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## INTRODUCTION

In essence, this paper deals with the problem of academic performance, i.e., how well students might be expected to perform once they get to college. More precisely it investigates the relationship between a student's scholastic aptitude and his or her academic performance over a four year period in a college of business administration. It is also concerned with the role core courses play in predicting over-all academic performance in the college of business. That is, do students who do well in the core courses also perform well in the remainder of the courses in their business program.

## PREVIOUS RESEARCH

Lavin (1965) identifies ability, personality traits and socio-economic status as the major predictors of academic performance. It would appear, however, that personality factors contribute only modestly to the prediction of academic performance. For example, study habits and attitudes, considered key "personality" variables by many researchers, have been found by Birney and Taylor to have only a .29 correlation with college grades. Another personality factor, student interests, was found by Chronbach (1949) to have only a .19 correlation with the grade averages of freshmen.

The importance of socio-economic status as a linear predictor of college academic performance is also open to debate. Friedhoff's (1955) research suggests that much of the association between college grades and socio-economic status is eliminated when ability is controlled. In addition, Boyce (1956) and Davis (1956) found an inverse rather than a direct relationship between socio-economic status and college grades. These latter studies have focused attention on the performance differences between public and private school students and the findings suggest that students who come from very wealthy families have more interest in propriety than achievement, hence do not strive for higher grades.

Ability has generally been measured by high school grades, intelligence tests or college level ability tests. Chronbach (<u>op. cit.</u>) found that college level ability tests correlated in the .50-.55 range with grade point averages. Henry (1950) found correlations as high as .70 between aptitude tests and college grades although .50 was more common. Swensen (1957) found that high school grades were the best single predictor of college grades while Astin (1969) has concluded that a combination of high school grades and ability tests is the best estimator of college academic performance.

Most of the research that has been conducted on the correlates of academic performance has relied on what Lavin (op. cit.) refers to as global measures of ability and performance, i.e. single over-all measures such as aptitude test scores and final grade point averages. A few researchers such as Travers (1949), Fisher (1955) Horst (1957), and Astin (1969) have used several dimensions of aptitude to predict over-all grade averages as well as grades in specific courses. However, the superiority of this type of differential analysis has been disputed by Chronbach (op. cit.) and Berdie (1955) who claim that multifactor tests of ability add little to the prediction of academic performance beyond what the general aptitude factor will predict. Perhaps more important, most studies concerning the prediction of academic performance have focused on college freshmen or college students in general while little if any attempt has been made to develop performance predictors for students taking a particular subject area or curriculum. Such predictors could lead to a more efficient allocation of human capital among professional and white collar occupations and at the same time make the educational system more responsive to the needs and aspirations of individual students.

### STUDY APPROACH

The objective of this study is to determine the degree of association between student intellectual ability and academic performance in a college of business administration. Ability is measured by college level entrance examination scores and the grade point average (G.P.A.) for seven core or foundation courses that are required of all business administration students.<sup>1</sup> Academic performance is measured in terms of the G.P.A. for all courses taken by the college of business administration student and the G.P.A. for economics and business courses only.

In determining the sample size for this study, it was assumed that the mean final grade plus and minus three standard deviations would include all the grades and that the maximum and minimum grade point averages were 4.0 and 2.0 respectively. Based on these assumptions, the range in final G.P.A. was 2.1 points and the standard deviation of the population mean was estimated to be 0.35.

To provide a narrow margin for error, a 99 per cent confidence level was established with the sample mean not allowed to vary more than 0.1 points from the population mean. This desired accuracy is obtained with a mean plus and minus 2.58 standard deviations. Given these parameters, N = 82.

The data for this study was obtained from the Admissions Office of Memphis State University. A table of four digit random numbers was used to select individual students, with the first digit in the random number representing a particular file drawer and the last three digits the specific record within the drawer. Each record selected included a final G.P.A. based on 132 hours of courses. G.P.A.'s had to be calculated, however, for business and economic subjects as well as the seven core courses. It should be noted that the final G.P.A. includes only the last grade earned by a student in a particular course while the G.P.A.'s for business and economic subjects and the core courses include <u>all</u> grades received for a particular course.

## STUDY FINDINGS

To test the hypothesis that academic performance in the college of business administration is dependent upon intellectual ability, the following arguments were specified:

1. Aptitude test scores are a measure of a student's general intelligence and problem solving capacity; therefore, they should have a strong positive association with final grade point averages.

2. The core courses in the college of business administration measure the student's ability to master basic concepts and principles in business, therefore, the grade point averages in these courses should have a strong positive association with final grade point averages.

Two different statistical tests were designed to answer the first argument. The first test consisted of dividing the student sample into "high ability" and "low ability" groups and then analyzing the differences in the mean grade point averages for (1) all courses taken in the college of business administration, (2) business and economic courses only, and (3) the seven core courses.<sup>2</sup> The results are summarized in Table 1. (All tables are at the end of this paper.)

As expected, Table 1 indicates that the high ability group out-performed the low ability group for each set of courses. This finding lends support to the argument that general learning ability accounts for much of the difference in academic performance regardless of the nature of courses or curriculum (see Chronbach, <u>op. cit.</u>). Table 1 also reveals that the mean G.P.A.'s for each set of courses are statistically significant at the 99% confidence level (i.e. the chance of obtaining the above listed Z scores for two groups within the same population is less than 1 in a hundred).

The second statistical test consisted of regressing aptitude test scores on G.P.A. scores for the above-mentioned sets of courses. The results of this test were inconclusive. Although the correlation coefficients had the right sign they were not statistically significant at the 95% confidence level. The regression coefficients also had the right sign but were highly unreliable predictors of G.P.A.'s. For the most part, the standard errors of the regression coefficients were as large or larger than the

coefficients themselves. Because of the disappointing results with correlation and regression, it is difficult to assess the merits of aptitude test scores as a predictor of academic performance in the college of business administration. Although it seems clear enough that students with higher aptitude test scores also make higher grades in the college of business, it is also apparent that aptitude test scores are not a good linear predictor of G.P.A.'s in business subjects. The problem, it would seem, is one of precision and reliability rather than direction. That is, we know that students with good learning ability will perform quite well in business courses but aptitude test scores do not measure this performance accurately.

To determine if the relationship between the grade point average for the core courses and the over-all grade point average for business administration courses is positive and statistically significant at both the 5% and 1% confidence levels, multiple correlation and regression analysis was performed using the following variables:

Dependent variables

- Y<sub>1</sub> = Final G.P.A. for all courses taken by the student in the college of business
- Y<sub>2</sub> = Final G.P.A. for all business and economics courses
- Independent variables (core courses) X<sub>1</sub> = G.P.A. for MANAGEMENT 1010, INTRODUC-TION TO BUSINESS
  - X<sub>2</sub> = G.P.A. for ACCOUNTING 2010, FUNDAMEN-TALS OF ACCOUNTING I
  - X<sub>3</sub> = G.P.A. for ACCOUNTING 2020, FUNDAMEN-TALS OF ACCOUNTING II
  - X<sub>4</sub> = G.P.A. for ECONOMICS 2110, PRINCIPLES OF ECONOMICS I
  - X<sub>5</sub> = G.P.A. for ECONOMICS 2120, PRINCIPLES OF ECONOMICS II
  - X<sub>6</sub> = G.P.A. for MANAGEMENT 2711, BUSINESS STATISTICS I
  - X<sub>7</sub> = G.P.A. for MANAGEMENT 3711, BUSINESS STATISTICS II

The results of the analysis when  $Y_1$  is regressed on  $X_1-X_7$  are summarized in Table 2. As Table 2 indicates, the core courses explain 53 per cent of the variation in the final G.P.A. The F test indicates that the ratio of explained to unexplained variance far exceeded what might be expected due to chance. Not all of the independent variables, however, are reliable predictors of final G.P.A. Using the rule of thumb that the regression coefficient must be more than twice its standard error to be reliable as a predictor, we find that both the statistics courses, the second course in economics principles and the first course in accounting principles fail to meet this test. One possible explanation for the poor showing of these variables is that they do not really provide a learning foundation for courses taken outside the college of business. This reasoning takes on added significance when one realizes these latter courses make up roughly 40-60 per cent of the total course load for the business student.

To test this hypothesis, the non-business courses were eliminated from the calculation of the final G.P.A. and  $Y_2$  was regressed on variables  $X_1-X_7$ . The results are shown in Table 3.

A comparison of tables 2 and 3 indicates that the coefficient of multiple correlation (R) and its square ( $\mathbb{R}^2$ ) increase markedly when nonbusiness courses are dropped from the regression run. This result tends to support the argument that the business core courses have little or no learning foundation for non-business courses. The high R (.8781) and  $\mathbb{R}^2$  (.7710) also butress the argument that one can predict a student's final grade point average by determining how well he did in the core courses.

The reliability of the individual core courses as predictors of over-all grade performance also improved. In the second run, only  $X_6$ , Business Statistics I, failed to meet the "rule of thumb" test.  $X_6$  had the wrong sign and in a test for collinearity, it was found that  $X_7$  and  $X_6$  had a correlation of .749, which tends to explain the latter variable's weak showing.

It is interesting to note that the influence of each independent variable on final G.P.A. varied considerably. Principles of Accounting II, Principles of Business, and Business Statistics II account for 87 per cent of the explained variance in the final G.P.A. On the other hand, Principles of Economics I and II and Business Statistics I account for only 13% of the explained variance. When major subject areas are combined, however, a slightly different picture emerges. More precisely, accounting has the greatest influence on final G.P.A., followed in order by economics, business statistics, and business principles.<sup>3</sup>

#### CONCLUSION

The results of the regression analysis support the argument that students' final G.P.A. in business and economic courses has a positive and high degree of association with the G.P.A. for the seven core courses. The argument that a positive and high degree of association exists between final G.P.A. and aptitude tests was not fully supported although it is apparent that students with high aptitude scores, when compared to students with low scores, obtain significantly higher final G.P.A.'s. The findings also suggest that the ability to handle basic business courses will not insure a high degree of proficiency in non-business courses, i.e. there is little or no learning transfer between business and non-business subjects. Said a little differently, demonstrated proficiency in the core business courses is not a reliable measure of general learning ability and aptitude; rather it is a

measure of the student's ability and capacity to handle business and economics subjects only.

# FOOTNOTES

<sup>1</sup>The seven core courses are as follows: Management 1010, Introduction to Business, Accounting 2010, Fundamentals of Accounting I, Accounting 2020, Fundamentals of Accounting II, Economics 2110, Principles of Economics I, Economics 2120, Principles of Economics II, Management 2711, Business Statistics I, Management 3711, Business Statistics II.

<sup>2</sup>High and low ability rankings were based on the mean aptitude test score for the above student sample. Those students with scores above the mean were placed in with the high ability group and those with scores below the mean were assigned to the low ability group. It should be noted that the mean score for the sample closely approximates the mean score for all freshmen students during the period under investigation.

<sup>3</sup>Due to a lack of space the regression run with the combined variables was not included in this paper. For further details see R. D. Dean and C. Branyan "Correlates of Academic Performance in the College of Business Administration." <u>Working Paper No. 26</u>, Memphis State University, Memphis, Tennessee 1973.

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Table	1.	Mean	G.P./	A.'s	and	Z	Scores
for	: Hi	gh and	Low	Abil	litv	Gı	coups

,	High Ability Group Mean G.P.A. (X <sub>1</sub> )	Low Ability Group Mean G.P.A. (X <sub>2</sub> )	z <sup>I</sup> Scores	Р
All Courses	2.54418	2.31941	2.8695*	.0041
Business/Economic Courses	2.58918	2.30862	2.7872*	.0053
Core Courses	2.50941	2.13751	3.0256*	.0024
Sample Size	38	43	*Significant at 99% level	

 $z^{I} = \frac{\overline{x}_{1} - \overline{x}_{2}}{s_{x_{1} - x_{2}}}$ 

Table	2.	Step-	Wise	Regression	Analysis	: F:	inal	G.P.A.	for
A11	Busi	ness	and	Non-Business	Courses	and	Core	Course	28

	Regression	Multiple <sub>2</sub>		Increase	F	Significant Points of F		
Variable	Coefficient	R	R	R <sup>2</sup>	Ratio	5%	1%	
	.10044							
x <sub>3</sub>	(.04004) .10559	.5126	.2627	.2627	28.508	3.96	6.96	
x <sub>1</sub>	(.04330) .08724	.6478	.4196	.1569	28.561	3.11	4.88	
×7	(.04835) .08716	.6845	.4685	.0489	22.919	2.72	4.04	
x <sub>4</sub>	(.04194) .06474	.7121	.5071	.0386	19.804	2.48	3.56	
x <sub>2</sub>	(.03898) .04066	.7228	.5225	.0154	16.631	2.33	3.25	
х <sub>5</sub>	(.04067) 02199	.7271	.5287	.0062	14.020	2.22	3.06	
x <sub>6</sub>	(.04857)	.7280	.5300	.0013	11.919	2.13	2.89	
Constant	1.36106		N=82					

	Regression	Multiple		Increase	F	Significant	Points of F	
Variable	Coefficient	R	R <sup>2</sup>	R <sup>2</sup>	Ratio	5%	1%	
<u> </u>	.14417							
x <sub>3</sub>	(.03578) .13331	.6257	.3915	.3915	51.469	3.96	6.96	
x <sub>1</sub>	(.03869) .13048	.7657	.5898	.1983	56.790	3.11	4.88	
x <sub>7</sub>	(.03918) .11833	.8215	.6748	.0850	53.954	2.72	4.04	
x <sub>5</sub>	(.03634) .11216	.8477	.7186	.0438	49.163	2.48	3.56	
x <sub>2</sub>	(.03483)	.8682	.7538	.0352	46.532	2.33	3.25	
x <sub>4</sub>	(.03749) 00952	.8780	.7708	.0171	42.084	2.22	3.06	
x <sub>6</sub>	(.13048)	.8781	.7710	.0001	35.591	2.13	2.89	
Constant	.78830		<b>N=8</b> 2					

# Table 3. Step-Wise Regression Analysis: Final G.P.A., Business and Economic Courses and Core Courses