Predictors of Retention: Identification of Students At-Risk and Implementation of Continued Intervention Strategies

Muriel C. Lopez-Wagner
California State University,
San Bernardino
Office of Institutional Research
mclopez@csusb.edu

Tanner Carollo
California State University,
San Bernardino
Office of Institutional Research
tcarollo@csusb.edu

Emily Shindledecker
California State University,
San Bernardino
Office of Institutional Research
eshindle@csusb.edu

Abstract - In recent years, retention rate into the sophomore year for California State University, San Bernardino (CSUSB) has improved and surpassed the CSU system-wide average. However, it is clear that the first two years of college are difficult for some students and these difficulties influence their decision to return. We examined data from 3,790 First Time Freshmen who entered CSUSB in fall 2009 and fall 2010 quarters, and conducted a binary logistic regression on these data. Ethnicity, high school GPA, University Studies 100 enrollment, first term GPA, percent of courses completed during the first year, and number of general education courses enrolled during the first year contributed to the overall significance of the model and accounted for 42% of the variance in sophomore year retention rates. Probability scores for sophomore retention rates were calculated for each student which ranged from high to low risk. The purpose of the study was to identify predictors of retention into the sophomore year, to identify students at-risk for dropout, and to provide continued intervention during the sophomore year.

Introduction

The first year of college life appears to be a critical period for young adults as college introduces a new environment and new set of crisis, which precipitates a need for new ways to respond. Research has shown that the highest loss of students occurs during the first year of college and is typically due to a variety of factors such as lack of engagement with the institution (Astin 1993; Pascarella & Terenzini, 1991), weak academic preparation in high school (Astin, Korn, & Green, 1987; Hirschy, Bremer, & Castellano, 2011; Tross, Harper, Osher, & Kneidinger, 2000), low college grade point average (Murtaugh, Burns, & Schuster, 1999), the number of developmental or remedial courses required (Bremer, Center, Opsal, Medhanie, Jang, & Geise, 2013), age, ethnicity, socioeconomic status, and other individual status factors (Hirschy et al., 2011; Peltier, Laden, & Matranga, 1999), lack of financial aid (Fike & Fike, 2008), and the interaction of these variables. Hence, many institutional interventions have been created for first year students to enhance retention into the second year (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Tinto, 1996; Upcraft & Gardner, 1989). Programs such as Freshman orientation and Freshman 101 courses have been implemented to better educate students about class registration, financial aid, time management, financial management, clubs, organizations, and advising with promising results. However, very little intentional programming exists to support students beyond their first year. Thus, at-risk students who return for their sophomore year may face additional challenges, prompting a departure between the second and third year for institutions such as CSUSB.

According to Tinto (1975, 1987, 1993), college introduces a period of transition from being a first time student to being a mature student and graduation from college indicates the student's commitment

and integration into the academic and social life of a campus. It has been shown that highly engaged students are more likely to continue in college and graduate than less engaged students (Gloria, Castellanos, Lopez, & Rosales, 2005; Hausmann, Schofield, & Woods, 2007; Pascarella & Terenzini, 1991; Tinto, 1987). According to Astin (1993), commitment and integration into the life of a campus is achieved through engagement with faculty, peers, courses, and activities. The process of commitment and integration during college seems to suggest development that goes beyond the first year of college and, because it is a developmental process, different factors become critical at various points during the life of college students. For instance, involvement in on-campus activities was important for first year students but not for sophomore students (Graunke & Woosley, 2005; Milem & Berger, 1997). Sophomores reported to be more troubled about deciding on a major and a career than other student groups (Gardner, 2000) and reported that faculty interactions were important to them (Graunke & Woosley, 2005; Juillerat, 2000). It was also suggested that academic disengagement could occur during the sophomore year (Pattengale & Schriener, 2000). Collectively, these studies indicate that the second year of college could be a difficult time for students and calls for institutional programming that is unique to these students.

CSUSB is a public, four-year university and post baccalaureate degree awarding institution located at the foothills of the San Bernardino mountains in Southern California. It primarily serves San Bernardino and Riverside counties, an area collectively referred to as the Inland Empire. CSUSB, established in 1965, is one of the 23 campuses in the California State University System and has been designated as a Hispanic Serving Institution. Today, it offers nearly 50 bachelor's degree programs, more than 25 master's degree programs, and one doctoral degree program, and serves more than 18,000 students. Eighty-seven percent of students seek an undergraduate degree; 81% attend on a full-time basis; 80% are first generation college students (parents without a bachelor's degree); 70% require one or more remedial courses in Math, English, or both; 62% are female; 49% are Hispanic; 22% are White; 8% are African American; 6% are Asian; and 5% are Non-Residents (CSUSB Office of Institutional Research Factbook, 2013). Undergraduate students' median age is 21 and graduate/post baccalaureate students' median age is 30 (CSUSB Office of Institutional Research Factbook, 2013). Current first-to-second year retention rate for CSUSB is 89% which surpasses the California State University (CSU) system wide retention rate of 84%. Second-to-third year retention for CSUSB is 79% which also surpasses the CSU system wide retention rate of 75%. However, for CSUSB, the loss of 190 students the first year and another 170 students the second year is not only enormous, but costly.
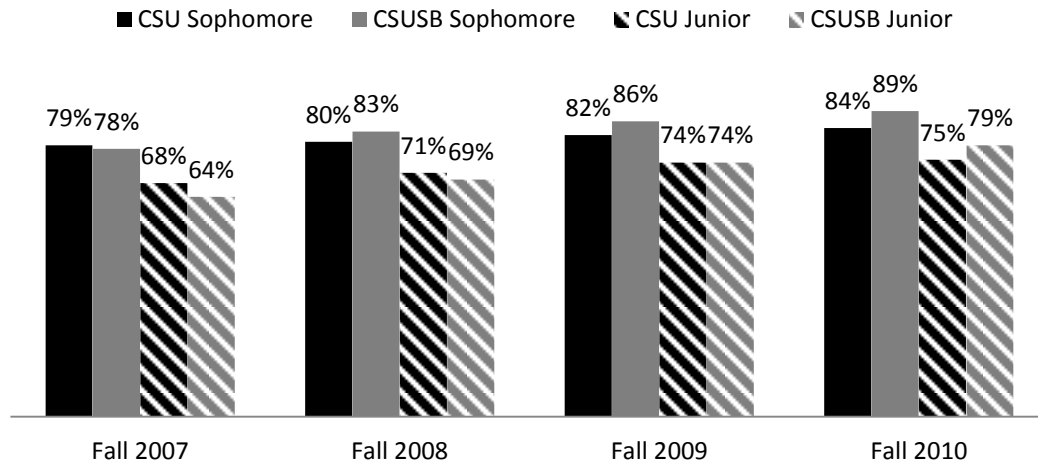
Retention Rates for CSU and CSUSB

Figure 1. Retention Rates for CSU and CSUSB.

Institutions have deployed a great amount of resources and time to engage first year students through a variety of programs and services to meet their needs which enhance retention in the sophomore year. However, it appears that institutions disengage from sophomore students as evidenced by the lack of research, assessment, and knowledge about further loss of students. For CSUSB, we see a substantial number of students not retained between their sophomore and junior years. It is for these reasons that we investigated variables that predicted retention into the sophomore year, and then, utilized this model to generate probability scores for each student in subsequent cohorts. This allowed CSUSB to develop interventions aimed at assisting at-risk sophomore students to persist into the junior year. Probability scores were utilized to categorize students into ten groups, or deciles, which ranged from 1 "High Risk" to 10 "Low Risk". This grouping will be used to assign students to various offices for advising and identifies students at-risk to implement interventions for an institution that has limited funding and resources.

Data Collection and Sampling

Archival data from CSUSB were extracted for 3,790 students who enrolled as first-time freshman in the fall quarters of 2009 and 2010. The sample consisted of 36% males and 64% females with an average age of 18 at the start of the fall terms. The majority 60% of students identified as Hispanic, 15% as Caucasian, 8% as African American, 7% as Asian/Pacific Islander, 4% as Two or more races, 3% as Unknown, 3% as Non-Resident, and 0.2% as Native American.

Statistical Methodology

In order to examine potential predictor variables of sophomore year retention, exploratory analyses were conducted on these data utilizing a series of chi-square tests of independence, z-tests of column proportions, and t-tests. Based upon the results from the analyses, the variables were categorized as: non-significant, excluded significant variables, or significant variables included in the model (Table 1).

Table 1. Exploratory Data Analyses

	Tested Variables	Description	Sig.	Why Excluded/Included
Non-significant	Gender	Male vs. Female	No	Not significant
	URM status	URM vs. Non-URM	No	Not significant
	Major declaration	"Undeclared" in 1st term	No	Not significant
	Basis of admission	Regular vs. Exceptional vs. Other	No	Not significant
	First-generation status	Parent's Education level	No	Not significant
Significant & Excluded	Geographic Origin	Riverside county, SB county, CA, Other U.S., Foreign	Yes	Overall significant but no within differences
	Full-time enrollment	Full-Time vs. Part-Time (1st Term)	Yes	Exceeded 9:1 ratio (98% full-time)
	SAT score	-	Yes	SATs are not required
	Remediation status	Required vs. Not Required	Yes	Examined in previous study & not a reliable variable
	% GE Units Completed	1st year completed units/attempted (GE)	Yes	Correlated with attempted/completed units (all)
Significant & Included	Ethnicity	-	Yes	Variable of high interest
	High School GPA	-	Yes	Predictor of college performance
	USTD 100	Enrolled in 1st Year Seminar in 1st term	Yes	High intervention potential
	First-term GPA	1st term GPA	Yes	Measure of 1st term performance
	% Units Completed	1st year completed units/attempted (all)	Yes	Indicator of 1st year success
	Enrolled # of GE courses	# of GE courses enrolled in 1st year	Yes	Reflection of "on track" students

The Retention Model

A simultaneous binary logistic regression was performed on sophomore year retention as the outcome variable with six predictors: ethnicity, high school grade point average, University Studies 100 enrollment, first-term grade point average, percentage of units completed during the course of the first year, and number of general education courses enrolled in during the first year. The analysis was performed utilizing the Statistical Package for the Social Sciences (SPSS). Forty-two cases (1%) with missing values on predictor variables were removed from further analyses. After deletion of these cases with missing values, data from 3,748 students were available for analysis. Specifically, 3,261 students were retained and 487 students were not retained in the fall term of their sophomore year.

A test of the full model with all six predictors against a constant-only model was statistically significant, $\chi^2(12) = 968.86$, $p < .05$, Nagelkerke $R^2 = .423$, indicating that the predictors, as a set, significantly distinguished between students who were retained versus students who were not retained at the start of their second sophomore year and explained 42% in second year of retention variance (Table 2). Classification set at 0.9 was adequate, with 80% of the non-retained and 76.5% of the retained students correctly predicted, for an overall success rate of 77% (Table 3).

Table 2. Binary Logistic Regression Model

	-2 Log likelihood	Chi-square	df	Sig	Nagelkerke R^2
Model	1926.58	968.86	12	.000*	0.423

*Significant at the $p < .05$ cut-value.

Table 3. Correct Classification Table

		Predicted		
		Sophomore Year Retention		
Observed		Not Retained	Retained	Percentage Correct
Sophomore Year Retention	Not Retained	391	96	80.3
	Retained	766	2495	76.5
	Overall Percentage			77.0

The cut value is .900

Table 4 shows the regression coefficients, standard errors, Wald statistics, degrees of freedom, significance, and odds ratios for each of the six predictors. According to the Wald criterion, five of the six variables significantly predicted student retention. Ethnicity significantly predicted student retention, $\chi^2(7) = 35.883$, $p < .05$, and results from the model suggest that Caucasians (OR = .456) and Non-Residents (OR = .361) are less likely to be retained when compared to Asians (reference group). High school grade point average significantly predicted student retention, $\chi^2(1) = 7.165$, $p < .05$, and as students' high school grade point average increases, their likelihood to be retained decreases (OR = .636). University Studies 100 enrollment significantly predicted student retention, $\chi^2(1) = 9.239$, $p < .05$, with students enrolled more likely to be retained than non-enrolled students (OR = 1.531). Percentage of units completed during the course of the first year significantly predicted retention, $\chi^2(1) = 243.805$, $p < .05$, and as the percentage of courses completed in the first year increases, the likelihood of being retained increases (OR = 1.066). The number of general education courses enrolled in during the course of the first year significantly predicted retention, $\chi^2(1) = 155.822$, $p < .05$, and as the number of general education courses enrolled in increases, the likelihood of being retained increases (OR = 1.415). First term grade point average was a *non-significant* predictor in the model of sophomore year retention, $\chi^2(1) = 2.795$, $p > .05$; however, as students first term grade point average increases, their likelihood to be retained increases (OR = 1.136). A model run with first term grade point average omitted weakened the overall model, and therefore, remained in the final model.

Table 4. Variables in the Equation

Variables	β	S.E.	Wald χ2	df	Sig	Odds Ratio
Ethnicity						
Asian (reference group)			35.883	7	.000*	
African American	-.020	.347	0.003	1	.954	.980
Native American	-.760	1.084	0.492	1	.483	.468
Caucasian	-.786	.309	6.475	1	.011*	.456
Two or more races	-.631	.397	2.521	1	.112	.532
Hispanic	.026	.288	0.008	1	.929	1.026
Unknown	-.746	.417	3.199	1	.074	.474
Non-Resident	-1.020	.411	6.166	1	.013*	.361
High School GPA	-.453	.169	7.165	1	.007*	.636
USTD Enrollment (1ˢᵗ term)	.426	.140	9.239	1	.002*	1.531
First-Term GPA	.128	.076	2.795	1	.095	1.136
Percentage of units completed (1ˢᵗ year)	.063	.004	243.805	1	.000*	1.066
Enrolled number of GE courses (1ˢᵗ year)	.347	.028	155.822	1	.000*	1.415
Constant	-4.498	.619	52.776	1	.000*	.011

*Significant at the $p < .05$ cut-value.

Practical Application of the Model

In order to utilize the model for practical application, probability scores for sophomore retention were calculated for each first-time freshman student in the fall 2009 and 2010 cohorts (See formula below). Probability scores were then converted into deciles ranging from 1-10, with 1 being students least likely to be retained (high risk) and 10 being students most likely to be retained (low risk).

$$ p = \frac{exp^{(a+b_1x_1+b_2x_2+b_3x_3+b_4x_4\cdots)}}{1 + exp^{(a+b_1x_1+b_2x_2+b_3x_3+b_4x_4\cdots)}} $$

Where:
p= probability of enrollment / non-enrollment
exp= base of natural logarithms (~2.72)
a=constant / intercept of the equation
b= coefficient of predictors (parameter estimates)

Tables 5 and 6 show that as students increase along the continuum from high to low risk they are more likely to be retained in the fall quarters of both their sophomore and junior years.

Table 5. Fall 2009 and Fall 2010 Cohorts: Sophomore Year Retention by Decile
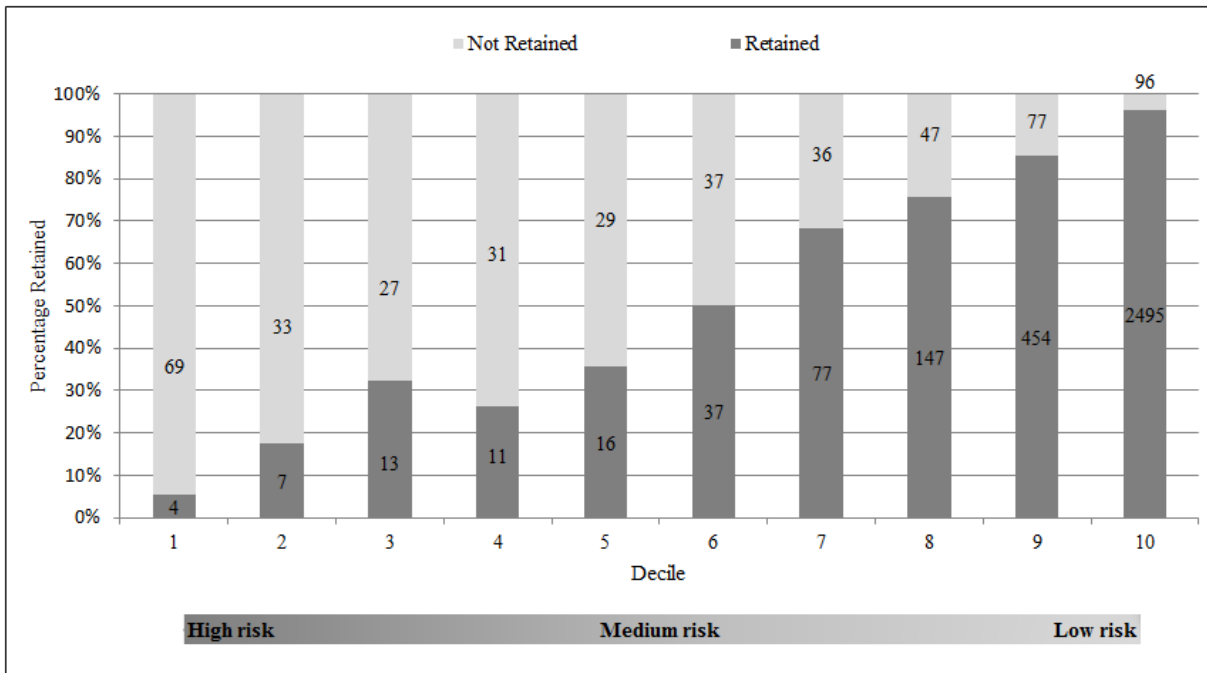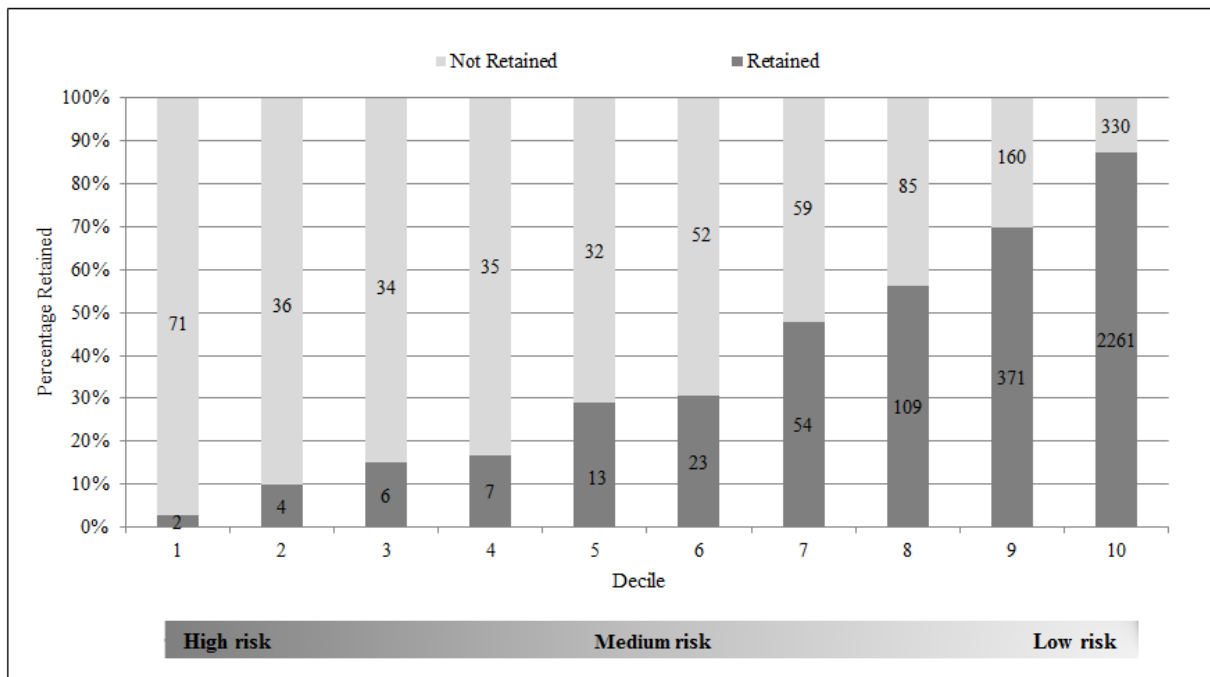

Table 6. Fall 2009 and Fall 2010 Cohorts: Junior Year Retention by Decile

Validation of the Model

The model was validated utilizing student data for first-time freshman students who enrolled in fall 2011. A test of the full model with all six predictors against a constant-only model was statistically

significant, $\chi^2(12) = 564.240$, $p < .05$, Nagelkerke $R^2 = .455$, indicating that the predictors, as a set, significantly distinguished between students who were retained versus students who were not retained at the start of their sophomore year, and explained 45.5% of retention variance. Validation of the model demonstrates its generalizability to future cohorts.

Summary

Prior to the development of this model, CSUSB relied on academic probation placement to identify at-risk students. While effective, this approach overlooked a number of students who may have benefited from available support services. Furthermore, this model provides support for the development of interventions aimed at assisting sophomores based on first year outcomes. As shown in Tables 5 and 6, students with assigned decile scores of 1-5 were retained from the sophomore to junior year at a rate of 63% while 88% of students with assigned decile scores of 6-10 were retained from the sophomore to the junior year.

Data Preparation for Intervention

Assigned deciles scores will be linked with student demographic and enrollment information. These data will be provided to the Co-Directors of Retention Projects, who will utilize this information to implement intervention strategies.

Planned Targeted Intervention Strategies

Research based on national trends in higher education show that numerous institutions have successfully increased the availability of advising services through the development of peer advising programs (Habley, 2004). CSUSB has utilized this guided research to develop the Student Success Peer Advising Program to provide a cost-effective and greatly needed resource for students (Koring and Campbell, 2005). Each peer advisor will be assigned a group of less than twenty at-risk students in order to provide intrusive advising services. At-risk students will be strongly encouraged by peer advisors to engage in: service and community learning, diversity/global learning experiences, learning communities, and undergraduate research. Peer advisors will engage in frequent (weekly or bi-weekly) contact to ensure that they are connected with the career center, resources, support, and information to help to address academic, social, and personal issues. Department chairs will also be provided a list of their at-risk students and will be encouraged to use a guided interview to further increase the student's integration with their intended major. In order to measure the outcome of successful student intervention practices, a variety of indicators will be assessed. We expect an increase in our sophomore to junior year retention rates, greater student involvement at the career center, departments reporting frequent contact with at-risk students, and enhanced student academic performance. These continued targeted intervention strategies will be implemented in order to enhance students' persistence throughout their academic career at CSUSB.

Acknowledgements

References

Astin, A. W. (1993). *What matters in college?* San Francisco: Jossey-Bass.

Astin, A. W., Korn, W., and Green, K. (1987). Retaining and satisfying students. *Educational Record, 68*, 647-658.

Bremer, C. D., Center, B. A., Opsal, C. L., Medhanie, A., Jang, Y. J., and Geise, A. C. (2013). Outcome trajectories of developmental students in community colleges. *Community College Review, 41*(2), 154-175.

CSUSB Office of Institutional Research. (2013). *Statistical Factbook 2013*. San Bernardino: California State University, San Bernardino.

Fike, D. S. and Fike, R. (2008). Predictors of first-year student retention in the community college. *Community College Review, 36*(2), 68-88.

Gardner, E. D. (2000). From drift to engagement: Finding purpose and making career connections in the sophomore year. In L. A. Schreiner & J. Pattengale (Eds.), *Visible solutions for invisible students: Helping sophomores succeed* (Monograph 31), pp. 67-77. Columbia, SC: University of South Carolina.

Gloria, A. M., Castellanos, J., Lopez, A. G., and Rosales, R. (2005). An examination of academic nonpersistence decisions of Latino undergraduates. *Hispanic Journal of Behavioral Sciences, 27*(2), 202-223.

Graunke, S. S. and Woosley, S. A. (2005). An exploration of the factors that affect the academic success of college sophomores. *College Student Journal, 39*(2), 367-376.

Habley, W. R. (2004). *The status of academic advising: Findings from the ACT Sixth National Survey* (NACADA Monograph No. 10). Manhattan: National Academic Advising Association.

Hausmann, L. R. M., Schofield, J. W., and Woods, R. L. (2007). Sense of belonging as a predictor of intentions to persist among African American and White first-year college students. *Research in Higher Education, 48*(7), 803-839.

Hirschy, A. S., Bremer, C. D., and Castellano, M. (2011). Career and technical education (CTE) student success in community colleges: A conceptual model. *Community College Review, 39*, 296-318.

Hunter, M. S., Tobolowsky, B. F., Gardner, J. N., Evenbeck, S. E., Pattengale, J. A., Schaller, M. A., Schreiner, L. A., and Associates. (2010). *Helping sophomores succeed: Understanding and improving the second year experience*. San Francisco: Jossey-Bass.

Juillerat, S. (2000). Assessing the expectations and satisfactions of sophomores. In L. A. Schreiner & J. Pattengale (Eds.), *Visible solutions for invisible students: Helping sophomores succeed* (Monograph 31), pp. 1929. Columbia, SC: University of South Carolina.

Koring, H., & Campbell, S. (2005). An introduction to peer advising. In H. Koring & S. Campbell (Eds.), *Peer advising: Intentional connections to support student learning* (Monograph No. 13) (pp. 9–19). Manhattan: National Academic Advising Association.

Kuh, G. D., Cruce, T. M., Shoup, R., Kinzie, J., and Gonyea, R. M. (2008). Unmasking the effects of student engagement on first-year college grades and persistence. Journal of Higher Education, 79(5), 540-563.

Milem, J. F. and Berger, J. B. (1997). A modified model of college student persistence: Exploring the relationship between Astin's theory of involvement and Tinto's theory of student departure. *Journal of College Student Development, 38*(4), 387-100.

Murtaugh, P. A., Burns, L. D., and Schuster, J. (1999). Predicting the retention of university students. *Research in Higher Education, 40*, 355–371.

Pascarella, E. T. and Terenzini, P. T. (1991). *How college affects students: Findings and insight from twenty years of research*. San Francisco: Jossey-Bass.

Pattengale, J. and Schreiner, L. A. (2000). What is the sophomore slump and why should we care? In L. A. Schreiner & J. Pattengale (Eds.), *Visible solutions for invisible students: Helping sophomores succeed* (Monograph 31), pp. vviii. Columbia, SC: University of South Carolina.

Peltier, G. L., Laden, R., and Matranga, M. (1999). Student persistence in college: A review of research. *Journal of College Student Retention, 1*, 357–376.

Reason, R. D. (2009). Student variables that predict retention: Recent research and new developments. *NASPA Journal, 46*(3), 482-501.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research, 45*, 89–125.

Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press.

Tinto, V. (1996). Reconstructing the first year of college. *Planning for Higher Education, 25*(1), 1-6.

Tross, S. A., Harper, J. P., Osher, L. W., and Kneidinger, L. M. (2000). Not just the usual cast of characteristics: Using personality to predict college performance and retention. *Journal of College Student Development, 41*, 323–334.

Upcraft, M. L. and Gardner, J. N. (1989). *The freshman year experience. Helping students survive and succeed in college*. San Francisco: Jossey-Bass.