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ABSTRACT

This study sought to determine which combination of criteria would accurately predict the success of students in graduate education who began their graduate studies on probationary admission status. Variables examined included grade point average (GPA) after 9 hours of graduate coursework, Graduate Record Examination (GRE) verbal, quantitative, and verbal scores, and final graduate GPA. The study examined the degree completion rates of 388 Master's degree students granted probationary admission and 1,135 Master's degree students granted regular admission between 1988 and 1994 at a medium-sized Midwestern university for whom GRE scores were available. It found that for probationary students, the best predictors of success (degree completion) were GRE quantitative scores, GRE analytical scores, and the nine-hour GPA. Overall, only the GRE verbal scores and the nine-hour GPA emerged as predictors of success for regular admission students. Since results varied on both sets of data when area analyses were performed, it appeared that predictors of success were dependent on major area of study. Three appendixes provide 27 tables comparing the success of probationary and regular admission students overall and by discipline. (Contains 16 references.) (MDM)

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PREDICTORS OF SUCCESS FOR STUDENTS ENTERING GRADUATE SCHOOL ON A PROBATIONARY BASIS

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PREDICTORS OF SUCCESS FOR STUDENTS ENTERING GRADUATE SCHOOL ON A PROBATIONARY BASIS

Departmental admission committees of master's level graduate programs are faced with the problem of evaluating application materials and choosing for admission those students who have the greatest potential for completion of degree requirements. Scores from the Graduate Record Examination (GRE) and undergraduate grade point average (UGPA), assumed to be valid predictors of future academic success, are used widely by colleges and universities to assess students' competency to perform proficiently at the graduate level.

Graduate student success has been examined by a number of writers with varying results. Exacerbating the diverse conclusions is the fact that researchers have not achieved concurrence on a definition of what graduate school "success" is. Many of the studies use first-year graduate grade point average (GGPA) as a measure of accomplishment, while others use overall GGPA, and a few have employed the graduated versus not graduated criterion. In addition, studies also differ in scope and size of sample. Some investigate specific disciplines, and others examine the total graduate population.

Studies utilizing first-year GGPA as a measure of success include those of Kingston (1985), Monahan (1991), and Vaseleck (1994). In addition to UGPA Kingston used data from the Graduate Record Examinations (GRE) Validity Study Service between March 1983 and November 1984. Overall, the results showed that the GRE quantitative score received the most weight for predicting first-

year GGPA, and the GRE analytical score received the least weight. Monahan studied the use of the GRE in the admissions process at Glassboro State University. Here, GRE and overall UGPA, considered as having the greatest importance, were used to make admission decisions. His research showed that neither the GRE nor UGPA were strong predictors of how well a student was likely to perform in the first year of graduate study. Results did indicate, however, that UGPA was slightly more predictive than the GRE. Vaseleck discussed legal problems in the misuse of higher education admissions tests. While not a formal research study, he utilized descriptive data gathered by the GRE Board in 1989-90 and concluded that, to avoid using predictors of academic success beyond "their useful life," the GRE loses relevance once a student is admitted and grades are earned. Actual in-school performance should be the "relevant criterion for decisions, not a test's prediction of that performance."

A study utilizing an entire graduate student population in determining the relationship between the GRE, UGPA, and final GGPA was performed by Harvancik and Golsan (1986). Their results showed that in all instances correlations between measures of achievement and GRE scores were significant. An earlier study by Hosford, Johnson, and Atkinson (1984), however, found a statistically significant correlation only between GGPA and the GRE verbal score.

Specific disciplines which have been examined include the areas of education, computer science, library science, nursing, and psychology. Two studies in education, Kaiser (1982) and de Felix and Houston (1986) showed that GRE scores were significant

predictors of GGPA, but Kaiser found that the GRE verbal score was the best and that the GRE quantitative score was the least predictive. Kaiser also noted that including UGPA did not significantly increase predictability. Wesche (1984) also studied graduate education students but concluded that neither the GRE nor UGPA were significant predictors of success, i.e., GGPA. The result of a study of graduate education students by Michael (1983) showed that composites of predictor variables yield higher validity than single predictors.

In computer science Kaiser (1982) discovered that the highest single predictor for GGPA, although not significant, was UGPA. The least significant factor was the GRE verbal score. Broadus and Elmore (1983) and Auld (1984) studied their respective library science programs. In the former, the GRE verbal score was the most valid predictor, but in the latter both individual and combined GRE scores moderately correlated with GGPA. A nursing study by Rhodes (1994) revealed that UGPA had a stronger correlation to first-year GGPA than did GRE scores. She also found that first-year GGPA was strongly predictive of the graduation GGPA. Finally, Goldberg and Alliger (1992) performed a meta-analysis covering psychology studies over a 40-year period and concluded that while the GRE is not a valid predictor of GGPA it does not necessarily mean that the GRE is not a valid predictor of graduate school success. They do assert, however, that the GRE quantitative score is predictive of grades in quantitative courses.

Other writers, Braun and Jones (1985) and Thornell and McCoy (1985) studied a variety of selected disciplines and concluded that

there is considerable variability in the predictive validity of GRE scores in different disciplines. Braun and Jones stated that overall studies were not reliable, but at the departmental level the results were useful and dependable. Thornell and McCoy also found that in all disciplines the relationship between the GRE verbal score and GGPA was higher than that between the GRE quantitative score and GGPA.

An important study by Mitchelson and Hoy (1984) explored the predictive validity of several factors (age, gender, marital status, primary language of student) in addition to the traditional academic variables (GRE scores, UGPA, and the rating of general scholastic ability on the personal reference form) for students in a graduate program in geography. They compared those who graduated with those who did not complete degree requirements. The best predictor model they found was one that was determined by multiplying the GRE quantitative score, undergraduate GPA, and the average rating of scholastic ability derived from letters of recommendation for each student. This model correctly predicted 146 of 160 students who did not obtain the master's degree. It also predicted 73 of 120 who <u>did</u> graduate, and their overall predictability was 78%.

The research clearly shows that as much variation exists between investigations of the same discipline as well as across academic areas. What has not received much study is the predictive validity of these factors for students for whom it is assumed success in graduate study is not likely, i.e., students who did not meet minimum admission standards and were denied entry to post-

baccalaureate work but allowed to take 9 hours of graduate course work to prove themselves. Wesche (1984) did study probationary education students (probationary status was determined solely on scores of the GRE or Miller Analogies Test) and found, not unexpectedly, that the GGPA and UGPA were lower, although not significantly, than those measures of regularly-admitted students. It is this group of students which is the focus of the current investigation. The following five criteria were examined for their predictive validity: scores on the three parts of the GRE (verbal, quantitative, and analytical) which were treated as separate predictor variables, the graduate grade point average after nine hours of course work (PGPA), and gender. For descriptive purposes only the final grade point average (GGPA) was also included.

Objectives

The purpose of this study was to determine which combination of criteria listed above would have accuracy in predicting of success of students in graduate education who began their studies on probationary admission status. For this examination success was defined as the completion of the master's degree. Although conceding that there is great variation in the quality of degree recipients, Mitchelson and Hoy (1984) assert that this is the most defensible criterion of graduate student success. Goldberg and Alliger (1992) agree. Asserting that researchers need to provide a better operational definition of success in graduate school, they state that the graduated versus not graduated criteria is a step in the right direction. Too, because the variability of grades in graduate school is small, it is often difficult to differentiate

between the outstanding and inadequate students. Unsuccessful graduate students were defined as those who either were academically dismissed from graduate study (did not maintain at least a 3.0 in all graduate work) or dropped out of a graduate program. A graduate student was identified as unsuccessful (or inactive) if he or she did not complete a graduate course within one year of the time of this study.

At the university surveyed there were two graduate school master's level admission classifications: regular admission and probationary admission. Regular admission was granted to those students who met minimum graduate school entrance requirements. Probationary admission was a temporary graduate school entry classification for students who did not meet minimum admission requirements, i.e., were denied admission, but received support from their major departments to take graduate courses on a directed plan of study (9 semester hours) in an effort to earn regular admission. These students either did not have an overall 2.75 undergraduate grade point average or did not have a 3.0 grade point average in the latter half of the baccalaureate degree. The grade point average was determined on a 4.0 scale.

Probationary students were also required to submit GRE general test scores. Once the directed plan of study was completed and test scores were received for these students, the major departments would either recommend regular admission or prohibit further graduate study.

Data Source

The study was conducted at a medium-sized Midwestern univer-

sity that has an average total enrollment of 19,500 students and an average graduate enrollment of 2,500 students. The subjects in the study came from those students who applied for graduate study for the years 1988-1994 and were United States citizens whose first language was English (international probationary students were not required to take the GRE). The total number of subjects granted probationary admission status was 1071. Those who started a graduate program and for whom the Graduate School has records of GRE scores numbered 388, of whom 258 graduated and 130 did not graduate. While the emphasis of the study was to predict the success of graduate students entering on probationary admission status, comparisons were also made with those students who earned regular admission. This information was used to determine if both sets of data followed similar patterns. Students in the regularly-admitted group numbered 5628 for whom records of GRE scores were found for 1135 applicants. Of the latter group 896 graduated and 239 did not.

Method

Since the dependent variable, success in a master's level program, was dichotomous, the analysis that would seem to be most appropriate would be a logistic regression. This allows the dependent variable to be dichotomous while the independent variables may be continuous or categorical.

After the overall analysis was performed with all probationary and regularly-admitted students, the students were categorized into areas of concentrations and the analysis was then performed on each of these areas. These areas were organized as follows:

Life Sciences: Audiology, Biology, Health Science, Physiology, Nursing, Speech Pathology, Wellness Management

Physical Sciences: Actuarial Science, Chemistry, Computer Science, Earth Science, General Science, Geology, Mathematics, Mathematical Statistics, Physics, Natural Resources

Communication Sciences: Information and Communication Science, Journalism, Public Relations, Speech

Education: Adult Education, Community Education, Curriculum, Early Childhood Education, Educational Administration, Elementary Education, Jr Hi/Middle School Education, Reading, Secondary Education, Special Education, Student Personnel Administration in Higher Education

Psychology: Counseling Psychology, Educational Psychology, Pre-Clinical Psychology, School Psychology, Social Psychology

Social Sciences: Anthropology, Archeological Resources Management, Political Science, Public Administration, Sociology, Social Science

Humanities and Arts: Art, Music, English, History, Linguistics, Spanish, Teaching of English to Speakers of Other Languages

Applied Sciences: Applied Gerontology, Architecture, Business, Dietetics, Executive Development for Public Service, Home Economics, Landscape Architecture, Physical Education, Technology Education, Urban Planning

These categories are similar to the categories used by Educational Testing Service in its analysis of GRE scores and also follow the college organizational lines at the institution where the study was conducted.

Descriptive Results

As would be expected, probationary students did not perform as well as regularly-admitted students on any of the measures of achievement. The results were also similar when comparing achievement measures of probationary students only who graduated with those who did not. With regularly-admitted students, however, differences between graduates and non-graduates were generally not as significant, and in some cases achievement measures were higher for the inactive group than for the group who completed degree requirements. The tables below illustrate these findings.

Figure 1
Descriptive Statistics

	Graduates		Non-Graduates	
	Probationary	Regular	Probationary	Regular
9-Hr GPA	3.58	3.71	3.35	3.46
GRE-V	449	486	421	500
GRE-Q	473	515	468	511
GRE-A	494	547	469	549
Final GGPA	3.61	3.76	3.29	3.42

It is also interesting to note that for both probationary and regularly-admitted students, the 9-hour graduate point average was very close to the final graduate grade point average earned. This supports Rhodes' study (1994) that first-year GGPA was strongly predictive of graduation GPA.

When individual areas were examined the results were mixed. Among the probationary students, only those graduates in Communication Sciences and Applied Sciences performed better than the non-

graduates in all criteria. In each of the other areas, at least one achievement factor was higher among those who did not graduate than for those who did.

For the regularly-admitted students, only those graduates in Psychology and Physical Sciences performed better in all criteria than non-graduates. In Education and Applied Sciences scores from each portion of the Graduate Record Examination were higher among non-graduates, while undergraduate, 9-hour, and final grade point averages were higher among the graduates. Only in the Social Sciences was undergraduate grade point average higher among non-graduates than graduates. Finally, in Humanities and Arts, Life Sciences, Communication Sciences, and Social Sciences scores from two of the three measures on the Graduate Record Examination were higher for non-graduates than graduates. See the Appendix for the tables which illustrate these findings.

In addition to the lower academic performance of the probationary students, a smaller percentage of them actually completed degree requirements as compared to the regularly-admitted students. The table below illustrates these findings.

Figure 2

PERCENTAGE OF GRADUATES BY AREA 1988-1995

	Took GRE		Did not take GRE	
Area	Regular	Probation	Regular	Probation
Education	73.4	59.4	45.6	37.3
Life Sciences	88.3	51.6	65.8	30.9
Physical Sci	76.2	56.2	56.7	49.2
Communication Sc	72.2	68.4	76.0	60.6
Social Sci	80.4	68.5	57.8	52.0
Humanities/Arts	71.8	52.3	73.5	34.8

Area	Took GRE		Did not take GRE	
	Regular	Probation	Regular	Probation
Applied Sci	72.5	58.8	49.0	36.8
Psychology	85.2	60.8	73.9	43.7
All	78.9	60.6	56.9	41.1

101 probationary students completed 9 semester hours but did not take the GRE and are now inactive. 699 regularly-admitted students completed 9 semester hours, did not take the GRE, and are now inactive.

Statistical Results

The logistic regression was performed on the data set of the probationary students and the data set containing the students who were admitted as regular students. The comparison of these regression equations is shown in Figure 3 below.

Figure 3

Logistic Regression Equations

All Probationary Students

	B	S.E.	Wald	df	Sig
Gender	-.2396	.1212	3.90	1	.05
Verbal	.0026	.0015	2.98	1	.08
Quantitative	-.0037	.0014	6.60	1	.01
Analytical	.0032	.0015	4.80	1	.03
	B	S.E.	Wald	df	Sig
9 Hr GPA	1.0225	.2396	18.21	1	.00
Constant	-3.8560	.9781	15.54	1	.00

All Regularly Admitted Students

	B	S.E.	Wald	df	Sig
Gender	-.0122	.0822	.0211	1	.88
Verbal	-.0029	.0010	8.6870	1	.00
Quantitative	.0005	.0009	.2932	1	.59
Analytical	-.0001	.0010	.0002	1	.98
9 Hr GPA	1.2616	.1814	48.3734	1	.00
Constant	-2.0724	.7060	8.6165	1	.00

The most significant factor in predicting successful completion of the graduate degree was the grade point average earned in the first nine semester hours of graduate course work. This was the case for both the probationary students and those students who were admitted as regular students. It is also noteworthy that the analytic and quantitative scores were significant predictors for the probationary students, but were not predictors for the regularly-admitted students. The verbal score was significant for regular students but was not significant at the .05 level for the probationary students. At the same time, gender was significant in predicting success for probationary students but not for regular students. Since gender was coded as "1" for female students and "2" for male students, it appeared that female students had a better chance for success than male students.

The classification for the probationary students was about 68% correct, while the classification for regular students was 80% correct. Figures 4 and 5 show the classification by the regression equations for each group.

Figure 4

Classification by Regression Equation

All Probationary Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	25	105	19.23
Success	19	238	92.61

Figure 5

Classification by Regression Equation

All Regularly Admitted Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	19	220	7.95
Success	7	882	99.21

In both cases, the logistic regression correctly predicted success in more than 90% of the cases where the student was, in fact, successful. The cases where the student was predicted to be successful, but was not successful are not problematic: students may drop out of a degree program for a variety of reasons which may not be academic. Fortunately, the percentage of the time when a student was predicted not to succeed, but in fact did succeed, was low.

When the logistic regression was applied to specific areas

of concentration, different patterns emerged. In the area of life sciences, the results displayed in Table 6 were obtained.

Figure 6

Logistic Regression Equations for Life Science Students

Probationary Students

	B	S.E.	Wald	df	Sig
Gender	-.6853	.6308	1.1805	1	.27
Verbal	-.0082	.0082	1.0087	1	.31
Quantitative	.0018	.0069	.0718	1	.78
Analytical	.0008	.0075	.0102	1	.91
9 Hr GPA	2.3900	1.2828	3.4710	1	.06
Constant	-4.8111	5.0099	.9222	1	.33

Regularly Admitted Students

	B	S.E.	Wald	df	Sig
Gender	-.1648	.4418	.1392	1	.70
Verbal	.0016	.0045	.1232	1	.72
Quantitative	-.0077	.0040	3.7739	1	.05
Analytical	-.0005	.0034	.0202	1	.88
9 Hr GPA	3.1914	.7602	17.6248	1	.00
Constant	-5.7507	2.5578	5.0548	1	.02

Since most of the programs in the life sciences concentration area are selective programs, the number of probationary students was low. However, as can be observed in Table 6, the only variable that came close to being significant was the grade point average in the first 9 hours of graduate course work. This factor was also the most significant for the regularly-admitted students.

As can be observed in Figure 7, the percentages of students predicted to succeed or not to succeed follow a similar pattern for all students as shown in Figures 4 and 5.

Figure 7

Classification of Life Science Students
by Logistic Regression

Probationary Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	4	6.	40.00
Success	2	14	87.50

Regularly Admitted Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	3	17	15.00
Success	3	148	98.01

There were data available for fewer students in the physical sciences. The total number of regularly admitted students in the physical sciences was 79, while the number of probationary students was 42. However, as can be observed from Figure 8, the grade point average in the first 9 hours of graduate course work was a significant predictor. No factor emerged as significant for predicting the success of regular students.

Figure 8

Logistic Regression Equations for Physical Science Students

Probationary Students

	B	S.E.	Wald	df	Sig
Gender	.1396	.6707	.0434	1	.83
Verbal	.0085	.0062	1.9225	1	.16
Quantitative	.0008	.0055	.0194	1	.88
Analytical	-.0056	.0057	.9459	1	.33
9 Hr GPA	2.7266	1.0088	7.3051	1	.00
Constant	-10.1424	4.8320	4.4058	1	.03

Regularly Admitted Students

	B	S.E.	Wald	df	Sig
Gender	-.0021	.2890	.0001	1	.99
Verbal	-.0009	.0036	.0624	1	.80
Quantitative	.0044	.0033	1.7495	1	.18
Analytical	-.0009	.0039	.0520	1	.81
9 Hr GPA	.4205	.8082	.2707	1	.60
Constant	-2.2752	3.4033	.4469	1	.50

The regression equations predicted that no student would not succeed who was admitted as a regular student. However, the prediction for probationary students in the physical sciences was more accurate than the prediction for all probationary students.

Figure 9

Classification of Physical Science Students by Logistic Regression

Probationary Students

	Prediction		
	No Success	Success	Percent Correct
Observed			

	No Success	Success	Percent Correct
No Success	11	5	68.75
Success	3	23	88.46

Regularly Admitted Students

Prediction

	No Success	Success	Percent Correct
Observed			
No Success	0	19	.00
Success	0	59	100.00

The results for the communications area were interesting, because, as illustrated in Figure 10, the GRE verbal scores were not significant. In fact, only gender was significant in the case of the regularly admitted students and was the only variable close to significance in the case of the probationary students.

Figure 10

Logistic Regression Tables for Communication Sciences Students

Probationary Students

	B	S.E.	Wald	df	Sig
Gender	-.5476	.3026	3.2753	1	.07
Verbal	.0000	.0039	.0000	1	.99
Quantitative	.0017	.0039	.1915	1	.66
Analytical	.0039	.0039	1.0395	1	.30
9 Hr GPA	.6453	.6255	1.0644	1	.30
Constant	-3.8314	2.5347	2.2848	1	.13

Regularly Admitted Students

	B	S.E.	Wald	df	Sig
Gender	-.3800	.1805	4.4330	1	.03
Verbal	-.0012	.0020	.3370	1	.56
Quantitative	.0015	.0021	.5112	1	.47
Analytical	-.0016	.0020	.7095	1	.39
9 Hr GPA	.3648	.2937	1.5434	1	.21
Constant	.5098	1.2838	.1577	1	.69

The predictions for each group from the equations presented in Figure 10 were about the same. These predictions are shown in Figure 11.

Figure 11

Classification of Communication Sciences Students by Logistic Regression

Probationary Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	3	15	16.67
Success	5	46	90.20

Regularly Admitted Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	0	55	.00
Success	1	141	99.30

The logistic regression equations for students concentrating in education were very different as can be seen in Figure 12. It is interesting to note that for probationary students, the GRE quantitative score was the only significant factor, while the grade point average in the first 9 hours was the only significant factor for regular students.

Figure 12

Logistic Regression Tables for Education Students

Probationary Students

	B	S.E.	Wald	df	Sig
Gender	-.0238	.2485	.0092	1	.92
Verbal	.0057	.0034	2.8425	1	.09
Quantitative	-.0073	.0032	5.2102	1	.02
Analytical	.0023	.0034	.4730	1	.49
9 Hr GPA	.5270	.7182	.5385	1	.46
Constant	-1.4430	2.7900	.2675	1	.60

Regularly Admitted Students

	B	S.E.	Wald	df	Sig
Gender	-.2569	.3234	.6308	1	.42
Verbal	-.0046	.0040	1.3687	1	.24
Quantitative	-.0017	.0037	.2090	1	.64
Analytical	-.0029	.0039	.5355	1	.46
9 Hr GPA	3.2363	1.2504	6.6994	1	.00
Constant	-6.5811	4.2685	2.3771	1	.12

While the equations presented in Figure 12 are different, the predictions for each group are about the same. This result is presented in Figure 13.

Figure 13

Classification of Education Students
by Logistic Regression

Probationary Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	7	23	23.33
Success	4	54	93.10

Regularly Admitted Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	5	17	22.73
Success	4	57	93.44

The psychology area of concentration admits comparatively few probationary students. The equation presented in Figure 14 was based on 19 students which may explain why no predictor was significant. The logistic regression equation for regularly-admitted students indicated that the GRE analytical score and the grade point average in the first 9 hours of course work were significant. The prediction of success or failure in this area of concentration was about the same for the probationary students and the regular students. This result is displayed in Figure 14.

Figure 14

Logistic Regression Tables for Psychology Students

Probationary Students

	B	S.E.	Wald	df	Sig
Gender	-.7849	.7315	1.1512	1	.28
Verbal	.0040	.0090	.1969	1	.65
Quantitative	-.0146	.0128	1.3114	1	.25
Analytical	.0091	.0088	1.0504	1	.30
9 Hr GPA	.7997	2.4305	.1083	1	.74
Constant	-.9038	7.0924	.0162	1	.89

Regularly Admitted Students

	B	S.E.	Wald	df	Sig
Gender	-.0839	.2049	.1677	1	.68
Verbal	-.0035	.0026	1.8589	1	.17
Quantitative	-.0019	.0026	.5418	1	.46
Analytical	.0056	.0025	5.0728	1	.02
9 Hr GPA	2.4645	.4555	29.2751	1	.00
Constant	-7.4686	1.8021	17.1768	1	.00

Figure 15

Classification of Psychology Students
by Logistic Regression

Probationary Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	1	4	20.00
Success	1	13	92.86

Regularly Admitted Students

Prediction

	No Success	Success	Percent Correct
Observed			
No Success	9	37	19.57
Success	2	261	99.24

Data were available for only 46 regularly admitted students and 31 probationary students in the social sciences. No predictor was significant for the probationary students in this area. Interestingly, the most significant predictor for the regular students was the GRE quantitative score. The result is displayed in Figure 16.

Figure 16

Logistic Regression Tables for Social Sciences Students

Probationary Students

	B	S.E.	Wald	df	Sig
Gender	-.2845	.5415	.2730	1	.60
Verbal	-.0099	.0080	1.5585	1	.21
Quantitative	-.0057	.0078	.5356	1	.46
Analytical	.0100	.0076	1.7117	1	.19
9 Hr GPA	2.7824	1.6371	2.8885	1	.08
Constant	-6.2971	4.3467	2.0987	1	.14

Regularly Admitted Students

	B	S.E.	Wald	df	Sig
Gender	.9170	.5271	3.0268	1	.08
Verbal	-.0166	.0088	3.5716	1	.05
Quantitative	.0166	.0067	6.1228	1	.01
Analytical	-.0016	.0065	.0599	1	.80
9 Hr GPA	.4289	1.3070	.1077	1	.74
Constant	1.5978	4.7364	.1138	1	.73

The predictions for success or failure followed the same pattern. These results are displayed in Figure 17.

Figure 17

Classification of Social Sciences Students by Logistic Regression

Probationary Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	4	4	50.00
Success	1	22	95.65

Regularly Admitted Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	4	5	44.44
Success	1	36	97.30

The number of probationary students in the humanities and arts was only 19. The predictor that appeared to be significant was the GRE quantitative score. For the regular students in the humanities and arts, the grade point average in the first 9 hours of course work was the only significant predictor. These results are displayed in Figure 18.

Figure 18

Logistic Regression Tables for Humanities/Arts Students

Probationary Students

	B	S.E.	Wald	df	Sig
Gender	-1.2090	1.1088	1.1888	1	.27
Verbal	.0173	.0149	1.3418	1	.24
Quantitative	-.0252	.0133	3.5736	1	.05
Analytical	.0206	.0134	2.3822	1	.12
9 Hr GPA	2.8404	2.3442	1.4681	1	.22
Constant	-15.2282	11.3325	1.8057	1	.17

Regularly Admitted Students

	B	S.E.	Wald	df	Sig
Gender	.0798	.1992	.1607	1	.68
Verbal	.0019	.0025	.5768	1	.44
Quantitative	.0013	.0023	.3274	1	.56
Analytical	-.0018	.0027	.4538	1	.50
9 Hr GPA	1.2111	.4211	8.2720	1	.00
Constant	-4.2334	2.2386	3.5763	1	.05

While the numbers were low for the probationary students in the humanities and arts, the predictions were quite good. The same pattern seemed to hold for the regularly admitted students.

Figure 19

Classification of Humanities/Arts Students by Logistic Regression

Probationary Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	7	1	87.50
Success	2	9	81.82

Regularly Admitted Students

Prediction

	No Success	Success	Percent Correct
Observed			
No Success	7	33	17.50
Success	4	98	96.08

In the applied sciences no predictor was significant for the probationary students. Yet the predictions were good. For the regularly admitted students the GRE verbal was the only significant predictor, although the grade point average in the first 9 hours of course work came close to being significant. This analysis is presented in Figure 20 and Figure 21.

Figure 20

Logistic Regression Tables for Applied Sciences Students

Probationary Students

	B	S.E.	Wald	df	Sig
Gender	-.1199	.2464	.2369	1	.62
Verbal	.0020	.0030	.4630	1	.49
Quantitative	-.0021	.0029	.4984	1	.48
Analytical	.0018	.0028	.4124	1	.52
9 Hr GPA	.8157	.5537	2.1704	1	.14
Constant	-3.1348	2.1473	2.1312	1	.14

Regularly Admitted Students

	B	S.E.	Wald	df	Sig
Gender	-.1198	.2647	.2048	1	.65
Verbal	-.0129	.0040	10.5663	1	.00
Quantitative	-.0002	.0037	.0033	1	.95
Analytical	.0030	.0036	.7008	1	.40
9 Hr GPA	1.2443	.6629	3.5238	1	.06
Constant	1.2239	2.3565	.2698	1	.60

Figure 21

Classification of Applied Sciences Students by Logistic Regression

Probationary Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	8	27	22.86
Success	4	54	93.10

Regularly Admitted Students

	Prediction		
	No Success	Success	Percent Correct
Observed			
No Success	7	21	25.00
Success	4	70	94.59

Conclusions

Overall, the data showed that for probationary students the best predictors of success were the quantitative and analytical portions of the Graduate Record Examination and the probationary grade point averages. Only Graduate Record Examination verbal and the graduate grade point average in the first nine hours of graduate study, however, emerged as significant predictors for regularly-admitted students. Since results varied on both sets of data when area analyses were performed, it appeared that predictors of success depended on major area of study.

The study provides educators and admissions' committees valuable information when making decisions on whether or not to allow probationary students to continue graduate study after the completion of the first nine hours and the submission of Graduate Record Examination scores. It allows individual areas of study to develop specific quantitative admission guidelines, in addition to qualitative measures such as letters of recommendation and individual student motivation, to help predict the likelihood of success in graduate education. This represents a departure from the current decision-making process at the university surveyed where, in actual practice, the grade point average on the first nine hours of graduate study is usually the only criterion used to determined regular admission. The nine-hour grade point average used in conjunction with scores on the Graduate Record Examination, and tailored to individual areas of study will make prediction of success more reliable.

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Appendix I

Comparison of Graduates and Non-Graduates Who Began as Probationary Students

Table 1

ALL PROBATIONARY STUDENTS

	Graduates (N=258)	Non-Graduates (N=130)
9-Hr GPA	3.58	3.35
GRE-V	449	421
GRE-Q	473	468
GRE-A	494	469
Final GGPA	3.61	3.29

Table 2

APPLIED SCIENCES

	Graduates (N=58)	Non-Graduates (N=35)
9-Hr GPA	3.65	3.47
GRE-V	418	394
GRE-Q	455	450
GRE-A	456	442
Final GGPA	3.63	3.41

Table 3

COMMUNICATION SCIENCES

	Graduates (N=51)	Non-Graduates (N=18)
9-Hr GPA	3.38	3.20
GRE-V	445	410
GRE-Q	471	422
GRE-A	519	467
Final GGPA	3.46	3.21

Table 4

EDUCATION

	Graduates (N=59)	Non-Graduates (N=30)
9-Hr GPA	3.70	3.65
GRE-V	423	398
GRE-Q	418	456
GRE-A	443	436
Final GGPA	3.71	3.55

Table 5

HUMANITIES AND ARTS

	Graduates (N=11)	Non-Graduates (N=8)
9-Hr GPA	3.52	3.56
GRE-V	503	437
GRE-Q	481	490
GRE-A	505	425
Final GGPA	3.64	3.39

Table 6

LIFE SCIENCES

	Graduates (N=16)	Non-Graduates (N=10)
9-Hr GPA	3.60	2.93
GRE-V	463	463
GRE-Q	490	455
GRE-A	534	505
Final GGPA	3.70	2.90

Table 7

PHYSICAL SCIENCES

	Graduates (N=26)	Non-Graduates (N=16)
9-Hr GPA	3.64	2.83
GRE-V	521	471
GRE-Q	618	581
GRE-A	563	567
Final GGPA	3.63	2.75

Table 8

PSYCHOLOGY

	Graduates (N=14)	Non-Graduates (N=5)
9-Hr GPA	3.66	3.63
GRE-V	499	460
GRE-Q	509	518
GRE-A	551	528
Final GGPA	3.61	3.63

Table 9

SOCIAL SCIENCES

	Graduates (N=23)	Non-Graduates (N=8)
9-Hr GPA	3.55	3.19
GRE-V	460	461
GRE-Q	466	431
GRE-A	520	476
Final GGPA	3.57	3.16

Appendix II

Comparison of Graduates and Non-Graduates Who Began as Regularly-Admitted Students

Table 1

ALL REGULARLY-ADMITTED STUDENTS

	Graduates (N=896)	Non-Graduates (N=239)
UG-GPA	3.29	3.20
9-Hr GPA	3.71	3.46
GRE-V	486	500
GRE-Q	515	511
GRE-A	547	549
Final GGPA	3.76	3.42

Table 2

APPLIED SCIENCES

	Graduates (N=74)	Non-Graduates (N=28)
UG-GPA	3.18	3.16
9-Hr GPA	3.65	3.47
GRE-V	446	513
GRE-Q	497	525
GRE-A	519	548
Final GGPA	3.69	3.39

Table 3

COMMUNICATION SCIENCES

	Graduates (N=143)	Non-Graduates (N=55)
UG-GPA	3.22	3.13
9-Hr GPA	3.53	3.45
GRE-V	487	494
GRE-Q	482	476
GRE-A	529	543
Final GGPA	3.65	3.45

Table 4

EDUCATION

	Graduates (N=61)	Non-Graduates (N=22)
UG-GPA	3.15	3.22
9-Hr GPA	3.83	3.71
GRE-V	446	490
GRE-Q	483	527
GRE-A	497	555
Final GGPA	3.83	3.73

Table 5

HUMANITIES AND ARTS

	Graduates (N=102)	Non-Graduates (N=40)
UG-GPA	3.42	3.34
9-Hr GPA	3.78	3.46
GRE-V	555	549
GRE-Q	529	534
GRE-A	574	587
Final GGPA	3.83	3.41

Table 6

LIFE SCIENCES

	Graduates (N=152)	Non-Graduates (N=20)
UG-GPA	3.29	3.08
9-Hr GPA	3.67	3.20
GRE-V	448	437
GRE-Q	469	498
GRE-A	516	522
Final GGPA	3.70	3.24

Table 7

PHYSICAL SCIENCES

	Graduates (N=61)	Non-Graduates (N=19)
UG-GPA	3.21	3.20
9-Hr GPA	3.68	3.63
GRE-V	489	483
GRE-Q	665	617
GRE-A	614	587
Final GGPA	3.75	3.57

Table 8

PSYCHOLOGY

	Graduates (N=266)	Non-Graduates (N=46)
UG-GPA	3.39	3.22
9-Hr GPA	3.79	3.34
GRE-V	505	492
GRE-Q	540	502
GRE-A	570	522
Final GGPA	3.83	3.33

Table 9

SOCIAL SCIENCES

	Graduates (N=37)	Non-Graduates (N=9)
UG-GPA	3.09	3.29
9-Hr GPA	3.69	3.61
GRE-V	464	516
GRE-Q	461	401
GRE-A	518	530
Final GGPA	3.73	3.22

Appendix III

Comparison of Graduates and Non-Graduates Of All Students 1988-1994

Table I

ALL STUDENTS

	Graduates (N=1154)	Non-Graduates (N=369)
UG-GPA	3.11	2.93
9-Hr GPA	3.68	3.42
GRE-V	478	472
GRE-Q	506	496
GRE-A	535	521
Final GGPA	3.72	3.37

Table 2

APPLIED SCIENCES

	Graduates (N=132)	Non-Graduates (N=63)
UG-GPA	2.83	2.75
9-Hr GPA	3.63	3.47
GRE-V	434	447
GRE-Q	478	483
GRE-A	491	489
Final GGPA	3.66	3.40

Table 3

COMMUNICATION SCIENCES

	Graduates (N=194)	Non-Graduates (N=73)
UG-GPA	3.03	2.96
9-Hr GPA	3.49	3.39
GRE-V	476	473
GRE-Q	479	462
GRE-A	526	524
Final GGPA	3.60	3.39

Table 4

EDUCATION

	Graduates (N=120)	Non-Graduates (N=52)
UG-GPA	2.83	2.75
9-Hr GPA	3.77	3.68
GRE-V	435	437
GRE-Q	451	486
GRE-A	470	486
Final GGPA	3.77	3.63

Table 5

HUMANITIES AND ARTS

	Graduates (N=113)	Non-Graduates (N=48)
UG-GPA	3.33	3.21
9-Hr GPA	3.76	3.48
GRE-V	550	530
GRE-Q	524	527
GRE-A	567	560
Final GGPA	3.81	3.40

Table 6

LIFE SCIENCES

	Graduates (N=168)	Non-Graduates (N=30)
UG-GPA	3.22	2.89
9-Hr GPA	3.66	3.17
GRE-V	449	445
GRE-Q	471	483
GRE-A	518	516
Final GGPA	3.70	3.12

Table 7

PHYSICAL SCIENCES

	Graduates (N=87)	Non-Graduates (N=35)
UG-GPA	2.99	2.86
9-Hr GPA	3.67	3.26
GRE-V	498	478
GRE-Q	651	601
GRE-A	599	578
Final GGPA	3.71	3.20

Table 8

PSYCHOLOGY

	Graduates (N=280)	Non-Graduates (N=51)
UG-GPA	3.34	3.15
9-Hr GPA	3.78	3.37
GRE-V	504	489
GRE-Q	539	504
GRE-A	570	523
Final GGPA	3.82	3.36

Table 9

SOCIAL SCIENCES

	Graduates (N=60)	Non-Graduates (N=17)
UG-GPA	2.85	2.89
9-Hr GPA	3.64	3.41
GRE-V	463	490
GRE-Q	463	415
GRE-A	519	504
Final GGPA	3.67	3.19