School*. Boston: Houghton Mifflin.

A CASE STUDY

Time Spent Writing Exam Answers As a Factor Related to Final Course Grade

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Introduction

Several factors are commonly assumed to be associated with superior performance in upper division undergraduate courses. These include strong academic preparation in related courses, employment or other life experience in the subject matter area, natural intelligence, and diligent work habits. Given the predominant weight of written course examinations in determining the final grade in many courses, students are quick to add "exam taking ability" as another crucial skill. Our interest in this report is how one component of "exam taking ability," namely the amount of time spent writing exam answers, correlates with the final course grade compared to more obvious academic background and experience factors.

Most instructors have been surprised by the large variation among students in time allotted to writing answers to examinations. It is not surprising to have some students leave a 2-hour final exam after an hour while others plead for extra time at the end of the period.

Two divergent, but potentially mutually valid, explanations emerge for students finishing exams in much less time than the stated limit: (1) the students have little to say due to a lack of studying the material tested over, or (2) the students have thoroughly mastered the material, require little time to ponder, and quickly write correct answers to the examination questions.

The purpose of this paper is to statistically measure the correlation of examination completion time, among other factors, to the final course grade in a senior farm management course. This study may help shed some light on the relative empirical importance of the two divergent explanations for speedy exam

completion offered above. The authors were unable to uncover prior research on this topic.

Course and Student Description

The case study is based on an advanced farm management course taught during spring semester 1987 at Washington State University. This senior-level course requires principles of economics and junior-level farm management as a prerequisite. It is the capstone farm and ranch management course in the Department of Agricultural Economics. It emphasizes hands-on solution of farm and ranch management problems using microcomputer software. The course also requires some knowledge of elementary accounting and statistics.

Table 1 describes the 34 students enrolled in the course during spring 1987. The background information was collected from a questionnaire completed by each student at the beginning of the semester and verified, where possible, by the enrollment listing from the Registrar's Office. The eight characteristics included in Table 1 are categorized into academic background factors, experience factors, other, and course performance. The course was split nearly evenly between Agricultural Economics majors and majors in other departments of the College of Agriculture and Home Economics. Approximately a third of the enrollees had taken one, two, or three or more, respectively, specified related courses in agricultural economics. Some 41 percent of the enrolled students ranked low in college computer training and experience, 32 percent moderate, and only 27 percent high or superior. This index was based on the number of computer science courses taken plus the number of composition of other courses taken which required extensive use of microcomputers. The students receiving the highest index of 1.00 had taken four such courses.

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Sixty-five percent of the students were seniors, about one-quarter were sophomores or juniors, and the remainder graduate students. Slightly over one-half of the class members were from the eastern half of Washington state, an area generally regarded as primarily rural and agriculturally oriented, while 29 percent were from western Washington and 15 percent from out of state or other countries. As noted in Table 1, an arbitrary integer index (0, 1, 2) was assigned to the three locations in an attempt to represent the proximity of the student's home to the source of most of the agricultural examples used liberally in course lectures and problem sets. Nearly all examples were based on Washington state agriculture, and most of these from eastern Washington. The location index was constructed so as to be positively correlated with relevant locational background.

The final exam in the course was limited to a preannounced maximum of 2½ hours. As shown in Table 1, 18 percent of the students completed the exam in less than an hour and a half while an equal percentage required between two hours and 10 minutes

Table 1. Description of 34 Enrolled Students, Ag Ec 440, Spring 1987.

Item	Percent of Total ^a
Academic Background Factors:	
1. [MAJOR]	
a. Ag. econ.: 1	47
b. Other: 0	53
2. No. related ag. econ. courses [AGCLASS]	
a. One	35
b. Two	32
c. Three or more	33
3. Computer skills index [CSI]	
a. Low: 0-.25	41
b. Mod.: .26-.50	32
c. High: .51-.75	18
d. Superior: .76-1.00	9
Experience Factors:	
4. Academic level [YEAR]	
a. Sophomore and junior: 2 & 3	24
b. Senior: 4	65
c. Graduate: MS (5) and Ph.D. (6)	12
5. Location of home index [LOC]	
a. Washington state, east of Cascades: 2	56
b. Washington state, west of Cascades: 1	29
c. Other: 0	15
Other:	
6. [SEX]	
a. Male: 1	71
b. Female: 0	29
7. Minutes to write final exam [TIME]	
a. ≤ 90	18
b. 90 < TIME ≤ 110	24
c. 110 < TIME ≤ 130	42
d. 130 < TIME ≤ 150	18
Course Performance:	
8. Course grade, percent [SCORE]	
a. 50 ≤ SCORE < 60	6
b. 60 ≤ SCORE < 70	29
c. 70 ≤ SCORE < 80	32
d. 80 ≤ SCORE < 90	29
e. 90 < SCORE ≤ 100	3

^a Some totals do not add to 100 due to rounding.

Table 2. Correlation Matrix of Selected Variables.

	Score	Major	AGClass	CSI	Year	Time	Sex	LOC
Score	1.00							
Major	.22	1.00						
AGClass	.40	.40	1.00					
CSI	.24	.24	.24	1.00				
Year	.10	-.01	.09	-.35	1.00			
Time	.49	.02	.32	.08	.34	1.00		
Sex	.09	-.04	-.12	.16	-.02	.11	1.00	
LOC	-.26	-.03	-.11	.15	-.28	-.34	-.05	1.00

and 2½ hours to finish. All but 9 percent of the 34 students received course scores between 60 and 90 percent, with approximately one-third scoring in the 70's.

Results

Table 2 presents the correlation matrix of the eight variables listed in Table 1. This table presents the simple pairwise correlation between all possible pairs of variables. The correlations are computed using the units of measurement specified in Table 1. For binary variables like MAJOR and SEX, the 0 or 1 index assigned to each category is listed. For example, Ag. Econ. major equals 1 and other majors equal 0. Other variables are measured in their natural units or in the units listed in Table 1. For example, a sophomore equals 2, and a 127-minute exam completion time equals 127.

The five academic background and experience variables were constructed so that stronger academic background or greater experience received a higher numerical value. Consequently, positive correlations were hypothesized throughout between these variables and course performance. Table 2 confirms that all academic background variables are positively correlated with course score but that the level of correlation is fairly low. The correlation of the two "experience" variables with course performance falls short of prior expectations. The correlation of academic class (YEAR) with SCORE is positive, but extremely low. The location variable exhibits an unexpected negative correlation with performance, albeit modest in magnitude. Interestingly, the correlation of 0.49 between time allotted to the final exam and final course grade is the highest among those reported in Table 2.

A more rigorous statistical analysis of the correlation of various variables with final course grade can be provided by using multiple regression analysis. This technique permits a formal statistical test of the significance of each potential explanatory variable once the concurrent contributions of other variables are taken into account (Pindyck and Rubinfeld; Chadwick et al.). Equation (1) presents the regression equation summarizing the estimated relationship between final course score and the seven explanatory variables listed in Table 1.

$$\text{Equation (1) SCORE} = 47.63 + 1.74 \text{ MAJOR} + 1.57 \text{ AGCLASS} + 5.14 \text{ CSI} - 0.49 \text{ YEAR} \\
\begin{matrix} (3.42) & (0.54) & (1.10) & (0.74) & (-0.21) \\ -1.89 \text{ LOC} + 0.21 \text{ TIME} + 1.01 \text{ SEX} \\ (-0.78) & (1.99) & (0.31) & & \end{matrix} \quad R^2 = 0.36 ; \text{ t-statistics in parentheses}$$

The R^2 for equation (1) indicates that the seven explanatory variables account for a little over a third, 36 percent, of the variation in course performance among the 34 students. The remaining variation is likely associated with difference natural ability, motivation, and other factors not included in the model.

Recall that all five academic and experience background factors (MAJOR, AGCLASS, CSI, YEAR and LOC) were hypothesized to contribute positively to course performance. However, equation (1) shows that two of these factors — YEAR and LOC — have negative signs, albeit not statistically significant. It is interesting to note that YEAR switched to a negative correlation with SCORE in equation (1), compared to positive in Table 2, as a consequence of considering the concurrent contributions of other explanatory variables.

None of the five academic and experience factors in equation (1) show a statistically significant relationship — positive or negative — with course performance at conventional levels of significance. In contrast, time spent writing the final exam is easily significant at the 10 percent level ($t = 1.706$) and just misses significance at the 5 percent level ($t = 2.056$). This confirms that the strong positive relationship between time spent writing tests and course performance holds up even when the concurrent influence of experience and background factors had been adjusted for. Indeed, TIME alone regressed on SCORE explained 24 percent of the variation in course performance; adding the other six variables added only 12 percent more explanation. The coefficient on TIME in equation (1) indicates that, on average, students receive 0.21 percentage points higher grade for each additional minute spent writing the final exam. At this rate, an extra 20 minutes spent on the final for this course was associated with four points gain in the final course grade.

Conclusions

The purpose of this paper was to statistically measure the correlation of time spent writing the final examination, among other factors, with the final course grade students received in a senior farm management course. The statistical results revealed that students who spent more time writing exam answers clearly averaged higher course grades. In contrast, being an ag. econ. major, having taken more related ag. econ. or computer science courses, being at a higher academic class level, or coming from a more agriculturally relevant home location had no

statistically significant influence on course performance.

Of the competing hypotheses advanced for speedy exam completion at the outset, these results support the first explanation: students who complete exams more quickly than their classmates may have little to write, due to inadequate studying of the material tested over. Of course, these results could be dependent upon the type of exam given in this particular course. However, the mixed numerical and essay final examination given in this course is fairly similar to that given in many junior and senior agricultural courses. It would be useful to have evidence from further studies covering different examination types, subject matters, and student composition to determine how *generally* the conclusion of this study applies.

The correlation and regression results also do not address the important question of direction of causation: (1) do better students spend more time writing exams?, or (2) do students receive better grades because they spend more time writing exams? A more in-depth study would be required to definitively resolve this question. Our hypothesis, however, is that the causation tends to run in both directions, with somewhat more weight possible on direction (1). However, to the extent that direction (2) is present at all — namely that students of equal “quality” can improve their grades by spending more time writing exams — the results of this study have an important implication for teachers. We teachers should encourage our students not to rush through exams. They should take full advantage of the time allotted in order to thoroughly read the questions, carefully think through and write their answers, and to proof these answers. This study provides tentative evidence that spending this additional time can pay off in better grades.

References

- Chadwick, Bruce A., Howard M. Bahr, and Stan L. Albrecht. *Social Science Research Methods*. Englewood Cliffs, New Jersey: Prentice Hall, 1984.
- Pindyck, Robert S. and David Rubinfeld. *Econometric Models and Economic Forecasts*. New York: McGraw Hill, 1981.

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