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Can UC Davis Admissions Measures Predict Graduation Rates?

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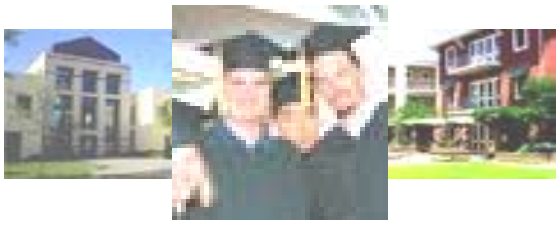
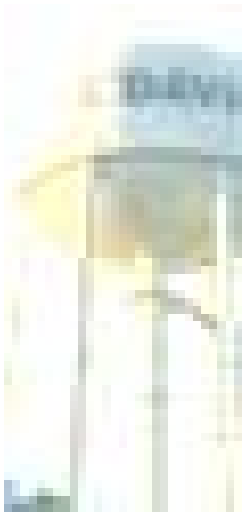


EXECUTIVE SUMMARY



This project was conducted at the request of the Admissions and Enrollment Committee of the Academic Senate. It was a study designed to determine the relationships between admissions measures, early University academic records, and degree completion. The study employed logistic regression to support computation of likelihood of degree completion corrected for students' academic preparation. These expected rates were compared to actual completion rates to learn which measures identified groups of over- and under-performers. All analyses used the entering freshman cohort of 1998. The fall 1998 cohort was selected as a compromise between the desire for as long a record as possible (five years) and for an admissions process that used essentially the same nonacademic measures as were in use in 2004. The cohort was further restricted to U.S. citizen students with complete College Board admissions records (n=3,136).

Key Findings

Students who were part-time in their first quarter of attendance were about one-half as likely to complete a degree in four years

The most surprising and perhaps the most significant finding was that students who were part-time in their first quarter of attendance because of workload units or other reasons were about one-half as likely to complete a degree in four years (24% vs. 47%). Given UC Davis' quarter system structure, the impact of a few units in a first quarter of attendance does not explain the pattern. It is more likely that workload placement and the decision to take a reduced degree units courseload reflected the summary judgment of advisor and student. Forcing students to take 12 or more degree units in the first quarter in addition to any workload placements is not necessarily the indicated intervention to yield a higher four-year graduation rate.

Among the personal characteristics available at application, one proved to be especially useful in identifying students who graduated at higher than predicted rates and who could overcome lower initial grade point averages to end with higher grade point averages. That characteristic was leadership.

Students assigned to Basic Math graduated at very low rates

Personal difficulty and challenging life circumstances do not vanish upon arrival to campus. Students who achieved UC eligibility in spite of difficult and challenging life circumstances do not graduate at as high a rate as predicted from their test scores and grade point averages. Personal circumstances continue to be a challenge for these students and compensating services offered by the University have not fully succeeded in ameliorating the circumstances.

More so than placement into other workload courses, it was clear that students assigned to Basic Math graduated at very low rates -

15% at four years and 43% at five years. Students with quantitative skill levels requiring Basic Math placement might be better served in another postsecondary environment.

Four-year completion rates were especially high for Environmental Sciences; Humanities, Arts and Cultural Studies; and the Social Sciences Divisions. Divisional differences at five years were somewhat less. One explanation for this pattern offered by Academic Senate Admissions and Enrollment Committee members was that degree requirements were more flexible in those divisions with higher four-year completion rates.

Degree requirements were more flexible in divisions with higher four-year completion rates

Overall and within academic division, females completed degrees at higher rates and more quickly, even in Engineering.

Based on the logistic regression analysis used in this study, minimum UC eligibility standards describe students with about a 20% chance of graduating in four years and a 50% chance of graduating in five years. Using an Academic Index at the 5th percentile of UC Davis students describe a student with about a 26% chance of graduating in four years and a 63% chance of graduating in five years. There were very few cases where the group or subgroup graduation rate fell below these standards. It should also be noted that UC's minimum rates are well above the average graduation rates nationwide.

One or two workload placements had only a small long-term effect

The fact that personal circumstance challenges receive additional points in the UC Davis admissions process as independent additive measures may be at odds with the data. There appears to be a threshold where the cumulative number of challenges may exceed the level that the student and University support services could reasonably be expected to overcome.

Placement into one or two workload classes a single time was not particularly deleterious to degree completion. More than one or two placements or repeating a workload course was deleterious.

There was little difference in graduation rates for students in the top three admissions test score quartiles, but differences were apparent for students in the bottom quartiles. There may be a lower threshold test score that should be considered in admission processes.

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RESULTS AND DISCUSSION

This report describes the results of an exploration into the admissions measures validity arena when the outcome of interest is degree completion generally and completion in four years specifically. It is in contrast to many validity studies that examine the extent to which first-year academic success can be predicted using measures available prior to matriculation. The dependent variables in standard admissions studies are first-year grade point average, academic good standing and satisfactory progress at the end of the freshman year. The standard study does not fit the University of California, Davis well for two reasons. First, retention is high as is the freshman academic success rate (about 90%)–variance is limited due to range restrictions in dependent and independent measures. Second, the University clearly asserts that it relies upon indicators of achievement in nonacademic areas and on successful academic achievement in difficult circumstances to produce a diverse student class–prediction of academic achievement, especially in the freshman year, is not the sole reason for admission.

Even though UC Davis considers evidence of personal qualities beyond academic performance, there remains a fundamental assumption that admitted students have a reasonable chance of completing a degree. UC Davis does not walk large numbers of students through a revolving door of debt accumulation and departure. To the contrary, it provides support services and financial resources to assist students from socially challenging environments with the objective of overcoming deficits and completing a degree. UC Davis also asserts that personal qualities can help to identify students who may experience initial setbacks but will ultimately succeed at rates higher than would be expected.

Student Cohort

This study relied on the new from high school entering student class of 1998 and followed their progression through Summer 2003, a five-year completion rate interval. In order to control for anomalous conditions and extraneous variables, this analysis was restricted to matriculating students with complete records: SAT I Verbal and Quantitative (SATV & SATM), GPA average in high school courses required for admission (HSGPA), SAT II Achievement Test Scores (ACH1, ACH2, ACH3), and the Academic Index (AI). The file was also restricted to U.S. residents. The number of students reported will therefore differ from other sources.

Results

To overview the analyses reported: they began with a traditional predictive validity study then transitioned to a more modern validity study using graduation outcomes. A remarkably important early indicator of delayed or derailed graduation was found: workload placements; this indicator was pursued in more detail.

Results of the analyses are presented in a series of tables:

1. The first table reports simple correlation between quantitative admissions measures and degree completion.
2. The second table considers the correlation of these same and a few other measures with degree completion using an exploratory technique to overcome range restrictions (graduation rate within quartiles).
3. The third table addresses the possibility of a pervasive intervening variable, major.
4. The next table reports the results of logistic regression and seeks to establish a UC minimum expectation for academic success when academic success is degree completion.
5. The fifth table applies logistic regression to admissions and demographic measures and reports expected and actual graduation rates.
6. The sixth table reports the outcome of a straightforward effort to identify which measures at admission could help identify students whose beginning University academic record might be problematic but who finish with grade point averages above the 50^{th} percentile.
7. The seventh table explores the part-time enrollment phenomenon and workload course placements.
8. These patterns are subjected to more scrutiny in the eighth table, repetition of workload classes.
9. The last table reports final academic status and outcome for students in workload classes at entry.

Predictive Validity

Whether or not application measures are useful in predicting who will and will not complete a degree is a question that can be addressed empirically. This was the first analysis attempted, a Pearson Correlation for a dichotomous and a continuous variable, equivalent to a point-biserial correlation.

Table 1 is structured as two sections. The top section describes correlations with graduation in four years and the bottom section with five years. The quantitative admissions measures are arrayed at the left and academic divisions are arrayed along the top. Correlations that exceeded 5% of variance explained ($r=\pm .224$) have been italicized. Five salient observations about these data follow:

1. That admissions measures were weakly correlated with and therefore weakly predictive of graduation;
2. That the most useful predictor of degree completion available at the time of enrollment was number of degree units taken in the first quarter (inversely, number of workload units);
3. That first year GPA (FRGPA) was moderately correlated with degree completion;
4. That there were disciplinary differences and little to no association between scores and degree completion for initial majors in Biological Sciences (BISC), Human Sciences (HUSC), and Agriculture's Undecided Major – Agriculture College-Wide (AGCW);
5. That high school GPA was not markedly superior to the SATI (SATM & SATV) and SATII (ACH1, ACH2, ACH3) scores and that Writing (ACH1) was the best individual predictor.

Table 1: Correlations of Admissions and Early Academic Measures with Graduation by Academic Division of Initial Major, Using Fall, 1998 cohort

	Overall	AGCW	AGSC	BISC	ENGI	ENVR	HARC	HUSC	LSCW	M&PS	SOSC	Mean
Number of Students	3,136	330	143	547	341	44	309	125	309	397	591	
4-Year												
SATV	0.14	0.10	***0.28***	0.12	0.19	-0.13	0.10	0.04	***0.24***	0.14	0.17	0.12
SATM	0.13	0.13	***0.23***	0.13	***0.25***	-0.07	0.13	0.15	***0.28***	0.21	0.10	0.15
ACH1	0.20	0.16	***0.29***	0.12	***0.28***	0.14	0.17	0.12	***0.28***	0.18	***0.23***	0.20
ACH2	0.11	0.14	***0.27***	0.12	***0.23***	-0.06	0.11	0.21	***0.29***	0.22	0.06	0.16
ACH3	0.08	0.03	0.21	0.02	0.22	-0.13	0.15	0.03	0.17	0.10	0.01	0.08
AI	0.20	0.21	***0.38***	0.20	***0.26***	0.02	***0.23***	0.18	***0.25***	***0.25***	***0.24***	0.22
HSGPA	0.15	0.19	***0.30***	0.16	0.14	0.08	0.18	0.14	0.10	0.17	0.23	0.17
1st Yr GPA (FRGPA)	***0.34***	***0.30***	***0.44***	***0.34***	***0.40***	***0.26***	***0.35***	***0.30***	***0.29***	***0.28***	***0.32***	***0.33***
1stQtrDgrUnits	***0.24***	0.17	***0.44***	***0.23***	***0.28***	***0.28***	0.13	0.12	***0.28***	***0.26***	***0.24***	***0.24***
5-Year												
SATV	0.11	0.16	***0.24***	0.02	0.13	0.02	0.12	0.02	0.12	0.18	0.07	0.11
SATM	0.12	0.13	0.16	0.07	0.22	-0.03	0.07	0.04	***0.23***	***0.26***	0.03	0.12
ACH1	0.14	0.16	0.22	-0.01	0.19	0.09	0.16	0.18	0.17	0.17	0.15	0.15
ACH2	0.13	0.15	0.12	0.08	***0.25***	0.12	0.09	0.13	***0.24***	***0.27***	0.03	0.15
ACH3	0.09	0.03	0.19	0.07	0.21	0.06	0.06	-0.02	0.19	0.18	0.01	0.10
AI	0.19	0.18	***0.41***	0.13	***0.32***	***0.23***	0.20	0.14	0.17	***0.27***	0.14	0.22
HSGPA	0.15	0.14	***0.42***	0.13	***0.26***	***0.29***	0.16	0.13	0.05	0.15	0.15	0.19
1st Yr GPA (FRGPA)	***0.37***	***0.38***	***0.39***	***0.36***	***0.48***	***0.54***	***0.35***	***0.30***	***0.30***	***0.39***	***0.31***	***0.38***
1stQtrDgrUnits	***0.23***	***0.23***	***0.27***	***0.23***	***0.28***	***0.35***	0.14	0.15	***0.31***	***0.30***	0.16	***0.24***

Italicized figures are instances of at least 5% of variance explained ($R \geq .224$)

Source: SARI Report 325

Most of the results were expected, but one was a surprise. As expected, a students' academic record and skill level and especially their performance as freshmen were weakly to moderately associated with subsequent performance. Not expected was the finding that English composition skill (ACH1) was a relatively strong predictor as a direct measure, and as an indirect measure associated with Subject A workload placement (1stQtrDgrUnits/workload placements). It should be noted that the strength of the correlations reported in Table 1 suffered from range restriction issues and normal limits to point-biserial correlations.

Table 2 displays four- and five-year graduation rates for a wide array of variables. The range restriction problem noted for Table 1 values was addressed in the first part of Table 2 where students were spread out along quantitative dimensions. The technique used placed students into rank-order quartiles. Instead of correlation statistics, strength of association is reflected in consistent and significant increases in graduation rates from bottom to top quartiles. HSGPA illustrates the pattern expected of a predictor. From bottom to top quartile, four-year graduation rates increased from 31% to 36% to 42% to 50%. Somewhat surprisingly, there was a predictor exhibiting a

stronger association with graduation rate, ACH1 (25% to 54% at four years). This technique produced the desired goal of illustrating positive correlation for all measures but was also successful in identifying new information. Of special interest was the fact that there were little to no four-year graduation rate differences for the top two quartiles of SAT1 and SAT2 scores and for the top three quartiles when looking at five-year graduation rates. It could be argued that only the bottom quartiles of admissions measures were indicative of significantly different, lower, graduation rates.

Table 2: Gross Association of Study Variables With Graduation Using Fall, 1998 cohort

		In 4 Years	In 5 Years	#
Base Rate		40%	75%	3,136
Admissions				
SATV				
	Top Quartile	46%	77%	717
	2nd Quartile	44%	78%	786
	3rd Quartile	40%	78%	808
	Bottom Quartile	31%	66%	825
SATM				
	Top Quartile	45%	79%	722
	2nd Quartile	45%	79%	863
	3rd Quartile	39%	75%	748
	Bottom Quartile	31%	67%	803
ACH1 (SAT2)				
	Top Quartile	54%	82%	762
	2nd Quartile	42%	77%	850
	3rd Quartile	38%	76%	744
	Bottom Quartile	25%	64%	780
ACH2 (SAT2)				
	Top Quartile	47%	80%	721
	2nd Quartile	40%	76%	781
	3rd Quartile	42%	77%	790
	Bottom Quartile	32%	66%	844
HSGPA				
	Top Quartile	50%	83%	844
	2nd Quartile	42%	78%	728
	3rd Quartile	36%	71%	791
	Bottom Quartile	31%	66%	773
Academic Index				
	Top Quartile	52%	83%	784
	2nd Quartile	44%	82%	782
	3rd Quartile	36%	71%	792
	Bottom Quartile	28%	64%	788
Income (n=2,679)				
Top Quartile	$92,501 and up	45%	78%	671
2nd Quartile	$60,001 - $92,500	44%	79%	690
3rd Quartile	$30,001 - $60,000	38%	76%	627
Bottom Quartile	$30,000 and Under	30%	64%	691

Table 2 (continued): Gross Association of Study Variables With Graduation Using Fall, 1998 cohort					
Leadership		40%	*	74%	622
Talent		35%	*	69%	272
Improvement		35%	*	67%	79
Overcoming Personal Difficulties		25%	*	59%	252
Disability		29%	*	65%	17
University Service		30%	*	65%	584
First Generation		33%	*	68%	586
Individual Initiative		31%	*	62%	324
Engl Not 1st Lang		35%	*	72%	423
Athlete		32%	*	76%	173
EOP		24%	*	61%	344
Division					
AGCW (Agriculture College-Wide)		42%		79%	
AGSC (Agricultural Science)		38%		70%	
BISC (Biological Sciences)		40%		73%	
ENGI (Engineering)		28%		72%	
ENVR (Environmental Science)		48%		84%	
HARC (L&S Humanities, Arts & Cultural Studies)		47%		73%	
HUSC (Agriculture Human Sciences)		44%		76%	
LSCW (L&S College-Wide)		35%		77%	
M&PS (L&S Math & Physical Sciences)		33%		69%	
SOSC (L&S Social Science)		47%		78%	
Demographic					
Sex	Female	46%		78%	
	Male	31%		69%	
Race/Eth (IPEDS)					
	Am Indian	32%		64%	
	Asian	41%		77%	
	Black	28%		70%	
	Hispanic	26%		59%	
	White	45%		78%	
	Unknown/Other	34%		67%	
Status					
	Full-time**	47%		81%	
	Part-time**	24%		59%	
Workload Courses					
College Writing (1,006)		30%		70%	
Basic Math (93)		15%		43%	
Algebra Review (253)		31%		70%	
Chemistry Preparatory (317)		27%		62%	

Table 2 (continued): Gross Association of Study Variables With Graduation Using Fall, 1998 cohort

Challenge Indices			
Academic			
	0 (n=1,300)	49%	82%
	1 (n=709)	40%	76%
	2 (n=503)	35%	75%
	3 (n=283)	34%	67%
	4 (n=244)	28%	64%
	5 (n=97)	24%	60%
Other			
	0 (n=1,811)	49%	82%
	1 (n=1,014)	30%	68%
	2 (n=253)	20%	55%
	3 (n=58)	9%	36%

Challenge index (Academic) is the count of occurences of scores in the lower quartile for GPA, SATV, SATM, ACH1, ACH2
Challenge index (Other) is the sum of occurences of Black, Hispanic, EOP, Part-Time in first quarter

This analysis began with fall 1998 new from high school students then removed students whose records were missing any of the following data: SATV, SATM, high school GPA, ACH1, ACH2, ACH3, Academic Index. The file was also restricted to U.S. residents.

*Only assigned if not admitted in first pass based on test scores and grade point average (about 40%).
**Full-time or part-time status in first quarter

Source: SARI Report 325

The quantitative admissions scores were combined into an Academic Index (AI) as used in 1998 admissions. Both in Tables 1 and 2, AI was a better predictor than any individual test score or HSGPA. As a more summary measure AI should be expected to be more highly correlated than its component parts.

The next variable was family income as reported by applying students. The association between four- and five-year graduation rates and income was positive and the strength of association was on the order of SATV or HSGPA. It was notable that half of students reporting family incomes reported incomes of $60,000 or less.

The next data series were especially pertinent to the 40% in 1998 who were admitted based on factors that went beyond academic achievement. These measures ranged from demonstration of outstanding leadership experiences to a series of indicators of social disadvantage and evidence of overcoming personal difficulties. Except for leadership, the students with credit in these areas did not graduate at rates equal to the campus average with one exception. Athletes had a 75% five-year completion rate. The lowest completion rates were for EOP students and students who overcame a personal difficulty.

When graduation rates were determined by academic division of initial major, part of what was learned was expected and part was unexpected. Predictably, Engineering students had a low four-year completion rate (28%). Less predictably, completion rates were especially high for Environmental Sciences; Humanities, Arts and Cultural Studies; and the Social Sciences. Divisional differences at five years were less. One explanation for this pattern offered by Academic Senate Admissions and Enrollment Committee members was that degree requirements were more flexible in those divisions with higher four-year completion rates.

The next section of Table 2 reported graduation rates by demographic variables: sex, race/ethnicity, and attendance status (full- or part-time). The differences seen here were some of the largest and most important. First, female students graduated at much higher rates than males. The difference at four years was 15% and was 9% at five years. Race/ethnicity was also clearly associated with likelihood of finishing in four and five years. The highest four-year rates were for White and Asian students (45% and 41%) and the lowest were for Hispanic and African-American students (26% and 28%). But the difference that exceeded any of these was between students classified as full- or part-time based on degree units taken in the first quarter of enrollment (47% and 24%). Students who were part-time in their first quarter of attendance because of workload units or other reasons were about one-half as likely to complete a degree in four years. The definition of full-time status used here was the same as used for Federal reporting, enrollment at the census point (15^{th} class day) in 12 or more units that count toward a degree. Workload units did not then and do not now count toward a degree at UC Davis.

As a first examination of the association of workload assignment and completion rate, Table 2 reports the four- and five-year graduation rates for students in workload courses during their first quarter. An interesting pattern emerged. While four-year completion rates were 10% or more lower for students in all courses, the differences at five years were much less for those who started in College Writing and Algebra Review. It was also clear that students assigned to Basic Math succeeded at a very low rate - 15% at four years and 43% at five years.

The final section of Table 2 reflects the possibility of cumulative effect of measures deemed significant as reported in the top part of Table 2. The academic challenge index was the count of instances of membership in the bottom quartile on academic measures. In other words, a student with an SATV in the bottom quartile and a HSGPA in the bottom quartile would have a score of two. The other challenge index was the numeric sum of part-time status, African-American or Hispanic, and EOP status. While both indices reported declining graduation rates and challenges accumulated, an academic challenge index of one or two was ameliorated by the five-year graduation count. The other challenge index was less encouraging. Even a score of one would predict difficulty and more than one was associated with substantial relative difficulty.

The possibility of an intervening disciplinary variable was explored and the results presented as Table 3. Two demographic variables, sex and enrollment status, were clearly related to completion in Table 2 but it could be argued that the underlying cause had more to do with discipline of major. For example, males completed four-year degrees at much lower rates than females but males were also more likely to major in Engineering, and Engineering majors had lower four-year completion rates. Completion rates for the two demographic variables were presented within academic division and the results generally held true. Overall and within academic division, females complete degrees at higher rates and more quickly than did students taking a full-time load of degree credit in the first quarter.

Table 3: Is Division of Initial Major an Intervening Variable?
Using Fall, 1998 cohort

	AGCW	AGSC	BISC	ENGI	ENVR	HARC	HUSC	LSCW	M&PS	SOSC
Enrollment Status										
Four-Year										
Full-Time (FT)*	49%	48%	47%	35%	50%	51%	47%	42%	40%	55%
Part-Time (PT)*	30%	12%	23%	14%	40%	37%	38%	17%	19%	28%
PT/FT*	61%	25%	50%	39%	80%	72%	80%	41%	47%	51%
FT-PT*	19%	36%	24%	21%	10%	14%	10%	25%	22%	27%
Five-Year										
Full-Time (FT)*	84%	78%	80%	81%	88%	77%	80%	84%	78%	83%
Part-Time (PT)*	68%	49%	57%	54%	70%	61%	68%	61%	52%	68%
PT/FT*	80%	62%	71%	67%	79%	79%	84%	73%	66%	83%
FT-PT*	17%	30%	23%	27%	18%	17%	13%	23%	26%	14%
Sex										
Four-Year										
Female (F)	49%	42%	44%	39%	54%	54%	48%	38%	38%	52%
Male (M)	29%	22%	33%	25%	38%	32%	30%	29%	30%	38%
M/F	60%	52%	76%	65%	70%	59%	62%	77%	79%	72%
F-M	20%	20%	11%	13%	16%	22%	18%	9%	8%	14%
Five-Year										
Female (F)	82%	81%	77%	77%	86%	77%	80%	79%	73%	81%
Male (M)	73%	66%	67%	71%	81%	61%	63%	73%	65%	73%
M/F	90%	81%	87%	92%	95%	79%	79%	92%	89%	89%
F-M	9%	16%	10%	6%	4%	17%	17%	6%	8%	9%

* Full-time or part-time status in first quarter
Source: SARI Report 325

The results reported in Table 4 introduced a new perspective. That perspective recognized the fact that many of the differences noted in earlier tables could be explained by differences in academic preparation or ability. Better-prepared students should and do complete at higher rates and confirming that fact is of little help in developing new understanding. One statistical method to help overcome that limitation is logistic regression. Logistic regression was employed to establish campus-wide four- and five-year graduation prediction models that were then applied to individual students' records and summarized by category. In other words, the quantitative admissions scores were entered for every student and a likelihood of degree completion resulted. The mean value of these likelihoods for all the students in a grouping, White students for example, was determined and compared to the actual graduation rate for the group. The technique therefore can be used to identify unpredictable outcomes and those atypical occurrences can help inform the admissions process.

Table 4: Logistic Regression Applications Using Fall, 1998 cohort

	Constant	Bgpa	Btest
Graduate in 4 Years	-6.21	0.889	0.000549
Graduate in 5 Years	-4.685	0.899	0.000547

	HSGPA	Scores	Logit	Probability
Graduate in 4 Years				
UC Eligibility Criteria	2.80	4,640	-1.173	24%
	2.85	4,384	-1.270	22%
	2.90	4,160	-1.348	21%
	2.95	3,984	-1.400	20%
	3.00	3,840	-1.435	19%
	3.05	3,720	-1.456	19%
	3.10	3,616	-1.469	19%
	3.15	3,512	-1.482	19%
	3.20	3,408	-1.494	18%
	3.25	3,320	-1.498	18%
	3.30	3,248	-1.493	18%
	3.35	3,192	-1.479	19%
	3.40	3,152	-1.457	19%
	3.45	3,128	-1.426	19%
	3.50	3,120	-1.386	20%
UCD Distribution				
Mean	3.70	4,540	-0.431	39%
Minimum (5%)	3.40	3,915	-1.038	26%
Graduate in 5 Years	2.80	4,640	0.370	59%
	2.85	4,384	0.275	57%
	2.90	4,160	0.198	55%
	2.95	3,984	0.146	54%
	3.00	3,840	0.112	53%
	3.05	3,720	0.092	52%
	3.10	3,616	0.080	52%
	3.15	3,512	0.068	52%
	3.20	3,408	0.056	51%
	3.25	3,320	0.053	51%
	3.30	3,248	0.058	51%
	3.35	3,192	0.073	52%
	3.40	3,152	0.096	52%
	3.45	3,128	0.128	53%
	3.50	3,120	0.168	54%
UCD Distribution				
Mean	3.70	4,540	1.121	75%
Minimum (5%)	3.40	3,915	0.513	63%

De defacto standards

4-year institutional minimum standard is about 26% (based on 5th percentile AI)
UC minimum is about 20%

5-year institutional minimum standard is about 63% (based on 5th percentile AI)
UC minimum is about 50%

Source: SARI Report 325

In addition, the minimal UC eligibility criteria published in UC System materials can be entered into the equations to establish System-wide minimal expectations for degree completion. That is, in effect, an acceptable *de facto* graduation rate within University policy. The formula elements are presented at the top of Table 4 for those familiar with the statistical technique. The remaining table sections apply the formula to the published minimum UC eligibility criteria and within boxed areas, to UC Davis data. The minimum criteria combinations suggested that the UC eligibility standard was about a 20% four-year graduation rate and a 50% five-year rate. The *de facto* standard technique was also applied to UC Davis data. This was done by rank ordering all students based on the academic index and selecting combinations that are at the 5th percentile. When those combination scores were inserted into the formula, a rough local minimum standard resulted. The 5th percentile was used as a conservative standard because University policy allowed a five percent exception rate. The local criteria suggested that UC Davis' minimum expectation was about a 26% four-year graduation rate and a 63% five-year rate.

A review of the data presented in Table 2 shows very few instances where the local standards (26% and 63%) were not met by student groupings. Those few groups not meeting the local minimum four-year completion standard were students in the bottom quartile on ACH1, EOP students, part-time students, students with five academic challenges and those with a score of two or higher on the other challenges index. For five-year completion, the groups were the same except that Hispanic students would be added. Using UC-wide minimum standards, only one group fell below, the 58 students with an other challenges index of 3. The fact that personal circumstance challenges receive additional points in the UC Davis admissions process in a linear, mutually independent way may be at odds with these data. There might be a point at which UC Davis should consider whether its support services can reasonably be expected to ameliorate multiple challenges.

Beginning with Table 5, comparisons were made between expected and observed graduation rates. The fundamental concept explored in these tables is that the difference between expectation and observation provides useful information. For example, if students in a cluster graduate at a higher than expected rate as a group after correcting for academic achievement and skill, then the grouping characteristic was useful in identifying a new success factor. Conversely, if students graduated at lower than expected rates after controlling for academic scores, then the grouping characteristic was depressing performance. An example of a characteristic associated with unexpected success was leadership. Students receiving leadership points graduated at the campus average rate in spite of having a significantly lower expected rate (32% vs. 40% for four years). A negative example was students overcoming a personal difficulty. As a group they were expected to graduate at a 32% rate in four years. Their actual four-year rate was 25%. This suggests that the students continued to experience personal difficulty after enrollment and that support services have not been adequate to offset its effects. Other negative outcomes of similar magnitude were students in the bottom quartile on ACH1, EOP students, Hispanic students, students classified as part-time, students in Basic Math and Chemistry Preparatory courses, and students with two or more other challenge index scores.

Table 5: Predicted Versus Actual Graduation Rates
Using Fall, 1998 cohort

		In 4 Years			In 5 Years		
Base Rate	(n=3,136)		40%			75%	
Admissions							
SATV		**Observed**	**Predicted**	**Difference**	**Observed**	**Predicted**	**Difference**
	Top Quartile	46%	48%	-3%	77%	81%	-4%
	2nd Quartile	44%	42%	2%	78%	77%	1%
	3rd Quartile	40%	37%	2%	78%	73%	5%
	Bottom Quartile	31%	33%	-2%	66%	68%	-2%
SATM							
	Top Quartile	45%	48%	-3%	79%	81%	-2%
	2nd Quartile	45%	42%	3%	79%	77%	2%
	3rd Quartile	39%	38%	1%	75%	73%	1%
	Bottom Quartile	31%	32%	-1%	67%	68%	-1%
ACH1 (SAT2)							
	Top Quartile	54%	49%	5%	82%	81%	1%
	2nd Quartile	42%	41%	1%	77%	76%	1%
	3rd Quartile	38%	37%	1%	76%	73%	3%
	Bottom Quartile	25%	32%	-7%	64%	68%	-4%
ACH2 (SAT2)							
	Top Quartile	47%	49%	-2%	80%	81%	-1%
	2nd Quartile	40%	42%	-3%	76%	77%	-1%
	3rd Quartile	42%	38%	3%	77%	74%	3%
	Bottom Quartile	32%	31%	1%	66%	67%	-1%
HSGPA							
	Top Quartile	50%	49%	1%	83%	81%	1%
	2nd Quartile	42%	43%	-1%	78%	78%	1%
	3rd Quartile	36%	38%	-2%	71%	73%	-2%
	Bottom Quartile	31%	29%	1%	66%	65%	1%
Academic Index							
	Top Quartile	52%	52%	0%	83%	84%	-1%
	2nd Quartile	44%	43%	0%	82%	78%	3%
	3rd Quartile	36%	37%	-1%	71%	73%	-2%
	Bottom Quartile	28%	27%	1%	64%	63%	1%
Income							
	Top Quartile	45%	41%	4%	78%	75%	3%
	2nd Quartile	44%	42%	2%	79%	76%	3%
	3rd Quartile	38%	40%	-2%	76%	75%	2%
	Bottom Quartile	30%	36%	-6%	64%	72%	-8%
Leadership		40%	32%	7%	74%	69%	5%
Talent		35%	33%	2%	69%	69%	0%
Improvement		35%	34%	2%	67%	69%	-2%
Overcoming Personal Diff.		25%	32%	-7%	59%	68%	-9%
Disability		29%	33%	-3%	65%	69%	-5%
University Service		30%	35%	-6%	65%	71%	-6%
First Generation		33%	35%	-2%	68%	71%	-3%
Individual Initiative		31%	36%	-5%	62%	71%	-9%
Engl Not 1st Lang		35%	39%	-4%	72%	74%	-2%
Athlete		32%	34%	-2%	76%	69%	7%
EOP		24%	34%	-11%	61%	70%	-9%

Table 5 (continued): Predicted Versus Actual Graduation Rates
Using Fall, 1998 cohort

Division		Observed	Predicted	Difference	Observed	Predicted	Difference
AGCW		42%	39%	3%	79%	74%	5%
AGSC		38%	40%	-2%	70%	75%	-5%
BISC		40%	43%	-3%	73%	77%	-4%
ENGI		28%	45%	-17%	72%	79%	-6%
ENVR		48%	43%	5%	84%	77%	7%
HARC		47%	37%	10%	73%	73%	0%
HUSC		44%	36%	8%	76%	72%	4%
LSCW		35%	38%	-3%	77%	73%	4%
M&PS		33%	38%	-5%	69%	73%	-4%
SOSC		47%	38%	9%	78%	73%	5%
Demographic		**Observed**	**Predicted**	**Difference**	**Observed**	**Predicted**	**Difference**
Sex	Female	46%	40%	7%	78%	74%	4%
	Male	31%	40%	-10%	69%	75%	-6%
Race/Eth (IPEDS)							
	Am Indian	32%	37%	-5%	64%	72%	-8%
	Asian	41%	39%	1%	77%	74%	3%
	Black	28%	32%	-4%	70%	67%	2%
	Hispanic	26%	36%	-10%	59%	71%	-13%
	White	45%	42%	3%	78%	76%	2%
	Unknown/Other	34%	38%	-4%	67%	73%	-6%
Status	Full-time*	47%	42%	5%	81%	76%	4%
	Part-time*	24%	35%	-11%	59%	70%	-11%
Workload Courses		**Observed**	**Predicted**	**Difference**	**Observed**	**Predicted**	**Difference**
College Writing (1,006)		30%	35%	-6%	70%	71%	-1%
Basic Math (93)		15%	29%	-14%	43%	64%	-21%
Algebra Review (253)		31%	32%	-1%	70%	68%	2%
Chemistry Preparatory (317)		27%	34%	-7%	62%	70%	-8%
Challenge Indices		**Observed**	**Predicted**	**Difference**	**Observed**	**Predicted**	**Difference**
Academic							
	0 (1,300)	49%	48%	1%	82%	81%	1%
	1 (709)	40%	38%	2%	76%	74%	2%
	2 (503)	35%	36%	-1%	75%	72%	2%
	3 (283)	34%	30%	4%	67%	67%	0%
	4 (244)	28%	28%	1%	64%	64%	0%
	5 (97)	24%	21%	3%	60%	55%	5%
Other							
	0 (1,811)	49%	43%	6%	82%	77%	5%
	1 (1,014)	30%	37%	-7%	68%	72%	-4%
	2 (253)	20%	32%	-12%	55%	68%	-13%
	3 (58)	9%	31%	-23%	36%	67%	-31%

*Full-time or part-time status in first quarter

Challenge index (Academic) is the count of occurences of scores in the lower quartile for GPA, SATV, SATM, ACH1, ACH2

Challenge index (Other) is the sum of occurences of Black, Hispanic, EOP, Part-Time in first quarter

Notes: This analysis began with fall 1998 new from high school students then removed students whose records were missing any of the following data: SATV, SATM, high school GPA, ACH1, ACH2, ACH3, Academic Index. The file was also restricted to U.S. residents.

Source: SARI Report 325

Students in one discipline, Engineering, completed in four years at lower than expected rates but were nearer expectation at five years. Students in three disciplinary areas graduated at rates higher than expected for four years: Humanities, Arts and Cultural Studies; Human Sciences; and Social Science. Humanities, Arts and Cultural Studies students also graduated at higher than expected rates at five years.

Table 6: Strong Finishers Using Fall, 1998 cohort

From 1st Year GPA to Final GPA

		Final GPA: Bottom Half (Lo)	Final GPA: Top Half (Hi)	Totals
1st Yr GPA (FRGPA)	Top Half (Hi)	9% 267	42% 1,320	1,587
	Bottom Half (Lo)	41% 1,290	**8.2%** 258	1,548
	Totals	1,557	1,578	3,135

	In 4 Years			In 5 Years		
Cross-Tabulation (FR-SR)		Predicted	Error		Predicted	Error
Hi-Hi	58%	45%	13%	79%	81%	-2%
Hi-Lo	28%	39%	-11%	74%	77%	-3%
Lo-Hi	54%	39%	16%	74%	73%	1%
Lo-Lo	21%	35%	-15%	71%	68%	2%

Lo-Hi Quadrant				
Demographic		Observed	Expected	Error
Sex	Female	64%	60%	5%
	Male	36%	41%	-5%
Race/Eth (IPEDS)				
	Am Indian	2%	1%	1%
	Asian	42%	38%	4%
	Black	2%	2%	-1%
	Hispanic	6%	10%	-4%
	White	35%	39%	-4%
	Unknown/ Other	13%	9%	3%
Status	Full-time*	65%	70%	-5%
	Part-time*	35%	30%	5%
Leadership		26%	20%	6%
Talent		10%	9%	1%
Improvement		2%	3%	<-1%
Overcoming Personal Diff.		8%	7%	1%
Disability		1%	1%	-1%
University Service (Outreach)		19%	14%	4%
First Generation		19%	17%	1%
Individual Initiative		10%	7%	3%
Engl Not 1st Lang		14%	12%	2%
Athlete		6%	5%	1%
EOP		11%	8%	3%

*Full-time or part-time status in first quarter
Source: SARI Report 325

Table 6 reports the results of an effort to identify students who might begin relatively poorly but finish very well. The analysis employed was to divide students on the basis of their first-year and final grade point averages into halves to form a two-by-two table. As shown, the large majority of students either began with a 1st Yr GPA (FRGPA) in the bottom 50% and finished with a cumulative GPA in the bottom 50% (41% Lo-Lo) or began and finished in the top half (42% Hi-Hi). The remaining students were about evenly split between those who went from the top half to the bottom half, (9% Hi-Lo), and those of special interest to this analysis: the students who began in the bottom half but ended in the top half (8% Lo-Hi). The characteristics of students in that last table cell were compared to the characteristics of all students and there was only one variable where observed proportion exceeded expected proportion by more than 5%: leadership. Once again, leadership proves to be an indicator of better than expected performance and, in this case, increased likelihood of overcoming initial academic problems.

Workload Placement

The last three tables are a series that addresses issues related to workload placement. Table 7 describes the characteristics of students taking workload courses. Table 8 repeats the observed versus expected graduation rate analysis for workload students. Table 9 identifies the number of students who left without graduating, who were or were not in good academic standing, by workload course placement.

Table 7: Workload Placements Using Fall, 1998 cohort

Who takes workload classes?

	College Writing	Algebra Review	Chemistry Preparatory	Basic Math
Total	1,006	253	317	93
Overall	32%	8%	10%	3%
Sex				
Female	30%	9%	13%	4%
Male	35%	7%	6%	2%
IPEDS				
Am Indian	29%	11%	18%	7%
Asian	42%	5%	10%	1%
Black	47%	12%	16%	18%
Hispanic	41%	10%	15%	12%
White	20%	9%	9%	8%
Unknown/Other	27%	10%	9%	4%
Enrollment Status				
Full-Time (FT)*	15%	12%	8%	6%
Part-Time (PT)*	72%	7%	15%	2%
Of those in course, the % PT	68%	44%	45%	66%

*Full-time or part-time status in first quarter

Source: SARI Report 325

Overall, 32% of freshmen took College Writing, 10% took Chemistry Preparatory, 8% took Algebra Review and 3% were in Basic Math. It is readily apparent that underrepresented minority students were more likely to be placed into these courses, but the largest discrepancies were for full- and part-time students. Up to 72% of part-time students were in workload courses (College Writing). As the full- and part-time distinction is largely a function of workload assignments, this approaches a tautology.

Table 8: Workload Enrollments and Graduation Using Fall, 1998 cohort

	In 4 Years			In 5 Years			#
Base Rate		Observed 40%			Observed 75%		3,136
Admissions	**Observed**	**Predicted**	**Difference**	**Observed**	**Predicted**	**Difference**	
College Writing							
0	46%	42%	3%	78%	76%	1%	2,130
1	30%	35%	-6%	70%	71%	-1%	744
2	23%	34%	-11%	66%	70%	-4%	231
3	17%	32%	-15%	47%	67%	-21%	30
Basic Math							
0	41%	40%	1%	76%	75%	1%	3,043
1	15%	29%	-14%	43%	64%	-21%	83
2		too few			too few		9
Algebra Review							
0	41%	41%	0%	75%	75%	0%	2,883
1	31%	32%	-1%	70%	68%	2%	242
2	0%	28%	-28%	64%	63%	0%	11
Chemistry Preparatory							
0	41%	40%	1%	76%	75%	1%	2,819
1	27%	34%	-7%	62%	70%	-8%	317
Total							
0	46%	43%	3%	77%	77%	0%	1,926
1	33%	36%	-3%	73%	72%	1%	782
2	28%	34%	-7%	71%	70%	1%	335
3	12%	30%	-18%	49%	66%	-18%	74
4	18%	27%	-9%	59%	62%	-3%	17

Source: SARI Report 325

Table 8 reports both the initial and repetitive frequency of workload course placements as well as comparing observed and predicted graduation rates. The last column reports frequencies. The first finding was very clear, few students repeated workload classes. The only significant exception was College Writing where 261 students took the class two times (231) or three times (30). What was more important in terms of degree completion was that a single workload placement was not particularly deleterious but that repeated placements were deleterious. When observed versus expected graduation rates were computed for workload placements across subject areas, it was again clear that 1 or 2 placements had little if any affect on degree completion, but that more than two placements were a problem. Do recall that the expected rates considered test scores and high

school grade point average so that the deficits were in addition to lower base graduation rates associated with lower scores and workload placement.

Table 9: Status and Academic Standing at End of Year 5
Using Fall, 1998 cohort

			GPA 2.0 or Higher		GPA < 2.0	
	%	#	%	#	%	#
All Freshmen						
Completed a Degree	75%	2,338	100%	2,338	0%	0
Continued Enrollment	11%	356	90%	322	10%	34
Not Enrolled, Not Graduated	14%	442	62%	276	38%	166
Total		3,136	94%	2,936	6%	200
College Writing						
Completed a Degree	68%	683	100%	683	0%	0
Continued Enrollment	15%	150	86%	129	14%	21
Not Enrolled, Not Graduated	17%	173	55%	96	45%	77
Total		1,006	90%	908	10%	98
Basic Math						
Completed a Degree	42%	39	100%	39	0%	0
Continued Enrollment	29%	27	93%	25	7%	2
Not Enrolled, Not Graduated	29%	27	59%	16	41%	11
Total		93	86%	80	14%	13
Algebra Review						
Completed a Degree	70%	177	100%	177	0%	0
Continued Enrollment	17%	43	93%	40	7%	3
Not Enrolled, Not Graduated	13%	33	48%	16	52%	17
Total		253	92%	233	8%	20
Chemistry Preparatory						
Completed a Degree	62%	196	100%	196	0%	0
Continued Enrollment	21%	65	94%	61	6%	4
Not Enrolled, Not Graduated	18%	56	59%	33	41%	23
Total		317	91%	290	9%	27

Note: Percentages may not sum to 100% due to rounding.
Source: SARI Report 325

The final table reports the academic standing of the cohort as of the end of the research period (summer, 2003) for all students and for students who began with workload course placements. The five-year degree completion rate for all students was 75%. For students with workload placements in College Writing or Algebra Review, completions rates were similar (68% and 70%). Chemistry Preparatory placements were slightly lower, 62%, and Basic Math placements were relatively low, 42%. Focusing on those students who were no longer enrolled and who had not graduated, stop-outs, found that most left in good academic standing. Overall, 62% had GPAs of 2.0 or better at departure. Similar proportions of dropouts left in good academic standing if their initial workload placement was College Writing (55%), Chemistry Preparatory (59%), Basic Math (59%), and Algebra Review (48%). Only 5% of the 1998 cohort left the University with a cumulative GPA under 2.0.