

# Research Study Project

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**Abstract**—This study examines differences in optimism, introversion, and alcohol consumption between STEM and non-STEM majors, aiming to understand how an academic discipline influences these psychological traits. Using a Google Forms survey distributed to 67 students (29 non-STEM and 38 STEM majors), we applied statistical tests to explore these differences. The results reveal significant differences in introversion and alcohol consumption, with STEM majors being more introverted and drinking less frequently compared to their non-STEM peers. However, no significant difference in overall optimism was found between the two groups. This paper discusses the implications of these findings, highlighting how academic fields may shape social behaviors and attitudes, and suggests avenues for further research to explore additional factors influencing student well-being.

## I. INTRODUCTION

Optimism, the general expectation that positive outcomes will prevail. This is a key psychological trait linked to mental health, academic success, and career achievements. Research shows that optimistic individuals tend to experience better well-being, resilience, and success across personal and professional domains. Understanding the factors that influence optimism is important for educators, psychologists, and policymakers. One potential factor is academic discipline. STEM (Science, Technology, Engineering, and Mathematics) majors often face rigorous coursework, high competition, and rapidly evolving fields, which may contribute to stress and lower optimism. In contrast, non-STEM fields like the humanities and social sciences may offer more flexibility and opportunities for personal growth, potentially fostering higher optimism. Despite these differences, research on whether STEM and non-STEM students differ in optimism levels is limited. This study seeks to fill that gap by examining whether STEM students have lower optimism compared to their non-STEM peers, and by exploring the factors contributing to these differences. Findings could provide insights into how academic environments shape optimism and guide interventions to better support student well-being and success.

## II. RELATED WORK

The relationship between academic discipline and psychological traits like optimism has received limited but growing attention. While optimism is widely recognized for its benefits in personal and professional success, fewer studies have explored how it varies across academic fields and how the unique demands of these disciplines influence students' outlooks. Research suggests that optimism plays a key role in academic performance, with more optimistic

students generally showing better achievement, higher motivation, and greater persistence (Carver et al., 2010). In STEM fields, characterized by rigorous coursework and high stress, research shows that academic pressure can negatively affect optimism (Sayyadpour et al., 2011). STEM students, especially in engineering and science, report higher stress and burnout, which may lower optimism (Pester et al., 2023). In contrast, non-STEM fields, while not without their own stresses, often offer more flexible coursework and career paths, which may foster higher optimism.

## III. EXPERIMENTAL DESIGN

Our research focuses on a main hypothesis with 2 related hypotheses.

**Main Null Hypothesis:** STEM majors have the same level of optimism as non-STEM majors. **Main Alternative Hypothesis:** There is a difference in optimism levels between STEM majors and non-STEM majors.

**Supporting Null Hypothesis 1:** STEM and non-STEM majors have the same ratio of introverts and extroverts. **Supporting Alternative Hypothesis 1:** STEM majors are more introverted than non-stem majors.

**Supporting Null Hypothesis 2:** There is no association between STEM vs. non-STEM majors and the frequency of alcohol consumption. **Supporting Alternative Hypothesis 2:** There is an association between the type of STEM vs. non-STEM majors and the frequency of alcohol consumption.

### A. Data Collection and methods

Data for this study were collected using an online survey distributed through Google Forms. The survey was designed to gather information on the variables of interest. To ensure a diverse sample, the survey was shared with various student groups across different academic majors, particularly focusing on those who identified as either STEM or non-STEM majors. To test the primary hypothesis regarding optimism, we conducted a two-sample t-test to compare the optimism scores between STEM and non-STEM students. Using the `scipy` stats library, we input the means, standard deviations, and sample sizes for both groups. For the second hypothesis, we compared the proportion of introverted students between STEM and non-STEM majors using a z-test for proportions. This test was performed using the `proportions` module from the `statsmodels` library. The number of introverted students in each group, as well as the total number of students in each group, were used as inputs to the test. For the analysis of our third hypothesis

regarding alcohol consumption frequency, we applied the Chi-square test of independence to determine if there is a significant relationship between the type of major (STEM vs. non-STEM) and the frequency of alcohol consumption. This test was chosen because the data is categorical, representing the number of students who drink alcohol on different frequency ranges of days (1-2, 3-4, 5+). The Chi-square test was performed using Python's `scipy stats` library with the `chi2` contingency function.

#### IV. RESULTS

The results of our statistical tests are presented below. We used a p-value rejection threshold of 0.05 for all tests. The first hypothesis tested was whether STEM majors are more optimistic than non-STEM majors. We conducted a two-sample t-test, and the resulting p-value was 0.5228. Since this p-value is well above the 0.05 threshold, we fail to reject the null hypothesis. Therefore, there is no statistically significant difference in optimism scores between STEM and non-STEM majors. For our second hypothesis, we tested whether STEM majors are more introverted than non-STEM majors. A z-test for proportions was used to compare the number of introverted students in each group. The p-value for this test was 0.0057, which is below the 0.05 significance level. As a result, we reject the null hypothesis and conclude that there is a statistically significant difference in the introversion levels between STEM and non-STEM majors, with STEM majors exhibiting more introverts on average. The third hypothesis examined whether STEM majors drink alcohol less frequently than non-STEM majors on a weekly basis. We applied the Chi-square test of independence to analyze the data, and the p-value was 0.0102, which is below the 0.05 threshold. This indicates a statistically significant difference in the frequency of alcohol consumption between STEM and non-STEM majors. Therefore, we reject the null hypothesis, suggesting that drinking frequency is not independent of academic major. STEM students were more likely to report drinking 1-2 days per week, while Non-STEM students had higher proportions in the more frequent drinking categories ("3-4 days" and "5+ days").

#### V. DISCUSSION

The purpose of this study was to explore differences between STEM and non-STEM majors in terms of optimism, introversion, and alcohol consumption. Our findings, based on statistical tests (two-sample t-test, z-test for proportions, and Chi-square test), revealed some significant differences, though not all hypotheses were supported. The first hypothesis suggested that STEM majors would be more optimistic than non-STEM majors, but this was not supported. This suggests that optimism may not be strongly influenced by academic discipline, or that other factors, such as personal circumstances or social support, may play a more significant role. Our second hypothesis, that STEM majors would be more introverted than non-STEM majors, was supported. STEM majors reported higher introversion, which aligns with previous research suggesting that STEM fields attract

more introverted individuals. This could be due to the solitary nature of STEM work, whereas non-STEM fields often promote more social interaction, contributing to higher extroversion. The third hypothesis, that there is an association between the type of major STEM vs. non-STEM and the frequency of alcohol consumption, was also supported. STEM majors drank less frequently, likely due to the demanding academic workload, which leaves them with less time for social activities. Non-STEM majors, with potentially more flexible schedules, may have more opportunities for social gatherings where alcohol consumption is common. These findings suggest that academic disciplines may shape social behaviors and lifestyles in meaningful ways.

#### VI. FUTURE WORK

While this study provides valuable insights into behavioral differences between STEM and non-STEM majors, there are several limitations. First, the sample size was small, with only 67 students, limiting the generalization and statistical power of the results. Additionally, the majority of STEM participants were data science majors at Baylor, which may not fully represent the diversity of STEM fields and could influence the findings, particularly given the unique nature of data science compared to other STEM disciplines. Second, the reliance on self-reported data introduces potential biases, such as social desirability or inaccurate recall. Students may have under reported alcohol consumption or overstated their optimism. Future studies could use objective measures or corroborating sources to reduce these biases. Finally, this study focused on optimism, introversion, and alcohol consumption, but other factors like personality traits, mental health, or socioeconomic status may also influence student behavior. Future research could examine these additional variables to better understand the underlying factors driving the observed differences.

#### VII. CONCLUSION

In summary, this study found that there is no significant difference in optimism between STEM and non-STEM majors, but there are significant differences in introversion and alcohol consumption. STEM majors tend to be more introverted and drink less frequently than their non-STEM counterparts. These findings contribute to our understanding of how academic disciplines may influence students' social behaviors and attitudes. Further research with larger and more diverse samples is needed to explore these differences in greater depth and to identify other factors that may play a role in shaping the experiences of STEM and non-STEM students.

#### REFERENCES

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