

Predicting Academic Success: Measures of Persistence

Introduction

Annually, James Madison University enrolls more than 4,000 first-time, full-time freshmen. The six-year graduation rate of these students is typically between 80 and 82 %. This is an extraordinary rate for an institution the size of JMU. So why study the factors that may impact student persistence to graduation? The reason is that the number of applications for the freshman class increased from 14,114 in 2001 to 22,221 in 2010 (57%). This increase placed additional pressure on the Office of Admissions to admit students who will be successful. Awareness of variables that affect student success may assist the Office of Admissions in this effort. Also we were able to obtain data that are not ordinarily available to the Admissions Office (first generation, degree aspirations, JMU as first choice), but potentially might be related to student graduation and academic success. This study is part one of a two-part study on the factors that affect student persistence to graduation at JMU or elsewhere. The purpose of part one is to examine the relationships between pre-JMU attendance variables and three measures of collegiate success in an effort to understand, identify, and aid students in their collegiate experiences. Part two will examine variables that may predict academic success after they enroll.

Method

This Research Note used the 3,285 first time, first-year students, who matriculated to JMU during the 2004-2005 academic year as subjects for this study. Information about these students was obtained from the official data files managed by the JMU Office of Institutional Research (OIR), the First Year Student Survey conducted by OIR, and admissions rating data from the Office of Admissions. For the first time, OIR was able to employ the services of the National Student Clearinghouse's StudentTracker program, a source of enrollment information of more than 93 % of students enrolled in higher education in the United States.

This research note describes four types of analyses on the relative predictive abilities of pre-attendance variables on three measures of success at JMU. The selected measures of success were: graduating with an undergraduate degree from JMU; cumulative GPA during JMU attendance; and graduating an undergraduate degree from any institution (JMU or other).

Student Demographics

Students in the completed sample were 35.6% male and 64.4% female. The race of the students was: 85.2% Caucasian-American/White, Non-Hispanic; 1.7% Hispanic, 4.7% Asian/Pacific Islander; 0.2% American Indian/Alaskan Native; 1.9% Black, Non-Hispanic; and 6.3% unreported. Virginia students represented 67.7% while non-Virginia students represented 32.3%.

Variables

The predictor variables were defined as any data collected from the time period prior to attending JMU that may be related to student persistence and

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who will succeed?**

performance at JMU. These potential predictors were subjected to univariate tests on the three measures of success (graduation for JMU, cumulative GPA at JMU, and graduating from any institutions, including JMU) to reduce the variables down to only those having a significant relationship to at least one of the three dependent variables being examined below. Those remaining variables are listed in the second column of the table below.

Table 1. Variables

Variables Considered	Source	Variables Selected
Financial need (via Pell Grant)	OIR data	X
International student status	OIR data	X
Gender	OIR data	X
Age when starting college	OIR data	X
Minority status	OIR data	X
First generation student	First-Year Survey	X
Residence (in-state vs. out-of-state)	OIR data	X
% of college cost paid by family	First-Year Survey	
High school GPA	Admissions	
Total SAT score	Admissions	X
JMU first choice	First-Year Survey	X
High school rank	First-Year Survey	X
Highest degree aspirations (Bachelors, Masters, Doctoral)	First-Year Survey	
Graduation from JMU	OIR data	Measure of Success
Graduated from anywhere	StudentTracker	Measure of Success
Cumulative GPA	PeopleSoft data	Measure of Success

Results

These data were analyzed using four methods. Graduation from JMU (Method 1) and graduation from any institution (Method 2) were categorical dependent variables and were each examined through discriminant analyses. Final cumulative GPA (Method 3), a continuous variable, was analyzed by multiple regression. A fourth analysis examined the strength of the relationships between total SAT score and high-school class rank for those who did graduate versus those who did not graduate (from JMU or from another institution).

Predictive Analyses for Graduation from JMU, or from Another Institution, and Final JMU GPA

The rank order of prediction is the order of importance of the predictor variables. For example, the variables examined explain 1.5 % of graduation from JMU. The predictor variables for JMU graduation, in ranked order, were high school rank in class, being a first-generation student, JMU being first choice institution, gender, and total SAT score. In the table below, the results are displayed for the predictive analyses for measures of success.

Table 2. Predictive Analyses for Measures of Success

Measures of Success	% Variance Explained	Key	Financial Need	International Student	Gender	Age	Minority Status	First Generation	Residence (IS vs. OS)	Total SAT	JMU First Choice	HS Rank
Graduated from JMU	1.5	Rank order of prediction			4			2		5	3	1
Final Cumulative GPA	14.9	Rank order of prediction	6		2	7		5	4	3		1
		Variance explained	*		3%	*		*	*	4%		7%
		Direction of impact	-		-	+		-	-	+		-
Graduated Anywhere	3.0	Rank order of prediction	6		1			2	4	5		3

Because the final cumulative GPA is the most likely to be predicted by the variables studied, the direction of impact of each predictor variable is important. Direction of impact explains how the predictor variable affects the predicted variables (measures of success). In this analysis, smaller financial aid need, being female, being older when first enrolled, having at least one parent who attended college, non-Virginia resident, higher total SAT, and higher high school rank are positively associated with final JMU GPA.

Results of Analyses of Differences between Correlations

Occasionally, some students have incongruent test scores and high school performance rankings. For example, a student may have a very high test score but is ranked poorly in his/her high school class. We guessed that larger incongruencies might be related to one of the measures of success. Differences in the strengths of graduate versus non-graduate correlations between SAT scores and actual and perceived high school rank were examined using the Fisher transformed value (Z) of the Pearson Product-Moment correlation (r) transformation and difference formula, as described by Sheskin (2007) and shown below.

$$Zr = 1/2 \ln[(1+r)/(1-r)]$$

$$Z = Zr_1 - Zr_2 / \text{SQRT}[(1/n_1 - 3) + 1/n_2 - 3]$$

The results indicate that there is a significant relationship between higher test scores and being ranked toward the top of the high school class, as one might suspect. However, this is unrelated to whether or not a student graduates. Larger incongruencies between test scores and high school rank are not related to any measures of success. However, it should be noted that the Admissions Office screens applicants to reduce these discrepancies, thereby minimizing this variability.

Discussion

As we began this study, we suspected that there may be some variables either known before the admissions review or collected prior to enrollment that could be related to student persistence or academic performance. We were mostly wrong. Only one of the four analyses yielded results having more than small predictive ability for the three measures of success. Student pre-attendance variables accounted for 14.9% of the variation in final cumulative GPA. High school rank and standardized test scores were, respectively, the top two contributors. Being ranked toward the top of the class in high school and higher test scores were associated with higher final cumulative GPAs at JMU. Because GPA is strongly related to ultimate graduation status, even the small level of prediction of GPA found in this study may allow early identification and intervention.

A significant finding of this study is that each student admitted and enrolled at JMU appears, based on the data available to the Admissions Office, to have an equal chance of graduating.

Originally, we planned to study factors that might be related to student success after enrollment. We were not able to identify a sufficient number of reasonable predictor variables to make this part of the study useful and meaningful. According to Tinto (1975), a student's commitment to JMU, the highest degree he or she aspires to, and integration into the academic and social life of the campus leads to student success. We will investigate whether we can find these and other potential indicators of success. These findings will be discussed in part two of this study.

Any questions about this study can be directed to the JMU Office of Institutional Research at 540-568-6830 or ask-oir@jmu.