2009

Using a Model that Predicts Individual Student Attrition to Intervene with Those Who are Most at Risk

Thomas E. Miller  
*University of South Florida*, millert@usf.edu

T. M. Tyree  
*Southern Connecticut State University*

Keri K. Riegler  
*University of South Florida*, keririegler@usf.edu

C. H. Herreid  
*University of South Florida*, herreid@usf.edu

Follow this and additional works at: [http://scholarcommons.usf.edu/esf_facpub](http://scholarcommons.usf.edu/esf_facpub)

Scholar Commons Citation  
Miller, Thomas E.; Tyree, T. M.; Riegler, Keri K.; and Herreid, C. H., "Using a Model that Predicts Individual Student Attrition to Intervene with Those Who are Most at Risk" (2009). *Educational and Psychological Studies Faculty Publications*. 28.  
[http://scholarcommons.usf.edu/esf_facpub/28](http://scholarcommons.usf.edu/esf_facpub/28)

This Article is brought to you for free and open access by the Educational and Psychological Studies at Scholar Commons. It has been accepted for inclusion in Educational and Psychological Studies Faculty Publications by an authorized administrator of Scholar Commons. For more information, please contact scholarcommons@usf.edu.
This Article describes the early outcomes of an ongoing project at the University of South Florida in Tampa that involves using a logistic regression formula derived from pre-matriculation characteristics to predict the risk of individual student attrition. The approach was first presented in the 83(2) issue of *College and University* (Miller 2007) and further detailed in the 83(3) issue (Miller and Herreid 2008). After risk of attrition was predicted for each entering first-time-in-college student, interventions were designed. The strategies for intervening with those at greatest risk of attrition were described in the 84(3) issue (Miller and Tyree 2009). A second model, based upon the students who entered in 2007, was described in the 84(4) issue (Herreid and Miller 2009). The project described in the 85(1) issue of C&U produced a model for predicting the risk of attrition of individual students between the beginning of the sophomore year and the beginning of the junior year. In this piece, the authors will describe the results of the prediction formula and the extent to which it appears to accurately predicts risk of student attrition. We will also describe the effect of the mentoring program, the applied intervention. Finally, we will present the current effort that is underway based upon what we learned, and the next steps in this effort to improve student success and persistence.
Individual Student Attrition

TO INTERVENE WITH THOSE WHO ARE MOST AT RISK

THE INSTITUTION

The University of South Florida (USF) is a large, public institution in a metropolitan setting. In 2006, when the USF project began, the total student population of the University was approximately 44,000, and the Tampa campus of USF had an enrollment of about 36,000 students. In the current year there are approximately 39,000 on the Tampa campus. The large population has provided USF with the opportunity to develop a statistical model relatively quickly. A cohort of over 4,000 first-time-in-college students is a sufficient population for a relatively reliable model to be constructed.

However, as far as the intervention with those at greatest risk of dropping out, USF does not easily give individual attention to students in any systematic way. It is simply too large an institution to do so in any regular fashion, and students do not expect it. Therefore, the institutional culture and large size was a disadvantage to USF in the development of interventions with individual students, and the experience we had with the intervention will show that difficulty.
This Article describes the early outcomes of an ongoing project at the University of South Florida in Tampa that involves using a logistic regression formula derived from pre-matriculation characteristics to predict the risk of individual student attrition. The approach was first presented in the 83(2) issue of *College and University* (Miller 2007) and further detailed in the 83(3) issue (Miller and Herreid 2008). After risk of attrition was predicted for each entering first-time-in-college student, interventions were designed. The strategies for intervening with those at greatest risk of attrition were described in the 84(3) issue (Miller and Tyree 2009). A second model, based upon the students who entered in 2007, was described in the 84(4) issue (Herreid and Miller 2009). The project described in the 85(1) issue of C&U produced a model for predicting the risk of attrition of individual students between the beginning of the sophomore year and the beginning of the junior year. In this piece, the authors will describe the results of the prediction formula and the extent to which it appears to accurately predicts risk of student attrition. We will also describe the effect of the mentoring program, the applied intervention. Finally, we will present the current effort that is underway based upon what we learned, and the next steps in this effort to improve student success and persistence.
THE INSTITUTION

The University of South Florida (USF) is a large, public institution in a metropolitan setting. In 2006, when the USF project began, the total student population of the University was approximately 44,000, and the Tampa campus of USF had an enrollment of about 36,000 students. In the current year there are approximately 39,000 on the Tampa campus. The large population has provided USF with the opportunity to develop a statistical model relatively quickly. A cohort of over 4,000 first-time-in-college students is a sufficient population for a relatively reliable model to be constructed.

However, as far as the intervention with those at greatest risk of dropping out, USF does not easily give individual attention to students in any systematic way. It is simply too large an institution to do so in any regular fashion, and students do not expect it. Therefore, the institutional culture and large size was a disadvantage to USF in the development of interventions with individual students, and the experience we had with the intervention will show that difficulty.
DATA COLLECTION AND METHODOLOGY

The College Student Experiences Questionnaire (CSEQ) is commonly used to assess the expectations that students have of the college-going experience before they matriculate (Gonyea 2003; Kuh and Pace 1998). It is often used in conjunction with its predecessor instrument, the College Student Experiences Questionnaire (CSEQ) to compare the expectations of students with their real college-going experiences. What students expect of the college experience may be of value in gaining understanding of their chances of success (Miller 2003), and it is on that premise that this project is partially based.

A data set was created with CSEQ survey results for the approximately 900 students who entered USF in fall 2006, and provided personally identifying information (the student identification number). This process allowed the researchers to supplement the CSEQ data with demographic information, academic performance data, standardized test scores, and other data collected by the University and of potential worth in differentiating between dropouts and persisters.

Logistic regression was used to determine which factors in the data set were of predictive value regarding risk of attrition of individual students. The logistic regression utility is the appropriate methodology when varying types of variables are used to predict a dichotomous one (persistence versus dropout).

RESULTS

The factors in the data set that demonstrated themselves to have merit in distinguishing between dropouts and persisters and became part of the attrition prediction formula were:

- High school grade point average (positively related to persistence)
- Being Black versus being White (positive)
- Expecting to participate in student clubs and organizations (positive)
- Expecting to read many textbooks or assigned books (positive)
- Expecting to read many non-assigned books (negative)
- Expecting to work off campus (negative)

These variables are discussed further in the article in the 85(4) College and University (Miller and Herreid 2008). Further analysis demonstrated a number of other variables from the data set that had value in distinguishing between persisters and dropouts but did not have enough power to be included in the model. Those variables included gender (men are more at risk), plans to live on campus (a positive persistence factor), and the time between the date of application and the date of matriculation (a positive predictor of persistence). Whatever variance they contributed independently was absorbed by other factors that were in the model.

THE MENTORING PROGRAM, VERSION I

The project team decided to house the intervention program in the Office of New Student Connections (NSC), a department of the Division of Student Affairs. The NSC operation has general responsibility for providing support to new students through a Week of Welcome program that takes place at the start of the academic year. Students are also supported through the NSC Web site and a regular newsletter. Social events are part of the programming as are the delivery of services and programs for the families of new students.

The core program for intervention with students determined to be at greatest risk would be called the Mentoring Program, and it would begin as a pilot program from which the organizers would learn about effective interventions and strategies that work and that would lead to steps for improvement and expansion in the subsequent years. The Mentoring Program is described in detail in the 84(3), issue of College and University (Miller and Tyree 2009).

The model identified about 450 students at the greatest risk, and planners selected 22 professional staff to be in this pilot program, and the number of students served by each of them was an average of ten. This resulted in about half of the students most at risk being part of the Mentoring Program. An advantage of this is that the researchers were left with convenient control and experimental groups of similar size, allowing for a test of the effect of the program, as we will demonstrate in following sections.

Some of the academic and student affairs administrators who became participants in the intervention were assigned students with whom they might already have a
connection, such as residence hall administrators being assigned groups of residence hall students, or instructors of the University Experience course being assigned students in their respective sections. Other mentors were assigned students, usually commuting students, with whom they had no relationship.

The staff members selected for the Mentoring Program were trained and oriented on the principles of the intended intervention and strategies proposed. The mentors were introduced to the model that predicted risk of attrition, giving them the assurance that they were being asked to assume duty that was based upon well-established science. The managers discussed some suggested ways to contact students. The first contact was seen as delicate, because students were not expecting it, and many of the mentors were strangers to them.

The managers and the researchers made it clear to the mentors that the prediction model did not suggest causation for any of the variables. For that reason the model was not to be the source for strategies to intervene. Rather, the mentors were given a set of reasons why students might drop out and were encouraged to elicit from the students any signs of concern in the conversations with them. The managers addressed risk issues associated with academic performance, such as a student exhibiting unclear or unreasonable goals about the college experience. A student with insufficient academic preparation would also be at risk, as would a student who was disengaged, bored, or disinterested in coursework.

Other signs of a potential disconnection that mentors were encouraged to look for were a student showing social isolation from peers or signals of stress or of concern for finances. Some students have challenges managing the new freedoms associated with going to college, and mentors were encouraged to watch for symptoms of that. Many students are at risk of attrition because of the distraction of conflicting commitments, such as off-campus employment, separation from significant others (family or friends), or even long commutes to campus. A final signal about which mentors were encouraged to converse with students is...
extent to which their expectations of the college experience were not met, and the ways in which that might be the case.

The training program included a discussion about the various departments at the University to which students with specific needs or concerns could be referred. The services and programs of each department were described to the mentors, so they could help students know what to expect, and the risk factors described previously were matched with departments that might provide specific support to students who show evidence of those conditions. Included among the referral departments were the counseling center, career services, the financial aid office, the tutoring and learning services/writing center, the center for student involvement, and the department of housing and residential education.

ALTERNATIVE INTERVENTION SERVICES

The project team for the Mentoring Program recognized that there were several specific programs and departments that already give close support and regular contact to the students they serve. As a result, students involved with those operations were excluded from the Mentoring Program, because the service would be redundant. However, each of those departments was very interested in having identified to them any of their students who were determined to be at risk, so they could be given special attention in addition to the regular service provided. Those departments and programs are the Academic Enrichment Center for Intercollegiate Athletics, the Freshman Summer Institute for students at risk, Student Support Services for a different collection of students at risk, the Honors College, and an additional collection of the freshman University Experience course instructors.

EARLY LESSONS PRIOR TO RESULTS ANALYSIS

At the mid-point of the academic year, the managers learned several things from the experience of mentors. First, many students did not immediately respond to the first contact, unless they knew the mentor. For that reason, University Experience and residence hall staff mentors were among the most successful in getting student responses.

Additionally, some mentors were not comfortable making cold phone calls and relied only on e-mail, with varying results. Also, some students did not respond immediately but did later, after mid-term grades. The managers believe that, irrespective of student response, there may be some good effect of the first contact from the mentor, as students are informed that somebody at the University is assigned to give them support, whether they take advantage of it or not.

RESULTS FROM THE APPLICATION OF THE MODEL

In the fall 2009 semester the project managers were able to assess the effectiveness of the model. At that point, the first-year persistence rate, to the beginning of the sophomore year, was determined. Establishing the accuracy of the model was essential in order to maintain the commitment of time and personnel to the intervention effort. This is true even though the model that was applied for the first year of this project is different from the model developed in the second year (Herreid and Miller 2009). The point is that, in order to continue to invest in the project, University officials need confidence in the process of the design of the model, not any particular formula for predicting attrition. Reassuring the USF community that the prematriculation variables that are included in model design are the right ones is very important. Also essential is that
the logistic regression application is seen as effective and as an accurate application for predicting student persistence.

As Table 1 (on page 16) shows, the persistence rate of students in the study who were predicted by the model to be most likely to remain at USF was 87 percent, and the rate for students predicted to be least likely to persist was 80 percent. Therefore, from an overall perspective and unrelated to any effect of the intervention the model appeared to have some power in predicting student persistence. The persistence rate of the total cohort in this study was 86.23 percent, which compares favorably with the reported persistence rate of 86.6 percent for the full class. The cohort for model construction was based upon only new students who were eighteen or nineteen years old, and who enrolled on the Tampa campus.

These results are encouraging for several reasons. In general, predicting human behavior is risky, and in this project there was a substantial commitment of human resources and, to a lesser extent, financial and material resources. The substantial gap in the rates of persistence between those predicted most likely to persist and those predicted less likely points toward power in the model. That power exists because some attrition is impossible to predict (health difficulties, changing family circumstances, and so forth). Also, the experiences of those more prone to drop out are unpredictable (forming of special significant relationships, establishing a special bond to an organization, etc.). In the context of those sorts of unpredictable factors, the gap in persistence appears meaningful and reassuring about the model.

These results are promising and generate confidence in the use of future applications of the predictive model, as well as for the development of other models for predicting persistence of sophomores (Miller and Herreid 2009) and for predicting persistence of transfer students.

RESULTS OF THE MENTORING PROGRAM INITIATIVE

Having established the predictive worth of the logistic regression model, the project team turned its attention to the effect of the Mentoring Program, the intervention initiative. Those results were less encouraging. Of the students who were predicted to be at risk and who received no intervention, 81.25 percent of them persisted to the sophomore year. Surprisingly, of the students who received an intervention, only 79.0 percent of them were retained. It is incongruous that the Mentoring Program actually had a more negative effect than no intervention at all, so the project team explored the specific results more carefully.

The team learned that commuting students in the program had a low persistence rate (77.95%) as did resident students whose mentors were non-residential professional staff (75.0%). Further, of those who were in the Mentoring Program, the highest persistence rates were by students whose mentors were their University Experience instructors (84.93%). Also, student athletes whose risk of attrition was high persisted at a rate of 93.33 percent. This clearly suggests that an intervention with a student at risk by a person with whom the student had no other reason for contact (commuters and residents supported by a staff member who did not live on campus) did not work. To the contrary, an intervention by a person with whom the student had a relationship (University Experience instructor or athletics academic advisor) was more effective. These lessons helped to shape the subsequent version of the intervention.

THE MENTORING PROGRAM, VERSION II

The pilot program provided helpful insight into opportunities for improvement as the Mentoring Program was modified for year two. The project team decided to take a slightly different approach in identifying and assigning mentors with the previous year’s results in mind. Feedback from the mentors suggested that students responded better to outreach from a person who had a natural connection to their student experience rather than what seemed like a random call from a university staff member. Thus, the team again removed students who were already participating in a program or activity that provides extra attention to their students (athletes, honors students and first-generation programs). These programs were notified of the predicted risk of attrition of their students so they were aware of their potential to be at risk for departing USF.

Then, the remaining students were divided into three sections—those who lived on campus, those who were taking a section of the University Experience course, and those who commute to campus. Students in each group were assigned mentors based on their unique needs and points of connection to the University. This revised approach created a greater capacity for mentoring relationships such that 413 students were assigned a mentor in the current year, compared with about half that number last year.
Because the students mentored by their University Experience (UE) instructors were most likely to persist, the team decided to extend an invitation to all instructors to mentor their students who were identified as at risk for departure. Of the 55 UE instructors for the fall semester, 33 participated in the Mentoring Program. Seven who were teaching for the first time were not invited to participate to avoid undue pressure on their overall experience and five declined the invitation to participate. Ninety-three of the 413 students were assigned to their UE instructors; on average an instructor had three to four students assigned to him/her. Training was provided to the University Experience instructors to help them understand why their students were more at risk for departing the university, and to coach them on how they might provide unique support to these students, beyond perhaps what they already provide to their class.

The remaining students were divided by their residential experience. The 182 students living in the residence hall were assigned to a residence life staff member. The housing department agreed to incorporate the mentoring role in the job expectation for the residence life coordinators and faculty-in-residence. This approach seemed especially appropriate given that year two of the mentoring program coincided with the implementation of a new first-year residency requirement at the university. It is important to note, however, that students living in the three-county region that surrounds the university were allowed an exception to the requirement, and about 57 percent of those students chose to commute from home during their first year.

The commuting students were assigned to a student peer mentor. Using upper-class students in a mentoring role was a new approach to making connections with these at-risk students. Four peer mentors were selected, hired and trained to serve in this capacity. All of the students had previously served as orientation team leaders and thus were very knowledgeable about first-year students and the University. Working in New Student Connections for five hours per week in the fall and spring semesters, these upper-class students have dedicated significant time to reaching out to their students. In total, 138 students were assigned to the four mentors such that the average number of first-year students assigned to a single peer mentor was 35.

Because mentors had varied success in connecting with their assigned students in the pilot program, more time was spent preparing and supporting the housing staff. The Office of New Student Connections facilitated two workshops before the beginning of fall semester to help the residence life coordinators gear up for their work. Surprising to some, living in the residence halls with the students did not automatically make it easier to connect with them. More regular outreach and support by New Student Connections, including convening a mid-semester meeting, has helped the staff identify mechanisms and opportunities for reaching the students. Connecting with students in buildings where staff members do not live or work has been among the top challenges facing some staff. Another consideration was each mentor’s capacity for building a successful relationship with a manageable number of students. On average, mentors were assigned twelve students for initial contact.

For the residence life and peer mentors, reaching out to these students has been equated to “cold calling” in sales. The mentors had to find ways to reach the students that would engage them. This may continue to be the greatest problem at USF associated with intervening with students at risk of attrition. Unlike smaller institutions where norms may include student connections with staff and faculty, the size of the University and its culture make those connections less familiar ground.

**NEXT RESEARCH STEPS**

The researchers will continue to refine the prediction model on an annual basis. In the spring of 2008, the researchers developed a USF-specific survey that included only the items from CSXQ that had been found to be of predictive worth. A more powerful model is currently being constructed, because in the administration of that survey during the summer orientation of 2008 more than 4,100 students completed the instrument and provided personally identifiable information. That generated a large number of records on which the next model will be based, and that will permit the construction of a model in which the researchers will have much more confidence. The researchers will describe that model in future writing.

One more area for attention by the researchers is the very large population of transfer students that enters the institution every year. USF has one of the largest transfer student populations in the country, with more transfer students being admitted annually than first-time-in-college (FTIC) students. The rate at which they persist to de-
gree completion is better than that of FTIC students, but there are so many of them, any improvement in their rate of persistence may be impactful.

**SOPHOMORE ATTENTION**

The original data set constructed from students entering the University in 2006 was used to develop a model to predict risk of sophomore-to-junior attrition, because that group was eligible to enter the junior year at the University in 2008 (Miller and Herreid 2009). There is reason to believe that attrition following the sophomore year is a significant problem for the University, because a number of selective colleges (such as Nursing, Business, and Education) govern admission to their programs in the junior year. Students who fail to gain admission to those colleges may choose other educational options outside of the University at that point.

At USF the various academic colleges assume the responsibility for providing academic advice to students who have declared or are tracking toward a specific major. The professional academic advisors in the colleges have accepted the responsibility for intervening with sophomores at risk of dropping out, and they are employing varying strategies for that effort. The researchers will track their respective efforts to determine which approaches have the best effect in the form of persistence to the junior year. Those results will inform best practice in intervention, as has been the case with first-time-in-college students.

**CONCLUSION**

The confirmation of the effectiveness of the logistic regression model using pre-matriculation data is the most positive and important result of this project. That application will be repeated and refined for the first-time-in-college cohorts over the coming years. The planners have confidence that the revised Mentoring Program has the potential to have a dramatic effect on student persistence. The effect of the changes in the program, using student peers and only mentors who have natural relationships with students at risk, will be closely monitored. If further refinements are called for, the planners will adapt the program accordingly. The intervention by college-based academic advisors will be monitored, and adjustments in that approach will be implemented as determined necessary. The researchers will develop a plan for intervening with transfer students who are risk of attrition and monitor its effect, also. The multiple applications of logistic regression to anticipate risk of attrition will be an ongoing, iterative process at the University of South Florida. The plan, of course, is to demonstrate an improved rate of student persistence and degree attainment. Researchers remain confident that improvement is within reach and that it will be demonstrated in the years to come.

**REFERENCES**


Herreid, C. and T. Miller. 2009. Analysis of variables to predict first-year persistence using logistic regression analysis at the University of South Florida: Model V. 2. College and University. 84(4).


Miller, T. 2007. Will they stay or will they go? Predicting the risk of attrition at a large public university. College and University. 83(3): 1–7.


Miller, T., and C. Herreid. 2009. Analysis of variables: predicting sophomore persistence using logistic regression analysis at the University of South Florida. College and University. 85(1).


Miller, T., and T. Tyree. 2009. Using a model that predicts individual student attrition to intervene with those who are most at risk. College and University. 84(3).

**About the Authors**

**THOMAS E. MILLER** is an Associate Professor at the Tampa campus of the University of South Florida, where he has served since 2001. He previously worked in student affairs positions at the University of South Florida, Eckerd College, and Canisius College; and he also held positions at Indiana University, and at Shippensburg University. Miller holds a bachelor's degree from Muhlenberg College and a master's degree and doctoral degree from Indiana University.

**TRACY TYREE** is the Associate Vice President of Student Affairs at the University of South Florida. She previously served as dean of student life at Susquehanna University, and has also worked at Mercer University and Lynchburg College. Tyree earned her bachelor's degree at the University of Florida, her master's degree at Indiana University, and her doctorate at the University of Maryland.

**KERI K. RIEGLER** is the Director of New Student Connections at the University of South Florida. She previously worked in orientation and student programming at the University of South Florida. Riegler holds a bachelor's degree from the University of Tampa, and a master's degree from the University of South Florida.

**CHARLENE HERREID** is Director of Student Affairs, Planning, Evaluation and Assessment at University of South Florida. She previously served as Director of Institutional Research at Saint Leo University for nine years. She received her bachelor's, master's, and Ph.D. degrees in Psychology from the University of Miami (Florida).