University Admission Criteria and Learning Style: Predictors of Academic Success?

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Abstract

This study was conducted to determine if university admissions criteria and student learning style were predictors of academic performance and degree completion of college agriculture students. Freshmen enrolled in the University of Missouri's College of Agriculture, Food and Natural Resources, in the fall semesters of 1997 (n = 245) and 1998 (n = 197), participated. ACT, high school core GPA, and high school class rank were investigated as predictors of academic performance and degree completion, in addition to students' preferred learning styles. Regression analysis was utilized to determine the variance in students' cumulative GPA at the completion of five academic years. Step-wise discriminant analysis was performed to build a predictive model for degree completion. Using the Davis (1971) correlation conventions, a low, positive relationship was found between students' preferred learning style and academic performance for both academic years. The best predictor of students' academic performance for both groups, as determined by cumulative college GPA, was their high school core GPA. For both groups, learning style was not a predictor of students' cumulative GPA. High school core GPA was found to have limited value in predicting agriculture students' degree completion rates.

Introduction

"Degree completion is the true bottom line for college administrators, state legislators, parents, and most importantly, studentsnot retention to the second year, not persistence without a degree, but completion." (Adelman, 1999, p.1). To assist faculty in helping students achieve academic success, variables should be identified to help predict whether or not students might have difficulties in achieving academic success, and therefore whether or not those students will have difficulties in completing a degree. In determining degree completion, university admissions offices have been applying their own predictors for years.

Universities across the nation have established criteria in the selection of students for admission. While the selection criteria vary among universities, most universities use some combination of high school grade point average, high school class rank, and ACT or SAT examination. However, are these admission criteria valid in predicting academic performance and degree completion of agriculture students?

National studies indicate that students who are able to achieve a bachelor's degree within four years of enrolling in college is declining (Astin, 1996; National Center for Educational Statistics [NCES], 1993). Adelman (1999) reported that the rigor of a student's high school curriculum explained more of the variance in degree completion than either ACT, high school class rank, or high school GPA. In addition, Adelman indicated that college admissions formulas that emphasized ACT, high school class rank, or high school GPA were more likely to produce lower degree completion rates. Thus, research is warranted that determines the best predictors of degree completion in colleges of agriculture.

Gregorc (1979) described a person's learning style as consisting of distinct behaviors which serve as stable indicators of how a person learns and adapts to his/her learning environment. The most extensively researched and applied learning style construct has been the field-dependence/independence dimension (Guild and Garger, 1985).

Individuals who prefer a field-dependent learning style tend to have a global perception, have a more difficult time solving problems, are more attuned to their social environment, learn better when concepts are humanized, and tend to favor a spectator approach to learning. Additionally, individuals preferring a field-dependent learning style have been found to be more extrinsically motivated and learn better when organization and structure is provided by the teacher. Conversely, individuals who prefer a field-independent learning style tend to view concepts more analytically, therefore finding it easier to

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solve problems. Individuals preferring a field-independent learning style are more likely to favor learning activities that require individual effort and study. In addition, they prefer to develop their own structure and organization for learning, are intrinsically motivated, and are less receptive to social reinforcement. (Jonassen and Grabowski, 1993).

Research has been conducted regarding the relationship between students' learning styles and academic performance (Witkin, 1973; Gregorc, 1979; Garger and Guild, 1984; Claxton and Murrell, 1987; Schroeder, 1993). These studies can be summarized by Schroeder (1993) who acknowledged that being cognizant of and accommodating variations in learning styles could improve curricula, the teaching-learning process, and ultimately the retention of students in higher education. Recent studies have focused on assessing the learning styles of students in colleges of agriculture. Learning styles have been found to have a positive relationship with academic performance, as measured by grade point average (Torres, 1993; Torres and Cano, 1994), performance in agriculture courses (Garton et al., 1999), and overall success in higher education (Cano and Porter, 1997; Cano, 1999).

Previous research has identified associations between learning style and academic performance. However, data are lacking that describes the relationship of university admission criteria and learning styles to students' academic performance and degree completion in colleges of agriculture. In addition, universities use selected criteria to determine if students are likely to be successful in their academic endeavors. By analyzing the admission criteria of groups of students who have been successful against groups who have not, the possibility exists to classify subsequent applicants for intervention strategies based upon an analysis of admission criteria. As a result of such strategies, the ultimate of goal of degree completion may be realized. Consequently, what are the best predictors of students' academic performance? Are these predictors consistent over time with different groups of students? Possessing this knowledge could provide faculty and academic advisors with information to assist at-risk students in achieving academic success and therefore completing a degree.

Purpose and Objectives

The purpose of the study was to determine predictors of academic performance and degree completion within the University of Missouri's College of Agriculture, Food and Natural Resource. In particular, the study investigated the impact using two groups freshmen entering the university in the fall of 1997 and 1998. As a result, the following research objectives were developed:

1.   Describe the relationship between students' learning styles and academic performance, as measured by cumulative grade point average (CGPA).

2.   Determine whether a linear combination of university admission criteria and/or learning style could predict academic performance, as measured by CGPA.

3.   Determine whether a linear combination of university admission criteria and/or learning style could predict students' degree completion.

Methods

The target population for this study was freshmen entering University of Missouri's College of Agriculture, Food and Natural Resource. The population was entering freshmen in the fall of 1997 (N = 326) and fall of 1998 (N = 338). The sample consisted of an intact group of freshmen enrolled in a college learning and development course (n_{97} = 245; n_{98} = 197). The study was identified as a trend type, longitudinal study because it investigated different groups from the same general population (Ary et al., 2002).

The Group Embedded Figures Test (GEFT) (Witkin et al., 1971) was administered to assess the preferred learning style of students as field-dependent or field-independent. The possible range of scores on the GEFT is zero to 18. Individuals scoring 11 or less were considered to prefer a field-dependent learning style, while individuals scoring 12 or greater were considered to prefer a field-independent learning style. The GEFT is a standardized instrument that has been used in educational research for more than 30 years (Guild and Garger, 1985). The validity and reliability of the GEFT was established by the developers of the instrument. The GEFT is a timed test; therefore internal consistency was measured by treating each section as split halves (r = .82) (Witkin et al., 1971).

Academic performance was measured by CGPA at the completion of the academic degree program or at the conclusion of the five years for students who had not earned a degree. University admission variables included ACT score, high school class rank, and high school core grade point average. High school core grade point average (GPA) was calculated based on courses required by the university for admission, English, math, science, social studies, foreign language and fine arts, and was determined from university admission data. Degree completion was determined based upon students' attainment of a baccalaureate degree at the conclusion of five academic years.

Descriptive statistics were generated on GEFT scores and academic admission variables (ACT, high school core GPA, and high school class rank). Pearson product-moment correlation coefficients were calculated between GEFT scores, academic admission variables, and cumulative grade point average and were interpreted using Davis's (1971) descriptors. Regression analysis was used to explain variance in students' CGPA. Step-wise discriminant analysis was performed to build a predictive model of

independent variables that could determine whether a linear combination of GEFT score, ACT score, high school class rank, and high school core GPA could be used to predict completion of a baccalaureate degree. An alpha level of .05 was established a priori.

Results and Discussion
Objective 1

The first objective sought to describe the relationship between students' learning styles and academic performance at the completion of five academic years for both the 1997 and 1998 groups of students. For 1997, 73% of the students, and for 1998, 63% of students possessed a preference for a field-independent learning style (Table 1). The remaining students, 27% in 1997 and 37% in 1998, preferred a field-dependent learning style.

multicollinearity. Using guidelines offered by Lewis-Beck (1980), each independent variable was regressed on the remaining independent variables for both groups. Regressing the independent variables on high school core GPA resulted in R^2 values of .75 for the 1997 group and .79 for the 1998 group, indicating a high degree of multicollinearity. Furthermore, a R^2 values of .74 for the 1997 group and .78 for the 1998 group were found when the independent variables were regressed on high school class rank, again indicating a high degree of multicollinearity. Due to a lower correlation coefficient with the criterion variable, high school class rank was excluded from consideration in the regression equation for both groups.

The remaining predictor variables (GEFT, ACT, and high school core GPA) were regressed on the criterion variable (CGPA) using step-wise multiple regression procedures. For the 1997 group, 31% of the variance in CGPA was accounted for by high school core GPA (Table 2). ACT score accounted for an additional 2% of the variance when entered into the regression analysis. Subsequently, a combination of high school core GPA and ACT score accounted for 33% of the variance in CGPA. Students' learning styles (GEFT scores) did not enter the regression equation. For the 1998 group, 34% of the variance in CGPA could be accounted for by high school GPA (Table 2). However, neither ACT nor learning style entered the regression equation for the 1998 group.

Table 1. Relationship Between Learning Style and Academic Performance (n_{97}=245; n_{98}=197)

	1997				1998			
	Field Dependent		Field Independent		Field Dependent		Field Independent	
CGPA	n	%	n	%	n	%	n	%
3.50 - 4.00	8	12.1	42	23.5	7	9.6	20	16.1
3.00 - 3.49	17	25.8	58	32.3	13	17.8	33	26.6
2.50 - 2.99	19	28.8	42	23.5	18	24.6	29	23.4
Total (>2.50)	44	66.7	142	79.3	38	52.0	82	66.1
2.00 - 2.49	13	19.7	19	10.6	21	28.8	19	15.3
1.50 - 1.99	6	9.1	12	6.7	8	11.0	17	13.7
below 1.49	3	4.5	6	3.4	6	8.2	6	4.9
Total (<2.50)	22	33.3	37	20.7	35	48.0	42	33.9
Total	66 (27%)		179 (73%)		73 (37%)		124 (63%)	

Note. r_{97}=.16 and r_{98}=.16; CGPA M_{97}=2.88 and M_{98}=2.65, SD_{97}=.71 and SD_{98}=.76; GEFT M_{97}=13.3 and M_{98}=12.5, SD_{97}=3.9 and SD_{98}=4.7

An analysis revealed that 67% of the 1997 field dependent students and 52% of the 1998 field dependent students achieved a CGPA of 2.5 or greater, while 33% of the 1997 field dependent students and 48% of the 1998 field dependent students earned less than a 2.5 CGPA. Conversely, 79% of the 1997 field independent students and 66% of the 1998 field independent students achieved a CGPA of 2.5 or greater, while the remaining 21% of the 1997 and 34% of the 1998 field independent students earned less than a 2.5 CGPA. A low, positive relationship (r_{97} = .16; r_{98} = .16) for both groups existed between students' GEFT scores and their CGPA.

Objective 2

The second research objective sought to determine whether a linear combination of university admission criteria and/or learning style could predict academic performance. The intercorrelation matrix of predictor variables revealed the presence of

Table 2. Step-wise Regression of High School Core GPA and GEFT Score on CGPA

	1997			1998		
Variable	R^2	b	t	R^2	b	t
High school core GPA	.31	.67	7.17*	.34	.82	9.67*
ACT	.33	.03	2.73*	--	--	--
(Constant)		-.13			-.02	

*p<.05

Objective 3

The third objective sought to determine the best predictors of degree completion as evidenced by students' attainment of a baccalaureate degree at the conclusion of five academic years. To accomplish this purpose, a discriminant analysis procedure was used to generate a predictive model of linear relationships between learning style (GEFT score) and university admission criteria (ACT score, high school core GPA) and degree completion. Descriptive data for the discriminating variables used for the model are presented in Table 3. Again, due to the presence of multicollinearity between the variables high school core GPA and high school class rank, the latter

variable was omitted from consideration. In addition, due to missing data on discriminating variables, eight cases were not included in the analysis for 1997 and 11 cases were not included for the 1998 analysis.

When employing discriminant analysis, high school core GPA was the only variable to enter the prediction equation (Wilks' Lambda$_{97}$ = .89, p < .05; Wilks' Lambda$_{98}$=.84, p < .05). GEFT score and ACT score were eliminated as discriminating variables. The Eigenvalue for the 1997 group (.13) and the 1998 group (.19) indicated the discriminating power of the discriminant function (Garson, 2001). The canonical correlation for the 1997 group (R$_c$ = .33) and the 1998 group (R$_c$=.40) expressed the degree of association between the groups and the discriminant scores. The canonical discriminant function coefficients for the 1997 group (High School Core GPA = 2.15, Constant = -7.32) and for the 1998 group (High School Core GPA = 2.04, Constant = -6.72) were the unstandardized discriminant function coefficients used to construct a prediction equation for classifying new cases. Overall the discriminant function was accurate in predicting 70% of the cases for the 1997 group and 67% of the 1998 group (Table 4).

Conclusions and Implications

For both the 1997 and 1998, a greater percentage of students with a field-independent learning style preference attained a CGPA of 2.5 or greater than students with a field-dependent learning style preference. While students with the field-independent learning style preference exhibited higher CGPAs in general, learning style had no predictive value when other variables were considered in predicting academic performance for both groups. Does this imply that students possessing a preference for a field-independent learning style were academically superior? Perhaps a more plausible conclusion would be that instructors' teaching styles, course assignments/projects, and course assessments were more suited to the strengths of field-independent learners. Because of learning style's lack of predictive value, it is difficult to conclude much about its value in the university arena.

For the 1997 group, the best predictor of academic performance was a combination of high school core grade point average and ACT score; ACT score accounted for only 2% of the variance in academic performance beyond the variance that could be accounted for by high school core GPA (31%). For the 1998 group, ACT score did not enter the step-wise equation, consequently high school core GPA alone accounted for 34% of the variance. Although Witkin et al. (1977) noted that field-independent learners tend to favor careers in areas such as agriculture, GEFT score was not a predictor of students' academic performance.

Prior research also identified high school GPA as a predictor of students' academic performance (Murtaugh et al., 1999; Wold and Worth, 1991). The findings of the current study and those of prior research should raise concern with the use of university wide admission criteria as adequate predictors for the success of students enrolled in colleges of agriculture. What additional variables account for the remaining variance in the academic performance of students? Additional research is warranted to establish valid and reliable predictors of student success in colleges of agriculture.

Vernon (1996) indicated that factors other than academic performance influence student retention and degree completion. The findings of this study identified that learning style, as operationalized by the GEFT, is not one of those factors. The current study contradicts the findings of those who found positive relationships with academic performance (Torres, 1993; Torres & Cano, 1994; Garton et al., 1999; Cano & Porter, 1997; Cano, 1999). This study, however, concurs with Dyer and Breja (1999) in that traditional admission criteria are limited, at best, in predicting academic performance, and degree completion. High school core GPA appeared to be hold the most promise in predicting students' attainment of a baccalaureate degree, yet only accounted for 31% of the variance for the 1997 group and 34% of the variance for the 1998 group. If this trend suggests that high school core GPA alone could predict degree completion, then why should universities include other variables as admission criteria?

Table 3. Means and Standard Deviations of Discriminating Variables

Discriminating Variables	1997				1998			
	Non-Graduates (n=60)		Graduates (n=177)		Non-Graduates (n=75)		Graduates (n=111)	
	M	SD	M	SD	M	SD	M	SD
GEFT	12.8	4.3	13.5	3.7	11.9	5.0	13.0	4.4
ACT	23.1	3.5	25.3	4.1	22.5	3.8	24.6	3.7
H.S. core GPA	3.08	.53	3.49	.47	3.01	.52	3.45	.47

Table 4. Classification of Cases for Degree Completion

	1997			1998		
		Predicted Group			Predicted Group	
	No. of Cases	Non-Graduates	Graduates	No. of Cases	Non-Graduates	Graduates
Non-graduates	62	39 (62.9%)	23 (37.1%)	79	51 (64.6%)	28 (35.4%)
Graduates	179	50 (27.9%)	129 (72.1%)	113	35 (31%)	78 (69%)

Note. Percent of cases correctly classified for 1997 = 69.7% and 1998 = 67.2%.

Summary

Although it may not be prudent to use only one variable as criteria for admissions, the study lends itself to discount all variables in question, except for high school core GPA, as a viable means of predicting degree completion. What if those variables are not the only means of predicting degree completion? Should other variables be considered in admitting students to colleges of agriculture? Vernon's (1996) study concurs with this notion. If a goal of the university is to be efficient and effective at educating its students, and subsequently have them graduate, then further research is needed to identify if other variables exist that can predict students' ability to complete a baccalaureate degree.

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