Investigating Academic Success Pathways for First-Time First-Year Students

DATA FELLOWS
CALIFORNIA STATE UNIVERSITY LONG BEACH

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Introduction

Student attrition poses a significant challenge in higher education today, impacting individuals, institutions, and society at large. It hampers efforts to promote equity and social mobility, wastes resources, and undermines institutional reputation and economic competitiveness.[1-3]

This project aims to develop a **Student Performance and Retention Dashboard** enabling faculty and student support professionals to analyze how pre-matriculation data, both academic and non-academic, in conjunction with early academic progress (semester 1-3), forecast favorable student outcomes.

Research Question

Which pre-matriculation and self-reported information in conjunction with 1st and 2nd semester academic performance at CSULB (course grades and GPAs) predict retention and major switching patterns in the context of the specific course, major, pathway, program, or demographic group?

Methods

As a proof of concept, we have developed a dashboard for a single cohort of students (Fall 2022 admitted first time first year students) by merging SSD data, Summer 2022 SOAR Advising Survey, Fall '22 and Spring '22 mathematics and quantitative reasoning / mathematics grades, F'22-F'23 CSULB GPAs, major/college, admission data (cs link reports), demographic data, and academic advising information.

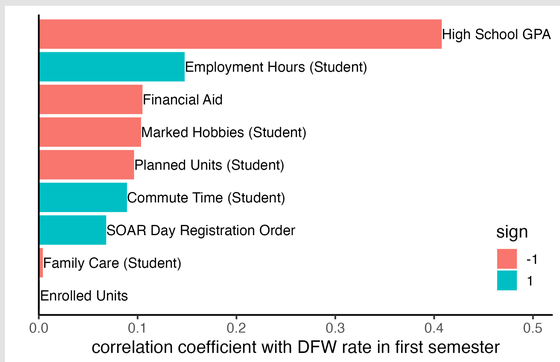

Figure 1: A strong correlation of High School GPA (A-G) with obtaining DFWs in the first semester was observed. This correlation is still strong but decreases for the second semester. Student reported elements such as employment hours (especially >15h / week) and commute time length are predictors of DFWs. Some data is self-reported by the student at SOAR registration when indicated with (Student).

Regression analysis shows that high school weighted GPA (A-G requirements) has the highest predictive power for DFW rate in the first semester, the # of DFWs, as well as student's attrition. However, other admission parameters as well as academic performance in the 1st and second semester modulate this main HS GPA dependence.

Results

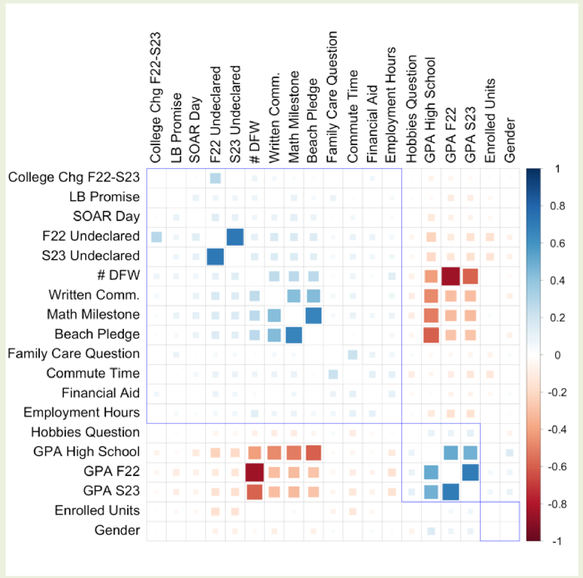

Figure 2. Pearson correlations for various variables available for >3500 FYFT students for Fall 2022 show three clusters: (1) Positive correlations of the number of DFW with employment hours, for example, (2) negative correlations with high school GPA, and (3) no correlations with enrolled units.

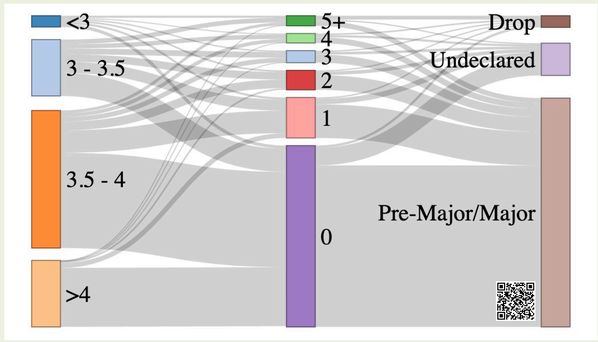

Figure 3: Sankey diagram illustrating major migration patterns for Fall 2022 FTFYS based on their HS GPA and performance in first semester courses.

MATH 104, 112A, and Intro Statistics (STAT 108, SOC 170, PSY 110, HDEV 190) are entry-level quantitative reasoning courses (General Education B4) available to all students without placement and normally taken by most first time first year students (FTFYS) at CSULB in their first semester. The diagrams below show major migration patterns for 2022 FTFYS based on the college of matriculation (**COHORT COLLEGE**) as of 2/2024 (**CURRENT COLLEGE**) for students who were enrolled in one of these B4 courses in **Fall 2022** semester. **NR** indicates students who dropped out of college, **HC** indicates the headcount. **Figures 4-6** show dramatic effects of receiving a DFW in one of these courses with attrition increasing from ca 20% for all enrolled students to 58% for students receiving DFW grade, to 70% for students who have not reenrolled to repeat the failed attempt at the course.

COLLEGE AS OF 2/2024 \ COHORT COLLEGE	ART	BUS	CLA	EDU	ENG	HHS	NSM	UND	HC
ART	278	1	2		1	3		12	297
BUS	5	61	15		2	10	2	12	107
CLA	17	13	371		1	16	1	62	481
EDU	1		5			4		3	13
ENG			1		15	2		5	23
HHS	10	9	20		3	466	2	145	655
NSM	1		2			3	9	2	17
UND	11	5	7		11	13	4	62	113
NR	57	34	78		16	115	9	128	437
HC	380	123	501		49	632	27	431	2143
NR%	15%	28%	16%		33%	18%	33%	30%	20%

Figure 4. Major migration: all students enrolled in MATH 104, 112A or intro statistics in F'23.

COLLEGE AS OF 2/2024 \ COHORT COLLEGE	ART	BUS	CLA	EDU	ENG	HHS	NSM	UND	HC
ART	14							2	16
BUS		8	2		1				11
CLA		6	45		1	2		9	63
EDU						1			1
ENG					1			1	2
HHS	1	2	5		1	24		11	44
NSM									
UND	5	3	2		3	3	1	10	27
NR	34	23	45		9	51	5	63	230
HC	54	42	99		16	81	6	96	394
NR%	63%	55%	45%		56%	63%	83%	66%	58%

Figure 5. Major migration: students who have received DFW grades in MATH 104, 112A or intro statistics in F'23.

COLLEGE AS OF 2/2024 \ COHORT COLLEGE	ART	BUS	CLA	EDU	ENG	HHS	NSM	UND	HC
ART	6							1	7
BUS		4	1						5
CLA		2	16			2		5	25
EDU									0
ENG									0
HHS	1	1	1		1	13		6	23
NSM									0
UND	1	1	1		2	1	1	4	11
NR	24	18	31		8	31	5	45	162
HC	32	26	50		11	47	6	61	233
NR%	75%	69%	62%		73%	66%	83%	74%	70%

Figure 6. Major migration: students who have received DFW grades in MATH 104, 112A or intro statistics in F'23 and have not reenrolled in appropriate QR course in Spring 2023.

(A)

COLLEGE AS OF 2/2024 \ COHORT COLLEGE	ART	BUS	CLA	EDU	ENG	HHS	NSM	UND	HC
ART	234	2	1		1	2	6	16	262
BUS	4	103	9		1	5	7	23	152
CLA	12	12	240		1	7	19	33	324
EDU	1	1	1	15		2	1	2	23
ENG		2	1		47	3	14	25	92
HHS	7	8	12	1		262	20	82	392
NSM	1		3		1	3	174	10	192
UND	8	3	2		2	2	11	48	76
NR	27	14	28	3	3	40	33	54	202
HC	294	145	297	19	56	326	285	293	1715
NR%	9%	10%	9%	16%	5%	12%	12%	18%	12%

(B)

COLLEGE AS OF 2/2024 \ COHORT COLLEGE	ART	BUS	CLA	EDU	ENG	HHS	NSM	UND	HC
ART	183	1	3		2	1	2	13	205
BUS	7	119	13		2	6	6	26	179
CLA	11	10	262	1	1	14	22	59	380
EDU		1	5	9		3	1	7	26
ENG	2	1	3		44		9	24	83
HHS	3	6	16		1	248	29	115	418
NSM	1				1	2	161	9	174
UND	7	2	11	2	3	7	13	75	120
NR	47	24	59	3	10	57	53	140	393
HC	261	164	372	15	64	338	296	468	1978
NR%	18%	15%	16%	20%	16%	17%	18%	30%	20%

Figure 7. Major migration: students who have indicated in SOAR Advising Survey that they expect to work for less (A) or more (B) than 15 hours per week.

The expected employment hours (based on the SOAR Advising Survey) appear to be the main non-academic factor predicting attrition. This effect is particularly notable for undeclared students showing both highest attrition (30%) and the highest % of students working > 15 hours per week.

Conclusions / Discussion

Previous research pinpoints various factors influencing student retention, including academic history, demographics, socio-economic status, and student's belonging within the institution and the chosen field. While many models accurately predict the likelihood of student attrition among specific student groups, they often lack "local insights" applicable to specific courses, degree programs, or academic advising contexts.[4-6]

- Over 30% of first-time first-year students received 1 or more of DFW grades in their first semester. First semester DFWs impact students' integration with the University community (sense of belonging) and their educational choices.
- Our analysis indicates that DFW grade in B4 course received in student's first semester at CSULB has a dramatic impact on academic outcomes with attrition increasing 2- to 3-fold.
- More accurate identification of students at risk for DFWs in their first-semester is critically important. Currently, more than 2/3 of students within the lowest HS GPA bracket (<3.0) earn one or more DFW grades in their first semester and face corresponding attrition rate.
- **Student Performance and Retention Dashboard could be used to identify additional** "local factors" affecting student's performance in their first semester

Implications for Action and Next Steps

- Continue development of Retention Dashboard with new visualization tools.
- Develop similar data dashboards for incoming cohorts of students. Identify additional key 1st and 2nd semester courses affecting student retention.
- Develop action plan to address key findings, particularly in supporting students at risk of failing courses in their first semester.
- Add key elements of SOAR survey information BeachConnect for advising teams.

References

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(3) Dohy, J., et al., Creating equitable access and opportunity: predictors of success for college freshmen who participate in a Living Learning Community, Multicult. Learn. Teach. 2023; 18(2): 211–229.

(4) Braswell, J., Student Attrition at CSULB: Interpretable Classification with Imbalanced Datasets, Project Report, Advisor: Dr. Kagba Suaray, 2021, accessed at www.proquest.com.

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(6) Identifying Factors in Student Attrition, Developing a Predictive Retention Model, and Implementing Strategies to Increase Student Persistence, Doshi, A., Ivezaj, L., Martin, N., Mizelle, B., Schryer, E., Data Fellows Symposium, 2023.

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