WESTMONT COLLEGE
Departmental Grades Report - Summer 2021

INTRODUCTION

During the 2020-21 school year, members of the Program Review Committee identified the potential value of providing academic departments data, disaggregated by various factors, and statistical analysis to use as they review their own programs. After talking with department chairs, a list of "introductory" courses was created and grades from the first and second semester of the 2020-21 school year were pulled by the Office of the Registrar. While individual reports were created for each participating department, this report contains analysis of the complete data set.

DATA SET

The Office of the Registrar provided an Excel file that ultimately resulted in 4,103 unique lines of data. Each line represented a grade earned by a student in one of the 62 introductory courses identified by departments. These 4,103 grades represent academic records from 1,132 students from courses taken during either the fall or spring semester of 2020-21 (an average of 3.625 course grades per student). Based on fall registration of 1,229 students, this data set contains at least one course grade from 92.1% of students.

The following courses were included in the study: AN-001, ART-001, ART-010, ART-015, ART-021, ART-022, ART-023, BIO-005, BIO-006, BIO-011, BIO-012, BIO-040, BIO-114, CHM-005, CHM-006, CHM-101, CHM-102, COM-006, COM-015, CS-010, CS-030, EB-003, EB-010, EB-011, EB-020, EB-030, ED-100, ED-101, ED-105, ED-160, ED-161, ENG-002, ENG-006, ENG-106, KNS-011, KNS-012, KNS-040, KNS-072, KNS-156, MA-005, MA-009, MA-010, MU-010, MU-012, MUA-078-1, PHI-006, PHY-021, PHY-023, POL-010, POL-020, POL-030, POL-040, PSY-001, PSY-013, RS-001, RS-010, RS-020, SOC-001, SP-100, TA-001, TA-010, and TA-036.

The table below reports the number of students with the number of course grades within the data set. It can be interpreted as follows: One student had ten course grades in the data set (the last column) while 192 students had one course grade in the data set (the second column).

# of Course Grades	1	2	3	4	5	6	7	8	9	10
# of Students	192	210	184	161	152	134	72	25	2	1

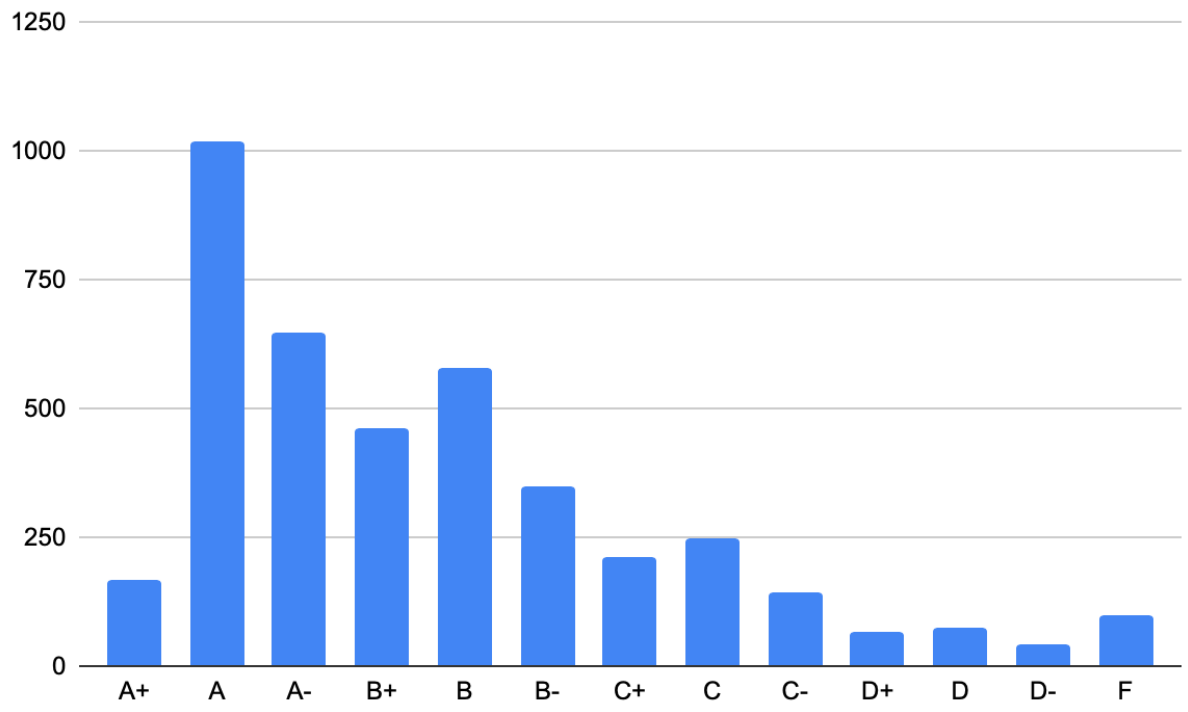
While student grade level was not considered in this analysis, due to the introductory nature f the courses, the majority of students with one or two grades in the data set were likely juniors or seniors while those with more grades in the data set were freshman and sophomores. As the courses were identified by departments and the grades represent all those earned in each course, the data was not randomly sampled and is illustrative of grades from the select set of courses only; the results that follow are not to be understood as representative of grades at Westmont as a whole. Finally, a handful of students took the same course in both the first and

second semester ostensibly to replace an initial low grade earned. Thus a few of the grades in the data set were earned by the same student in the same course.

The following table reports the number of letter grades assigned in the data set.

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
169	1017	646	460	580	348	213	248	142	65	76	41	98

The histogram below provides a visual representation of the distribution of these grades. The median letter grade assigned was a B+ and the mode was an A. Interestingly, close to half (44.7%) of grades assigned were in the A range while a much smaller percentage of grades were in the D and F range (6.8%). As a result, the distribution of letter grades is skewed toward the top end of the grading scale and does not follow a normal distribution.



To compute the mean of the data set, the grade point average (GPA), letter grades were assigned numeric values based on Westmont's definition of letter grades (A+ = 4.0, A = 4.0, A- = 3.7, etc.). The GPA of the 4,103 letter grades was 3.107 with a standard deviation of 0.951. The median grade (B+ = 3.3) is slightly higher than the average grade (3.107). Because, as mentioned earlier, the grades are primarily from introductory courses, the 3.107 GPA is not representative of the student body as a whole but could be reasonably interpreted as representative of grades earned in introductory coursework at Westmont.

GPA OF COMPLETE DATA SET DISAGGREGATED BY RACE/ETHNICITY

The table below presents the GPA for the data set disaggregated by IPEDS race/ethnicity.

	NUMBER (n)	GPA	ST DEV GPA
American Indian/Alaska Native	5	2.600	0.490
Asian	291	3.248	0.780
Black or African American	63	2.589	1.193
Hawaiian/Pacific Islander	25	2.640	1.081
Hispanic/Latino	851	2.858	1.035
Non-Resident Alien	68	2.788	1.190
Two or More Races	228	3.269	.905
Unknown	385	2.926	1.090
White	2187	3.232	0.863
TOTAL	**4103**	**3.107**	**0.951**

As can be seen from the tabled values, the number of grades from several of the race/ethnicity groups is small. Because each data point is an individual grade, the number of students represented within the race/ethnicity groupings is even smaller. For example, all five course grades in the American Indian/Alaska Native group were earned by one student; the twenty-five grades in the Hawaiian/Pacific Islander group were earned by seven students; and eighteen students identified as Black or African American earned the sixty-three grades in that group.

For statistical analyses to be valid, certain expectations must be met. As mentioned, the data here are from a skewed distribution, not a normal distribution. With large sample sizes, requirements related to normality can be relaxed. So, while analyzing data from the White, Asian, Hispanic/Latino, and Two or More groups may be reasonable, the sample sizes from the other groups are likely too small to give confidence in any outcome from a typical statistical test. Independence within the data set is also important to consider. While course grades were determined by different faculty members, from different courses, within different fields of study, because multiple grades within each group were earned by individual students, the data inherently have a level of dependence. So while the 4,103 grades represents a large data set, these are from 1,132 students, a smaller but still large data set. As with normality, a large number of grades within a group will increase the independence of grades within that group as the total number of students represented within the group increases. With the average of roughly 3.6 grades per student, group sizes that exceed 100 will contain roughly 30 or more students and have a level of independence. So, statistical analysis done in the report did not use data from groups with less than 100 grades. While statistics and findings from the following

analysis may align with trends that truly exist and would be found if larger data sets were analyzed, definitive conclusions regarding trends should be used with caution.

As it relates to the IPEDS race/ethnicity groupings of appropriate size, GPA data from the Asian, Hispanic/Latino, Two or More, Unknown, and White race/ethnicity groups were used to test if they differ significantly. The findings indicate there is enough evidence to reject the hypothesis that the groups have equal grade point averages ($p < 0.0001$). Thus, there was a significant difference between the GPAs of one or more of the race/ethnicity groups. Further analysis indicates the GPA for Hispanic/Latino and Unknown groups did not differ significantly. Similarly, GPAs for Asian, Two or More Races, and White groupings did not differ significantly. However, the GPA for these two groupings did significantly differ from one another - the Hispanic/Latino and Unknown race/ethnic groups had significantly lower GPAs than Asian, Two or More Races, and White race ethnic groups. Because the race/ethnic composition of the Unknown group is unclear, recommendations based on the finding are limited. However, because the Hispanic/Latino GPA is significantly lower than others, that group may benefit from additional support or attention while taking introductory courses.

Further consideration should be used when interpreting the data and results as the IPEDS Race/Ethnicity grouping does not necessarily assign students to categories as one might assume. During the admission process, students are provided several descriptor fields to self-report race/ethnicity. While what is used for IPEDS reporting represents the primary categorization for each student, the other optional descriptor fields may collect additional race/ethnicity information from each student. Of the sixty-eight students represented in the Two or More Races group, twelve reported Black or African American in one of the optional descriptor fields. Regardless of race, for IPEDS reporting, all international students are categorized as Non-Resident Alien. So, international students who self-identify as Black or African American are grouped in the Non-Resident Alien IPEDS category. A handful of students who reported Hispanic/Latino as their primary race/ethnicity also reported Black or African American in one of the optional descriptor fields. As a result, data from Black or African American students is spread across multiple IPEDS categories. The table below reports the GPA data for students who indicated Black or African American on at least one of the self-reported fields:

IPEDS CATEGORY	**NUMBER of Grades (n)**	**NUMBER of Students**	**GPA**	**ST DEV**
Black or African American	63	18	2.589	1.193
Hispanic/Latino	20	5	2.620	0.996
Non-Resident Alien	42	9	2.402	1.311
Two or More Races	40	12	3.105	1.050
TOTAL	165	44	2.670	1.188

So, while the 2.589 GPA reports the average for the eighteen students in the IPEDS Black or African American group, the 2.670 GPA is representative of the forty-four students in the sample who self-reported Black or African American on at least one of the descriptor fields.

Of note, WASC, the federal government, and most other organizations, view data reported from the IPEDS categorization only and do not ask for or consider further clarification on race/ethnicity. So, from their perspective, the IPEDS data reported above represents the current situation at Westmont.

Finally, while it is interesting that the GPA of Black or African American students within the Two or More Races grouping was higher (3.105) than the group as a whole (2.670) and was close to the GPA for the entire data set (3.107), as already mentioned, due to the small sample sizes and dependence within the grades, statistical analysis was not performed on these groupings.

GPA OF COMPLETE DATA SET DISAGGREGATED BY OTHER FACTORS

To provide further insight, the course grade data was disaggregated by other factors available within the student records system.

HABH/AWU

In other studies at Westmont, two groupings of race/ethnicity subgroups have been used to disaggregate data. These groupings, based loosely on historic and social factors, typically have enough data points to allow statistical comparisons to be made. The HABH group consists of grades earned by Hawaiian/Pacific Islander, American/Alaska Native, Black or African American, and Hispanic/Latino students. AWU group consists of grades earned by Asian, White, and Unknown students. As the IPEDS classification Non-resident Alien and Two or More Races contain students of mixed race/ethnicity, their grades were not included in the following analysis.

The table below provides summary statistics for the data set when disaggregated by HABH and AWU status:

	NUMBER (n)	**GPA**	**ST DEV**
AWU	2,863	3.192	0.895
HABH	944	2.833	1.047
TOTAL	4,103	3.107	0.951

The GPA for HABH grades (2.833) differed significantly ($p < 0.0002$) from the GPA for AWU grades (3.192). The difference in GPAs was 0.359. Grades of HABH students in these courses had a roughly B- average while the average of AWU students was a B.

Disaggregating further by first generation status, grades from first generation HABH students had a GPA of 2.540. The GPAs of the three other groups - first generation AWU, non-first generation AWU, and non-first generation HABH - were all much closer to the overall GPA of 3.107 (3.045, 3.205, and 2.987 respectively). This situation could be summarized as first generation HABH students earning a bit higher than a C+ while other students earn a B. This finding could indicate first generation HABH students would benefit the most from additional attention or support while in these courses.

GENDER

The table below provides summary statistics for the data set when disaggregated by gender:

	NUMBER (n)	**GPA**	**ST DEV**
Female	2,435	3.139	0.959
Male	1,668	3.060	0.938
TOTAL	4,103	3.107	0.951

The percentage of course grades from females in the data set (59.3%) is close to the percentage of female students attending Westmont in 2020-21 (60.4% in the fall of 2020). The GPA of female students exceeded that of male students by 0.079. While the underlying distribution of grades was already identified as skewed (not normally distributed), the sample sizes are large enough to allow for a simple statistical test of significance. The test identified a significant difference between the GPA of males and females ($p = 0.0090$) indicating the GPA of grades earned by females is significantly higher than that of males. (While one may argue 0.079 is not practically higher, in this case it is significantly higher.)

Conger and Evans (2008) studied persistence and GPA of males and females in their first semester of college. They summarized their findings with the following statement (italics added for emphasis):

> We find that males earn lower GPAs and credits in their first semester of college largely because they enter college with lower non-cognitive skills, captured by lower high school grades. After the first semester, males fall further behind their female counterparts in grades and credits. *Some of this widening disparity continues to be explained by females' higher non-cognitive abilities, yet gender differences in college course-taking and majors also plays a substantial role in explaining gaps in credits, grades, persistence, and graduation.*

In the data set examined by the authors, the difference between female and male average GPA (0.17) was larger than the difference found in this data set (0.079). This could be viewed as encouraging. Some of the “non-cognitive” differences noted by the authors include financial aid, choice of course work, and choice of major. Non-cognitive skills discussed in the literature include social skills, persistence, creativity, goal setting, and others.

Gender was further disaggregated by IPEDS race/ethnicity. Of note, the GPA of Black or African American female students (3.006) was much higher than that of Black or African American males (2.003) with the latter group having the lowest average GPA of all sub-groupings (the next lowest GPA for a sub-grouping was 2.600). Black or African American females scored much closer to the average GPA of all females (3.006 v 3.139) while Black or African American males scored a full grade point below the average of all males (2.003 v 3.060). Again, because of the small number of students in the Black and African American group, these trends may not be present when larger data sets are examined but are interesting statistics to consider. However, this suggests additional attention and support may benefit male Black and African American students.

FIRST GENERATION

The table below provides summary statistics for the data set when disaggregated by first generation status:

	NUMBER (n)	**GPA**	**ST DEV**
First Generation Student	605	2.772	1.061
NOT First Generation	3,498	3.165	0.919
TOTAL	4,103	3.107	0.951

Generally defined as “students whose parents do not have a college degree” (Hui, 2017), first generation status is self-reported by the student during the admission process. The average GPA from courses taken by first generation students (2.772) is significantly lower ($p < 0.0001$) than that of non-first generation students (3.165). The difference between group GPAs (0.393) is larger than the difference seen when disaggregating by gender (0.079). In more understandable terms, first generation students earn, on average, a B- while their non-first generation counterparts earn just above a B on average. While this may seem small, it could be influential when students pursue advanced degrees.

In her dissertation, Hui described several factors reported in other studies that influence the success of first generation students including family income and support, race/ethnicity, educational aspirations, academic preparedness, and general lack of supportive community. Westmont has strategically created processes to support first generation students and the statistics reported here should not be interpreted to suggest these efforts are being unsuccessful. It is valuable to identify the difference, discuss and implement targeted strategies, and monitor outcomes in future years.

The first generation group was further disaggregated by race/ethnicity. Hispanic/Latino first generation students (n = 298) had a 2.545 GPA. White first generation students (n = 173) had a 3.038 GPA for comparison. The first generation Non-Resident Aliens sub-group had the lowest GPA of the sub-groupings (GPA = 2.386) followed by first generation Black or African American

students (GPA = 2.437). Going against the overall trend of females having a higher GPA than males, the GPA for first generation female students was 2.745 (n = 385) while the GPA for first generation male students was 2.819 (n = 220). While the difference between first generation female and male students is small (0.074) it bucks the general trend and should be considered. Broadly speaking, focus should be given to non-White first generation students.

AP EXAM

In the admissions process, students who score a 4 or 5 on an AP exam will submit results to Westmont to gain academic credits. The table below provides summary statistics from the grade data set when disaggregated by whether the student had scored a four or five on one or more AP exam(s) during their high school years:

	NUMBER (n)	**GPA**	**ST DEV**
AP Score of 4 or 5	1,386	3.500	0.716
NO AP Score Reported to College	2,717	2.907	0.993
TOTAL	4,103	3.107	0.951

Of the 4,103 grades in the data set, 1,386 (33.7%) were earned by a student who scored a 4 or 5 on one or more AP exam(s). The 0.593 difference in average GPA (3.500 versus 2.907) is significant ($p < 0.0001$) and is larger than the differences identified when the data were disaggregated by both gender and first generation status (0.393 and 0.079). This could indicate students who engaged deeply (and successfully) in an AP course while in high school have a strong advantage over students who did not. As the course grades in this data set are more representative of freshman and sophomores, it would be interesting to see if this trend persists during the junior and senior year or if students who enter the College without successful experiences in more rigorous coursework close this gap as a result of their experiences at Westmont.

The table below presents the AP exam data further disaggregated by IPEDS race/ethnicity to identify if this result holds across race/ethnicity:

	NUMBER (n)	**GPA of AP Score of 4 or 5**	**GPA of NO AP Score**	**DELTA**
American Indian/Alaska Native	5	2.600	-	N/A
Asian	120	3.503	3.070	0.433
Black or African American	17	2.612	2.580	0.032
Hawaiian/Pacific Islander	8	3.088	2.429	0.659

Hispanic/Latino	237	3.332	2.675	0.657
Non-Resident Alien	3	4.000	2.732	1.268
Two or More Races	56	3.629	3.152	0.477
Unknown	89	3.627	2.716	0.911
White	851	3.549	3.029	0.520
TOTAL	1,386	3.500	2.907	0.593

In all race/ethnic groups, the sub-group who scored a 4 or 5 on at least one AP exam had a higher GPA then the corresponding sub-group who did not. The differences in GPA of the corresponding groups exceeded 0.4 in all but the Black or African American group which differed by only 0.032 (2.612 v 2.580). So, the general trend holds across race/ethnicity.

While not reported in the table, the standard deviation for the sub-groups that scored a 4 or 5 on at least one AP test was smaller than the standard deviation for the non-AP groups. This result could imply that not only do the students who scored a 4 or 5 on at least one AP exam have a higher GPA, the grades they earn are more consistent; students in the group earned mostly As and Bs with very few low grades.

Disaggregating the AP score data by gender reveals females were slightly more represented in the AP Score of 4 or 5 group in comparison to the data set as a whole (64.2% v 59.3%). Following the trend mentioned earlier, the GPA from course grades earned by females who earned a score of 4 or 5 on an AP exam was higher than that of males in the same group (3.561 v 3.390). However, in the non-AP group grades earned by females had a lower GPA than that of males (2.896 v 2.921). This could indicate females in the non-AP group are missing some of the non-cognitive skills that may be present in females in the AP group.

A small number of course grades in the AP Score 4 or 5 group were earned by first generation students (8.3% of the grades in the group). The GPA of the first generation AP group exceeded that of their non-AP counterparts (3.130 v 2.687) indicating they too benefited from deeply engaging in AP work during high school. However, their GPA (3.130) was lower than that of non-first generation students in their group (3.534), indicating AP participation alone did not result in equalizing academic outcomes. The difference in GPA between the first generation AP and non-first generation AP students (0.404) is similar to that seen in the first generation and non-first generation data (0.393) which could indicate the success of these first generation students in their high school AP coursework did not help close the gap between them and their non-first generation peers.

SAT CUMULATIVE SCORE

To explore the relationship of SAT score to grades earned, course grades were grouped by quartile in which the cumulative SAT score of the student who earned the grade fell. The table below reports statistics disaggregated by quartile:

	NUMBER (n)	GPA	ST DEV
0 to 25th Percentile	22	2.891	0.712
25th to 50th Percentile	320	2.432	1.113
50th to 75th Percentile	985	2.910	0.940
75th or Above Percentile	1628	3.401	0.995
TOTAL	2,955	3.129	0.933

As tabled, 2,955 of the grades in the data set were earned by a student with a cumulative SAT score reported (72.2% of grades in the data set). While historical data were not reviewed, it is likely this percentage is lower than would have been in previous years. Due to Covid-19 closing sites used for standardized testing and a host of government safety requirements, the opportunity for high school students to take the SAT was impacted. As a result, many colleges, including Westmont, adopted test-optional admission policies for the 2020-21 admissions cycle. This resulted in fewer freshmen reporting SAT scores to the college.

The vast majority of grades in this SAT data set were earned by students who scored in the 50th percentile or above (88.4%) and so further disaggregation may provide more insight. Regardless, it is clear from the tabled values that as the percentile increases, the GPA increases.

The GPA of the 28.2% of grades earned by students who did not report an SAT score was 3.052 and is lower than the 3.129 GPA of the group that reported their SAT score (a difference of 0.077). Given the large sample sizes, this difference in GPAs is statistically significant ($p = 0.0204$); the average GPA of these groups differ significantly. This result could be influenced by the grade level of students. Freshmen are more likely to not have reported SAT scores due to the test optional admission policy and freshman may have earned lower grades as they adjusted to the rigors of college coursework. Their lower grades would be over-represented in the “did not report an SAT” group. Juniors and seniors are likely to have reported an SAT and are, arguably, more prepared to be successful in an introductory course and so may earn higher grades and be overrepresented in the “did report an SAT” group. Regretfully, this type of association is not possible to determine with the current data set. If the two groups are reasonably similar in composition, this significant difference could indicate students who do not submit SAT scores during the admissions process do not experience the same level of academic success, as represented by GPA, than students who did submit their SAT score during the admissions process.

While the 2.891 GPA from the 0 to 25th quartile stands out as being much higher than the GPA from the 25th to 50th quartile (2.432) and close to the GPA for the 50th to 75th quartile (2.910), the small sample size and potential dependence within the grades makes any speculation about this result suspect.

Further disaggregating the data by other variables, other trends already seen continued to be present: females had a higher GPA than males, first generation students had a lower GPA than non-first generation students, and the trends seen in IPEDS race/ethnicity were largely again present (White, Asian, and Two or More Races had higher GPAs than other groups).

CONCLUSION

To provide departments with feedback on the performance of students within a group of courses of interest to departments, generally identified as introductory courses, 4,103 course grades from the first and second semester of the 2020-21 school year were analyzed. The following summary comments are provided:

1. Distribution of grades: With 44.7% of grades in the data set falling in the A range, grades assigned in these introductory courses are skewed toward the top of the scale. This outcome could align with the practice of assigning course grades based on content mastery rather than strictly comparing the performance of students to their peers. After creating individual reports for the 20 departments, assignment of grades vary widely by department.
2. Small sample size: Except for the American/ Alaska Native group with only five grades, sample sizes for the other race/ethnicity groups seem reasonably large. However, because a single student could contribute as few as one and as many as ten grades to a data set, the number of students represented within some of the race/ethnicity categories is small. This means interpretation of results for the American/Alaska Native, Black or African American, Hawaiian/Pacific Islander, and Non-Resident Alien groups should be done with caution as the small samples may not accurately reflect trends in the entire population.
3. Black or African American males: As noted, Black or African American males had the lowest GPA of all sub-groups; this could indicate they would benefit the most from specific and proactive attention.
4. First generation students: First generation students earned lower grades then their non-first generation peers. Westmont should continue to work closely with this group of students. While not part of this study, because first generation status is self-reported and the definition of the term may be misunderstood, there may be value in verifying first generation status with both those who report being first generation and those who do not.
5. First generation non-resident alien students: Non-resident alien students who identify as first generation may need additional attention. Likely to be international students, this group may well be adjusting to a new culture in addition to the rigor of a new academic

environment. In the departmental data, this group specifically struggled in political science which may be related to their unfamiliarity with America.

6. Non-AP students: Interestingly, the largest difference in average GPA was seen between the group of students who scored a 4 or 5 on an AP exam and those who did not. While factors that directly contribute to this could vary widely and include things like motivation to excel academically, previous access to advanced course work, acquisition and retention of skills, and general academic preparation, students without success in AP course work are not performing comparably to those who have had success in AP course work.
7. Cumulative SAT: With the new test optional admissions policy adopted in response to Covid-19 impacting student access to SAT and ACT testing, the number of students who submit standardized scores will likely continue to decline. The unequal GPAs for the SAT and non-SAT groups could be related to over representation of freshman and sophomore students in the non-SAT group. But it could also be an indication that there is a difference in academic performance between students who submit their SAT scores as part of the application process and those that don't.
8. To help understand the effect of the factor pairs studied, Hedge's g was computed for the following factor pairs: HABH/AWU, female/male, first generation/non-first generation, and AP/non-AP. Hedge's g is a measure of effect size and indicates how much one group differs from another; a larger Hedge's g indicates the discriminating factor has more effect than a smaller Hedge's g. The following rule of thumb is used to interpret these measures: Small effect = 0.2, medium effect = 0.5, and large effect = 0.8. The table below reports the Hedge's g statistic for the four factor pairs:

FACTOR	HEDGES' g
HABH/AWU	0.3840
Male/Female	0.0831
First Generation/non-First Generation	0.4175
AP 4 or 5/no AP 4 or 5	0.6524

These measures indicate that while statistically significant differences were found for all pairs of groupings, the effect size of gender was very small, the effect size of HABH/AWU and first generation status were similar and close to medium, and the effect size of AP 4 or 5 was between medium and large. This would suggest, assuming all students have reasonably similar academic promise, that first generation students, HABH, and students who did not score a 4 or 5 on an AP exam have the greatest potential to increase their GPA. As the largest factor, students who have not scored a 4 or 5 on an AP exam may benefit the most by specific efforts.