CollegeBoard

DECEMBER 2020

Using the SAT® and Landscape™ for Retention and Academic Advising on Campus

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Abstract

The current study examines how the integration of SAT scores with context information about students' neighborhood and high school from the College Board's Landscape™ resource can provide institutions with a nuanced perspective on students' expected performance and retention. This allows institutions to identify incoming students that may benefit from interventions and enhanced academic advising based on easily accessed applicant data. Based on a sample of 188,177 students enrolled at 156 four-year colleges and universities, we examined relationships between SAT scores, Landscape context information, and the SAT in Context to predict first-year academic performance and retention to the second year of college. Results of this study show that:

- There is a strong, positive relationship between SAT scores and both academic performance and retention to second year.
- Student neighborhood and high school context information from Landscape moderates SAT-FYGPA and HSGPA-FYGPA relationships, and in particular, the HSGPA-FYGPA relationship. The added contextual information from Landscape allows institutions to use the SAT and HSGPA more effectively to understand how students are expected to perform and know which students may need more focused support to be most successful.
- Students with low SAT scores at their college but with top SAT scores at their high schools tended to come from high-challenge environments, and though their HSGPAs may have equaled those of their college peers, these students had lower SAT scores and earned lower FYGPAs in college. Notably, however, these students had above average retention rates despite having below average FYGPAs.
- Context information from Landscape was more informative for contextualizing student performance in college than student race/ethnicity. Students from underrepresented groups who come from low-challenge environments enter college with higher SAT scores than do students from high-challenge environments who are not from underrepresented groups. The students from underrepresented groups who came from low-challenge environments also earn higher FYGPAs and have higher retention rates than do students from high-challenge environments who are not from underrepresented groups.

When used with Landscape context information and the SAT in Context, SAT scores allow institutions to more effectively identify students who will be successful on campus and those who may benefit from additional academic support as they enter college. Such data can inform important conversations with students about the transition to college to promote students' academic success.

Introduction

Recent SAT validity research shows that SAT scores are useful tools for understanding how students will perform in college, both generally and in particular courses (e.g. Westrick, Marini, Young, Ng, Shmueli, & Shaw, 2019; Westrick, Marini, Shmueli, Young, Shaw, & Ng, 2020). However, there is another important lens with which to consider these research findings and further examine, and that is for academic advising on campus.

A key function of academic advising is to help students more deeply connect with the institution so that students succeed academically and persist to graduation (Drake, 2011). Academic advising is most successful when advisors are armed with accurate and timely student data (Nutt, 2017). It is well established that students with low admission test scores and high school grade point averages (HSGPA) earn lower first-year GPAs (FYGPA) on average (Zwick, 2006). Paying attention to students' performance in the first year of college is key as the literature indicates that FYGPA is the best predictor of retention (Pascarella & Terenzini, 2005), and academic performance is a strong predictor of degree completion (Adelman, 2006). Research has also shown that students who seriously underperform, defined as earning a FYGPA well below what was predicted given their admission test scores and HSGPA, are at greatest risk of not returning for their second year of college (Shaw & Mattern, 2013).

It seems natural that "many institutions have implemented early-warning systems that alert faculty and staff to student struggles and allow for early intervention before their struggles undermine motivation and in turn persistence" (Tinto, 2015, p. 7). To the extent that SAT scores and context information about high schools and home neighborhoods can inform academic advising conversations and interventions implemented for students even earlier, as they arrive on campus, and then as they progress through their studies, this can contribute to notably more positive student and institutional success outcomes.

What follows is a review of previous research on the relationships between SAT scores and retention. We then introduce information on two measures from the College Board's Landscape resource, which, when combined with SAT data, can provide institutions with a more nuanced understanding of their incoming students' academic strengths and needs, allowing institutions to provide targeted support to incoming students and ideally improve and monitor their performance and risk for not returning.

Previous Research

Of note, the current SAT, introduced in 2016, is an academic achievement measure that identifies students' academic preparedness for postsecondary studies. Specifically, the SAT reflects the work that students do in high school, focusing on the core knowledge and skills that research has shown to be critical for students to be ready for college and career.[1] Scholarly research and empirical data derived

[1] More information on the development of the SAT can be found in *Test Specifications for the Redesigned SAT®* (College Board, 2015) and *SAT® Suite of Assessments Technical Manual: Characteristics of the SAT* (College Board, 2017).

from secondary and postsecondary curriculum surveys conducted by College Board and other organizations, as well as research indicating what is most essential for college readiness and success formed the evidentiary foundation for specifying the test content and domains of interest (College Board, 2017). The SAT includes the Evidence-based Reading and Writing section, the Math section, and an optional Essay section.[2]

SAT Relationships with FYGPA and Retention

Recent SAT validity studies have focused on using SAT scores and HSGPA to predict FYGPA and retention (Marini, Westrick, Young, Ng, Shmueli, & Shaw, 2019; Westrick et al., 2019). These studies showed that students with higher SAT scores and HSGPAs earn higher FYGPAs and have higher retention rates than do students with lower SAT scores and HSGPAs. Across subgroups, there were differences in overall retention rates, notably across students grouped by race/ethnicity and highest parental education level, but the differences largely disappeared after accounting for students' SAT scores. That is, students with similar performances on the SAT had similar FYGPAs and retention rates, regardless of subgroupings. (Marini et al., 2019).

Overprediction and Underprediction of FYGPA (Residual Analyses)

Students with the same SAT score and the same HSGPA rarely earn the exact same FYGPA in college. Students' academic performances vary for a variety of reasons, and it is important to understand average under- and overprediction estimates of college grades based on HSGPA and SAT scores. Enrollment and student affairs professionals benefit from this information related to prediction accuracy as it helps them to best connect admitted students to appropriate first-year supports to optimize college success.

Residual analyses show which subgroups tend to earn FYGPAs that are higher or lower than predicted. For analyses examining the overprediction and underprediction of FYGPA, a common regression is used at each institution to estimate students' future academic performance. Residuals are the differences between what is predicted and what is actually observed. In this case, the residual is the difference between the predicted FYGPA and actual FYGPA.

In an overall analysis, there is no residual value to share because the students who underperform and the students who overperform cancel each other out. Subgroup analyses, however, show us which groups, on average, earn grades that are higher than predicted (underpredicted) or lower than predicted (overpredicted). Past research (Marini et al., 2019) has shown that the academic performances of the following subgroups tend to be underpredicted: females, Asians, Whites, and students whose parents' highest education level is a bachelor's degree or higher. Conversely, the academic performances of the following subgroups tend to be overpredicted: males, students from underrepresented groups, and students whose parents' highest education level is less than a bachelor's degree. Students in the subgroups whose FYGPAs were, on average, overpredicted also had, to varying

[2] Validity evidence for the SAT Essay section can be found in *Validity of SAT® Essay Scores for Predicting First-Year Grades* (Marini et al., 2019).

degrees, lower retention rates than subgroups whose academic performances were underpredicted. Mattern, Sanchez, and Ndum (2017) have shared that such over- and underprediction is likely the result of non-cognitive variables omitted from the regression equation, but over- and underprediction are also impacted by phenomena like grading differences in coursework pursued in college, among other factors.

An extension of the residual analyses is the classification of students based on the amount of over- or underprediction observed (Shaw & Mattern, 2013). In earlier SAT validity studies (Marini et al., 2019; Westrick et al., 2019) students were placed into two categories: "Performing as Expected or Overperforming" or "Underperforming." Students were categorized as Underperforming when their actual FYGPAs were more than 1.5 standard deviations below their predicted FYGPA. Overall, these students have much lower retention rates (40%) than do the students who perform as expected or above what was expected (87%).

Institutional Admission Rates and Retention

In addition to differences in expected versus actual performance (residuals) and retention rates by student subgroups, another finding from previous research is that institutional admission rates were related to retention rates (Marini et al., 2019). As admission rates increased, retention rates decreased, even after accounting for SAT scores. Noteworthy was that at the most-selective institutions, those accepting less than 25% of applicants, students had high retention rates regardless of whether they entered college with low SAT scores or underperformed in their first year of college.

Current Study

The current study aims to extend our understanding of SAT score relationships with college performance, retention, and risk across student and institutional subgroups and connect this information to practical uses in academic advising to promote students' success. The inclusion of Landscape's neighborhood and high school information will provide context to students' incoming HSGPAs and SAT scores and the difference between their predicted FYGPAs and actual FYGPAs.

Landscape is a College Board resource for enrollment management professionals that provides consistent information about a student's neighborhood and high school, which helps colleges and universities thoughtfully consider students' academic accomplishment in context during the application and scholarship review process. As institutions seek to expand opportunity for low-income and under-resourced students, this study will provide insights on how students from more challenging environments may be expected to perform so institutions can provide appropriate advising and support services.

Methodology

Sample

College Board broadly recruited four-year institutions with at least 250 first-year students (at least 75 of whom had to have SAT scores) to participate in this study. These institutions provided data through College Board's secure online Admitted Class Evaluation Service (ACES™) system. This study also

required that students have neighborhood and high school information to provide environmental context. Ultimately, students from 156 institutions had the complete student-level and environmental-level information needed for the analyses that follow in this section of the report.

Table 1 includes the characteristics of the institutions in the sample and shows that the sample is quite diverse regarding region of the United States, control (public/private), selectivity, and size. Compared to the population[3] of four-year institutions for this study, the institutional study sample included more public institutions, more "selective" institutions, and more "large" and "very large" institutions than the reference population. This is to be expected, as there was a sample size minimum to participate in the study, and more-selective institutions rather than less-selective institutions would be more apt to use the SAT and therefore to be interested in examining the relationship between the SAT and college outcomes.

Table 1: Institutional Characteristics of the 2017 SAT Validity Study Sample and Population of Four-Year Institutions

		Sample (*k*=156)	Reference Population of Institutions (*k*=1,230)
U.S. Region	Midwest	34 (22%)	343 (28%)
	Mid-Atlantic	28 (18%)	246 (20%)
	New England	19 (12%)	119 (10%)
	South	26 (17%)	277 (23%)
	Southwest	18 (12%)	90 (7%)
	West	31 (20%)	155 (13%)
Control	Public	75 (48%)	417 (34%)
	Private	81 (52%)	813 (66%)
Admittance Rate	Under 25%	16 (10%)	57 (5%)
	25% to 50%	29 (19%)	211 (17%)
	51% to 75%	65 (42%)	651 (53%)
	Over 75%	46 (29%)	311 (25%)
Undergraduate Enrollment	Small	61 (39%)	761 (62%)
	Medium	28 (18%)	202 (16%)
	Large	27 (17%)	136 (11%)
	Very Large	40 (26%)	131 (11%)

Note. *k* = number of institutions. Percentages may not sum to 100 due to rounding. Undergraduate enrollment was categorized as follows: small: 4,999 or less; medium: 5,000 to 9,999; large: 10,000 to 19,999; and very large: 20,000 or more.

Inclusion in the study sample required students to have new SAT scores, a valid self-reported high school GPA (HSGPA), and valid domain-specific course grades supplied by the institution. Moreover, each student record had to be matched to their high school and neighborhood environmental data using the students' high school codes, if available. This resulted in a sample size of 188,177 students. See Table 2 for more information about the characteristics of the student sample and the population of 2017 graduating seniors who took the new SAT. Compared to the population, the study sample, which

[3] The population included four-year public or private nonprofit institutions that accepted 90% or fewer applicants for admission.

included students who were enrolled in college, has slightly more female students, slightly more White students and fewer Black or African American students, and more students whose highest parental education level was a bachelor's degree or higher than was the case in the overall SAT-taking population.

Table 2: Student Characteristics of the 2017 SAT Validity Study Sample and 2017 Graduating Seniors with SAT Scores

		Sample (*n*=188,177)	**2017 Graduating Seniors who took the SAT (*N*=1,715,481)**
Gender	Male	80,834 (43%)	809,462 (47%)
	Female	107,343 (57%)	906,019 (53%)
Race/Ethnicity	American Indian or Alaska Native	577 (<1%)	7,782 (<1%)
	Asian	17,940 (10%)	158,031 (9%)
	Black or African American	13,612 (7%)	225,860 (13%)
	Hispanic or Latino	39,370 (21%)	408,067 (24%)
	Native Hawaiian or Other Pacific Islander	247 (<1%)	4,131 (<1%)
	White	106,732 (57%)	760,362 (44%)
	Two or More Races	7,148 (4%)	57,049 (3%)
	Not Stated	2,551 (1%)	94,199 (5%)
Highest Parental Education Level	No High School Diploma	10,461 (6%)	137,437 (8%)
	High School Diploma	40,324 (21%)	482,194 (28%)
	Associate Degree	13,438 (7%)	134,451 (8%)
	Bachelor's Degree	68,637 (36%)	473,103 (28%)
	Graduate Degree	52,762 (28%)	339,743 (20%)
	Not Stated	2,555 (1%)	148,553 (9%)

Measures

High School GPA (HSGPA). Students' self-reported HSGPA was obtained from the SAT Questionnaire when they registered for the SAT and is reported on a 12-point interval scale ranging from 0.00 (F) to 4.33 (A+). Institution-provided HSGPA could not be used in this national study because it is reported on so many different scales across institutions. Note that the inclusion of self-reported HSGPA is consistent with previous admission test validity studies (e.g. Mattern & Patterson, 2014; Sawyer, 2013), and studies have found self-reported HSGPA to be highly correlated with actual HSGPA (Kuncel, Credé, & Thomas, 2005; Shaw & Mattern, 2009). In the class of 2017, 93% of the SAT-taking population reported their HSGPA. At the student level, the HSGPA measure in this study had a sample mean of 3.67 (*SD*=0.47). Across the 156 institutions included in this study, institutional mean HSGPAs ranged from 3.00 to 4.14.

SAT Scores. SAT scores were obtained from College Board's database and matched to each student provided in the institution files. The SAT scores included in this study are:

> **SAT Total Score (400 to 1600 scale**)**—**increments of 10, student sample mean of 1187 (*SD*=163). Institutional mean SAT Total scores ranged from 888 to 1484.

SAT Evidence-Based Reading and Writing (ERW) Section Score (200 to 800 scale)—increments of 10, student sample mean of 595 (*SD*=82). Institutional mean SAT ERW section scores ranged from 433 to 759. The ERW section consists of 96 items, 52 from the Reading Test and 44 from the Writing and Language Test.

SAT Math Section Score (200 to 800 scale)—increments of 10, student sample mean of 589 (*SD*=91). Institutional mean SAT Math section scores ranged from 455 to 725. The Math section consists of 58 items.

Landscape Variables.

Average Context Percentiles and Context Quintiles—Landscape[4] includes neighborhood and high school percentiles: (i) at the neighborhood level, which is defined by a student's census tract, and (ii) at the high school level, which is defined by the census tracts of college-bound seniors at a high school. Applicants from the same census tract share the same neighborhood data and indicators; applicants from the same high school share the same high school data and indicators. These indicators are College attendance, Crime, Education level, Household structure, Housing stability, and Median family income. These 6 indicators are averaged and presented on a 1—100 scale to provide a Neighborhood Average and a High School Average. A higher value on the 1—100 scale indicates a higher level of challenge related to educational opportunities and outcomes. For this study, these two averages are averaged, and then these percentiles are in turn split into quintiles, with students in the top 20% representing students from the most challenging environments, in Context Quintile 5. This is done for each quintile, with students in the bottom 20%, students from the least challenging environments, in Context Quintile 1. Average Context Percentile of students in this study had a student sample mean of 38 (*SD*=28). Institutional mean Average Context Percentile ranged from 15 to 79.

SAT in Context: SAT High School Quartiles—The SAT in Context is an indicator of students' SAT performance compared to the 25th, 50th, and 75th, percentile of SAT scores at the high school, based on a three-year average of high school's SAT scores. For example, students whose SAT Total scores are in the top 25% at their high school, based on a three-year average of the high school's SAT scores, are placed in the top SAT High School Quartile. This categorization ignores how the students' SAT scores compare with the scores of other students nationwide and within their college or university.

First-Year GPA (FYGPA). Each institution provided FYGPA values for their 2017 first-time, first-year students. Student FYGPAs across the 156 institutions in this sample ranged from 0.00 to 4.30. FYGPA had a student sample mean of 3.03 (*SD*=0.81). Institutional mean FYGPAs ranged from 2.20 to 3.59.

[4] For detailed information on Landscape and the data elements included, please visit cb.org/landscape.

Retention Rate. Retention was defined as returning to the same institution for the second academic year (1=retained; 0=not retained). Each institution provided retention information for their 2017 first-time, first-year students. Institutional retention rates across the 156 institutions in this sample ranged from .60 to .98, and the average retention rate was .83 (*SD*=.37), or 83%.

Descriptive Statistics

This report presents descriptive statistics for the overall sample and multiple subgroups. In the main body of the report we present descriptive statistics for the overall sample and key subgroups, and most of the descriptive statistics for the subgroups are in Appendix A (Tables A 1 through A 17).

Descriptive statistics are not analyses, but they do allow for the observation of patterns in predictor and outcome measures across different subgroups. In this study, the patterns across Context Quintiles show that while students in different Context Quintiles often perform quite similarly on measures such as HSGPA, their SAT scores, FYGPAs, and retention rates differ. These similarities and differences provide context to the results of the differential prediction and retention analyses that follow.

Starting with the overall sample, Table 3 includes descriptive statistics for all measures of interest in the sample and for the 2017 SAT-tested graduating seniors. As the sample includes students enrolled in college, it is not surprising that these students are academically stronger than the total SAT test-taking population across all measures. Descriptive statistics are reported for all SAT scores utilized in the study analyses—SAT Total, SAT ERW section, and SAT Math section scores—as well as HSGPA, FYGPA, and retention rate.

Table 3: Descriptive Statistics for Measures of Interest

	Study Sample					2017 Graduating Seniors Who Took the SAT				
Measure	*n*	*Mean*	*SD*	*Min*	*Max*	*N*	*Mean*	*SD*	*Min*	*Max*
SAT Total Score	188,177	1184	161	400	1600	1,715,481	1060	195	400	1600
SAT ERW Section Score	188,177	595	82	200	800	1,715,481	533	100	200	800
SAT Math Section Score	188,177	589	91	200	800	1,715,481	527	107	200	800
HSGPA	188,177	3.67	0.47	0.00	4.33	1,594,136	3.33	0.65	0.00	4.33
FYGPA	188,177	3.03	0.81	0.00	4.30					
Retention Rate	188,177	0.83	0.37	0.00	1.00					
Note. Not all 2017 graduating seniors who took the SAT reported their HSGPA.										

Table 4 presents descriptive statistics for all measures of interest in the sample broken out by institutional characteristics. As seen in earlier SAT research (Marini et al., 2019), the most notable patterns are those across institutional admittance rates. As institutional admittance rates increase (become less selective), mean SAT scores, HSGPAs, FYGPAs, and retention rates decrease. Differences in FYGPAs across institutional admittance rates largely disappeared when controlling for students' SAT Total scores (see Table A 3). However, differences in retention rates persisted even when controlling for students' SAT Total scores, with retention rates generally being highest at the more-selective institutions and lowest at the least-selective institutions for students within the same SAT Total score bands.

Table 4: Means (SDs) for Measures of Interest and Retention Rates, by Institutional Characteristics

		k	*n*	ERW	Math	Total Score	HSGPA	FYGPA	Retention Rate
Control	Private not for profit	81	38,236	614 (85)	607 (95)	1222 (168)	3.71 (0.46)	3.18 (0.69)	86%
	Public	75	149,941	590 (81)	584 (90)	1174 (158)	3.66 (0.48)	2.99 (0.83)	83%
Admittance Rate	Under 25%	16	9,971	681 (68)	686 (81)	1367 (137)	3.99 (0.30)	3.36 (0.53)	94%
	25% to 50%	29	38,636	625 (77)	628 (88)	1253 (151)	3.84 (0.38)	3.15 (0.66)	88%
	51% to 75%	65	93,491	587 (78)	578 (85)	1165 (149)	3.64 (0.47)	3.00 (0.83)	83%
	Over 75%	46	46,079	568 (78)	557 (83)	1125 (148)	3.51 (0.51)	2.92 (0.88)	78%
Undergraduate Enrollment Size	Small	61	18,994	579 (87)	565 (90)	1144 (165)	3.58 (0.51)	3.02 (0.81)	80%
	Medium	28	21,012	561 (81)	551 (88)	1113 (156)	3.48 (0.52)	2.90 (0.87)	79%
	Large	27	34,292	600 (86)	593 (95)	1193 (169)	3.64 (0.47)	3.05 (0.79)	82%
	Very large	40	113,879	602 (78)	599 (89)	1201 (154)	3.72 (0.44)	3.05 (0.80)	85%
Overall		156	188,177	595 (82)	589 (91)	1184 (161)	3.67 (0.47)	3.03 (0.81)	83%

Table 5 presents descriptive statistics for all measures of interest in the sample broken out by student characteristics. As seen in earlier SAT research (Marini et al., 2019), the most consistent patterns are those across parental education levels. As parental education levels decrease, mean SAT scores, HSGPAs, FYGPAs, and retention rates generally decrease as well, but controlling for SAT Total scores (Table A 5) reduces the differences in mean FYGPAs and retention rates. As found in Marini et al. (2019), however, differences in mean FYGPAs and retention rates between race/ethnic subgroups[5] noticeably decreased after controlling for SAT Total scores (Table A 5). That is, across race/ethnicity subgroups, students with similar SAT scores have similar outcomes. However, the gaps in mean FYGPAs and retention rates for male and female students seen in Table 5 increase after controlling for SAT Total scores (Table A 5). Among male and female students with similar SAT scores, female students earn higher FYGPAs and have higher retention rates.

[5] Some of the subgroups have small sample sizes, and interpretation of the results for these subgroups should be made with caution.

Table 5: Means (SDs) for Measures of Interest and Retention Rates, by Student Characteristics

Subgroup		*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention Rate
Gender	Female	107,343	590 (81)	572 (88)	1162 (157)	3.70 (0.45)	3.12 (0.76)	84%
	Male	80,834	602 (83)	611 (91)	1213 (161)	3.62 (0.50)	2.91 (0.86)	82%
Race/ Ethnicity	American Indian or Alaska Native	577	556 (75)	548 (85)	1104 (147)	3.57 (0.49)	2.70 (0.93)	76%
	Asian	17,940	618 (83)	650 (94)	1268 (162)	3.77 (0.40)	3.17 (0.68)	88%
	Black or African American	13,612	547 (81)	527 (84)	1074 (152)	3.46 (0.53)	2.68 (0.88)	79%
	Hispanic or Latino	39,370	567 (81)	557 (85)	1124 (154)	3.63 (0.48)	2.84 (0.84)	81%
	Native Hawaiian or Other Pacific Islander	247	580 (81)	577 (90)	1157 (160)	3.56 (0.50)	2.72 (0.89)	75%
	Two or more races	7,148	614 (79)	605 (90)	1219 (157)	3.70 (0.46)	3.02 (0.83)	85%
	White	106,732	608 (77)	598 (85)	1206 (149)	3.69 (0.46)	3.12 (0.78)	84%
	No response	2,551	565 (86)	553 (92)	1118 (166)	3.50 (0.51)	2.82 (0.89)	78%
Highest Level of Parental Education	Graduate Degree	52,762	629 (78)	623 (89)	1252 (154)	3.74 (0.45)	3.20 (0.72)	87%
	Bachelor's Degree	68,637	602 (76)	597 (86)	1199 (149)	3.69 (0.46)	3.10 (0.76)	85%
	Associate Degree	13,438	571 (77)	561 (83)	1132 (147)	3.61 (0.49)	2.89 (0.86)	79%
	High School Diploma	40,324	565 (78)	557 (85)	1122 (149)	3.59 (0.49)	2.81 (0.88)	78%
	No High School Diploma	10,461	537 (77)	538 (87)	1074 (150)	3.58 (0.49)	2.74 (0.83)	79%
	No Response	2,555	535 (83)	531 (89)	1065 (158)	3.44 (0.52)	2.68 (0.90)	76%
Best Language	English Only	158,212	600 (80)	592 (89)	1192 (158)	3.67 (0.47)	3.05 (0.80)	84%
	English and Another	27,139	570 (85)	571 (97)	1141 (169)	3.65 (0.47)	2.89 (0.81)	82%
	Another	1,991	544 (90)	633 (121)	1177 (193)	3.70 (0.43)	3.00 (0.79)	77%
Overall		188,177	595 (82)	589 (91)	1184 (161)	3.67 (0.47)	3.03 (0.81)	83%

In Table 6, descriptive statistics are presented for the sample by Context Quintiles. Students in Context Quintile 1 (low challenge) have the highest mean SAT scores, FYGPAs, and retention rates, and in a stairstep fashion, mean SAT scores, FYGPAs, and retention rates decrease as challenge levels increase, with students in Context Quintile 5 (high challenge) having the lowest mean SAT scores, FYGPAs, and retention rates. The one measure that bucks this trend is HSGPA, which is nearly uniform across challenge levels, especially across Context Quintiles 2, 3, and 4.[6] This is likely due to the fact that HSGPA is a local measure where grades assigned within high schools vary much more than do mean HSGPAs across high schools (Zwick & Greif Green, 2007). Note than in this study, students from low-challenge environments in Context Quintile 1 had the second lowest mean HSGPA, only 0.06 points higher than

[6] In this sample of students enrolled at four-year institutions, the near uniformity in mean HSGPAs across the Context Quintiles likely reflects the critical role HSGPA plays in admission decisions at institutions (particularly those without open admissions).

the mean HSGPA for students from high-challenge environments in Context Quintile 5, which is a negligible difference in light of the *SD*s associated with HSGPA for the study sample (0.47) and the reference population (0.65).

Table 6: Means (SDs) for Measures of Interest and Retention Rates, by Context Quintiles

Context Quintile	*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention Rate
1	66,034	619 (77)	619 (88)	1239 (152)	3.65 (0.46)	3.19 (0.72)	87%
2	42,739	604 (78)	597 (86)	1202 (151)	3.70 (0.46)	3.09 (0.77)	85%
3	33,897	589 (79)	580 (85)	1169 (150)	3.69 (0.47)	2.98 (0.82)	82%
4	25,134	572 (79)	560 (85)	1132 (151)	3.68 (0.49)	2.88 (0.86)	80%
5	20,373	535 (78)	524 (81)	1059 (146)	3.59 (0.51)	2.64 (0.91)	76%

Our final set of descriptive statistics are retention rates by FYGPA levels. As mentioned in the introduction, research has shown that FYGPA is the strongest predictor of student retention. For the current study, Table 7 shows student retention rates by FYGPA bands, overall and by Context Quintiles,

Table 7: Retention Rates by FYGPA, Context Quintile, and Student Grouping

		Overall		Other		Underrepresented	
FYGPA	Context Quintile	n	Retention Rate	n	Retention Rate	n	Retention Rate
3.50 or Higher	1	27,026	92%	24,348	92%	2,678	91%
	2	15,192	92%	12,913	92%	2,279	92%
	3	10,316	92%	8,135	92%	2,181	91%
	4	6,419	90%	4,256	91%	2,163	90%
	5	3,340	90%	1,151	91%	2,189	90%
	Overall	62,293	92%	50,803	92%	11,490	91%
3.00-3.49	1	19,418	90%	16,953	90%	2,465	90%
	2	12,465	90%	9,818	90%	2,647	92%
	3	9,584	89%	6,757	89%	2,827	89%
	4	6,919	89%	3,877	89%	3,042	89%
	5	4,921	89%	1,217	89%	3,704	89%
	Overall	53,307	90%	38,622	90%	14,685	90%
2.50-2.99	1	10,578	87%	9,045	87%	1,533	87%
	2	7,622	86%	5,869	86%	1,753	87%
	3	6,620	84%	4,401	84%	2,219	85%
	4	5,300	85%	2,573	85%	2,727	86%
	5	4,856	87%	1,024	86%	3,832	88%
	Overall	34,976	86%	22,912	86%	12,064	86%
2.00-2.49	1	4,809	81%	4,044	81%	765	81%
	2	3,866	79%	2,806	78%	1,060	81%
	3	3,687	78%	2,323	76%	1,364	79%
	4	3,214	79%	1,473	75%	1,741	82%
	5	3,319	79%	625	77%	2,694	80%
	Overall	18,895	79%	11,271	78%	7,624	80%
Less than 2.00	1	4,203	41%	3,471	40%	732	43%
	2	3,594	38%	2,605	37%	989	43%
	3	3,690	36%	2,350	34%	1,340	40%
	4	3,282	35%	1,530	31%	1,752	38%
	5	3,937	33%	807	27%	3,130	34%
	Overall	18,706	37%	10,763	36%	7,943	38%

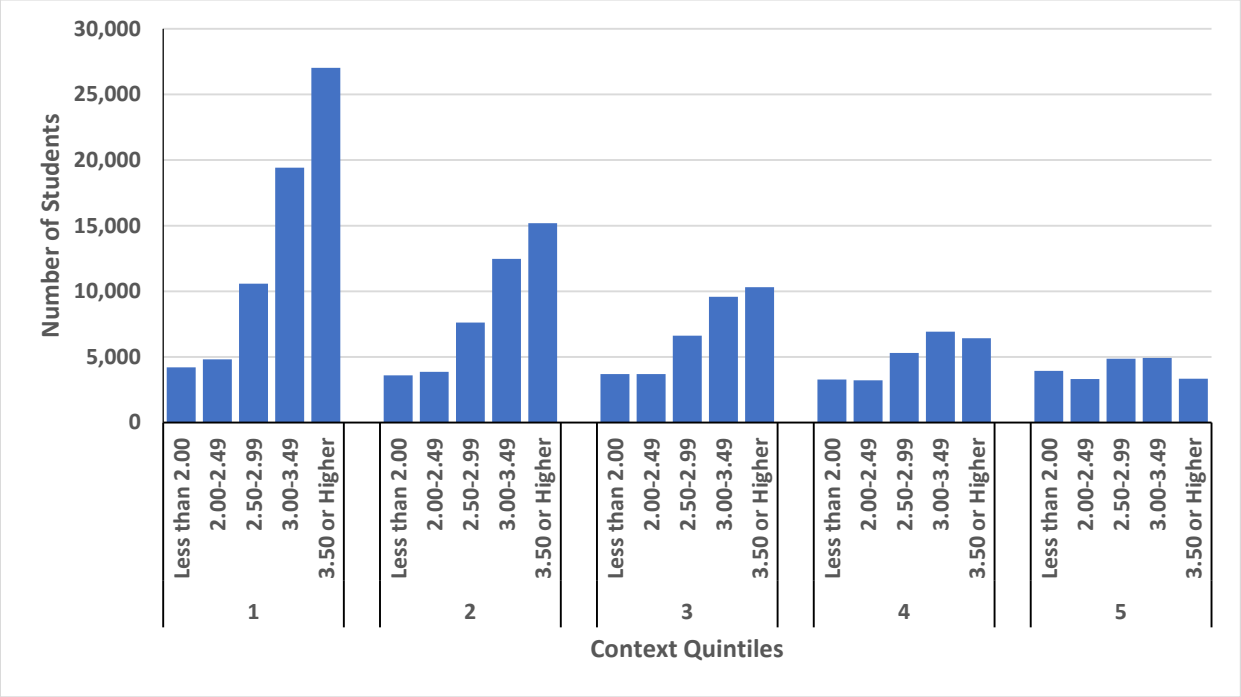
as well as by student grouping.[7] Overall, retention rates were highest for students with FYGPAs of 3.50 or higher, 92%, and retention rates decreased as FYGPA decreased, to a low of 37% for students with FYGPAs below 2.00. Note that for students with FYGPAs below 2.00, low retention rates are not surprising as they are often asked to leave the institution for academic reasons. A positive finding was that within FYGPA bands the retention rates were stable across Context Quintiles for students with FYGPAs above 2.00. Another positive finding was that students in higher FYGPA bands had retention rates that were always as high as or higher than the students in lower FYGPA bands, regardless of Context Quintiles. For example, students with FYGPAs of 3.00 to 3.49 in Context Quintile 5 (high challenge) had a retention rate of 89%, whereas students with FYGPAs between 2.50 and 2.99 in Context Quintile 1 (low challenge) had a retention rate of 87%. An interesting finding was that for students from underrepresented groups earning FYGPAs below 2.99, their retention rates were almost always higher than those for Other students in the same FYGPA band and Context Quintile.

As shown in Table 7, there was a clear relationship between FYGPA and retention, confirming a general finding reported in the literature (Pascarella & Terenzini, 2005). Students with higher FYGPAs had higher retention rates. Moreover, aside from students struggling with FYGPAs below 2.00, students with equal FYGPAs, regardless of challenge level, had nearly identical retention rates, and this was true for both Underrepresented and Other students. The importance of this cannot be stressed enough. Regardless of environmental context and student grouping, students whose college academic performances were alike had nearly identical retention rates. This helps explain why FYGPA is such an important performance criterion as we consider applicants for admission and help enrolled students to be as successful as possible in the first year. The goal is for all students to complete their degrees at the institution in a timely manner, and the FYGPA measure is a stepping stone to understanding how well-positioned students are to do this.

Although this finding was positive, what may be lost is that students from high-challenge environments tended to earn lower FYGPAs. This is illustrated in Figure 1. Compared with the students in the other Context Quintiles, the students in Context Quintile 5 are spread out across the five FYGPA bands, with roughly 60% of the students earning a FYGPA below a 3.00. In contrast, 70% of the students in Context Quintile 1 had FYGPAs of 3.00 or higher.

[7] Small sample sizes made analyses across FYGPA bands, racial/ethnic groups, and Context Quintiles impractical as certain subgroups would be excluded from the analyses. Therefore, we decided to classify American Indian or Alaska Native, Black or African American, Hispanic or Latino, and Native Hawaiian or Other Pacific Islander students as Underrepresented and all other students as Other.

Figure 1: FYGPA Distributions by Context Quintiles



Knowing that students from high-challenge environments, even before they start their first year of college, will, on average, have lower FYGPAs, which lead to lower retention rates, is vital to understanding that many of these students may benefit from interventions that would help keep them academically on track for continued success in college. Ideally *both* SAT scores and HSGPA would help institutions identify students who will earn lower FYGPAs, but as seen throughout the descriptive statistic tables with students broken out by Context Quintiles, while SAT scores move in tandem with FYGPA and retention rates, HSGPA seems to be disconnected from the other measures, especially for students from high-challenge environments. It is also critical to understand that students from high-challenge environments are not, on average, predicted to have FYGPAs as low as seen in the tables. This subject is addressed in the next section.

Analyses

Differential Prediction of FYGPA by Subgroup and Retention

As a reminder, we were interested in understanding how the utility of the SAT and HSGPA may vary across different Context Quintiles. We were also interested in understanding how the use of the SAT and HSGPA together might improve the accuracy of predictions versus using one measure alone, across the Context Quintiles. Accurate prediction of college performance is key to best understanding which students may need extra academic advising and supports to be successful.

Differential prediction of FYGPA by student subgroup was evaluated based on regression equations to predict FYGPA using SAT scores (ERW and Math), HSGPA, and SAT scores and HSGPA together. First, overall regressions were run within institutions and the residuals—actual FYGPA minus predicted

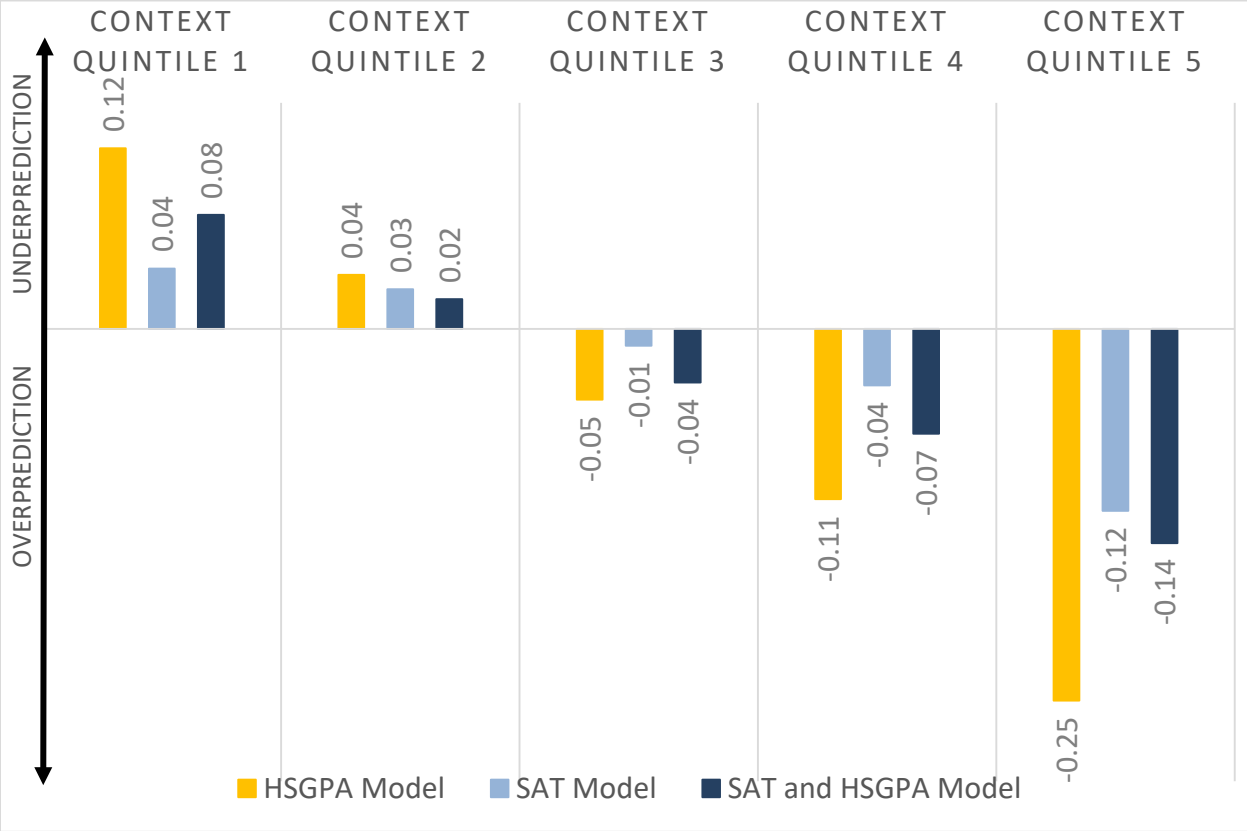
FYGPA—for individual students were calculated. Next, average residuals were calculated by subgroup across all institutions (if n≥15 at the institution level). A negative mean residual indicates that the predictors overestimate FYGPA for students within the subgroup, on average. A positive mean residual indicates that the predictors underestimate FYGPA for students within the subgroup, on average. Note that differential prediction analyses are not meaningfully analyzed by institutional subgroups (e.g., public and private) since regressions are run at the institution level and the mean residual for a given institution is zero by definition. Therefore, only student subgroups were analyzed in the differential prediction analyses, to include students subdivided by Context Quintiles.

Results

Overprediction and Underprediction of FYGPA across Context Quintiles

Figure 2 shows the mean residuals for the three models used to predict FYGPA at the institution level. Going from left to right, from Context Quintile 1 (low challenge) to Context Quintile 5 (high challenge), we see that the residuals for all three models go from positive (underprediction) to negative. What this means is that, on average, there is a relationship between students' challenge levels and whether they earn FYGPAs that are lower or higher than predicted. Even though students at the same college entered with the same HSGPA and had the same predicted FYGPA, their actual FYGPAs differed depending on their context information, captured by Landscape.

Figure 2: Overprediction (-) and Underprediction (+) of FYGPA by Context Quintiles



For example, under the HSGPA alone model, some students were predicted to have a FYGPA of 3.00 at their institutions based on their HSGPAs. However, the residual analyses tell us that students in Context Quintiles 1, 2, 3, 4, and 5 earned actual mean FYGPAs of 3.12, 3.04, 2.95, 2.89, and 2.75, respectively. From this example, we can see that the gap between students in Context Quintiles 1 and 5 using the HSGPA alone model is 0.37. In contrast, the difference is only 0.16 when using the SAT alone model, a 57% reduction. Adding HSGPA to the SAT model, however, increases the gap to 0.22, a 38% increase in prediction error.

The pattern shown in Figure 2 (and Table B 1) held across multiple subgroup analyses presented in Appendix B.[8] On average, students from high-challenge environments in Context Quintile 5 had negative residuals (overprediction of FYGPA) for the three FYGPA prediction models (HSGPA alone, the SAT alone, and the SAT plus HSGPA), indicating that their actual FYGPAs were lower than their predicted FYGPAs. As challenge decreased, the amount of overprediction decreased and in most cases transitioned to underprediction for students in Context Quintile 1. Based on students disaggregated by self-reported race/ethnicity as an example, this can be seen in Figure 3 for Context Quintile 5, in which students in all subgroups had mean FYGPAs that were overpredicted, and in Figure 4 for Context Quintile 1, in which most subgroups had mean FYGPAs that were underpredicted.

[8] In Appendix B, we present the residuals for the following subgroups: Students' Context Quintiles (Table B 1); Context Quintiles and Institutional Control (Table B 2); Context Quintiles and Institutional Admittance Rate (Table B 3); Context Quintiles, Institutional Admittance Rate, and Control (Table B 4); Context Quintiles and Institution Size (Table B 5); Context Quintiles and Gender (Table B 6); Context Quintiles and Race/Ethnicity (Table B 7); Context Quintiles and Highest Parental Education Level (Table B 8); Context Quintiles and Best Language (Table B 9); Context Quintiles and Student Grouping (Table B 10); and Student Grouping, Context Quintile, and Institution Admittance Rate (Table B 11).

Figure 3: Overprediction (-) and Underprediction (+) of FYGPA by Race/Ethnicity within Context Quintile 5 (High Challenge)

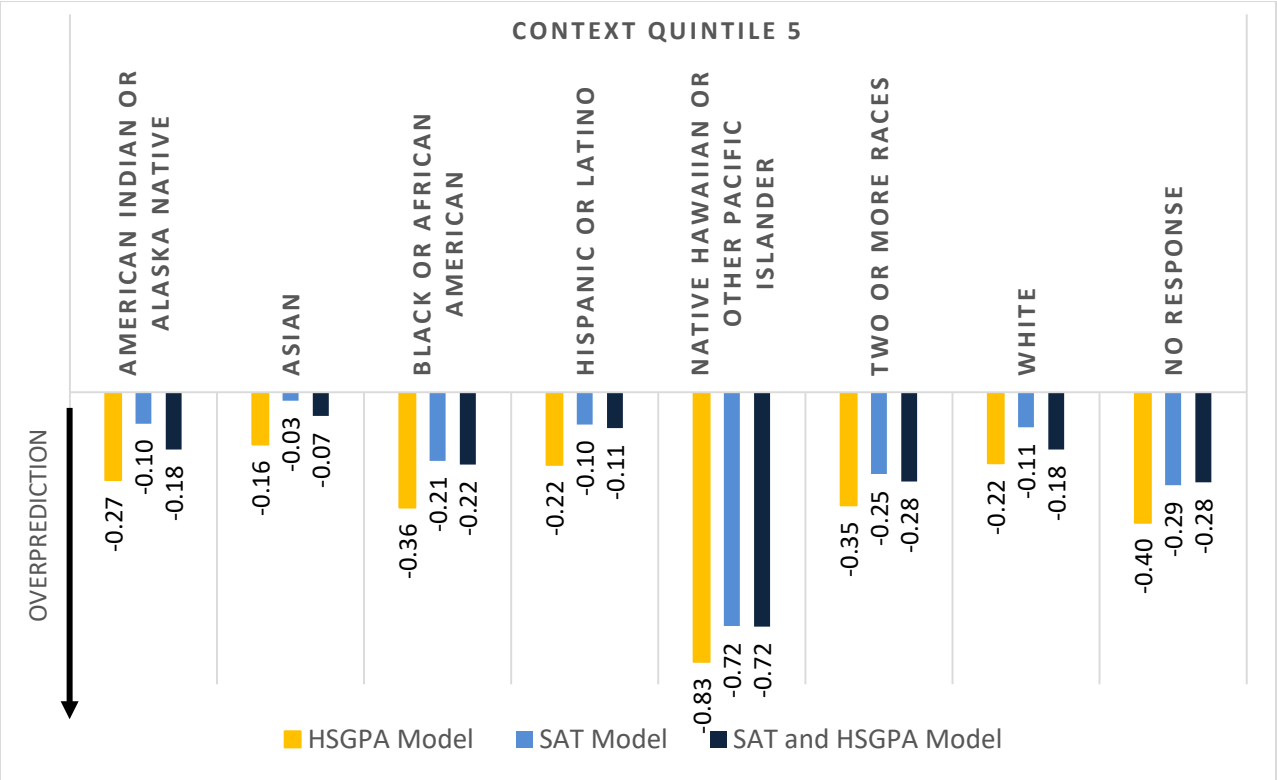
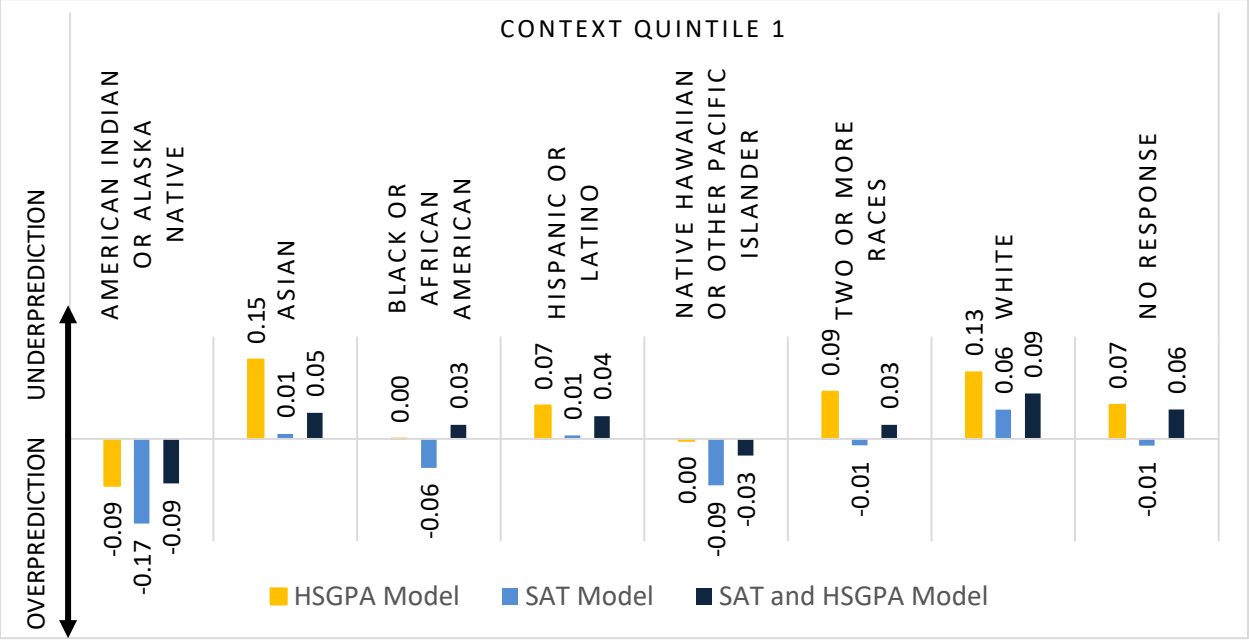


Figure 4: Overprediction (-) and Underprediction (+) of FYGPA by Race/Ethnicity within Context Quintile 1 (Low Challenge)



A second pattern that emerged from the residual analyses was that across challenge levels, the SAT alone model produced the smallest residual in most cases, indicating that the SAT provided the most accurate prediction of FYGPA. Across the 11 tables in Appendix B, out of 261 comparisons, the residual for the SAT alone model was more accurate than the residual for the HSGPA alone model 213 times and was equal to the residual for the HSGPA alone model 19 times, representing 89% of all comparisons. In fact, the SAT alone model provided a more accurate prediction of FYGPA than the joint SAT plus HSGPA model in most cases, indicating that the inclusion of HSGPA reduced the accuracy of the prediction of FYGPA.

Tables 8 and 9 contain results that are restricted to Context Quintile 5 and show FYGPA differential prediction results by institutional and student characteristics; results for all Context Quintiles are presented in Appendix B. These tables show that: 1) the predicted FYGPAs of the students were overestimated in all three models (HSGPA alone, SAT alone, and SAT and HSGPA together), and 2) the residuals for the SAT model were always smaller (showed less error) than the residuals for the HSGPA model. Moreover, in only three instances did the addition of HSGPA to SAT scores increase the accuracy of the prediction of FYGPA. For the remaining 26 subgroup analyses—nearly 90% of the analyses—in these two tables, the joint use of HSGPA and the SAT provided a less accurate prediction of FYGPA than did the SAT used alone.

Table 8: Overprediction (-) and Underprediction (+) of FYGPA for Students in Context Quintile 5 (High Challenge), by Institutional Characteristics

				FYGPA Prediction Model		
Subgroup		*k*	*n*	HSGPA	SAT	SAT and HSGPA
Control	Private not for profit	81	1,782	-0.28	-0.13	-0.17
	Public	75	18,591	-0.24	-0.12	-0.14
Admittance Rate	Under 25%	16	1,026	-0.33	-0.12	-0.13
	25% to 50%	29	4,120	-0.28	-0.12	-0.12
	51% to 75%	65	10,725	-0.24	-0.12	-0.15
	Over 75%	46	4,502	-0.22	-0.12	-0.15
Undergraduate Enrollment Size	Small	61	1,344	-0.23	-0.10	-0.14
	Medium	28	2,730	-0.20	-0.11	-0.13
	Large	27	2,651	-0.23	-0.13	-0.14
	Very large	40	13,648	-0.26	-0.12	-0.14

Note. Negative = Overprediction; Positive = Underprediction

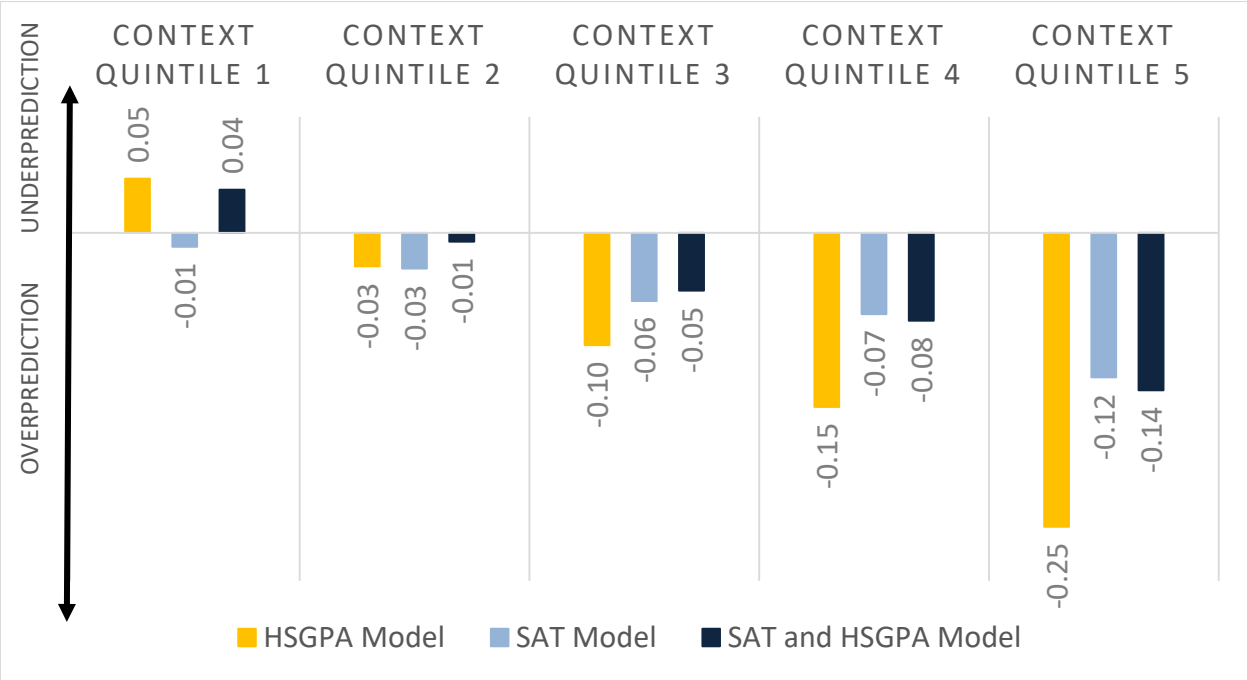
Table 9: Overprediction (-) and Underprediction (+) of FYGPA and Retention Rates for Students in Context Quintile 5 (High Challenge), by Student Characteristics

			FYGPA Prediction Model		
Subgroup		*n*	HSGPA	SAT	SAT and HSGPA
Gender	Female	12,777	-0.19	-0.02	-0.06
	Male	7,596	-0.34	-0.30	-0.28
Race/ Ethnicity	American Indian or Alaska Native	83	-0.27	-0.10	-0.18
	Asian	1,325	-0.16	-0.03	-0.07
	Black or African American	3,365	-0.36	-0.21	-0.22
	Hispanic or Latino	12,081	-0.22	-0.10	-0.11
	Native Hawaiian or Other Pacific Islander	20	-0.83	-0.72	-0.72
	Two or more races	429	-0.35	-0.25	-0.28
	White	2,817	-0.22	-0.11	-0.18
	No response	253	-0.40	-0.29	-0.28
Highest Level of Parental Education	Graduate Degree	1,359	-0.13	-0.04	-0.08
	Bachelor's Degree	3,083	-0.18	-0.07	-0.11
	Associate Degree	1,757	-0.30	-0.16	-0.21
	High School Diploma	8,246	-0.29	-0.17	-0.19
	No High School Diploma	5,375	-0.22	-0.07	-0.08
	No Response	553	-0.34	-0.16	-0.18
Best Language	English Only	11,830	-0.26	-0.15	-0.18
	English and Another	8,137	-0.22	-0.08	-0.10
	Another	325	-0.23	0.04	-0.03

Note. Negative = Overprediction; Positive = Underprediction

As noted earlier, one of the notable findings from previous research (Marini et al., 2019) and earlier analyses in this report is that more-selective institutions have high retention rates regardless of students' SAT scores or their FYGPAs. We examined this further by calculating the mean residuals for over- and underprediction of FYGPA analyses by Context Quintiles and students' grouping (Underrepresented or Other; Table B 10), and then again across institution admittance rates categories (Table B 11). Figure 5 presents the residuals for the students from underrepresented groups across Context Quintiles overall. The general pattern resembles that for the overall sample in Figure 2, but, for the students from underrepresented groups, the mean residuals are negative for students in Context Quintile 2, though the residuals for students in that quintile are close to zero. What is important here, however, are the residuals for students in Context Quintile 5. Although the residuals are negative for both Underrepresented and Other students (see Tables B10 and B 11), note that Underrepresented students make up more than three-fourths of the students in Context Quintile 5, and 29% of Underrepresented students are in this high-challenge category (versus 4% of students classified as Other). That being said, the key takeaway is that the academic performances of the students in Context Quintile 5 were overpredicted, especially by HSGPA, regardless of their student grouping and the admission selectivity of the institutions these students attend. Academic advisors at all institutions should note this.

Figure 5: Overprediction (-) and Underprediction (+) of FYGPA for Students from Underrepresented Groups by Context Quintiles



SAT in Context

While admissions officers seek to understand an applicant's academic performance relative to their environment, they also see value in examining performance relative to their high school peers. One method to assess relative performance is by considering an applicant's test score compared to typical scores of all students from their high school. This allows admissions practitioners to identify high performing students, who may otherwise be unnoticed if their test score was not presented within high school test averages. Table 10 contains the descriptive statistics for students disaggregated by quartiles based on their SAT performances relative to the students within their high schools. Students in the bottom 25% on the SAT within their high schools had the lowest mean SAT scores and HSGPAs, and they also had the lowest mean FYGPAs and retention rates to the second year in college. Moving up through the high school SAT quartiles, mean SAT scores, HSGPAs, FYGPAs, and retention rates increased, with students in the top 25% having the highest means and retention rates.

Table 10: Descriptive Statistics for Students Categorized by Their SAT Performance Relative to Their High School Peers

HS SAT Quartile	*n*	SAT Total Score	HSGPA	FYGPA	Retention Rate
High (Top 25%)	81,870	1291 (125)	3.87 (0.39)	3.20 (0.75)	87%
Mid-High (Second 25%)	54,505	1161 (115)	3.63 (0.44)	2.99 (0.80)	83%
Low-Mid (Third 25%)	34,615	1073 (113)	3.45 (0.46)	2.84 (0.83)	79%
Low (Bottom 25%)	17,187	966 (117)	3.24 (0.48)	2.67 (0.85)	76%

The fact that, on average, high-performing high school students earn higher mean FYGPAs and have higher retention rates in college than do their former high school classmates is consistent with what is found within colleges and universities. Extensive validity research has shown that within a college and university, students who enter with higher SAT scores and HSGPAs tend to earn higher FYGPAs and have higher retention rates, and students who enter with lower SAT scores and HSGPAs tend to earn lower FYGPAs and have lower retention rates (Bridgeman, McCamley-Jenkins, & Ervin, 2000; Mattern & Patterson, 2014; Westrick et al., 2019; Zwick, 2006). A question that emerges, however, is whether students' superior performance as measured by the SAT and HSGPA within their high schools overrides their performance on these two measures relative to their college peers. Specifically for this study, we wanted to determine whether it is more important in college to have been among the best in your high school on the SAT, or whether it is more important in college to be among the best in your college on the SAT, at least in regard to grades earned in the first year of college? To explore this question, we further categorized the students into quartiles based on the SAT total scores relative to their peers within their colleges and universities. This allowed us to place students into one of 16 categories accounting for their SAT performances relative to both their high school peers and their college peers.

Table 11 contains descriptive statistics for students categorized by the SAT performance relative to their high school peers as well as their college peers. Going from left to right in the table, within the High School SAT Quartiles, students' FYGPAs are lowest for students in the bottom College SAT Quartile and highest for students in the top College SAT Quartile, and in three out of four high school SAT quartiles, retention rates also increased as quartile increased.[9] Within the SAT College Quartile columns, going from bottom to top, as High School SAT Quartiles increased, so did mean FYGPAs and retention rates.

[9] As the students were grouped according to their SAT scores, the mean SAT scores also increased when going from left to right for each high school SAT Quartile. HSGPA, on the other hand, appeared to have no relationship with the other three measures. Whereas FYGPAs and retention rates increased in tandem with SAT scores, HSGPA was relatively flat or fluctuated up and down. Within the Mid-High (Second 25%) High School SAT Quartile, mean HSGPAs actually decreased as mean SAT scores, FYGPAs, and retention rates increased.

Table 11: Descriptive Statistics for Students Categorized by Their SAT Performance Relative to Their High School Peers and Their College Peers

		College SAT Quartile			
	High School SAT Quartile	Low (Bottom 25%)	Low-Mid (Third 25%)	Mid-High (Second 25%)	High (Top 25%)
Number of Students	High (Top 25%)	6,753	13,983	22,601	38,533
	Mid-High (Second 25%)	11,440	16,596	17,385	9,084
	Low-Mid (Third 25%)	13,692	12,524	6,718	1,681
	Low (Bottom 25%)	12,555	3,575	873	184
HSGPA	High (Top 25%)	3.84	3.87	3.85	3.89
	Mid-High (Second 25%)	3.69	3.64	3.61	3.59
	Low-Mid (Third 25%)	3.49	3.43	3.41	3.43
	Low (Bottom 25%)	3.25	3.21	3.19	3.31
SAT Total Score	High (Top 25%)	1124	1212	1269	1363
	Mid-High (Second 25%)	1067	1140	1188	1269
	Low-Mid (Third 25%)	1010	1083	1144	1241
	Low (Bottom 25%)	931	1040	1119	1238
FYGPA	High (Top 25%)	2.83	3.04	3.15	3.36
	Mid-High (Second 25%)	2.81	2.95	3.05	3.19
	Low-Mid (Third 25%)	2.73	2.86	2.97	3.12
	Low (Bottom 25%)	2.61	2.78	2.90	3.19
FYGPA (z score)	High (Top 25%)	-0.56	-0.16	0.07	0.41
	Mid-High (Second 25%)	-0.40	-0.10	0.10	0.31
	Low-Mid (Third 25%)	-0.36	-0.09	0.10	0.28
	Low (Bottom 25%)	-0.38	-0.10	0.07	0.37
Retention Rate	High (Top 25%)	84%	87%	87%	88%
	Mid-High (Second 25%)	83%	83%	82%	83%
	Low-Mid (Third 25%)	78%	79%	79%	83%
	Low (Bottom 25%)	75%	76%	79%	87%

As mean FYGPAs vary across institutions, we calculated a z-score for FYGPA for each student at the institution-level to determine how students performed relative to their peers within the same institution. To get a student's FYGPA z-score, the mean FYGPA at the student's institution was subtracted from the student's FYGPA, and the difference was divided by the institution's standard deviation for FYGPA. With the mean set at zero (and the standard deviation set at one), a positive z-score indicates that the student's FYGPA was above institutional average, and a negative z-score indicates that a student's mean FYGPA was below the institutional average. For the 16 subgroups in Table 11, FYGPA z-scores were averaged at the institution level, and then each mean was weighted by the number of students in the subgroup at the institution. For each of the subgroups, the weights were summed across institutions and divided by the total number students within the subgroup across institutions to get the average FYGPA z-score. In Table 11, going from left (College SAT Quartile = Low) to right (College SAT Quartile = High), within high school SAT quartiles, the z-scores go from negative (below average) and increase in each cell to the right, with the highest positive (above average) z-scores in the far-right column. In contrast, when going from bottom to top within college SAT Quartiles, there is

no clear pattern in FYGPA z-scores as high school SAT quartile increases.[10] These patterns suggest that students' relative standing among their college peers on the SAT is more relevant than their relative standing among their high school peers on the SAT in regard to their academic performance in college. In other words, with regard to FYGPA, it is more important to have been among the best in your college on the SAT than it was to have been among the best in your high school on the SAT.

As for retention rates, going from left to right across college SAT quartiles within high school SAT quartiles in Table 11, retention rates were generally level for the top two high school SAT quartiles. For students in the third high school SAT quartile, retention rates were generally level across the first three College SAT quartiles, with a slight increase for the students in the top 25% at their college. For students in the lowest high school SAT quartile, retention rates gradually increased as students standing on the SAT increased within their college. Going from bottom to top—within college SAT quartiles and across high school SAT quartiles—the retention rates trend upwards in the first three columns, and the same trend was seen among students in the top college SAT quartile (with the exception of the smallest subgroup (n=184), students in the bottom high school SAT quartile and highest college SAT quartile).

The current results suggest that there may be a relationship between how students ranked on the SAT within their high schools and their persistence in college, more so than how they ranked on the SAT within their colleges. However, the interpretation of these results is difficult given that it has been established earlier in this report as well as previous research (Marini et al., 2019), that retention rates tend to be higher at more-selective institutions, and that more-selective institutions enroll students with higher SAT scores and HSGPAs.[11]

Table 12 shows the average differences in predicted versus actual FYGPAs (residuals) for the 16 subgroups. Within high school SAT quartiles, going from left to right across college SAT quartiles, the general trend is that residuals for both HSGPA and the SAT go from negative (overprediction) to positive (underprediction).[12] At the institution level, as noted earlier, there are no residuals from the overall regression analysis, and residuals are only found once students within the institution are subdivided in some way, such as Context Quintiles. The pattern across college SAT quartiles, then, may mean that students in the lower college SAT quartiles belong to subgroups whose FYGPAs tend to be overpredicted and the students in the upper college SAT quartiles belong to subgroups whose FYGPAs tend to be underpredicted. We will return to this shortly. Also note that the residuals for the SAT were relatively stable across the college SAT quartiles, ranging from -0.11 to 0.09, but the HSGPA residuals were more volatile, ranging from -0.34 to 0.43. Moreover, in 13 of the 16 subgroups, the SAT residual was smaller

[10] The small differences within college SAT quartile columns may be due to differential course taking, as students with higher SAT scores may be taking more STEM courses. This can be explored in future research.

[11] Additional analyses broken out by institutional admission rates would result in small numbers of students within some of the cells and the results would have to be interpreted with caution. Future research in this topic is needed.

[12] The one exception is the Low-Mid high school SAT quartile where the residuals are always positive, but the direction of change for these residuals follows the same pattern as the others where the greatest amount of underprediction is for the students in the top quartile of their college's SAT distribution.

(more accurate) than the HSGPA residual. This underscores the difference of the two measures, with HSGPA being a local measure that varies more within high schools than it does across high schools (Zwick & Greif-Green, 2007) and the SAT being a standardized measure with the same meaning regardless of where a student resides or went to high school. This is another topic we will return to later.

Table 12: Overprediction (-) and Underprediction (+) of FYGPA for Students Categorized by their SAT Performance Relative to Their High School Peers and Their College Peers

		College SAT Quartile			
HS SAT Quartile		Low (Bottom 25%)	Low-Mid (Third 25%)	Mid-High (Second 25%)	High (Top 25%)
High (Top 25%)	HSGPA Residual	-0.34	-0.14	-0.01	0.18
	SAT Residual	-0.11	-0.05	-0.03	0.00
	SAT + HSGPA Residual	-0.14	-0.08	-0.06	-0.02
Mid-High (Second 25%)	HSGPA Residual	-0.24	-0.06	0.07	0.22
	SAT Residual	-0.02	0.00	0.01	0.01
	SAT + HSGPA Residual	-0.05	-0.01	0.02	0.06
Low-Mid (Third 25%)	HSGPA Residual	0.01	0.01	0.15	0.28
	SAT Residual	0.02	0.03	0.03	0.00
	SAT + HSGPA Residual	0.01	0.06	0.10	0.11
Low (Bottom 25%)	HSGPA Residual	-0.11	0.10	0.24	0.43
	SAT Residual	0.08	0.04	0.02	0.09
	SAT + HSGPA Residual	0.10	0.15	0.18	0.26

Of special interest were the students whose SAT scores were in the top 25% of the students in their high school but were in the bottom 25% of the students at their college. As shown in Table 11, these students numbered 6,753, 71% of which were in Context Quintiles 4 or 5 (high challenge) and attended 121 of the 156 institutions included in the study. These students had a mean HSGPA of 3.84 (versus 3.67 for the full sample), a mean SAT total score of 1124 (sample mean=1184), and a mean FYGPA of 2.83 (sample mean=3.03). Compared to the students whose SAT scores placed them in the top 75% of SAT scores at their institutions, the 12 subgroups found in the three columns on the right of Table 11, the students in the top 25% of their high schools and bottom 25% of their colleges had a higher mean FYGPA than that for only one of the 12 subgroups. Although these means are aggregated across institutions with different grading standards and mean FYGPAs, this suggests that how students compared with their college peers on the SAT was more important than how they compared with their high school peers in regard to predicting their college-level academic performance. Again, this indicates that in regard to college performance, it is more important to have been among the best in your college on the SAT, than it was to have been among the best in your high school on the SAT.

When using mean FYGPA z-scores instead of mean FYGPA as our metric (Table 11), the picture of students whose SAT Total scores were in the top 25% of their high school but in the bottom 25% of their college is much the same. Of the 16 subgroups, these students had the lowest mean FYGPA z-score,

-0.56, more than half a standard deviation below the average FYGPA at their institutions. At an institution where the mean FYGPA was 3.00 and the standard deviation was 0.80, a student with a FYGPA z-score of -0.56 would have an FYGPA of 2.55.

In sum, the students whose SAT Total scores were in the top 25% of the students in their high school on the SAT but were in the bottom 25% of the students at their college on the SAT had not performed as well as or better than their college peers who had entered college with higher SAT scores. Moreover, these students did not perform as well as predicted. As shown in Table 12, the residuals for these students were -0.34, -0.11, and -0.14 using the HSGPA alone, SAT alone, and joint SAT and HSGPA models, respectively, to predict FYGPA. The SAT and especially HSGPA overpredicted their academic performance in the first year of college. The silver lining of these analyses was that the students in this specific subgroup had an 84% retention rate, slightly above the sample average of 83%, despite having a below average FYGPA. So, while these students had relatively weaker performance in college, they were persisting to the second year at respectable rates.

Discussion

It is difficult to overemphasize the importance of students' environmental information when considering and contextualizing academic performance in high school in order to understand student success in college. Though it has been well established that the SAT and HSGPA predict FYGPA and that FYGPA predicts retention, a key contribution of this study has been the inclusion of Landscape or environmental context data, to further contextualize and add value to SAT and HSGPA information utilized across enrollment management offices.

Notably, context information from Landscape was more informative for contextualizing student performance in college than student race/ethnicity. Students from underrepresented groups who came from low-challenge environments enter college with lower HSGPAs but higher SAT scores than do students from high-challenge environments who are not from underrepresented groups (Tables A 18 and A 19). The students from underrepresented groups who came from low-challenge environments also earn higher FYGPAs and have higher retention rates than do students from high-challenge environments who are not from underrepresented groups.

This study also showed that challenge level moderates the SAT-FYGPA and HSGPA-FYGPA relationships, especially the HSGPA-FYGPA relationship. As college academic performance is so positively related to retention, it is critical that institutions predict FYGPA as accurately as possible so they can identify students who may struggle academically in their first year of college. Using an overall regression model to predict FYGPA to estimate the predicted performance of each student given their SAT scores and HSGPA results in students with the same SAT scores and HSGPAs having the same predicted FYGPA. However, challenge levels moderate the SAT-FYGPA and HSGPA-FYGPA relationships, and the HSGPA-FYGPA relationship in particular**.** First-year GPAs for students from low-challenge environments tend to be underpredicted. That is, students from low-challenge environments tend to earn grades higher than they were predicted to earn based on their HSGPAs and SAT scores. At the

other extreme, FYGPAs for students from high-challenge environments tend to be overpredicted. That is, students from high-challenge environments tend to earn FYGPAs that are lower than what they were predicted to earn based on their HSGPAs and SAT scores.

We want to reiterate that the amount of overprediction of FYGPA tends to increase as the level of challenge increases, especially when HSGPA is used alone to predict FYGPA. As this study has shown, using the SAT alone or with HSGPA almost always provided a more accurate prediction of FYGPA than did using HSGPA alone. This is critical for institutions considering test-optional or test-blind admission policies because they are missing key predictors of FYGPA. Students who have predicted FYGPAs that are lower than average are expected to have retention rates that are lower than average, and when their actual FYGPAs are even lower than predicted, their retention rates may also be lower than predicted, especially when using HSGPA alone to predict future academic performance. **The combination of HSGPA, SAT scores, and Landscape information provides institutions with the most accuracy in identifying students who may benefit from advising and other supports that can increase the students' levels of academic success and, ultimately, retention.**

Given the mission-driven goal of enrolling more students from low-resourced environments, it is key that appropriate supports be in place to help ensure their retention. Data reveal that students from high-challenge environments will, on average, 1) enter college with lower SAT scores than those of their peers, 2) be predicted to earn lower FYGPAs than those of their peers, 3) earn grades that are lower than what was already predicted, and 4) ultimately have lower retention rates. **This awareness should NOT serve as a barrier to providing these students with the opportunity to study at an institution but inform possible educational resources that can best position students from more challenging high school and neighborhood environments to be successful on campus.** Previous research has highlighted some of the challenges that first-generation and low-income students face (Kopp & Shaw, 2016), and some promising interventions that may boost academic performance and retention (Tinto, 2012).

Though challenge levels proved to be a valuable tool for understanding and contextualizing students' academic performance and retention rates, we also want to remind readers that actual grades earned in college were more important for retention than was context information based on their high school and neighborhood information. Of course context information from Landscape is available upon arrival to campus to help with proactive supports and interventions while a FYGPA is earned over time. As shown in Table 7, students with high FYGPAs who came from high-challenge environments had retention rates higher than or as high as those for students with lower FYGPAs who came from low-challenge environments. The problem is that although some students from high-challenge environments earn high FYGPAs, most of these students do not earn high FYGPAs. They earn low FYGPAs, lower than predicted. This is critical because academic performance is the best predictor of student retention (Pascarella & Terenzini, 2005), and the results of this study confirm this. Furthermore, academic performance is a strong predictor of degree completion (Adelman, 2006), which is the ultimate goal for most students. It has been stated that granting access to higher education to underprepared students without providing them with support is not really providing them an equal opportunity to succeed (Engstrom & Tinto, 2008). Closing graduation gaps is a desirable outcome, but students from high-challenge environments

who graduate with low GPAs may find themselves facing limited access to both jobs and graduate programs. **Opening up employment opportunities and access to prestigious graduate programs that have stringent college GPA requirements to students/graduates from challenging environments is also a worthy endeavor for institutions to monitor and support.**

Finally, the SAT in Context analyses provided valuable information on a specific subgroup of students, students whose SAT Total scores were in the top 25% of the students in their high school on the SAT but were in the bottom 25% of the students at their college on the SAT. This is an important group to consider because although their scores may be weaker for the institution, their performance surpasses that of their high school peers. The question is what this additional layer of performance information might tell us about the student. For FYGPA, where these students ranked on the SAT among their *college* peers was more important than where they ranked on the SAT among their high school peers, as seen by their lower FYGPAs overall and relative to their peers within their institutions. For students accustomed to being among the best students through high school, the increased difficulty of college coursework and competition with other highly capable students for grades may be unsettling, and "without a belief in one's ability to succeed, even students with the ability to do so may struggle in college and become discouraged (Tinto, 2015, p. 4)."[13] However, **their retention rate (84%) was slightly higher than the study average (83%). Perhaps it is the success they had in high school that contributed to their second-year persistence in spite earning FYGPAs that were a full letter-grade below their HSGPAs on average.** Perhaps a noncognitive factor that was not measured in this study, be it called self-efficacy, grit, persistence, or drive, contributed to their desire to continue working toward a degree. Regardless of the reason, this is a promising finding that there is additional SAT performance-related information to be garnered, beyond the score itself, and to be applied toward helping students plan for and ultimately achieve success in their higher education goals. Further institution-specific research in this area could prove useful.

Conclusion

Findings from the current study validate the use of the SAT, HSGPA, and Landscape context information for campus retention analyses, critical academic advising conversations, and related resource allocation on campus. This study has shown that neighborhood and high school context information moderates the SAT-FYGPA and HSGPA-FYGPA relationships, especially the HSGPA-FYGPA relationship. The added contextual information from Landscape allows institutions to use the SAT and HSGPA more effectively to understand how students are expected to perform and know which students may need more focused support to be most successful.

The SAT in Context analyses showed that students with low SAT scores at their college but with top-tier SAT scores at their high schools tended to come from high-challenge environments, and though their

[13] However, self-efficacy does not automatically lead to success. Tinto (2015, p. 4) went on to add, "Conversely, even a strong belief in one's ability to succeed at a particular task does not ensure success in that task if the student does not possess the academic skills required to do so."

HSGPAs may have equaled those of their college peers, these students from high-challenge environments had lower SAT scores and earned lower FYGPAs. The silver lining was that these students had slightly above average retention rates despite having below average FYGPAs. This is an interesting finding deserving further research.

Having an awareness of which students may struggle academically on campus is important because there are later consequences for students who do not excel but continue to persist toward their degree. Students may encounter reduced opportunities to enter preferred majors or degree programs. Come graduation, low GPAs may result in reduced opportunities for employment or graduate school. While admitting students from high-challenge environments to college provides important educational and life opportunities for them that are also typically mission-driven, it is equally important to ensure the institutional capability to provide the appropriate academic support so that these opportunities can be fully realized.

We believe that information from this study and previous research on the SAT can help institutions achieve these goals. Colleges can use SAT scores and Landscape information to identify admitted students from high-challenge environments who may benefit from enhanced academic support or guidance to ease the transition from high school to college and support their successful path to degree completion.

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Appendix A: Descriptive Statistics by Outcome Sample

Table A 1: Number of Students, Mean FYGPAs and Retention Rates by HSGPA and SAT Total Score Bands

		SAT Total Score Band					
	HSGPA	600-790	800-990	1000-1190	1200-1390	1400-1600	Overall
Number of Students	A+	24	588	4,931	11,526	5,829	22,898
	A	132	3,054	18,348	27,397	8,716	57,649
	A-	166	4,475	20,455	18,877	3,249	47,224
	B+	285	5,955	15,946	8,361	805	31,355
	B	281	4,891	10,231	3,567	299	19,269
	B-	170	2,257	3,270	834	54	6,587
	C+ or lower	153	1,292	1,447	291		3,195
	Overall	1,211	22,512	74,628	70,853	18,964	188,177
FYGPA	A+	2.24	2.81	3.24	3.47	3.67	3.45
	A	2.42	2.77	3.12	3.35	3.55	3.28
	A-	2.35	2.67	2.98	3.18	3.34	3.05
	B+	2.20	2.52	2.76	2.97	3.07	2.77
	B	2.16	2.40	2.56	2.70	2.83	2.54
	B-	2.04	2.24	2.30	2.47	2.55	2.30
	C+ or lower	1.85	2.04	2.08	2.13		2.06
	Overall	2.17	2.51	2.88	3.23	3.51	3.03
Retention Rate	A+	58%	80%	88%	91%	94%	91%
	A	73%	77%	85%	91%	93%	89%
	A-	71%	75%	83%	88%	91%	85%
	B+	65%	72%	78%	84%	87%	78%
	B	65%	69%	74%	78%	82%	73%
	B-	62%	65%	67%	73%	81%	67%
	C+ or lower	52%	60%	60%	62%		60%
	Overall	64%	72%	80%	88%	93%	83%

Note. Cells with less than 15 students were excluded (e.g., SAT Total Score Band 400-590).

Table A 2: Sample Sizes by Institution Characteristics and SAT Total Score Bands

Subgroup		*k*	n	600-790	800-990	1000-1190	1200-1390	1400-1600
Control	Private not for profit	81	38,236	171	3,505	13,149	14,925	6,485
	Public	75	149,941	1,040	19,007	61,479	55,928	12,479
Admittance Rate	Under 25%	16	9,971		106	1,166	3,772	4,924
	25% to 50%	29	38,636	117	2,204	10,216	19,276	6,822
	51% to 75%	65	93,491	587	11,820	40,642	34,837	5,599
	Over 75%	46	46,079	504	8,382	22,604	12,968	1,619
Undergraduate Enrollment Size	Small	61	18,994	237	3,377	8,298	5,672	1,410
	Medium	28	21,012	278	4,694	9,803	5,443	793
	Large	27	34,292	238	4,115	13,013	12,493	4,431
	Very large	40	113,879	458	10,326	43,514	47,245	12,330
Overall		156	188,177	1,211	22,512	74,628	70,853	18,964

Note. Cells with less than 15 students were excluded (e.g., SAT Total Score Band 400-590).

Table A 3: Mean FYGPAs and Retention Rates by Institution Characteristics and SAT Total Score Bands

		Mean FYGPA by SAT Total Score Band						Mean Retention Rate by SAT Total Score Band				
Subgroup		600-790	800-990	1000-1190	1200-1390	1400-1600		600-790	800-990	1000-1190	1200-1390	1400-1600
Control	Private not for profit	2.28	2.65	3.02	3.31	3.54		64%	74%	81%	89%	93%
	Public	2.15	2.48	2.85	3.21	3.50		65%	71%	80%	88%	93%
Admittance Rate	Under 25%		2.54	2.95	3.29	3.54			92%	93%	94%	94%
	25% to 50%	2.19	2.53	2.93	3.22	3.49		68%	76%	85%	90%	93%
	51% to 75%	2.24	2.52	2.87	3.24	3.51		67%	73%	80%	88%	92%
	Over 75%	2.07	2.49	2.87	3.23	3.57		61%	69%	77%	84%	89%
Undergraduate Enrollment Size	Small	2.06	2.51	2.95	3.32	3.55		57%	69%	79%	88%	92%
	Medium	2.07	2.43	2.90	3.27	3.55		60%	70%	78%	86%	93%
	Large	2.29	2.54	2.89	3.23	3.53		71%	71%	79%	87%	92%
	Very large	2.22	2.53	2.86	3.22	3.50		68%	73%	81%	89%	93%
Overall		2.17	2.51	2.88	3.23	3.51		64%	72%	80%	88%	93%

Note. Cells with less than 15 students were excluded (e.g., SAT Total Score Band 400-590).

Table A 4: Number of Students and Retention Rates by Student Characteristics and SAT Total Score Bands

			Number of Students by SAT Total Score Bands				
Subgroup		Overall	600-790	800-990	1000-1190	1200-1390	1400-1600
Gender	Female	107,343	780	15,309	45,960	37,470	7,818
	Male	80,834	431	7,203	28,668	33,383	11,146
Race/ Ethnicity	American Indian or Alaska Native	577		106	309	139	
	Asian	17,940	54	1,027	4,507	8,152	4,200
	Black or African American	13,612	369	3,892	6,434	2,634	281
	Hispanic or Latino	39,370	455	7,801	18,427	10,955	1,730
	Native Hawaiian or Other Pacific Islander	247		34	116	76	19
	Two or more races	7,148	24	588	2,508	3,057	971
	White	106,732	259	8,489	41,216	45,149	11,615
	No response	2,551	39	575	1,111	691	135
Highest Parental Education Level Completed	Graduate Degree	52,762	102	2,793	15,548	24,294	10,024
	Bachelor's Degree	68,637	249	5,826	27,068	28,776	6,715
	Associate Degree	13,438	104	2,302	6,532	3,989	510
	High School Diploma	40,324	424	7,779	19,406	11,264	1,449
	No High School Diploma	10,461	244	3,008	4,968	2,037	203
	No Response	2,555	88	804	1,106	493	63
Best Language	English Only	158,212	804	16,763	62,136	61,938	16,565
	English and Another	27,139	336	5,209	11,553	7,971	2,068
	Another	1,991	43	356	600	719	272
Overall		188,177	1,211	22,512	74,628	70,853	18,964

Note. Cells with less than 15 students were excluded (e.g., SAT Total Score Band 400-590).

Table A 5: Mean FYGPAs and Retention Rates by Student Characteristics and SAT Total Score Bands

		Mean FYGPAs by SAT Total Score Bands						Mean Retention Rates by SAT Total Score Bands				
Subgroup		600-790	800-990	1000-1190	1200-1390	1400-1600		600-790	800-990	1000-1190	1200-1390	1400-1600
Gender	Female	2.24	2.59	3.01	3.37	3.62		66%	73%	82%	90%	94%
	Male	2.03	2.33	2.67	3.08	3.44		62%	69%	77%	86%	92%
Race/ Ethnicity	American Indian or Alaska Native		2.26	2.69	3.04				68%	74%	86%	
	Asian	2.13	2.64	2.94	3.21	3.49		65%	78%	83%	90%	92%
	Black or African American	2.11	2.39	2.71	3.08	3.26		66%	71%	81%	88%	92%
	Hispanic or Latino	2.19	2.48	2.79	3.12	3.37		67%	73%	80%	87%	92%
	Native Hawaiian or Other Pacific Islander		2.19	2.60	3.01	3.38			50%	72%	88%	89%
	Two or more races	2.41	2.34	2.81	3.17	3.52		83%	68%	79%	89%	94%
	White	2.19	2.59	2.95	3.28	3.55		56%	71%	80%	88%	93%
	No response	2.17	2.43	2.79	3.09	3.49		72%	69%	77%	84%	93%
Highest Parental Education Level Completed	Graduate Degree	2.31	2.61	2.96	3.29	3.55		72%	75%	83%	89%	93%
	Bachelor's Degree	2.29	2.60	2.95	3.26	3.51		66%	73%	82%	89%	93%
	Associate Degree	2.05	2.49	2.83	3.15	3.44		67%	71%	77%	85%	91%
	High School Diploma	2.08	2.43	2.77	3.11	3.34		62%	69%	77%	86%	92%
	No High School Diploma	2.18	2.50	2.76	3.08	3.29		64%	73%	80%	88%	87%
	No Response	2.14	2.42	2.72	3.06	3.09		60%	70%	77%	85%	86%
Best Language	English Only	2.14	2.51	2.89	3.24	3.53		63%	71%	80%	88%	93%
	English and Another	2.21	2.51	2.81	3.15	3.43		68%	75%	81%	88%	91%
	Another	2.30	2.64	2.90	3.16	3.36		72%	71%	77%	80%	79%
Overall		2.17	2.51	2.88	3.23	3.51		64%	72%	80%	88%	93%

Note. Cells with less than 15 students were excluded (e.g., SAT Total Score Band 400-590).

Table A 6: Sample Sizes, Mean FYGPAs and Retention Rates by Context Quintiles and SAT Total Score Bands

		SAT Total Score Band				
	Context Quintile	600-790	800-990	1000-1190	1200-1390	1400-1600
Number of Students	1	111	3,799	21,469	29,901	10,751
	2	128	3,687	16,715	17,682	4,527
	3	144	4,198	14,816	12,425	2,313
	4	233	4,449	11,880	7,462	1,108
	5	595	6,379	9,748	3,383	265
	Overall	1,211	22,512	74,628	70,853	18,964
FYGPA	1	2.42	2.67	2.98	3.28	3.54
	2	2.21	2.61	2.92	3.25	3.50
	3	2.18	2.51	2.87	3.20	3.47
	4	2.18	2.48	2.81	3.15	3.45
	5	2.10	2.38	2.70	3.03	3.27
	Overall	2.17	2.51	2.88	3.23	3.51
Retention Rate	1	74%	75%	82%	89%	93%
	2	63%	73%	81%	89%	92%
	3	65%	71%	79%	88%	92%
	4	61%	70%	79%	86%	92%
	5	65%	70%	78%	85%	89%
	Overall	64%	72%	80%	88%	93%

Table A 7: Sample Sizes, Mean FYGPA and Retention Rates by Context Quintiles and HSGPA

		HSGPA						
	Context Quintile	C+ or lower	B-	B	B+	A-	A	A+
Number of Students	1	959	2,240	7,098	11,435	17,562	19,945	6,795
	2	615	1,267	3,923	6,736	10,850	13,744	5,604
	3	540	1,109	3,222	5,251	8,244	10,793	4,738
	4	470	925	2,528	4,011	5,966	7,683	3,551
	5	611	1,046	2,498	3,922	4,602	5,484	2,210
	Overall	3,195	6,587	19,269	31,355	47,224	57,649	22,898
FYGPA	1	2.23	2.43	2.69	2.97	3.23	3.45	3.59
	2	2.11	2.33	2.57	2.80	3.09	3.32	3.51
	3	2.00	2.22	2.48	2.69	2.96	3.22	3.43
	4	1.90	2.22	2.40	2.59	2.86	3.11	3.36
	5	1.92	2.12	2.30	2.45	2.68	2.90	3.11
	Overall	2.06	2.30	2.54	2.77	3.05	3.28	3.45
Retention Rate	1	65%	70%	77%	83%	88%	92%	92%
	2	62%	67%	74%	80%	85%	89%	93%
	3	57%	66%	71%	75%	83%	87%	90%
	4	54%	66%	70%	74%	81%	85%	89%
	5	56%	62%	68%	72%	78%	83%	86%
	Overall	60%	67%	73%	78%	85%	89%	91%

Table A 8: Means (SDs) for Measures of Interest and Retention Rates, by Institutional Control and Students' Context Quintiles

Control	Context Quintile	*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention Rate
Private not-for-profit	1	18,411	629 (82)	627 (93)	1256 (164)	3.68 (0.45)	3.27 (0.63)	88%
	2	9,062	613 (84)	604 (92)	1216 (164)	3.73 (0.46)	3.19 (0.69)	86%
	3	5,653	600 (84)	588 (91)	1188 (163)	3.74 (0.47)	3.09 (0.74)	83%
	4	3,328	589 (84)	576 (90)	1165 (160)	3.75 (0.48)	3.01 (0.78)	80%
	5	1,782	561 (86)	551 (88)	1112 (161)	3.68 (0.51)	2.84 (0.80)	79%
Public	1	47,623	616 (74)	616 (86)	1232 (147)	3.64 (0.46)	3.16 (0.75)	86%
	2	33,677	602 (76)	596 (85)	1198 (147)	3.69 (0.46)	3.06 (0.79)	85%
	3	28,244	587 (77)	578 (84)	1165 (148)	3.69 (0.47)	2.96 (0.83)	82%
	4	21,806	570 (78)	557 (84)	1127 (149)	3.67 (0.49)	2.86 (0.87)	80%
	5	18,591	532 (77)	521 (80)	1054 (144)	3.58 (0.51)	2.62 (0.91)	76%

Table A 9: Means (SDs) for Measures of Interest and Retention Rates, by Institutional Admittance Rates and Students' Context Quintiles

Admittance Rate	Context Quintile	*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention Rate
Under 25%	1	4,606	701 (57)	713 (66)	1415 (111)	3.97 (0.30)	3.49 (0.45)	94%
	2	2,036	692 (59)	697 (71)	1389 (117)	4.02 (0.30)	3.40 (0.50)	94%
	3	1,267	674 (65)	676 (76)	1350 (128)	4.03 (0.30)	3.31 (0.55)	94%
	4	1,036	655 (68)	649 (81)	1304 (136)	4.02 (0.30)	3.19 (0.57)	93%
	5	1,026	604 (68)	593 (79)	1197 (133)	3.98 (0.31)	2.96 (0.60)	92%
25% to 50%	1	14,725	652 (65)	661 (76)	1313 (126)	3.83 (0.36)	3.31 (0.58)	91%
	2	8,618	633 (73)	635 (83)	1269 (140)	3.87 (0.37)	3.19 (0.64)	89%
	3	6,484	616 (75)	616 (85)	1232 (144)	3.86 (0.38)	3.07 (0.68)	87%
	4	4,689	597 (75)	597 (85)	1194 (144)	3.85 (0.39)	2.98 (0.68)	86%
	5	4,120	557 (76)	551 (83)	1107 (145)	3.78 (0.42)	2.76 (0.73)	83%
51% to 75%	1	29,895	610 (72)	608 (81)	1217 (139)	3.62 (0.45)	3.17 (0.74)	86%
	2	21,260	599 (72)	589 (80)	1188 (138)	3.67 (0.45)	3.07 (0.79)	85%
	3	17,906	585 (75)	572 (79)	1157 (140)	3.67 (0.47)	2.97 (0.84)	82%
	4	13,705	567 (76)	552 (79)	1119 (141)	3.65 (0.49)	2.86 (0.88)	80%
	5	10,725	529 (76)	517 (77)	1046 (139)	3.54 (0.51)	2.61 (0.94)	75%
Over 75%	1	16,808	585 (73)	578 (80)	1163 (140)	3.47 (0.49)	3.03 (0.80)	81%
	2	10,825	576 (75)	564 (80)	1140 (141)	3.55 (0.49)	2.98 (0.84)	80%
	3	8,240	566 (77)	552 (81)	1117 (144)	3.57 (0.51)	2.89 (0.89)	76%
	4	5,704	549 (77)	532 (80)	1080 (143)	3.53 (0.53)	2.78 (0.95)	73%
	5	4,502	514 (74)	500 (74)	1013 (135)	3.43 (0.56)	2.54 (1.01)	70%

Table A 10: Means (SDs) for Measures of Interest and Retention Rates, by Control, Admittance Rates, and Context Quintiles

Control	Admittance Rate	Context Quintile	*n*	ERW	Math	SAT	HSGPA	FYGPA	Retention Rate
Private not-for-profit	Under 25%	1	3,891	702 (57)	714 (66)	1416 (111)	3.97 (0.30)	3.49 (0.45)	94%
		2	1,415	696 (59)	701 (72)	1397 (118)	4.01 (0.31)	3.40 (0.52)	93%
		3	782	683 (64)	687 (72)	1370 (122)	4.04 (0.31)	3.31 (0.56)	92%
		4	477	677 (63)	669 (77)	1346 (126)	4.06 (0.31)	3.22 (0.60)	93%
		5	282	642 (69)	638 (77)	1280 (131)	4.00 (0.32)	3.08 (0.54)	94%
	25% to 50%	1	6,073	645 (67)	644 (78)	1288 (130)	3.74 (0.39)	3.31 (0.57)	89%
		2	2,753	627 (77)	617 (85)	1244 (147)	3.78 (0.42)	3.23 (0.66)	87%
		3	1,634	613 (77)	601 (86)	1214 (148)	3.76 (0.44)	3.09 (0.75)	84%
		4	973	598 (78)	590 (85)	1189 (148)	3.80 (0.44)	3.07 (0.72)	82%
		5	516	573 (77)	562 (80)	1135 (142)	3.72 (0.45)	2.90 (0.73)	85%
	51% to 75%	1	5,291	589 (74)	579 (81)	1168 (141)	3.55 (0.45)	3.17 (0.68)	85%
		2	3,014	588 (74)	574 (80)	1162 (138)	3.64 (0.45)	3.11 (0.71)	84%
		3	1,946	579 (79)	562 (79)	1141 (144)	3.66 (0.46)	3.02 (0.76)	81%
		4	1,179	565 (75)	547 (78)	1112 (138)	3.66 (0.48)	2.92 (0.80)	78%
		5	623	532 (78)	521 (76)	1053 (138)	3.59 (0.55)	2.74 (0.85)	70%
	Over 75%	1	3,156	575 (70)	566 (75)	1142 (131)	3.43 (0.49)	3.10 (0.73)	82%
		2	1,880	569 (74)	557 (74)	1127 (133)	3.59 (0.50)	3.12 (0.75)	82%
		3	1,291	564 (75)	549 (76)	1113 (137)	3.65 (0.51)	3.07 (0.78)	78%
		4	699	556 (71)	540 (71)	1096 (126)	3.65 (0.52)	2.93 (0.89)	72%
		5	361	530 (78)	518 (77)	1049 (140)	3.52 (0.53)	2.73 (0.91)	73%
Public	Under 25%	1	715	697 (56)	711 (69)	1408 (112)	3.99 (0.27)	3.51 (0.46)	95%
		2	621	684 (56)	687 (70)	1370 (114)	4.03 (0.27)	3.42 (0.46)	97%
		3	485	658 (65)	659 (80)	1317 (131)	4.03 (0.28)	3.30 (0.53)	96%
		4	559	636 (66)	632 (81)	1268 (134)	3.99 (0.28)	3.17 (0.55)	94%
		5	744	590 (61)	576 (73)	1166 (120)	3.97 (0.31)	2.91 (0.61)	91%
	25% to 50%	1	8,652	658 (63)	673 (73)	1330 (121)	3.89 (0.32)	3.31 (0.59)	92%
		2	5,865	636 (70)	644 (81)	1280 (135)	3.91 (0.33)	3.18 (0.63)	90%
		3	4,850	617 (74)	622 (84)	1238 (142)	3.89 (0.35)	3.06 (0.66)	88%
		4	3,716	597 (74)	598 (85)	1195 (144)	3.86 (0.37)	2.96 (0.66)	87%
		5	3,604	554 (75)	549 (84)	1103 (145)	3.79 (0.41)	2.74 (0.73)	83%
	51% to 75%	1	24,604	614 (70)	614 (80)	1228 (137)	3.64 (0.45)	3.17 (0.75)	86%
		2	18,246	601 (72)	592 (79)	1192 (138)	3.68 (0.45)	3.07 (0.80)	85%
		3	15,960	586 (74)	573 (79)	1159 (139)	3.67 (0.47)	2.96 (0.85)	82%
		4	12,526	567 (76)	553 (79)	1120 (141)	3.65 (0.49)	2.85 (0.89)	80%
		5	10,102	529 (76)	517 (77)	1046 (139)	3.54 (0.50)	2.60 (0.94)	75%
	Over 75%	1	13,652	587 (73)	581 (81)	1168 (141)	3.47 (0.49)	3.02 (0.81)	81%
		2	8,945	577 (76)	565 (81)	1143 (143)	3.54 (0.49)	2.95 (0.86)	79%
		3	6,949	566 (77)	552 (81)	1118 (145)	3.55 (0.51)	2.86 (0.91)	76%
		4	5,005	548 (78)	530 (81)	1078 (145)	3.52 (0.53)	2.76 (0.96)	73%
		5	4,141	512 (74)	498 (74)	1010 (134)	3.42 (0.56)	2.52 (1.01)	69%

Table A 11: Means (SDs) for Measures of Interest and Retention Rates, by Institution Size and Students' Context Quintiles

Institution Size (number of undergraduates)	Context Quintile	*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention
Small (less than 5,000)	1	7,110	600 (84)	590 (89)	1190 (162)	3.55 (0.49)	3.14 (0.71)	85%
	2	4,729	582 (85)	567 (88)	1149 (160)	3.61 (0.50)	3.07 (0.77)	82%
	3	3,572	568 (85)	550 (84)	1118 (157)	3.61 (0.52)	2.95 (0.86)	78%
	4	2,239	557 (85)	536 (84)	1093 (156)	3.61 (0.54)	2.83 (0.92)	73%
	5	1,344	527 (85)	512 (85)	1039 (156)	3.52 (0.58)	2.66 (0.93)	71%
Medium (5,000 to 9,999)	1	7,861	585 (76)	576 (86)	1161 (150)	3.47 (0.50)	3.09 (0.77)	82%
	2	4,392	574 (77)	563 (84)	1137 (149)	3.52 (0.51)	3.00 (0.82)	81%
	3	3,375	556 (78)	542 (84)	1097 (149)	3.51 (0.53)	2.83 (0.89)	76%
	4	2,654	535 (76)	523 (82)	1058 (144)	3.47 (0.55)	2.68 (0.93)	75%
	5	2,730	508 (71)	498 (74)	1006 (131)	3.44 (0.54)	2.49 (0.93)	73%
Large (10,000 to 19,999)	1	14,145	629 (78)	626 (89)	1255 (154)	3.65 (0.46)	3.20 (0.68)	86%
	2	7,712	605 (81)	595 (89)	1200 (157)	3.66 (0.46)	3.08 (0.76)	83%
	3	5,764	586 (80)	573 (87)	1159 (154)	3.64 (0.47)	2.96 (0.82)	80%
	4	4,020	564 (82)	551 (87)	1115 (155)	3.62 (0.49)	2.85 (0.86)	77%
	5	2,651	522 (82)	510 (85)	1032 (155)	3.46 (0.53)	2.60 (0.92)	74%
Very Large (20,000 or more)	1	36,918	627 (72)	631 (84)	1258 (143)	3.71 (0.43)	3.21 (0.72)	88%
	2	25,906	614 (73)	609 (83)	1223 (142)	3.75 (0.43)	3.11 (0.77)	87%
	3	21,186	600 (75)	592 (82)	1192 (142)	3.75 (0.44)	3.01 (0.80)	84%
	4	16,221	582 (76)	571 (83)	1154 (144)	3.74 (0.46)	2.92 (0.83)	83%
	5	13,648	544 (76)	533 (80)	1077 (143)	3.65 (0.49)	2.68 (0.89)	78%

Table A 12: Means (SDs) for Measures of Interest and Retention Rates, by Students' Gender and Context Quintiles

Gender	Context Quintile	*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention Rate
Female	1	35,479	616 (76)	604 (86)	1219 (150)	3.70 (0.44)	3.30 (0.64)	88%
	2	24,085	601 (77)	582 (83)	1183 (147)	3.74 (0.44)	3.19 (0.71)	86%
	3	19,794	585 (77)	564 (81)	1149 (145)	3.73 (0.45)	3.07 (0.77)	83%
	4	15,208	569 (78)	546 (81)	1115 (146)	3.71 (0.47)	2.96 (0.82)	81%
	5	12,777	531 (77)	512 (77)	1043 (141)	3.62 (0.50)	2.72 (0.87)	78%
Male	1	30,555	624 (78)	638 (87)	1261 (152)	3.60 (0.48)	3.06 (0.78)	85%
	2	18,654	609 (79)	617 (87)	1226 (152)	3.65 (0.49)	2.95 (0.83)	83%
	3	14,103	595 (80)	602 (86)	1197 (153)	3.64 (0.50)	2.85 (0.87)	81%
	4	9,926	577 (81)	581 (87)	1159 (154)	3.63 (0.51)	2.75 (0.90)	79%
	5	7,596	541 (80)	545 (84)	1086 (151)	3.54 (0.54)	2.51 (0.95)	73%

Table A 13: Means (SDs) for Measures of Interest and Retention Rates, by Students' Race/Ethnicity and Context Quintiles

Race/Ethnicity	Context Quintile	*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention Rate
American Indian or Alaska Native	1	158	584 (72)	589 (81)	1173 (137)	3.50 (0.53)	2.84 (0.92)	80%
	2	127	570 (64)	563 (70)	1133 (121)	3.64 (0.46)	2.83 (0.89)	80%
	3	104	557 (74)	544 (82)	1100 (140)	3.62 (0.47)	2.68 (0.90)	74%
	4	105	531 (75)	514 (78)	1044 (143)	3.52 (0.52)	2.54 (0.95)	67%
	5	83	511 (69)	496 (78)	1007 (135)	3.58 (0.47)	2.49 (0.94)	77%
Asian	1	6,661	645 (77)	682 (84)	1327 (146)	3.75 (0.40)	3.28 (0.66)	88%
	2	4,204	621 (77)	654 (87)	1274 (147)	3.79 (0.39)	3.20 (0.64)	89%
	3	3,266	605 (79)	637 (91)	1242 (152)	3.79 (0.41)	3.12 (0.69)	88%
	4	2,484	591 (81)	618 (93)	1209 (158)	3.77 (0.41)	3.08 (0.67)	88%
	5	1,325	551 (84)	568 (93)	1119 (162)	3.75 (0.43)	2.85 (0.79)	84%
Black or African American	1	1,890	581 (80)	567 (87)	1148 (155)	3.46 (0.51)	2.91 (0.81)	84%
	2	2,349	565 (79)	546 (83)	1111 (149)	3.45 (0.53)	2.80 (0.85)	83%
	3	2,953	554 (79)	532 (80)	1086 (146)	3.46 (0.52)	2.74 (0.83)	81%
	4	3,055	539 (77)	518 (79)	1057 (143)	3.49 (0.53)	2.63 (0.89)	79%
	5	3,365	516 (76)	496 (76)	1012 (138)	3.45 (0.56)	2.48 (0.93)	74%
Hispanic or Latino	1	6,059	612 (75)	605 (85)	1217 (148)	3.64 (0.46)	3.10 (0.75)	85%
	2	6,178	595 (75)	582 (82)	1176 (145)	3.67 (0.46)	2.99 (0.77)	84%
	3	6,819	577 (77)	566 (80)	1143 (144)	3.66 (0.47)	2.89 (0.82)	81%
	4	8,233	559 (74)	548 (78)	1106 (139)	3.64 (0.49)	2.81 (0.83)	80%
	5	12,081	530 (75)	520 (78)	1050 (139)	3.58 (0.50)	2.64 (0.88)	77%
Native Hawaiian or Other Pacific Islander	1	66	609 (73)	621 (81)	1230 (143)	3.59 (0.44)	3.02 (0.75)	82%
	2	74	582 (80)	577 (83)	1159 (153)	3.51 (0.52)	2.65 (1.02)	78%
	3	55	567 (86)	560 (97)	1127 (172)	3.65 (0.56)	2.73 (0.71)	71%
	4	32	557 (82)	539 (85)	1096 (155)	3.46 (0.51)	2.61 (0.79)	63%
	5	20	547 (68)	541 (70)	1088 (129)	3.62 (0.47)	2.13 (1.07)	70%
No response	1	945	592 (81)	584 (89)	1176 (158)	3.49 (0.50)	3.02 (0.79)	83%
	2	588	571 (83)	561 (86)	1132 (155)	3.52 (0.52)	2.84 (0.85)	79%
	3	440	555 (85)	541 (95)	1096 (167)	3.54 (0.54)	2.75 (0.93)	74%
	4	325	535 (81)	522 (85)	1056 (154)	3.52 (0.48)	2.67 (0.87)	72%
	5	253	502 (71)	484 (66)	986 (124)	3.40 (0.52)	2.34 (1.00)	66%
Two or more races	1	2,573	636 (73)	635 (85)	1271 (147)	3.69 (0.43)	3.18 (0.73)	88%
	2	1,829	618 (77)	608 (87)	1226 (152)	3.72 (0.46)	3.07 (0.79)	86%
	3	1,434	605 (77)	590 (84)	1194 (148)	3.71 (0.45)	2.94 (0.84)	83%
	4	883	586 (76)	567 (82)	1153 (147)	3.70 (0.49)	2.85 (0.90)	79%
	5	429	552 (78)	536 (82)	1088 (146)	3.60 (0.57)	2.56 (1.04)	72%
White	1	47,682	618 (76)	614 (85)	1232 (148)	3.65 (0.46)	3.20 (0.71)	87%
	2	27,390	607 (77)	597 (83)	1204 (147)	3.71 (0.45)	3.13 (0.77)	85%
	3	18,826	597 (76)	582 (81)	1179 (144)	3.73 (0.47)	3.04 (0.82)	82%
	4	10,017	589 (77)	569 (81)	1158 (145)	3.75 (0.47)	2.97 (0.88)	79%
	5	2,817	572 (79)	554 (78)	1127 (144)	3.72 (0.49)	2.81 (0.96)	76%

Table A 14: Means (SDs) for Measures of Interest and Retention Rates, by Highest Parental Education Level and Context Quintile

Highest Parental Education Level	Context Quintile	*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention Rate
Graduate Degree	1	26,850	640 (75)	640 (87)	1279 (149)	3.71 (0.44)	3.27 (0.68)	88%
	2	12,985	629 (76)	619 (87)	1248 (150)	3.76 (0.44)	3.20 (0.71)	88%
	3	7,665	618 (78)	602 (86)	1220 (151)	3.78 (0.45)	3.14 (0.76)	85%
	4	3,903	604 (79)	585 (86)	1189 (152)	3.80 (0.47)	3.05 (0.82)	84%
	5	1,359	571 (86)	548 (85)	1119 (159)	3.70 (0.52)	2.86 (0.86)	80%
Bachelor's Degree	1	28,921	613 (74)	614 (85)	1226 (146)	3.64 (0.46)	3.18 (0.71)	87%
	2	17,439	605 (74)	599 (84)	1204 (144)	3.71 (0.45)	3.12 (0.75)	86%
	3	12,218	596 (75)	587 (83)	1183 (144)	3.73 (0.46)	3.04 (0.78)	84%
	4	6,976	584 (77)	568 (84)	1152 (147)	3.72 (0.47)	2.97 (0.82)	82%
	5	3,083	554 (79)	539 (85)	1093 (151)	3.66 (0.52)	2.77 (0.90)	78%
Associate Degree	1	2,820	585 (73)	580 (83)	1165 (143)	3.54 (0.49)	3.04 (0.78)	81%
	2	3,081	582 (74)	572 (81)	1154 (142)	3.62 (0.47)	2.97 (0.84)	80%
	3	3,213	573 (77)	562 (81)	1134 (144)	3.64 (0.49)	2.88 (0.85)	78%
	4	2,567	565 (77)	549 (79)	1114 (143)	3.66 (0.49)	2.83 (0.89)	79%
	5	1,757	536 (75)	523 (79)	1059 (141)	3.61 (0.51)	2.60 (0.94)	76%
High School Diploma	1	6,402	586 (75)	584 (85)	1171 (146)	3.54 (0.48)	3.00 (0.80)	81%
	2	8,013	579 (75)	573 (83)	1151 (145)	3.60 (0.49)	2.91 (0.84)	80%
	3	8,979	570 (75)	562 (83)	1132 (144)	3.62 (0.49)	2.84 (0.87)	78%
	4	8,684	561 (76)	550 (83)	1111 (146)	3.63 (0.49)	2.77 (0.88)	78%
	5	8,246	535 (76)	523 (79)	1058 (142)	3.57 (0.51)	2.59 (0.92)	75%
No High School Diploma	1	351	580 (79)	598 (98)	1178 (160)	3.59 (0.50)	3.02 (0.74)	82%
	2	764	565 (77)	577 (94)	1141 (154)	3.59 (0.48)	2.97 (0.72)	83%
	3	1,383	555 (75)	563 (89)	1118 (149)	3.60 (0.48)	2.84 (0.83)	81%
	4	2,588	547 (75)	550 (86)	1097 (147)	3.60 (0.48)	2.81 (0.79)	82%
	5	5,375	520 (74)	516 (79)	1036 (139)	3.56 (0.50)	2.64 (0.86)	77%
No Response	1	690	568 (77)	564 (86)	1133 (149)	3.41 (0.49)	2.88 (0.85)	82%
	2	457	555 (81)	554 (86)	1109 (150)	3.51 (0.49)	2.78 (0.85)	80%
	3	439	538 (79)	535 (87)	1073 (148)	3.49 (0.53)	2.69 (0.86)	74%
	4	416	521 (80)	515 (81)	1035 (145)	3.43 (0.54)	2.58 (0.90)	70%
	5	553	484 (70)	478 (75)	962 (131)	3.39 (0.55)	2.40 (0.97)	71%

Table A 15: Means (SDs) for Measures of Interest and Retention Rates, by Best Language and Context Quintile

Best Language	Context Quintile	*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention Rate
English Only	1	60,096	620 (76)	617 (87)	1237 (151)	3.65 (0.46)	3.19 (0.72)	87%
	2	37,988	606 (77)	596 (85)	1202 (150)	3.70 (0.46)	3.10 (0.77)	85%
	3	28,987	592 (78)	579 (84)	1171 (149)	3.69 (0.48)	2.99 (0.83)	82%
	4	19,311	577 (79)	561 (84)	1138 (151)	3.68 (0.49)	2.89 (0.87)	80%
	5	11,830	542 (79)	527 (82)	1069 (148)	3.58 (0.53)	2.63 (0.93)	75%
English and Another	1	5,057	622 (80)	636 (95)	1258 (160)	3.67 (0.45)	3.14 (0.72)	86%
	2	4,142	598 (77)	605 (92)	1203 (154)	3.69 (0.45)	3.04 (0.74)	87%
	3	4,419	577 (79)	578 (91)	1155 (155)	3.70 (0.46)	2.96 (0.77)	83%
	4	5,384	558 (76)	555 (85)	1113 (146)	3.65 (0.48)	2.84 (0.80)	82%
	5	8,137	527 (75)	520 (79)	1047 (140)	3.60 (0.49)	2.66 (0.86)	78%
Another	1	543	586 (80)	694 (90)	1280 (151)	3.71 (0.39)	3.17 (0.69)	79%
	2	434	560 (86)	664 (105)	1224 (169)	3.72 (0.39)	3.03 (0.78)	78%
	3	350	548 (83)	648 (113)	1196 (174)	3.71 (0.43)	2.96 (0.82)	76%
	4	339	521 (83)	593 (118)	1115 (182)	3.72 (0.44)	3.01 (0.71)	78%
	5	325	474 (77)	514 (97)	989 (156)	3.63 (0.51)	2.68 (0.92)	74%
Omitted	1	338	591 (85)	586 (99)	1177 (172)	3.48 (0.51)	3.03 (0.73)	83%
	2	175	571 (87)	568 (99)	1139 (171)	3.59 (0.49)	2.88 (0.90)	78%
	3	141	547 (91)	542 (92)	1089 (168)	3.51 (0.53)	2.72 (1.01)	77%
	4	100	530 (83)	511 (94)	1041 (164)	3.48 (0.60)	2.67 (0.96)	76%
	5	81	494 (75)	491 (82)	985 (147)	3.39 (0.55)	2.44 (0.96)	68%

Table A 16: Means (SDs) for Measures of Interest and Retention Rates, by Student Grouping and Context Quintile

Student Grouping	Context Quintile	*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention Rate
Underrepresented	1	8,173	604 (78)	596 (87)	1200 (152)	3.59 (0.48)	3.05 (0.77)	85%
	2	8,728	586 (77)	572 (84)	1158 (149)	3.61 (0.49)	2.93 (0.80)	84%
	3	9,931	570 (78)	556 (82)	1125 (147)	3.60 (0.49)	2.84 (0.83)	81%
	4	11,425	553 (76)	539 (79)	1093 (142)	3.59 (0.50)	2.76 (0.85)	79%
	5	15,549	527 (75)	515 (78)	1042 (140)	3.55 (0.52)	2.60 (0.89)	76%
Other	1	57,861	621 (76)	623 (88)	1244 (152)	3.66 (0.46)	3.21 (0.71)	87%
	2	34,011	609 (77)	604 (86)	1213 (149)	3.72 (0.45)	3.13 (0.76)	85%
	3	23,966	598 (77)	589 (85)	1187 (148)	3.73 (0.46)	3.04 (0.81)	83%
	4	13,709	588 (79)	577 (86)	1165 (150)	3.75 (0.46)	2.98 (0.85)	81%
	5	4,824	561 (82)	553 (84)	1114 (152)	3.70 (0.49)	2.78 (0.93)	77%

Table A 17: Means (SDs) for Measures of Interest and Retention Rates, by Student Grouping, Institution Admittance Rate, and Context Quintile

Student Grouping	Admittance Rate	Context Quintile	*n*	SAT ERW	SAT Math	SAT Total Score	HSGPA	FYGPA	Retention Rate
Underrepresented	Under 25%	1	694	686 (59)	689 (73)	1375 (119)	3.91 (0.35)	3.35 (0.49)	95%
		2	499	671 (61)	666 (73)	1336 (122)	3.94 (0.34)	3.23 (0.58)	93%
		3	489	655 (67)	651 (79)	1306 (133)	3.96 (0.34)	3.17 (0.53)	93%
		4	573	638 (67)	623 (78)	1261 (132)	3.99 (0.31)	3.07 (0.58)	94%
		5	856	599 (67)	583 (74)	1182 (128)	3.96 (0.32)	2.91 (0.60)	91%
	25% to 50%	1	1,926	634 (65)	630 (76)	1264 (127)	3.78 (0.38)	3.19 (0.63)	90%
		2	1,874	617 (72)	607 (78)	1224 (137)	3.81 (0.40)	3.09 (0.67)	89%
		3	2,237	598 (75)	584 (79)	1182 (140)	3.79 (0.41)	2.97 (0.69)	86%
		4	2,317	581 (71)	569 (78)	1150 (135)	3.80 (0.41)	2.88 (0.67)	85%
		5	3,265	550 (74)	540 (80)	1091 (140)	3.76 (0.42)	2.73 (0.72)	83%
	51% to 75%	1	3,736	591 (72)	580 (79)	1171 (138)	3.54 (0.47)	3.01 (0.81)	83%
		2	4,334	579 (72)	562 (77)	1141 (135)	3.57 (0.47)	2.92 (0.81)	84%
		3	5,041	563 (72)	547 (74)	1110 (132)	3.56 (0.48)	2.80 (0.86)	80%
		4	6,058	545 (71)	530 (73)	1075 (130)	3.55 (0.49)	2.72 (0.87)	79%
		5	7,913	518 (72)	507 (74)	1025 (131)	3.49 (0.50)	2.56 (0.92)	75%
	Over 75%	1	1,817	570 (74)	557 (79)	1127 (141)	3.40 (0.51)	2.87 (0.85)	78%
		2	2,021	552 (71)	536 (76)	1089 (135)	3.42 (0.53)	2.75 (0.90)	77%
		3	2,164	539 (74)	525 (79)	1063 (139)	3.44 (0.53)	2.73 (0.89)	74%
		4	2,477	528 (72)	514 (75)	1042 (133)	3.43 (0.54)	2.66 (0.96)	72%
		5	3,515	507 (70)	493 (72)	1000 (128)	3.40 (0.56)	2.50 (1.00)	69%
Other	Under 25%	1	3,912	704 (56)	718 (64)	1422 (108)	3.98 (0.28)	3.51 (0.44)	94%
		2	1,537	699 (56)	707 (68)	1406 (110)	4.05 (0.28)	3.46 (0.46)	94%
		3	778	686 (62)	692 (70)	1377 (117)	4.08 (0.26)	3.40 (0.54)	95%
		4	463	676 (63)	681 (74)	1357 (121)	4.07 (0.27)	3.34 (0.52)	93%
		5	170	632 (63)	642 (82)	1274 (133)	4.04 (0.24)	3.18 (0.53)	95%
	25% to 50%	1	12,799	655 (65)	666 (75)	1320 (124)	3.84 (0.36)	3.33 (0.57)	91%
		2	6,744	638 (72)	643 (82)	1281 (139)	3.88 (0.36)	3.22 (0.63)	89%
		3	4,247	625 (73)	634 (83)	1259 (139)	3.89 (0.36)	3.12 (0.67)	88%
		4	2,372	613 (75)	624 (84)	1236 (140)	3.89 (0.36)	3.08 (0.67)	87%
		5	855	582 (77)	590 (86)	1171 (146)	3.86 (0.40)	2.85 (0.74)	86%
	51% to 75%	1	26,159	612 (71)	611 (81)	1224 (138)	3.63 (0.44)	3.19 (0.73)	87%
		2	16,926	604 (72)	596 (79)	1200 (136)	3.70 (0.45)	3.11 (0.78)	85%
		3	12,865	594 (74)	582 (79)	1176 (139)	3.72 (0.45)	3.03 (0.82)	83%
		4	7,647	585 (75)	570 (79)	1154 (139)	3.74 (0.46)	2.97 (0.87)	81%
		5	2,812	558 (80)	546 (79)	1104 (145)	3.69 (0.49)	2.76 (0.97)	76%
	Over 75%	1	14,991	587 (73)	581 (80)	1168 (139)	3.47 (0.49)	3.05 (0.79)	82%
		2	8,804	581 (75)	570 (79)	1152 (140)	3.58 (0.48)	3.04 (0.82)	80%
		3	6,076	575 (76)	561 (79)	1137 (140)	3.61 (0.50)	2.95 (0.89)	77%
		4	3,227	564 (77)	545 (80)	1109 (143)	3.62 (0.51)	2.88 (0.93)	74%
		5	987	538 (83)	525 (77)	1063 (146)	3.54 (0.54)	2.68 (1.00)	71%

Appendix B: Overprediction and Underprediction of FYGPA

Table B 1: Overprediction (-) and Underprediction (+) of FYGPA by Context Quintiles

		FYGPA Prediction Model		
Context Quintile	*n*	HSGPA	SAT	SAT and HSGPA
1	66,034	0.12	0.04	0.08
2	42,739	0.04	0.03	0.02
3	33,897	-0.05	-0.01	-0.04
4	25,134	-0.11	-0.04	-0.07
5	20,373	-0.25	-0.12	-0.14

Note. Negative = Overprediction; Positive = Underprediction

Table B 2: Overprediction (-) and Underprediction (+) of FYGPA by Students' Context Quintiles and Institutional Control

			FYGPA Prediction Model		
Context Quintile	Control	n	HSGPA	SAT	SAT and HSGPA
1	Private not-for-profit	18,411	0.08	0.03	0.06
	Public	47,623	0.13	0.04	0.08
2	Private not-for-profit	9,062	0.00	0.01	0.00
	Public	33,677	0.05	0.03	0.03
3	Private not-for-profit	5,653	-0.09	-0.03	-0.06
	Public	28,244	-0.04	-0.01	-0.03
4	Private not-for-profit	3,328	-0.16	-0.06	-0.11
	Public	21,806	-0.11	-0.03	-0.06
5	Private not-for-profit	1,782	-0.28	-0.13	-0.17
	Public	18,591	-0.24	-0.12	-0.14

Note. Negative = Overprediction; Positive = Underprediction

Table B 3: Overprediction (-) and Underprediction (+) of FYGPA by Context Quintiles and Institutional Admittance Rate

			FYGPA Prediction Model		
Context Quintile	Admittance Rate	*n*	HSGPA	SAT	SAT and HSGPA
1	Under 25%	4,606	0.11	0.05	0.06
	25% to 50%	14,725	0.12	0.05	0.06
	51% to 75%	29,895	0.13	0.05	0.09
	Over 75%	16,808	0.10	0.02	0.07
2	Under 25%	2,036	0.03	0.00	0.00
	25% to 50%	8,618	0.04	0.03	0.01
	51% to 75%	21,260	0.04	0.03	0.02
	Over 75%	10,825	0.03	0.03	0.02
3	Under 25%	1,267	-0.06	-0.03	-0.04
	25% to 50%	6,484	-0.05	-0.03	-0.04
	51% to 75%	17,906	-0.04	-0.01	-0.03
	Over 75%	8,240	-0.05	0.00	-0.04
4	Under 25%	1,036	-0.15	-0.07	-0.08
	25% to 50%	4,689	-0.13	-0.05	-0.06
	51% to 75%	13,705	-0.11	-0.04	-0.07
	Over 75%	5,704	-0.10	-0.02	-0.07
5	Under 25%	1,026	-0.33	-0.12	-0.13
	25% to 50%	4,120	-0.28	-0.12	-0.12
	51% to 75%	10,725	-0.24	-0.12	-0.15
	Over 75%	4,502	-0.22	-0.12	-0.15

Note. Negative = Overprediction; Positive = Underprediction

Table B 4: Overprediction (-) and Underprediction (+) of FYGPA by Context Quintiles, Institutional Admittance Rate, and Control

				FYGPA Prediction Model		
Context Quintile	Admittance Rate	Control	*n*	HSGPA	SAT	SAT and HSGPA
1	Under 25%	Private not-for-profit	3,891	0.08	0.04	0.05
		Public	715	0.26	0.08	0.09
	25%-50%	Private not-for-profit	6,073	0.08	0.03	0.06
		Public	8,652	0.14	0.06	0.07
	51%-75%	Private not-for-profit	5,291	0.08	0.03	0.06
		Public	24,604	0.14	0.05	0.09
	Over 75%	Private not-for-profit	3,156	0.08	0.00	0.05
		Public	13,652	0.10	0.02	0.07
2	Under 25%	Private not-for-profit	1,415	-0.02	-0.01	-0.02
		Public	621	0.15	0.04	0.04
	25%-50%	Private not-for-profit	2,753	-0.01	0.01	-0.01
		Public	5,865	0.06	0.03	0.02
	51%-75%	Private not-for-profit	3,014	0.00	0.00	-0.01
		Public	18,246	0.05	0.03	0.03
	Over 75%	Private not-for-profit	1,880	0.02	0.05	0.03
		Public	8,945	0.03	0.03	0.02
3	Under 25%	Private not-for-profit	782	-0.12	-0.06	-0.07
		Public	485	0.04	0.02	0.02
	25%-50%	Private not-for-profit	1,634	-0.12	-0.07	-0.09
		Public	4,850	-0.03	-0.02	-0.03
	51%-75%	Private not-for-profit	1,946	-0.07	-0.02	-0.05
		Public	15,960	-0.04	-0.01	-0.03
	Over 75%	Private not-for-profit	1,291	-0.06	0.02	-0.04
		Public	6,949	-0.05	-0.01	-0.04
4	Under 25%	Private not-for-profit	477	-0.22	-0.11	-0.14
		Public	559	-0.08	-0.03	-0.03
	25%-50%	Private not-for-profit	973	-0.16	-0.06	-0.10
		Public	3,716	-0.12	-0.05	-0.05
	51%-75%	Private not-for-profit	1,179	-0.12	-0.03	-0.08
		Public	12,526	-0.11	-0.04	-0.07
	Over 75%	Private not-for-profit	699	-0.17	-0.07	-0.13
		Public	5,005	-0.09	-0.01	-0.06
5	Under 25%	Private not-for-profit	282	-0.34	-0.16	-0.19
		Public	744	-0.33	-0.11	-0.11
	25%-50%	Private not-for-profit	516	-0.29	-0.12	-0.16
		Public	3,604	-0.28	-0.12	-0.12
	51%-75%	Private not-for-profit	623	-0.26	-0.10	-0.16
		Public	10,102	-0.24	-0.12	-0.15
	Over 75%	Private not-for-profit	361	-0.27	-0.15	-0.18
		Public	4,141	-0.22	-0.11	-0.14

Note. Negative = Overprediction; Positive = Underprediction

Table B 5: Overprediction (-) and Underprediction (+) of FYGPA by Context Quintiles and Institution Size

Context Quintile	Institution Size	*n*	HSGPA	SAT	SAT and HSGPA
1	Small	7,110	0.09	0.02	0.06
	Medium	7,861	0.09	0.02	0.06
	Large	14,145	0.09	0.03	0.06
	Very Large	36,918	0.14	0.05	0.09
2	Small	4,729	0.03	0.03	0.02
	Medium	4,392	0.04	0.04	0.03
	Large	7,712	0.01	0.02	0.01
	Very Large	25,906	0.04	0.03	0.02
3	Small	3,572	-0.05	0.00	-0.04
	Medium	3,375	-0.03	0.00	-0.03
	Large	5,764	-0.05	-0.01	-0.04
	Very Large	21,186	-0.05	-0.02	-0.04
4	Small	2,239	-0.15	-0.07	-0.11
	Medium	2,654	-0.09	-0.03	-0.06
	Large	4,020	-0.12	-0.04	-0.08
	Very Large	16,221	-0.11	-0.04	-0.06
5	Small	1,344	-0.23	-0.10	-0.14
	Medium	2,730	-0.20	-0.11	-0.13
	Large	2,651	-0.23	-0.13	-0.14
	Very Large	13,648	-0.26	-0.12	-0.14

Note. Negative = Overprediction; Positive = Underprediction

Table B 6: Overprediction (-) and Underprediction (+) of FYGPA by Context Quintiles and Gender

			FYGPA Prediction Model		
Context Quintile	Gender	*n*	HSGPA	SAT	SAT and HSGPA
1	Female	35,479	0.19	0.17	0.17
	Male	30,555	0.03	-0.11	-0.04
2	Female	24,085	0.11	0.15	0.12
	Male	18,654	-0.06	-0.14	-0.10
3	Female	19,794	0.02	0.11	0.05
	Male	14,103	-0.14	-0.18	-0.16
4	Female	15,208	-0.06	0.07	0.01
	Male	9,926	-0.20	-0.20	-0.19
5	Female	12,777	-0.19	-0.02	-0.06
	Male	7,596	-0.34	-0.30	-0.28
Overall	Female	107,343	0.06	0.12	0.09
	Male	80,834	-0.08	-0.16	-0.11

Note. Negative = Overprediction; Positive = Underprediction

Table B 7: Overprediction (-) and Underprediction (+) of FYGPA by Context Quintiles and Race/Ethnicity

			FYGPA Prediction Model		
Context Quintile	Race/Ethnicity	*n*	HSGPA	SAT	SAT and HSGPA
1	American Indian or Alaska Native	158	-0.09	-0.17	-0.09
	Asian	6,661	0.15	0.01	0.05
	Black or African American	1,890	0.00	-0.06	0.03
	Hispanic or Latino	6,059	0.07	0.01	0.04
	Native Hawaiian or Other Pacific Islander	66	0.00	-0.09	-0.03
	Two or more races	2,573	0.09	-0.01	0.03
	White	47,682	0.13	0.06	0.09
	No response	945	0.07	-0.01	0.06
2	American Indian or Alaska Native	127	-0.14	-0.06	-0.09
	Asian	4,204	0.09	0.04	0.04
	Black or African American	2,349	-0.06	-0.08	-0.01
	Hispanic or Latino	6,178	-0.01	-0.01	0.00
	Native Hawaiian or Other Pacific Islander	74	-0.21	-0.27	-0.20
	Two or more races	1,829	0.00	-0.03	-0.03
	White	27,390	0.05	0.05	0.03
	No response	588	-0.07	-0.08	-0.05
3	American Indian or Alaska Native	104	-0.27	-0.19	-0.22
	Asian	3,266	0.03	0.02	0.01
	Black or African American	2,953	-0.12	-0.09	-0.05
	Hispanic or Latino	6,819	-0.08	-0.04	-0.05
	Native Hawaiian or Other Pacific Islander	55	-0.26	-0.16	-0.19
	Two or more races	1,434	-0.12	-0.11	-0.13
	White	18,826	-0.03	0.02	-0.03
	No response	440	-0.16	-0.09	-0.11
4	American Indian or Alaska Native	105	-0.25	-0.14	-0.16
	Asian	2,484	0.01	0.04	0.02
	Black or African American	3,055	-0.23	-0.14	-0.13
	Hispanic or Latino	8,233	-0.12	-0.04	-0.05
	Native Hawaiian or Other Pacific Islander	32	-0.19	-0.21	-0.14
	Two or more races	883	-0.18	-0.13	-0.15
	White	10,017	-0.09	-0.01	-0.08
	No response	325	-0.19	-0.08	-0.09
5	American Indian or Alaska Native	83	-0.27	-0.10	-0.18
	Asian	1,325	-0.16	-0.03	-0.07
	Black or African American	3,365	-0.36	-0.21	-0.22
	Hispanic or Latino	12,081	-0.22	-0.10	-0.11
	Native Hawaiian or Other Pacific Islander	20	-0.83	-0.72	-0.72
	Two or more races	429	-0.35	-0.25	-0.28
	White	2,817	-0.22	-0.11	-0.18
	No response	253	-0.40	-0.29	-0.28
Overall	American Indian or Alaska Native	577	-0.19	-0.13	-0.14
	Asian	17,940	0.07	0.02	0.03
	Black or African American	13,612	-0.17	-0.13	-0.09
	Hispanic or Latino	39,370	-0.10	-0.05	-0.05
	Native Hawaiian or Other Pacific Islander	247	-0.22	-0.22	-0.19
	Two or more races	7,148	-0.04	-0.07	-0.06
	White	106,732	0.05	0.04	0.03
	No response	2,551	-0.08	-0.08	-0.05

Note. Negative = Overprediction; Positive = Underprediction

Table B 8: Overprediction (-) and Underprediction (+) of FYGPA by Context Quintiles and Highest Parental Education Level

Context Quintile	Highest Parental Education Level	*n*	HSGPA	SAT	SAT and HSGPA
1	Graduate Degree	26,850	0.14	0.04	0.08
	Bachelor's Degree	28,921	0.13	0.05	0.09
	Associate Degree	2,820	0.07	0.02	0.06
	HS Diploma	6,402	0.03	-0.02	0.02
	No HS Diploma	351	0.03	0.03	0.04
	No Response	690	-0.01	-0.06	0.01
2	Graduate Degree	12,985	0.08	0.04	0.04
	Bachelor's Degree	17,439	0.06	0.05	0.04
	Associate Degree	3,081	-0.02	0.00	-0.01
	HS Diploma	8,013	-0.05	-0.04	-0.04
	No HS Diploma	764	0.02	0.04	0.07
	No Response	457	-0.12	-0.09	-0.08
3	Graduate Degree	7,665	0.03	0.03	0.01
	Bachelor's Degree	12,218	-0.02	0.02	-0.01
	Associate Degree	3,213	-0.09	-0.04	-0.07
	HS Diploma	8,979	-0.12	-0.07	-0.09
	No HS Diploma	1,383	-0.09	-0.03	-0.03
	No Response	439	-0.18	-0.10	-0.11
4	Graduate Degree	3,903	-0.05	0.00	-0.04
	Bachelor's Degree	6,976	-0.07	0.00	-0.04
	Associate Degree	2,567	-0.14	-0.06	-0.10
	HS Diploma	8,684	-0.17	-0.09	-0.11
	No HS Diploma	2,588	-0.10	-0.01	-0.01
	No Response	416	-0.21	-0.11	-0.11
5	Graduate Degree	1,359	-0.13	-0.04	-0.08
	Bachelor's Degree	3,083	-0.18	-0.07	-0.11
	Associate Degree	1,757	-0.30	-0.16	-0.21
	HS Diploma	8,246	-0.29	-0.17	-0.19
	No HS Diploma	5,375	-0.22	-0.07	-0.08
	No Response	553	-0.34	-0.16	-0.18
Overall	Graduate Degree	52,762	0.09	0.04	0.04
	Bachelor's Degree	68,637	0.05	0.04	0.04
	Associate Degree	13,438	-0.08	-0.04	-0.05
	HS Diploma	40,324	-0.13	-0.08	-0.09
	No HS Diploma	10,461	-0.15	-0.04	-0.04
	No Response	2,555	-0.16	-0.10	-0.09

Note. Negative = Overprediction; Positive = Underprediction

Table B 9: Overprediction (-) and Underprediction (+) of FYGPA by Context Quintiles and Best Language

			FYGPA Prediction Model		
Context Quintile	Best Language	*n*	HSGPA	SAT	SAT and HSGPA
1	English Only	60,096	0.12	0.05	0.08
	English and Another	5,057	0.07	-0.02	0.02
	Another	543	0.08	0.02	0.06
2	English Only	37,988	0.04	0.03	0.02
	English and Another	4,142	0.00	0.00	0.00
	Another	434	-0.01	0.00	0.00
3	English Only	28,987	-0.05	-0.01	-0.04
	English and Another	4,419	-0.05	0.00	-0.01
	Another	350	-0.06	-0.02	-0.02
4	English Only	19,311	-0.12	-0.05	-0.08
	English and Another	5,384	-0.11	-0.02	-0.04
	Another	339	0.02	0.19	0.13
5	English Only	11,830	-0.26	-0.15	-0.18
	English and Another	8,137	-0.22	-0.08	-0.10
	Another	325	-0.23	0.04	-0.03
Overall	English Only	15,8212	0.01	0.01	0.01
	English and Another	27,139	-0.08	-0.03	-0.03
	Another	1,991	-0.03	0.04	0.03

Note. Negative = Overprediction; Positive = Underprediction

Table B 10: Overprediction (-) and Underprediction (+) of FYGPA by Student Grouping and Context Quintiles

Student Grouping	Context Quintile	*n*		HSGPA	SAT	SAT and HSGPA
Underrepresented	1	8,173		0.05	-0.01	0.04
	2	8,728		-0.03	-0.03	-0.01
	3	9,931		-0.10	-0.06	-0.05
	4	11,425		-0.15	-0.07	-0.08
	5	15,549		-0.25	-0.12	-0.14
	Overall	53,806		-0.12	-0.07	-0.06
Other	1	57,861		0.13	0.05	0.08
	2	34,011		0.05	0.04	0.03
	3	23,966		-0.03	0.01	-0.03
	4	13,709		-0.08	-0.01	-0.06
	5	4,824		-0.22	-0.11	-0.16
	Overall	134,371		0.05	0.03	0.02

Note. Negative = Overprediction; Positive = Underprediction

Table B 11: Overprediction (-) and Underprediction (+) of FYGPA by Student Grouping, Context Quintile, and Institution Admittance Rate

Student Grouping	Context Quintile	Admittance Rate	*n*	HSGPA	SAT	SAT and HSGPA
Underrepresented	1	Under 25%	694	-0.01	-0.03	-0.01
		25%-50%	1,926	0.03	0.00	0.03
		51%-75%	3,736	0.07	-0.01	0.05
		Over 75%	1,817	0.04	-0.03	0.04
	2	Under 25%	499	-0.11	-0.08	-0.07
		25%-50%	1,874	-0.03	-0.01	-0.01
		51%-75%	4,334	-0.02	-0.02	0.00
		Over 75%	2,021	-0.03	-0.05	-0.01
	3	Under 25%	489	-0.17	-0.09	-0.09
		25%-50%	2,237	-0.11	-0.06	-0.05
		51%-75%	5,041	-0.10	-0.07	-0.06
		Over 75%	2,164	-0.06	-0.03	-0.02
	4	Under 25%	573	-0.25	-0.12	-0.13
		25%-50%	2,317	-0.20	-0.09	-0.09
		51%-75%	6,058	-0.15	-0.07	-0.08
		Over 75%	2,477	-0.09	-0.04	-0.04
	5	Under 25%	856	-0.37	-0.14	-0.15
		25%-50%	3,265	-0.29	-0.12	-0.12
		51%-75%	7,913	-0.24	-0.13	-0.14
		Over 75%	3,515	-0.22	-0.12	-0.14
Other	1	Under 25%	3,912	0.13	0.06	0.07
		25%-50%	12,799	0.13	0.05	0.07
		51%-75%	26,159	0.14	0.06	0.09
		Over 75%	14,991	0.11	0.02	0.07
	2	Under 25%	1,537	0.08	0.03	0.02
		25%-50%	6,744	0.06	0.04	0.02
		51%-75%	16,926	0.05	0.04	0.03
		Over 75%	8,804	0.04	0.05	0.03
	3	Under 25%	778	0.01	0.02	0.00
		25%-50%	4,247	-0.02	-0.01	-0.04
		51%-75%	12,865	-0.02	0.02	-0.02
		Over 75%	6,076	-0.05	0.01	-0.05
	4	Under 25%	463	-0.01	0.00	-0.02
		25%-50%	2,372	-0.05	-0.01	-0.04
		51%-75%	7,647	-0.09	-0.01	-0.07
		Over 75%	3,227	-0.10	0.00	-0.08
	5	Under 25%	170	-0.13	-0.02	-0.04
		25%-50%	855	-0.23	-0.12	-0.13
		51%-75%	2,812	-0.22	-0.11	-0.17
		Over 75%	987	-0.23	-0.11	-0.18

Note. Negative = Overprediction; Positive = Underprediction

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