Denison Students' GPAs Determinants Analysis

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Introduction

In this project, we are going to address the question:

How do factors contribute to Denison students' GPA?

The grade point average (GPA) serves as a pivotal indicator of academic performance and achievement, influencing not only individual academic trajectories but also broader opportunities for future education and career prospects. GPA is also a controversial topic of concern as some might argue that it is a measure of intelligence and diligence while some might disagree. Apart from Asian countries' education, the United States' educational system is among the most rigorous, so it is important to verify whether it is absolutely true that one might find it difficult to achieve their highly desired GPA with certain affecting factors.

In the scope of Denison's student body, understanding the determinants that shape GPA outcomes among Denison students is essential for educators, administrators, policymakers, and students themselves. By unraveling the multifaceted interplay of factors impacting GPA, we can glean insights that inform strategic interventions, educational policies, and support mechanisms tailored to enhance student success and well-being.

Data and Design

The data we'll use for our analysis is the March 2024 Denison survey conducted on the Denison's student body in order to gain a better understanding of the social and intellectual life of Denison students. The students were asked about the activities/groups they participate in on and off campus, elections, mental health, and religion. There are also two alcohol consumption questions that require the students to answer about their closest friend's drinking habits, ensuring the accuracy of the data.

Regarding the variables to be emphasized on in this analysis of GPA, besides the general variables provided above, the survey data supplied us with the relevant information on the students' stress levels, their major division (Social Science, Sciences, Humanities, Arts, Interdisciplinary Programs and Undecided), the GPA of each individual, how much they participate in class, their ethnicity and whether or not they are international students.

Analysis

Predictions

Our predictions regarding academic trends at Denison University suggest that students with higher GPAs are likely to experience more stress due to them having to work harder for their grades. Moreover, we anticipate that STEM majors may exhibit lower average GPAs because of the rigorous nature of their subjects, which demand substantial effort. Additionally, we project that most international students enrolled at Denison with scholarships are likely to have higher GPAs, as most enroll here with financial aid, which is merit-based. Thus, their commitment to academic excellence is expected to persist at the university level, therefore positively impacting their GPA. Furthermore, we also want to tackle the general assumption that Asian students tend to attain higher GPAs, possibly due to cultural values emphasizing academic excellence. All in all, the upcoming analysis will provide clarity on our presumptions.

Figure 1: Denison Students' GPA Distribution

The plot illustrates the distribution of GPA among Denison students. The x-axis represents the GPA ranging from 2.0 to 4.0, and the y-axis shows the density of students achieving these scores. The plot peaks between 3.5 and 4.0, indicating that a majority of Denison students have relatively high GPAs. This suggests either an effective academic environment or possible grade inflation. As the graph peaks at around 3.65 - 3.7, our grades here at Denison contrast with the situation at Harvard, where the most common GPA is reportedly around 3.9, indicating significant grade inflation (Barton, 2022) Therefore, we can safely confirm that the GPA at Denison does not suffer from grade inflation, and Denison's GPA distribution signifies a rigorous and effective curriculum.

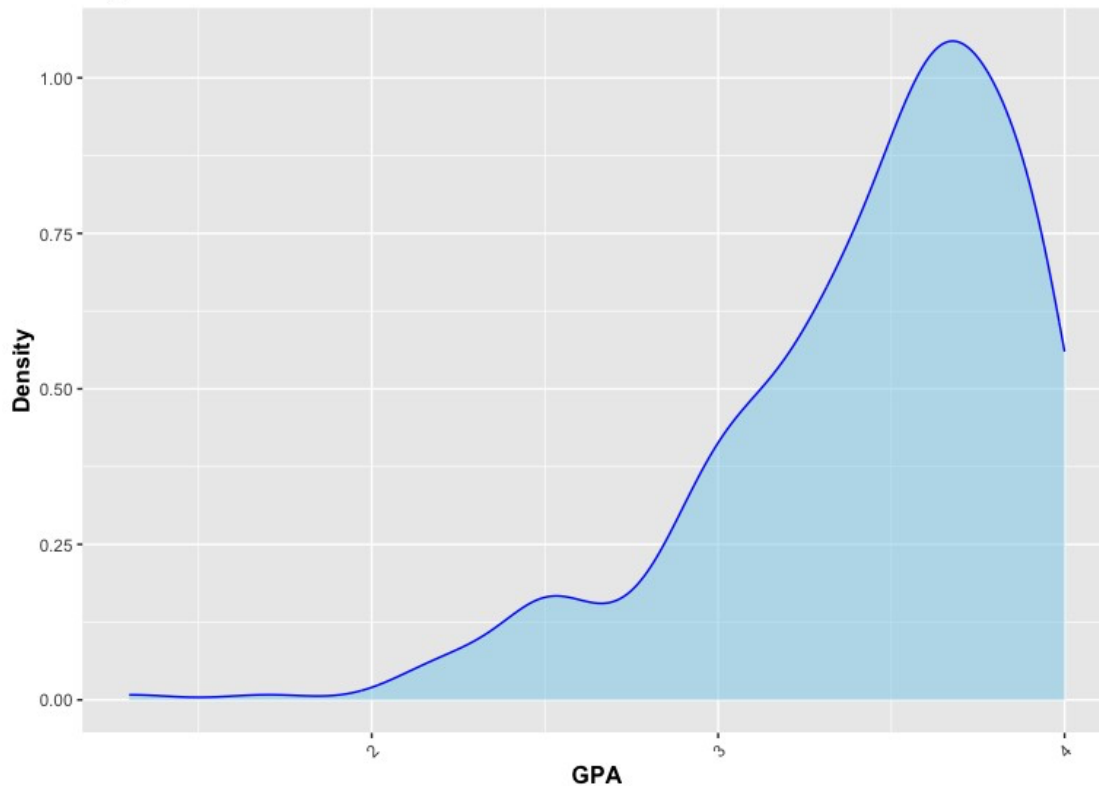**Figure 1: Denison students' GPA distribution**

Figure 2: Closest friends' days of alcohol consumption

This bar chart represents the number of days Denison students' closest friends engage in heavy drinking (four or more drinks within two hours). We consider this question highly effective, as survey takers tend to answer wrongly when it comes to their habits, especially drinking (Egele, Kiefer, & Stark, 2021) Thus, letting their friends answer the question will effectively showcase the drinking habits of Denison students. The x-axis categorizes the days per week from 0 to 7, while the y-axis indicates the count of students reporting each category. The majority of students report that their closest friends do not engage in heavy drinking frequently, with most reporting 0 to 2 days. As such, heavy drinking among Denison students is not a common occurrence throughout the week.

Figure 2: Closest friends' days of alcohol consumption

Most of Denison students' closest friends take 0 to 2 days of consuming 4 or more alcoholic drinks in the 2-hour period
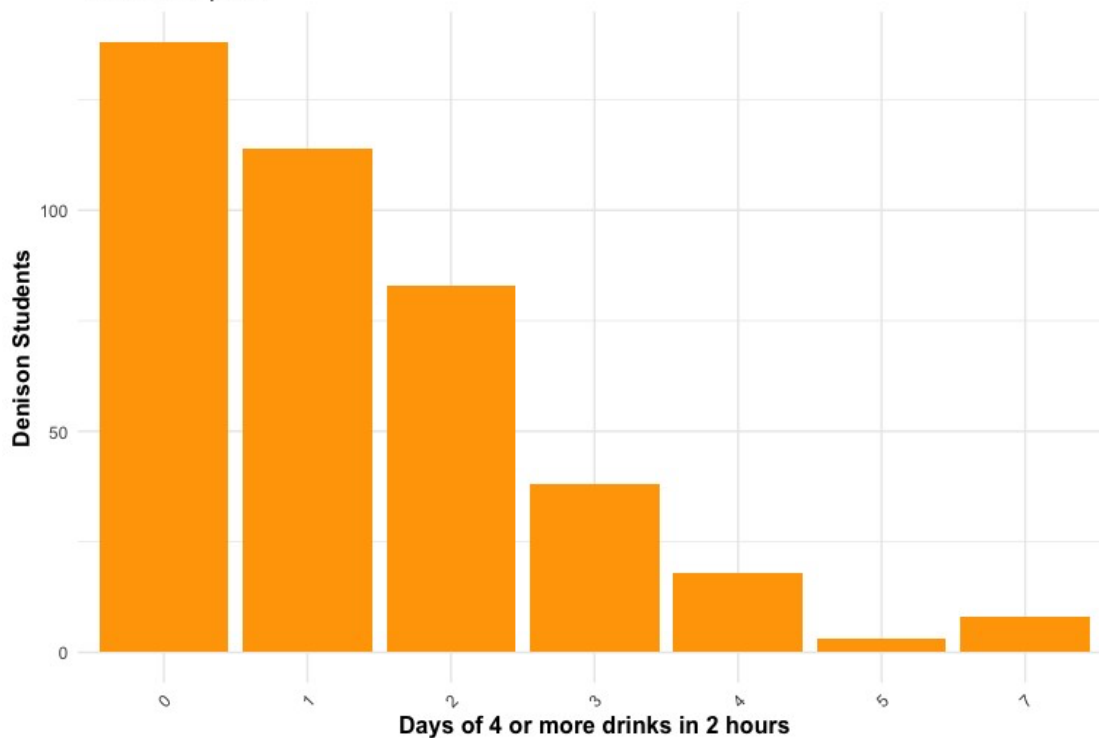

Figure 3: Denison Students' GPA Correlation to Stress Levels

The scatter plot displays a data point correlating a Denison student's GPA to their stress level. GPA values range from approximately 0 to 4, plotted on the x-axis, while stress levels, ranging from 0 to 100, are plotted on the y-axis. Surprisingly, the red trend line suggests a non-linear relationship between GPA and stress levels. The trend peaks around a GPA of 2.5 to 3.0, indicating that students with a GPA around this value tend to experience higher stress levels. The trend line decreases slightly towards the highest GPAs, suggesting a decrease in stress levels for students achieving near perfect or perfect GPAs. Moreover, the shaded gray area around the trend line possibly represents a confidence interval, showing the variability and uncertainty around the estimated average stress level for each GPA score. Overall, it is observable that "Denison students with the highest GPAs do not have to be the most stressful," which aligns with the downward slope of the trend line as it comes to a GPA of 4.

Figure 3: Denison students' GPA correlation to Stress Levels

Students with the highest GPAs does not have to be the most stressful
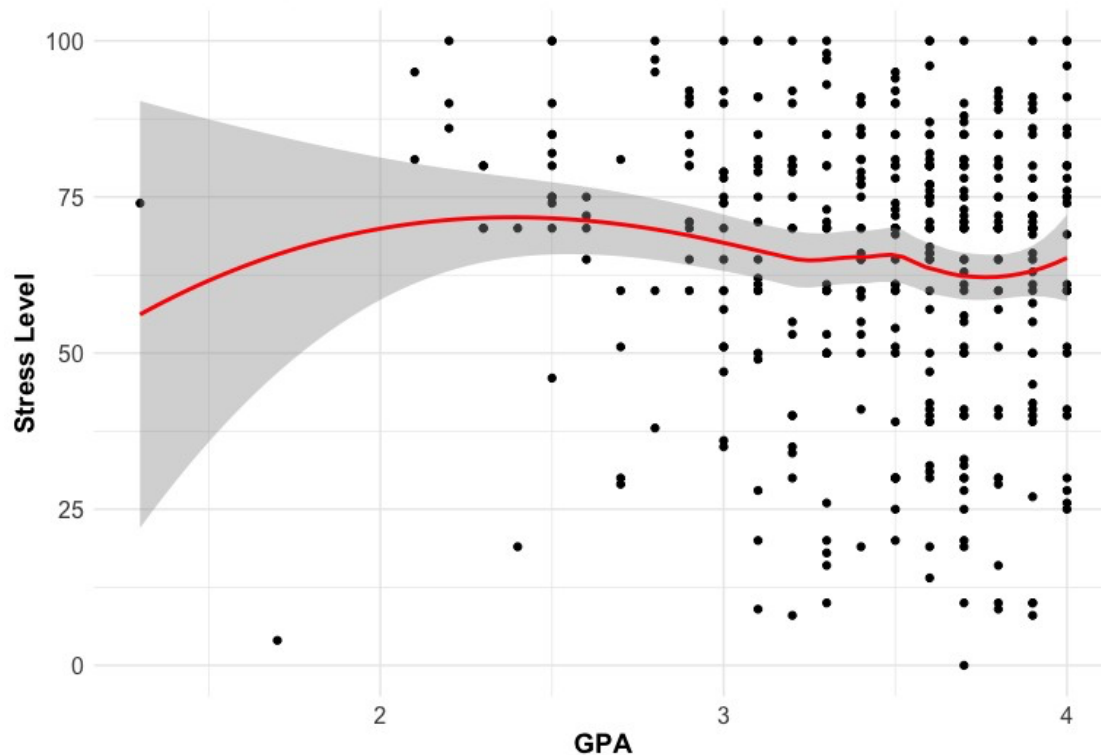
Figure 4: Relationship Between GPA and Student Type

The data visualization contrasts the GPA ranges of international students versus other student types at Denison University. The graph employs vertical line segments for each student type to illustrate the range of GPAs. For international students, the line goes from about 3.40 to nearly 3.65, indicating a wide variation in GPA but also the highest maximum GPA compared to other students. In contrast, the GPA range for other students is much narrower, spanning from just below 3.40 to above 3.45. This compact range suggests less variability in GPA among this group. In conclusion, the graph highlights that while international students achieve the highest GPAs, they also experience the greatest variation in academic performance.

Figure 4: Relationship Between GPA and Student Type

International students have a higher maximum GPA compared to others, but varies a great range
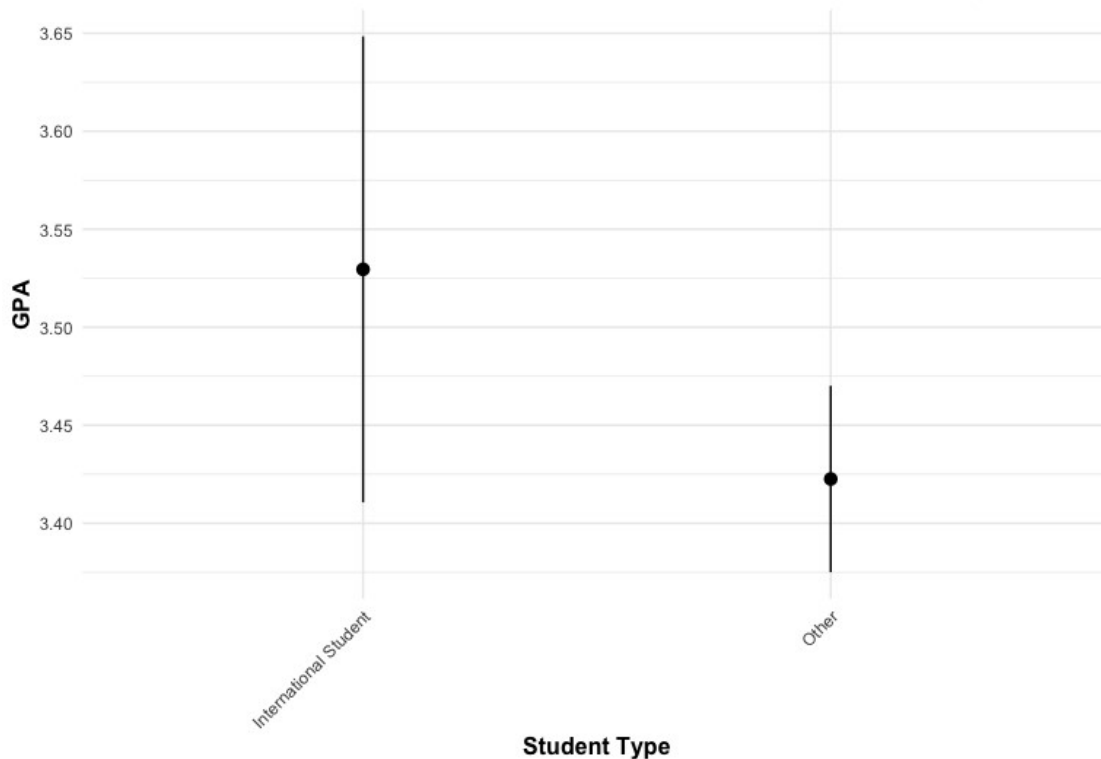

Figure 5: GPA Distribution by Major Division

The data visualization shows Denison students' GPA distributions across various academic majors including Arts, Undecided, Social Sciences, Sciences, Humanities, and Interdisciplinary. Each major is represented by a vertical line with three distinct points: the lowest point indicates the minimum GPA, the middle point likely represents the average GPA, and the highest point indicates the maximum GPA within that major. It is notable that the Undecided major students have the highest maximum GPA among all divisions. However, the Interdisciplinary, Humanities, and Sciences majors have higher average GPAs, as indicated by the height of their middle points in the graph. Additionally, it is a fun fact that the Arts major seems to have the lowest average GPA due to the creative curriculum. Overall, this graphical representation highlights the variations in students' GPA outcomes across different academic fields at Denison University.

Figure 5: GPA Distribution by Major Division
Interdisciplinary students have the highest maximum GPA
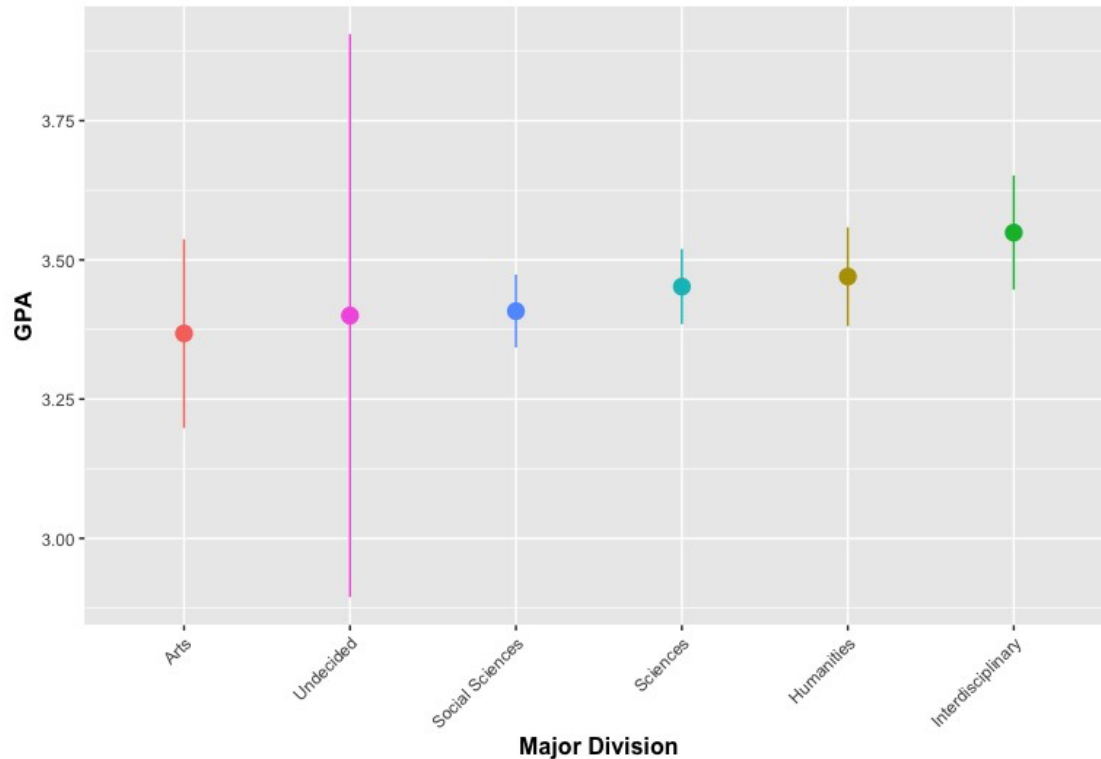
Figure 6: Class Participation's correlation to GPA

The scatter plot demonstrates the relationship between Denison students' individual frequency of class participation and their corresponding GPA. The level of class participation is measured anywhere from 0 to 100% scale. From the plot's trend line, it can be deduced that the higher the students' rate of participation in class, the higher chance that they have a high GPA as the plot peaks at the participation level of around 78%, with the highest GPA of 4.0. On the other hand, there are more and more data recorded when we approach closer and closer to the plot's peak, indicating that Denison students have the tendency to participate more in class.

Figure 6: Class Participation's correlation to GPA
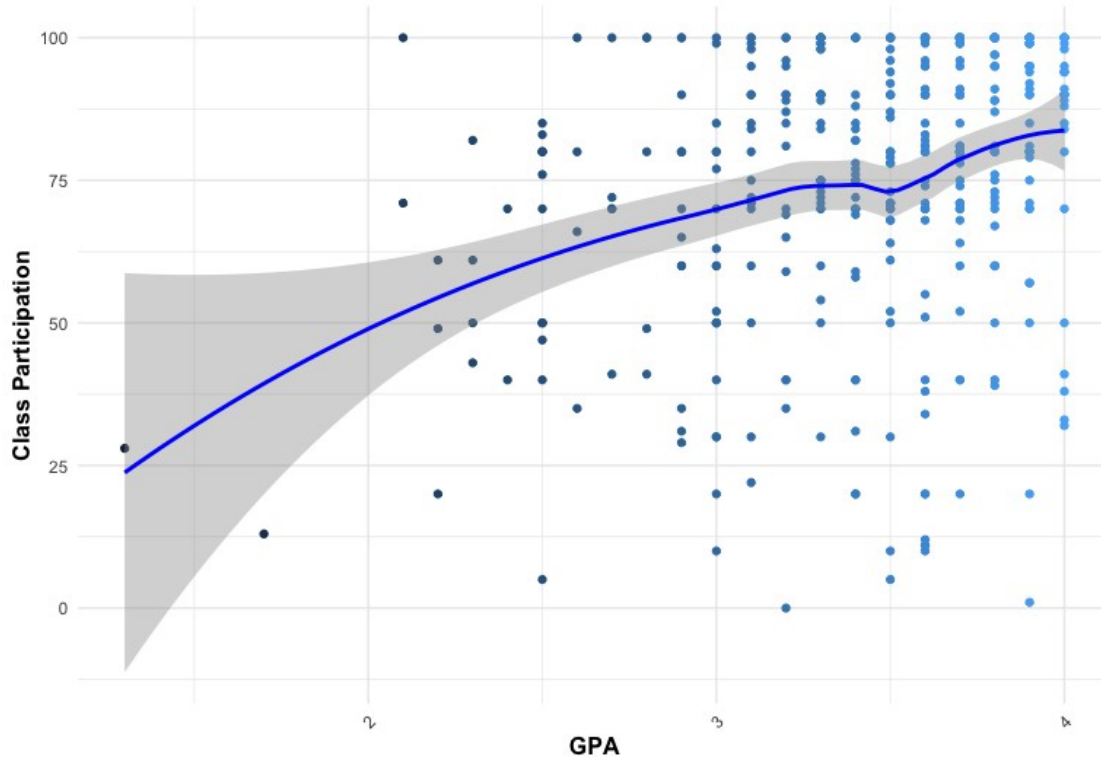The more active students are in classtime, the better their grades are

Figure 7: GPA Distribution by Race/Ethnicity

The point range illustration in Figure 8 illustrates the GPA distribution by race/ethnicity among students, showing mean GPA for different groups. Asian and White students, along with those categorized as "Other" (not including Black and Hispanic students), display higher average GPA, each notably exceeding a 3.25 mean GPA. However, this shows that the common knowledge that Asian students exhibit higher GPA is false, as shown on the graph. Furthermore, the line for white students is the shortest, as indicated by the majority of students being white - around 60% (US News, 2023).

Figure 7: GPA Distribution by Race/Ethnicity

White, Asian students and others (excluding Black and Hispanic students) have the highest GPA averages.
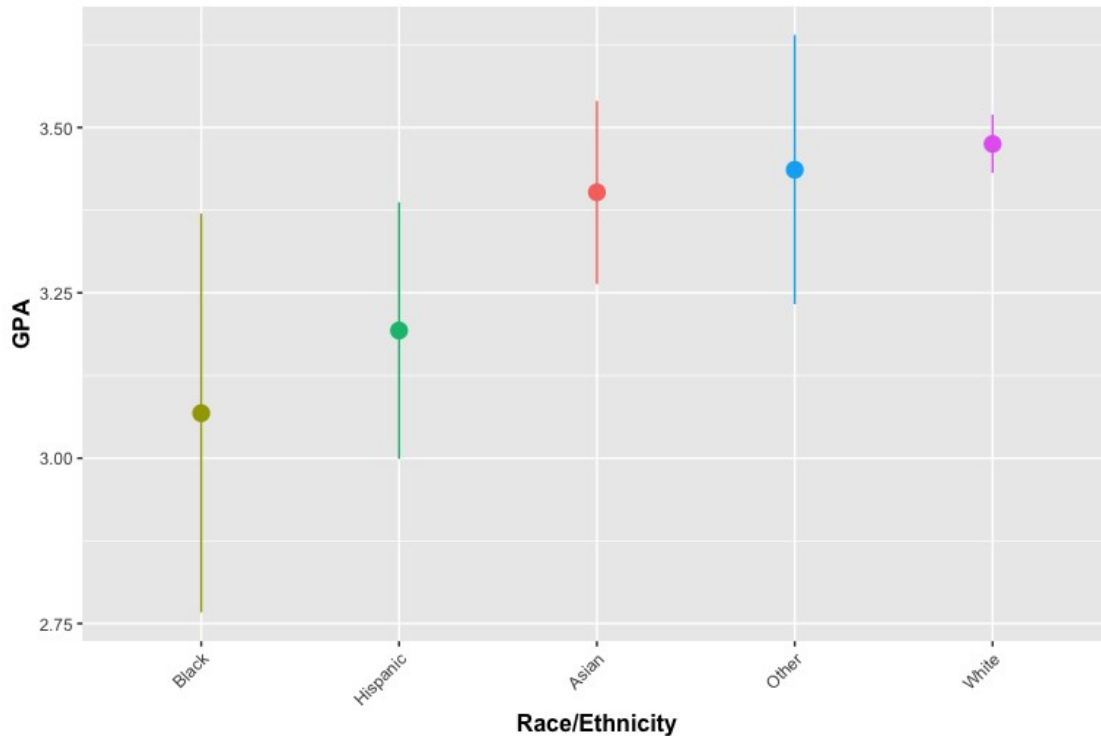
Figure 8: Mean GPA of students who involved in activities outside class

The point ranges illustrate the mean GPA of students who involved in activities outside of class and the particular activities being considered. Students who took part in community services and club sports, along with the "Other Extracurriculars", have the highest average GPA of around 3.5. The reason for this might be due to the fact that students who participated in club sports perfectly acknowledge that they only participating in the sports of their interest once a week for fun and health maintenance, resulting in a better work-life balance and a better academic performance is expected. Secondly, community services not only have undergraduates as volunteers, but also high school students who do it for a better college application, which means that it could just be students who have a higher GPA that is affiliated with community service works have done it since their high school years, and their willingness to do it at such an early stage can be a factor that contributes to their good grades. On the other hand, students who participate in the remaining activities/organizations have their GPA well above 3.3, which is very good. That being said, Denison students who take part in extracurricular outside of class tend to have a higher average GPA of the range 3.3 to 3.55.

Figure 8: Mean GPA of students who involved in activities outside class

Extracurriculars don't seem to affect students' GPA too much. Students who do Community Services have the highest average GPA, followed by other extracurriculars, club sports, performing arts.
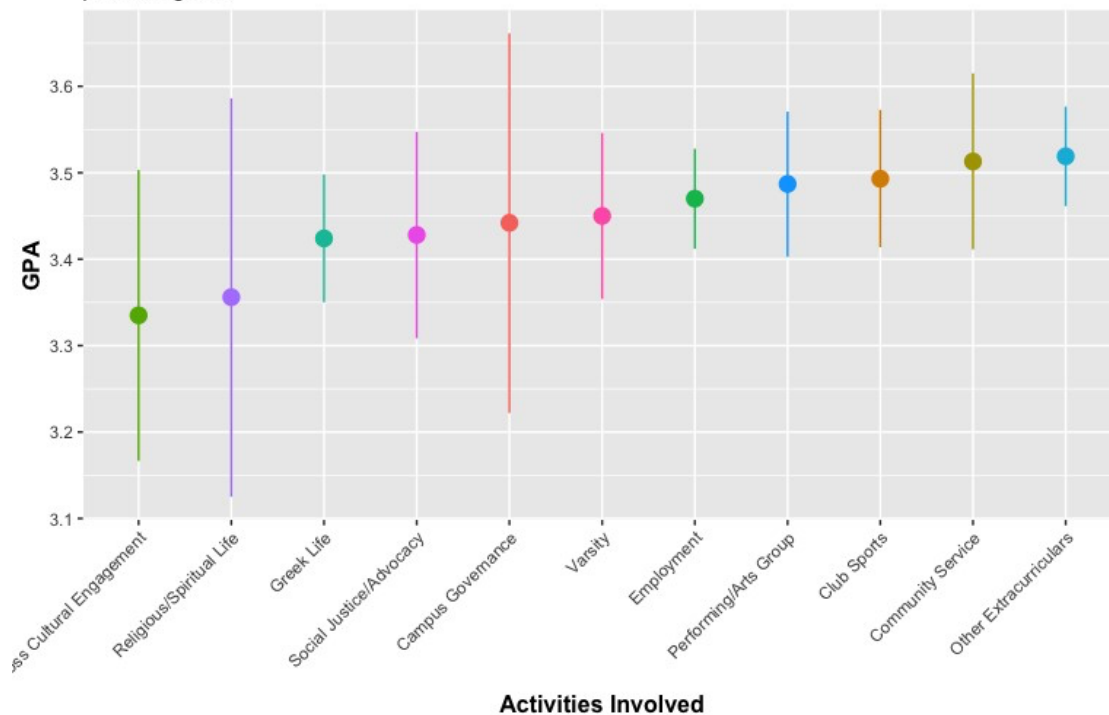
Conclusion

In conclusion, our analysis of how various factors contribute to Denison students' GPA has uncovered important patterns and trends. Students with lower GPA tend to report higher stress levels, although it should be noted that the data supporting this finding is based on a relatively small sample size, indicating a need for broader research to confirm these trends. Furthermore, art students typically have lower GPA, which may be influenced by the less conventional grading rubrics and subjectivity. International students often achieve higher GPA, possibly due to the higher stakes associated with keeping their GPA to a certain level to maintain their scholarships. Interestingly, contrary to common stereotypes, Asian students do not attain the highest GPA, which may result from factors such as the choice of major, adaptation to a new educational system, and language barriers.

The next step should include a section dedicated to the relationship between GPA and stress levels, as stated above. Future research should also focus on deeper investigation into the satisfaction levels of students with their major's department, as this could provide further insight into how departmental support and academic engagement influence GPA. Additionally, examining trends in students' major selection and their correlation with GPA

ranges could identify academic trends. After that, the implementation of new teaching methods in the education system can help schools boost their student performance.

Reference

Barton, A. (2022). Grade inflation: What goes up must come down. The Harvard Crimson. https://www.thecrimson.com/article/2022/10/3/barton-grade-inflation/.

Egele, V. S., Kiefer, L. H., & Stark, R. (2021). Faking self-reports of health behavior: A comparison between a within- and a between-subjects design. Health Psychology and Behavioral Medicine, 9(1), 895–916. https://doi.org/10.1080/21642850.2021.1991803.

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