

A Model for Predicting Student Success

MAIR 2012: ROUND-TABLE DISCUSSIONS

**By Tiffany Gregory
The University of Mississippi**

This discussion will look into two models of prediction for student success defined in different ways. The discussion will showcase some implications and cautions of both of these studies and their effect on the University of Mississippi New Freshmen population now and in the future. There will also be a discussion of some potential future studies that will be occurring to gauge and predict student success on campus, not limited to New Freshmen.

I. What is student success?

Student success can be defined in a number of ways including, but not limited to, the following:

- Retention of Students
 - From semester-to-semester
 - From year-to-year
 - Within Degree Programs
 - Within Schools/Colleges across the University
 - Within Departments
 - Within Areas of Studies (e.g. STEM fields)
- High College GPAs
- Success within Certain Courses
- Graduation
 - Overall Graduation
 - Graduation within a certain degree program
 - Graduation within a certain time frame

II. How can we as IR&A offices help with student success?

- Predictive Studies: Using historical trends to predict future outcomes.
 - How would predictive studies help students directly and the universities ultimately?
 - Identify students that are potential high risk students then we can direct funds and resources directly to those students as an early intervention strategy.
 - Advise students differently and more effectively.
 - Have a better understanding of the student body and success at your specific university.

III. Two Main studies that I would like to discuss today

- Predicting student success in terms of 1st semester Cumulative College GPA for New Freshmen
 - In the book, Crossing the Finish Line: Completing College at America's Public Universities by William G. Bowen, Matthew M. Chingos & Michael S. McPherson it was found that first year GPA is a significant predictor of retention and graduation.
 - Statistical Method Used:
 - Multiple Regression Analysis
 - Population:
 - Three cohorts of New Freshmen Data from The University of Mississippi
 - Independent Variables Analyzed:
 - There are other studies out there that use surveys, questionnaires, personality indicators, etc. but all of these modes of gaining further behavioral information cost money and time (all of which I know we don't have tons of running through our offices). These studies are great and have better expandability of variance but they are also limited.

○ Predicting student success in terms of 1st semester Cumulative College GPA for New Freshmen (Continued)

- So, in my analysis, knowing that there is a limit in resources available, I limit the variables to factors known prior to orientation, in order for this predictive model to be used as an advising help within orientation sessions.

- Gender
- Citizenship
- Ethnicity
- Core and Overall HS GPA
- ACT/SAT Highest Score
- Submitted a FASFA or Not
- Parent(s) attended college
- MS Resident
- School or College
- Specific Program of Study

○ Model Building:

- Overall Model Building
- By Specific School or College
 - Because I suspected that different trends would arise for different schools/colleges.

○ Factors that were identified to be statistically important.

Overall Model	Liberal Arts	Business	Applied Sciences
Core High School GPA	Core High School GPA	Core High School GPA	Core High School GPA
High Score	High Score	High Score	High Score
Gender	Gender	Gender	Gender
Parents College	Parents College	Parents College	Parents College
Submitted FASFA	Submitted FASFA	Citizenship	Ethnicity
Pharmacy	Specific Program vs Undecided		
Business			
Accountancy			
Engineering			
Citizenship			
Ethnicity			
Adjusted R-Squared 0.358	Adjusted R-Squared 0.371	Adjusted R-Squared 0.349	Adjusted R-Squared 0.398
Engineering	Pharmacy	Education	Accountancy
Core High School GPA	Core High School GPA	Core High School GPA	Core High School GPA
High Score	High Score	High Score	High Score
Gender	Gender	Gender	Parents College
Citizenship	Citizenship	Submitted FASFA	
	Specific Program vs Undecided		
	Ethnicity		
Adjusted R-Squared 0.361	Adjusted R-Squared 0.466	Adjusted R-Squared 0.395	Adjusted R-Squared 0.437

○ Notable Findings:

- Overall, for this study, Core High School GPA was the strongest predictor for the overall model as well as the models built for each school, which lines up with many other findings in research on Higher Education student success.
 - For instance, in the overall model, of the 35.8% of the total variance explained by all of these independent variables 29.4% is explained alone by the Core High School GPA.

- Predicted the Probability of Success of New Freshmen in Math 261 (Calculus I). Where “Success” was defined by a student receiving an A through a C.
 - Statistical Method Used:
 - Binary Logistic Regression
 - Population:
 - New Freshmen students that were enrolled and did not withdrawal before the official drop date in the Fall 2011-12.
 - Independent Variables Analyzed:
 - Core and Overall High School GPA
 - Highest ACT/SAT Score
 - Max ACT Math Subscore (Converted SAT Score)
 - Max ACT Verbal Subscore (Converted SAT Score)
 - Semester Hours taking while enrolled in Math 261
 - Gender
 - Ethnicity
 - Age
 - MS Resident
 - Variables that were found to be statistically significant:
 - Overall High School GPA
 - Highest ACT/SAT Score
 - Model Results:

New Freshmen Using Final Logistic Regression Model*							
Results		Successful		Not Successful		Total	
		Num	%	Num	%	Num	%
Predicted Correctly		222	70.0%	40	12.6%	262	82.6%
Did Not Predict Correctly with Model	Predicted to Fail but Succeeded	26	8.2%			55	17.4%
	Predicted to Succeed but Failed			29	9.1%		
Total		248	78.2%	69	21.8%	317	100%

*Overall High School GPA and Highest ACT/Converted SAT were used within the model.

**Decision cut point was 0.65.

IV. Implications and Results

- Predicting the 1st Semester College GPA
 - High School GPA was identified as a strong predictor of success in students and was previously not included in the list of “advising” information during orientation sessions in many of the departments. As a result of this study, high school GPA was added to this list of factors that the advisor was supposed to take in consideration when advising New Freshmen.
 - There was a lot of concern over the nature of using this predictive model with advisors.
 - If an advisor tells a student that most likely they will receive a certain GPA, based on certain variables known about them already, how would the student take this information?
 - Would it motivate them to study harder?
 - Would it demotivate them and have a learned helplessness effect?
 - Would this affect the nature of the courses they would enroll in?
 - Even though these results were not used as an advising tool directly, by the repetitive presentation of these results, it is now understood by many people on campus that make decisions about students on a regular basis, High School GPA is ultimately the best predictor of success in college.
- Predicting the Probability of Success for New Freshmen in Math 261
 - This is a very recent project, finished within the last month, so the verdict is still out on the implications of this study.
 - However, the Math department wants to set a recommended High School GPA and ACT for students to enroll in Math 261. If they do not meet the High School GPA/ACT standard, they should enroll in a Math course that will help them prepare for Math 261.
 - This recommendation uses the combination of Overall High School GPA and Highest ACT/converted SAT Score.

V. Caution when doing predictive studies for student success.

- Both of these models do not explain 100% of the variance so therefore should be used with the understanding that when predicting human behavior there are always exceptions to trends as well as other variables not included in the model that could aid in the prediction of student performance (e.g. personality indicators, study behaviors, support structure, student involvement, etc...).
- These studies should be used as a guide or an introduction into the understanding of student success.
- Understanding the delicate implications of telling a student that they will or will not succeed and how that will ultimately affect their actions related to their future success.

VI. Future Studies

- Predict Success for other Math 261 students (not new Freshmen)
 - It was found that this group has a much lower success rate than New Freshmen in Math 261, and therefore needed to be studied separately.
- Effects of different cohorts or certain groups of students and their success versus the regular student body.
 - Residential College Students
 - New Transfer Students
 - International Students