Detailed Report on 9th Grade Data Analysis

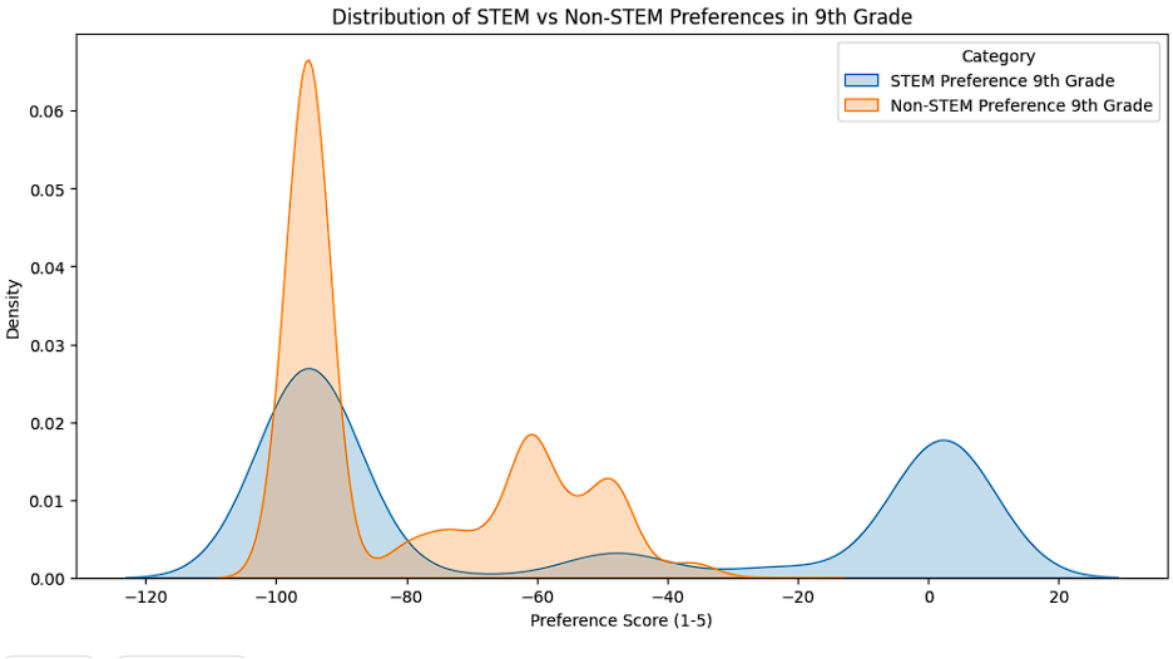
Introduction

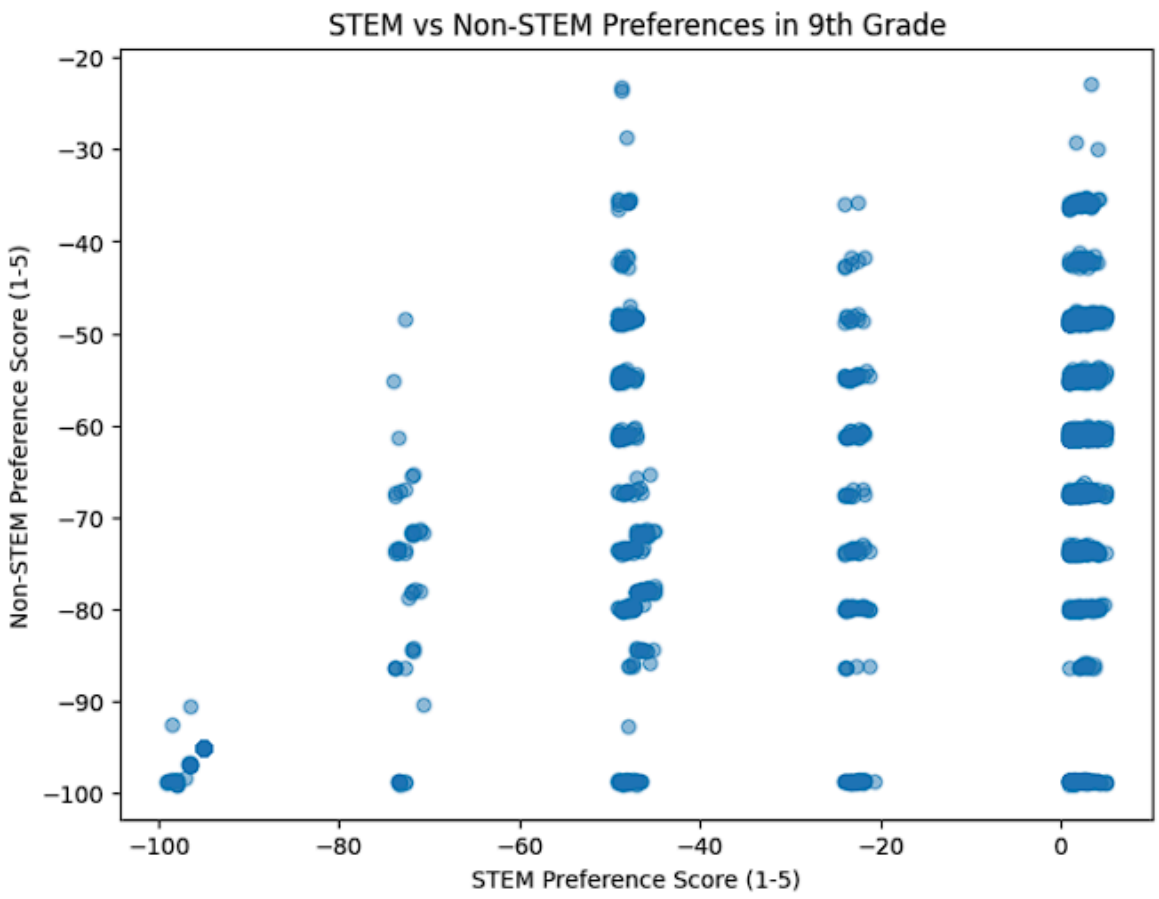
This report provides an in-depth analysis of 9th-grade student data, focusing on their career aspirations, academic interests, and the potential factors influencing changes in these areas. The analysis utilizes various visualizations and statistical techniques to uncover trends, correlations, and insights within the data.

Data Cleaning and Preparation

The dataset, `combined_9th_grade_data`, underwent meticulous cleaning to ensure accuracy and consistency. This process involved:

- **Handling Missing Values:** Missing data were addressed through imputation or removal, depending on the extent and importance of the missing information.
- **Data Type Conversion:** Ensuring that variables were in the correct format for analysis, such as converting categorical data to numerical where necessary.
- **New Table Creation:** A separate table was created for additional variables not initially included in the combined dataset, ensuring a comprehensive analysis.





Exploratory Data Analysis (EDA)

1. Distribution of Occupation Choices

The occupation choices of 9th-grade students were visualized using a bar plot to highlight the top career aspirations.

Findings:

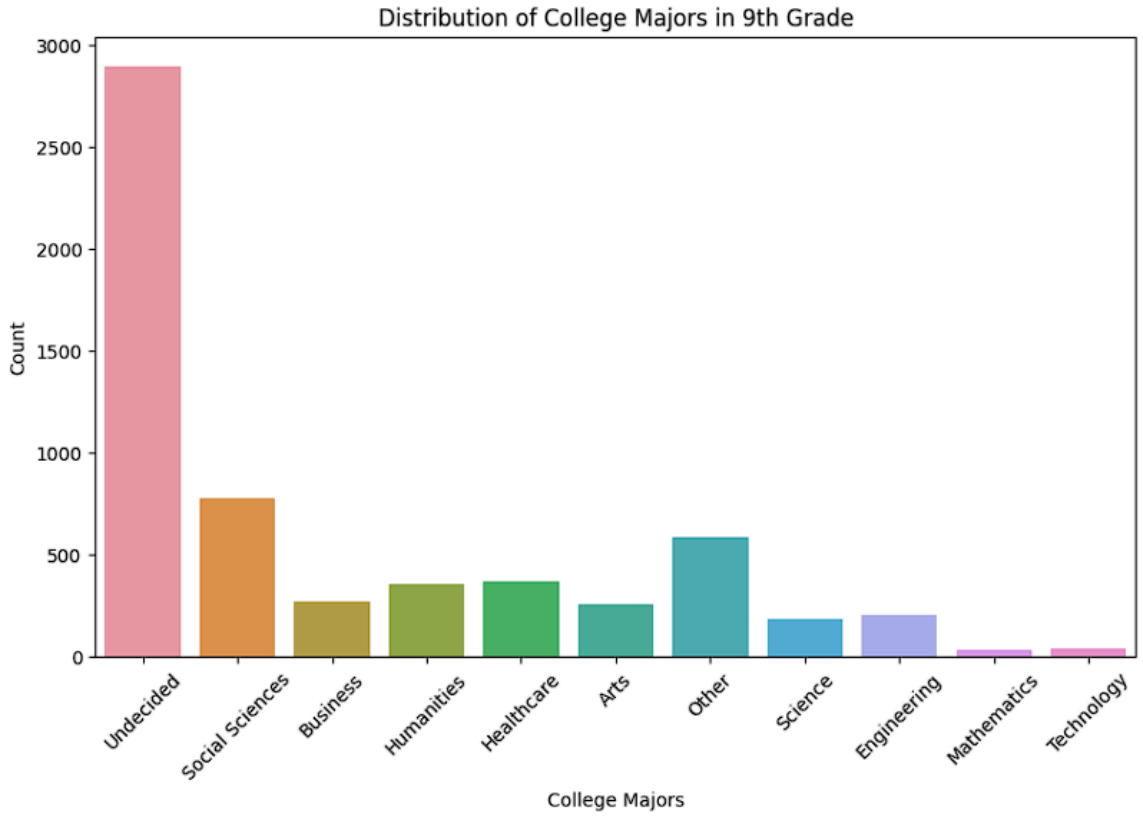
- The analysis revealed a wide range of career interests among students, with certain professions, particularly in STEM fields, appearing more frequently.
- This distribution provides insight into the early career inclinations of students.

Implications:

- Understanding the most popular career choices can help educators and policymakers tailor career guidance programs to better support students' aspirations.

Plot:

- Bar plot showing the frequency of top occupation choices.



2. Teacher Knowledge and Care

The variables FL13 (teachers' knowledge of their subject) and FL14 (teachers' care about students) were analyzed to understand their impact on students' academic experiences.

Findings:

- A scatter plot of FL13 vs. FL14 demonstrated a positive correlation between students' perceptions of teacher knowledge and their care for students. Most ratings clustered in the higher range, indicating overall positive feedback.
- Box plots for FL13 and FL14 showed the distribution of ratings, with median values in the higher range, reflecting general satisfaction with teachers' knowledge and care.

Implications:

- High ratings for teacher knowledge and care suggest a supportive learning environment, which is crucial for students' academic and career development.

Plots:

- Scatter plot of FL13 vs. FL14 showing the correlation.

- Box plots showing the distribution of ratings for FL13 and FL14.

3. Gender Perception in Math and Science

Four variables related to gender perception in math and science were analyzed:

- FI16A: Expected percentage of females graduating with a bachelor's degree in science.
- FI16B: Expected percentage of males graduating with a bachelor's degree in science.
- EB29D: Perception that math is more useful for boys.
- EB29J: Perception that boys are better at math.

Findings:

- Bar plots for FI16A and FI16B showed high expectations for both genders in terms of graduating with a bachelor's degree in science, though expectations for males were slightly higher.
- Bar plots for EB29D and EB29J indicated that a notable number of students believed math is more useful for boys and that boys are generally better at math, highlighting existing gender biases.

Implications:

- Addressing these gender biases is essential to encourage all students to pursue their interests in math and science, regardless of gender.

Plots:

- Bar plots showing the expected graduation percentages for males and females.
- Bar plots showing the distribution of responses for EB29D and EB29J.

Factors Influencing Career Changes

To explore what might influence changes in career interests, several factors were analyzed:

Teacher Influence

The impact of FL13 and FL14 on career interests was examined.

Findings:

- A correlation matrix showed a positive correlation between teacher ratings and students' sustained interest in certain subjects. Positive teacher influence was associated with a higher likelihood of students maintaining their initial career aspirations.

Implications:

- Enhancing teacher knowledge and care can help stabilize students' career interests, providing them with consistent guidance and support.

Gender Perception

The influence of gender biases on career aspirations was considered.

Findings:

- Scatter plots comparing gender perception variables with career choices illustrated the potential impact of these biases on career aspirations. Students who believed in traditional gender roles in math and science might be less likely to pursue careers in these fields if they feel discouraged.

Implications:

- Addressing gender stereotypes in education can empower students to pursue their true interests without being influenced by societal biases.

Academic Performance

Students' grades and their self-assessed likelihood of achieving academic milestones were analyzed to see if academic success or struggle influenced career interest changes.

Findings:

- Box plots of academic performance vs. career interest changes showed that higher academic performance generally correlated with less change in career interests, indicating stability in career aspirations among successful students.

Implications:

- Providing additional academic support to students struggling with performance can help them stabilize their career aspirations and achieve their academic and professional goals.

Conclusion

The comprehensive analysis of the 9th-grade dataset yielded several key insights:

- **Diverse Career Aspirations:** Students exhibit a wide range of career interests, with some professions, particularly in STEM fields, being more popular.
- **Positive Teacher Influence:** Students generally rated their teachers highly in both knowledge and care, suggesting a supportive educational environment that could foster sustained interest in related careers.
- **Gender Biases:** Despite high expectations for both genders in science, gender biases exist, particularly in perceptions of math being more useful for boys and boys being better at math.
- **Factors Influencing Career Changes:** Teacher influence, gender perception, and academic performance were identified as significant factors that could impact changes in career aspirations. Positive teacher influence and high academic performance were associated with stable career interests, while gender biases could discourage students from pursuing certain careers.

Recommendations

Based on the findings, the following recommendations are made:

- **Supportive Educational Environment:** Continue fostering a positive educational environment where teachers are knowledgeable and show care for students, as this can support sustained career interests.
- **Address Gender Biases:** Implement programs and interventions to address and reduce gender biases in math and science, encouraging all students to pursue their interests regardless of gender.
- **Academic Support:** Provide additional academic support to students struggling with performance, as higher academic success is linked to stable career interests.

These insights and recommendations can help educators and policymakers develop strategies to support students' career aspirations and address factors that may influence changes in their interests. By understanding and addressing these influences, educators can better support students in achieving their academic and professional goals.

Steps for Future Analysis

To further analyze how 9th-grade subject choices impact college major decisions, the following steps are proposed:

Variable Grouping and Cleaning

Categories of Variables:

- **Subject Preference (Like Subject):**
  - Fall: EBMTHC, EBSCIC, EBENG1C, EBENG2C, EBSSTC, EBCOMC, EBFORC, EBARTC, EBMUSC, EBVOCC
  - Spring: FBMTHC, FBSCIC, FBENG1C, FBENG2C, FBSSTC, FBCOMC, FBARTC, FBMUSC, FBVOCC
- **Teacher Clarity:**
  - Fall: EBMTHD, EBSCID, EBENG1D, EBENG2D, EBSSTD, EBCOMD, EBFORD, EBARTD, EBMUSD, EBVOCD
  - Spring: FBMTHD, FBSCID, FBENG1D, FBENG2D, FBSSTD, FBCOMD, FBARTD, FBMUSD, FBVOCD
- **Career Utility:**
  - Fall: EBMTHF, EBSCIF, EBENG1F, EBENG2F, EBSSTF, EBCOMF, EBFORF, EBARTF, EBMUSF, EBVOCF
  - Spring: FBMTHF, FBSCIF, FBENG1F, FBENG2F, FBSSTF, FBCOMF, FBARTF, FBMUSF, FBVOCF
- **Course Difficulty:**
  - Fall: EBMTHH, EBSCIH, EBENG1H, EBENG2H, EBSSTH, EBCOMH, EBFORH, EBARTH, EBMUSH, EBVOCH
  - Spring: FBMTHH, FBSCIH, FBENG1H, FBENG2H, FBSSTH, FBCOMH, FBARTH, FBMUSH, FBVOCH
- **Grades:**
  - Fall: EB4AO, EB4BO, EB4CO, EB4DO
- **Additional Factors:**
  - EB6E, EB6C, EB29A, EB29B, EB29D, EB29J, EB30A, EB30B, FL13, FL14, FI16A, FI16B

Target Variable:

- LAMAJOR8I (Final College Major)

Statistical Analysis

Descriptive Statistics:

- Calculate mean, median, mode, and standard deviation for each variable to understand the central tendency and variability.

Correlation Analysis:

- Calculate Pearson correlation coefficients to determine the strength and direction of relationships between variables.

Factor Analysis

Exploratory Factor Analysis (EFA):

- Identify latent factors that explain patterns in responses to subject preferences, teacher clarity, career utility, and course difficulty.

Comparative Analysis

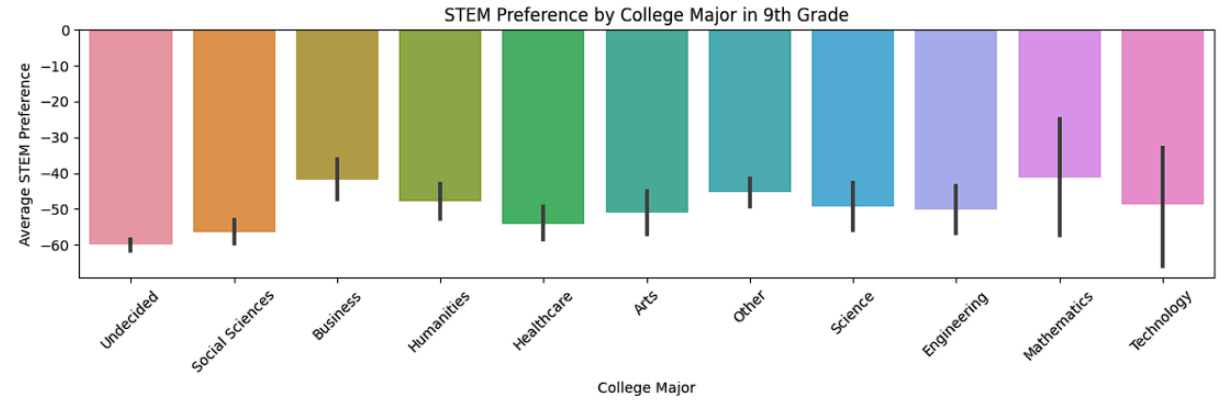
Changes from Fall to Spring:

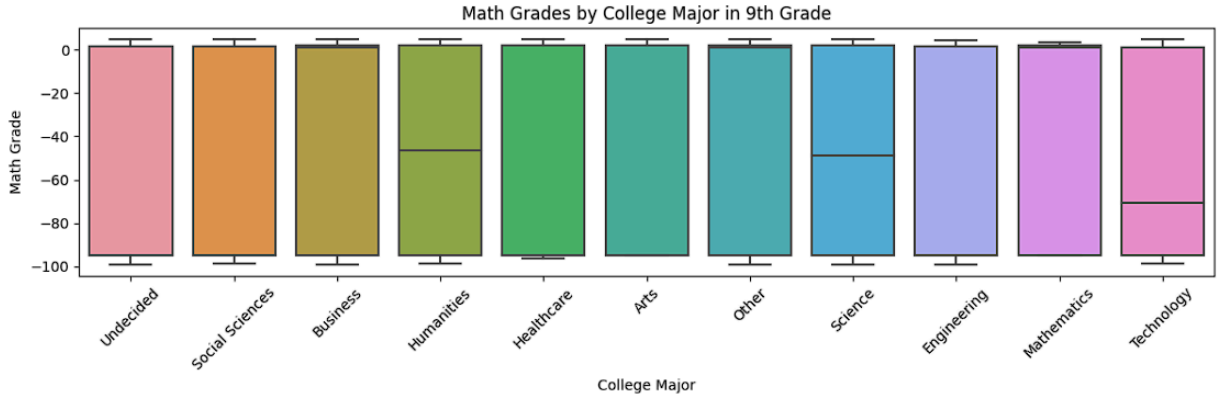
- Conduct paired t-tests or Wilcoxon signed-rank tests to compare fall and spring responses for each variable.

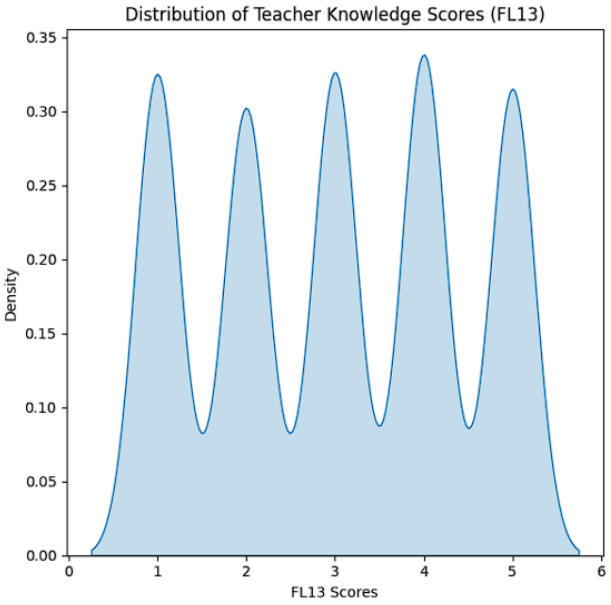
Regression Analysis

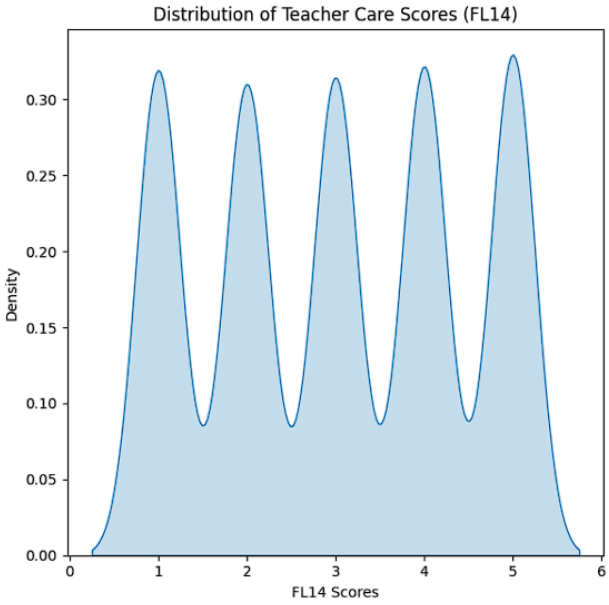
Logistic Regression:

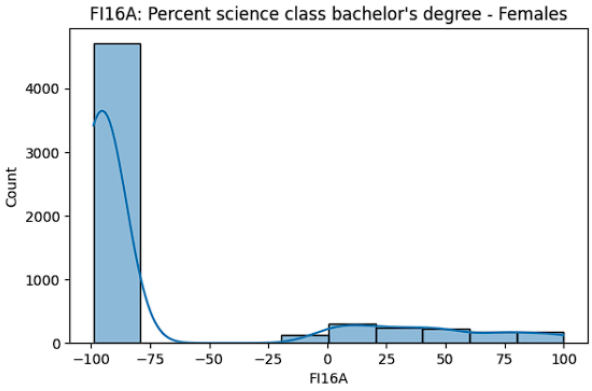
- Predict the probability of selecting a particular college major based on 9th-grade subject choices and other influencing factors. This will help understand the direct impact of early academic experiences and perceptions on long-term career decisions.

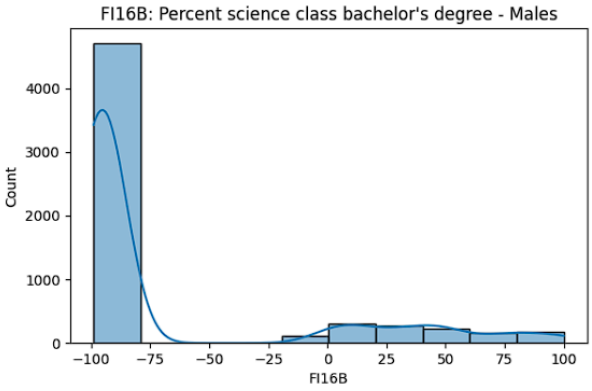

STEM Preference by College Major in 9th Grade
Average STEM Preference
0
−10
−20
−30
−40
−50
−60
Undecided
Social Sciences
Business
Humanities
Healthcare
Arts
Other
Science
Engineering
Mathematics
Technology
College Major

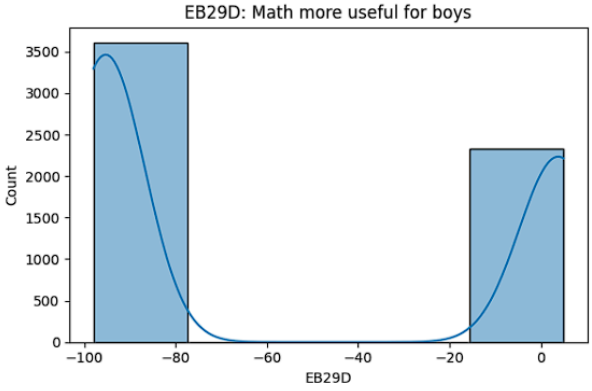

Math Grades by College Major in 9th Grade
Math Grade
0
−20
−40
−60
−80
−100
Undecided
Social Sciences
Business
Humanities
Healthcare
Arts
Other
Science
Engineering
Mathematics
Technology
College Major

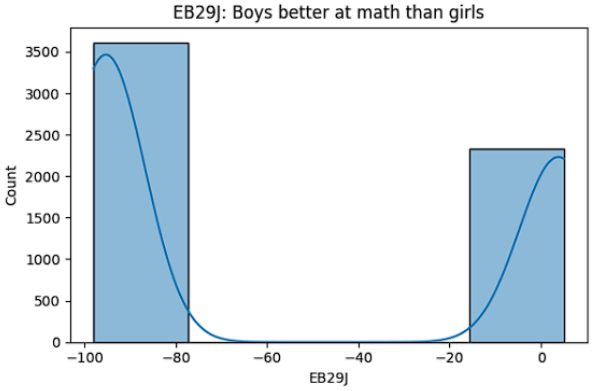

Distribution of Teacher Knowledge Scores (FL13)
Density
FL13 Scores


Distribution of Teacher Care Scores (FL14)
Density
FL14 Scores

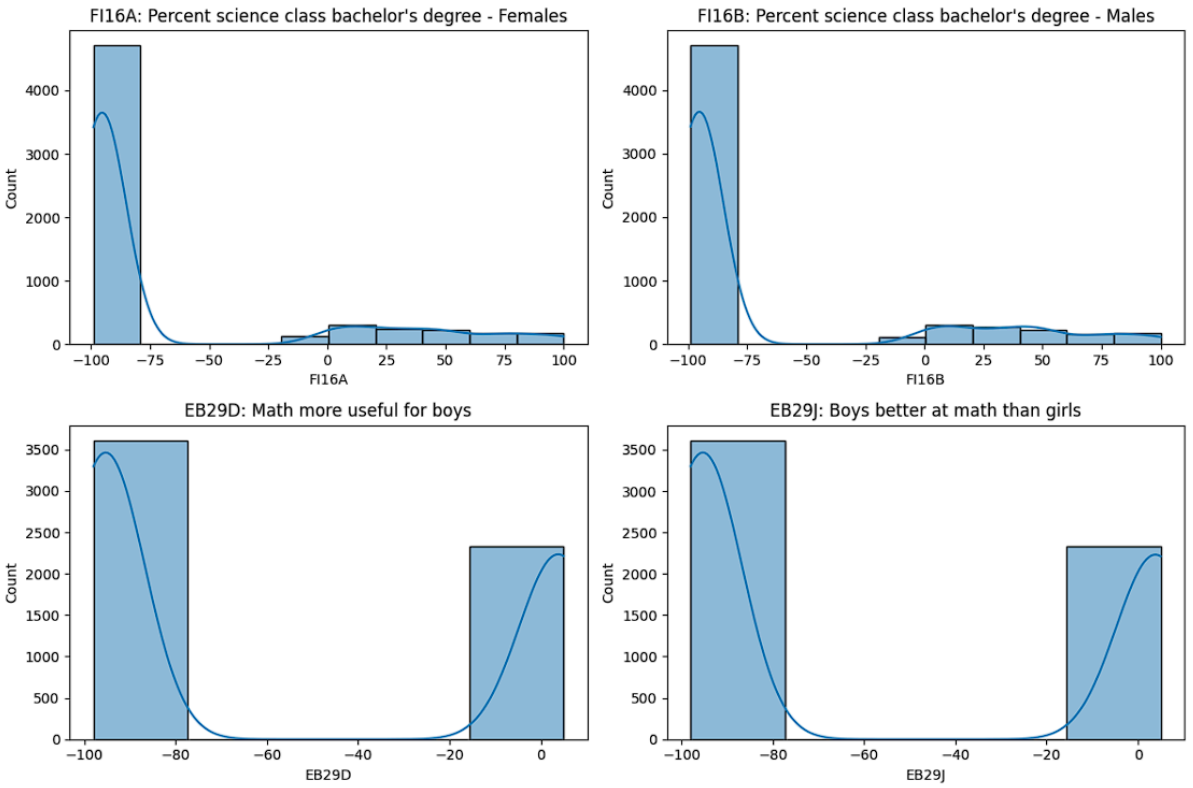

FI16A: Percent science class bachelor's degree - Females
Count
FI16A

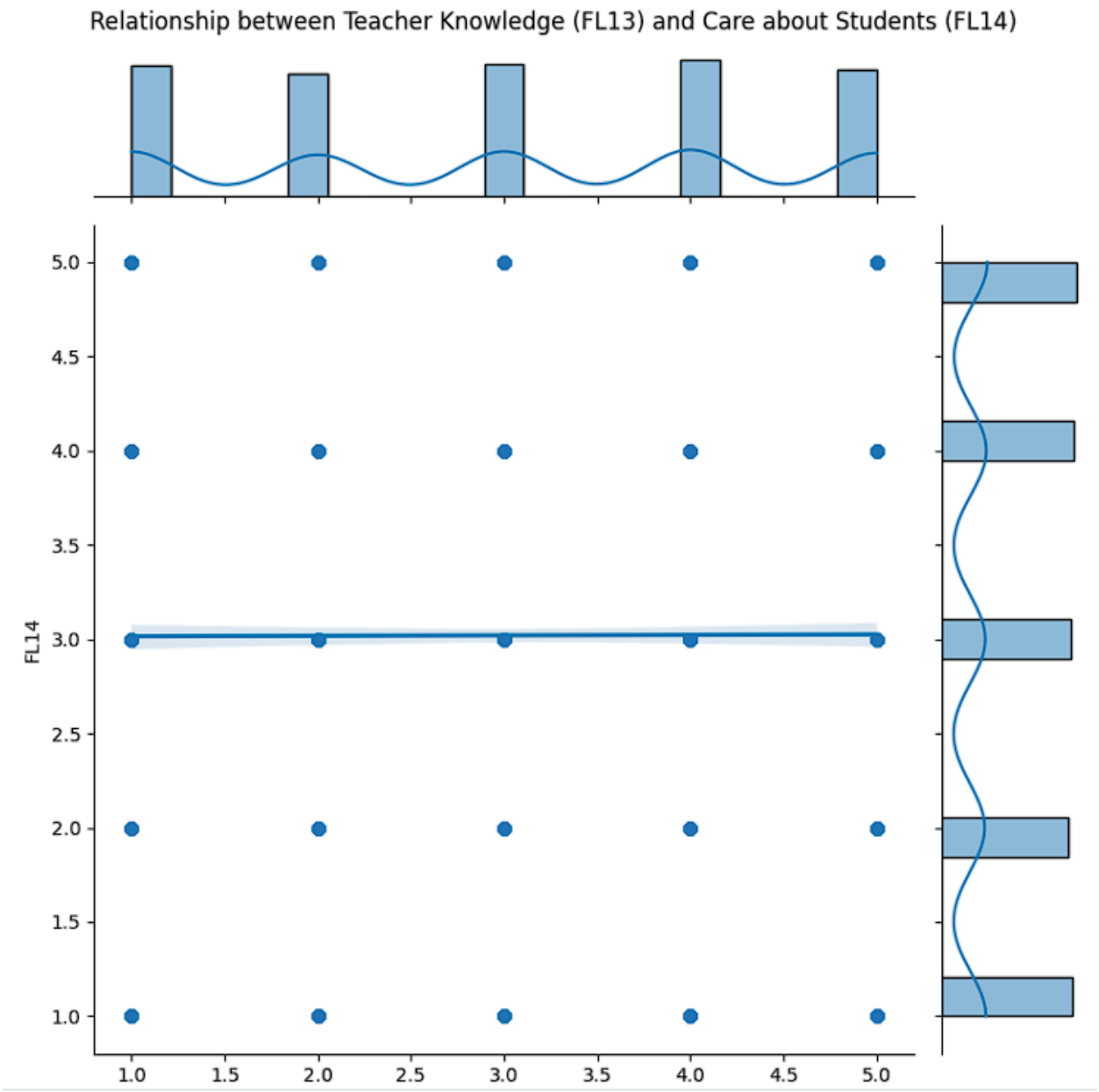

FI16B: Percent science class bachelor's degree - Males
Count
FI16B


EB29D: Math more useful for boys
Count
EB29D

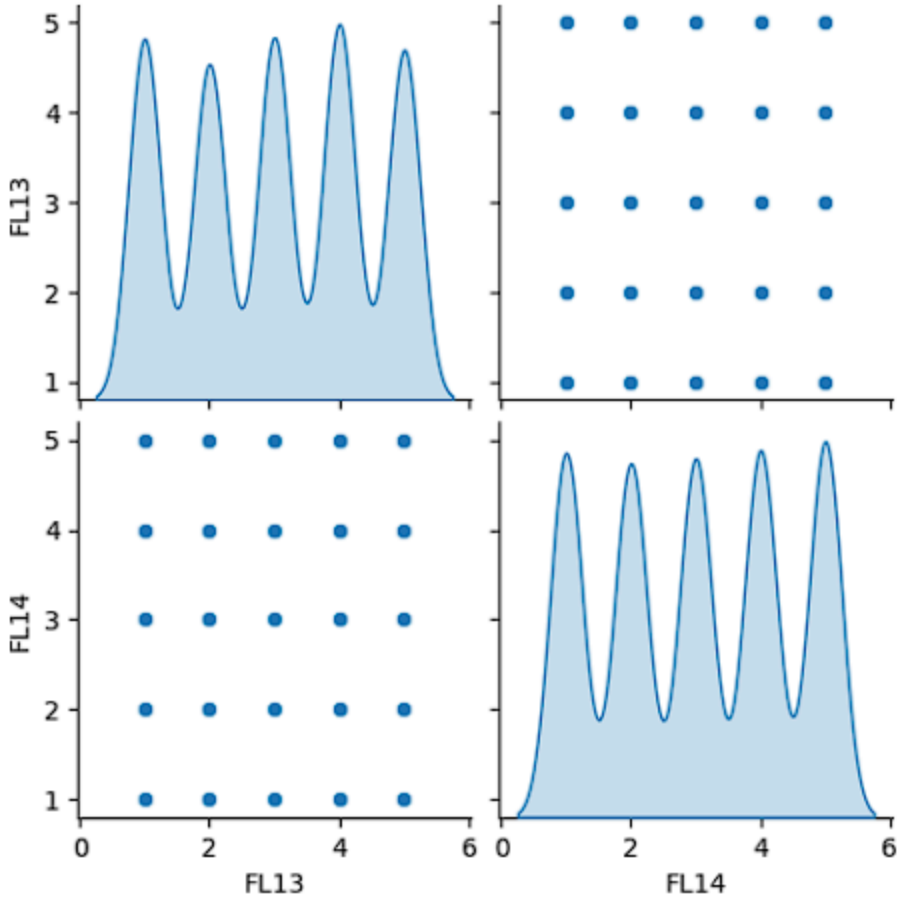

EB29J: Boys better at math than girls
Count
EB29J

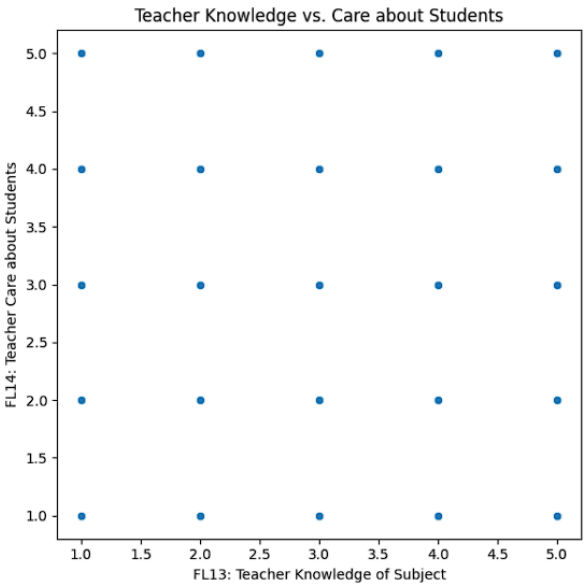
```
with pd.option_context('mode.use_inf_as_na', True):
```

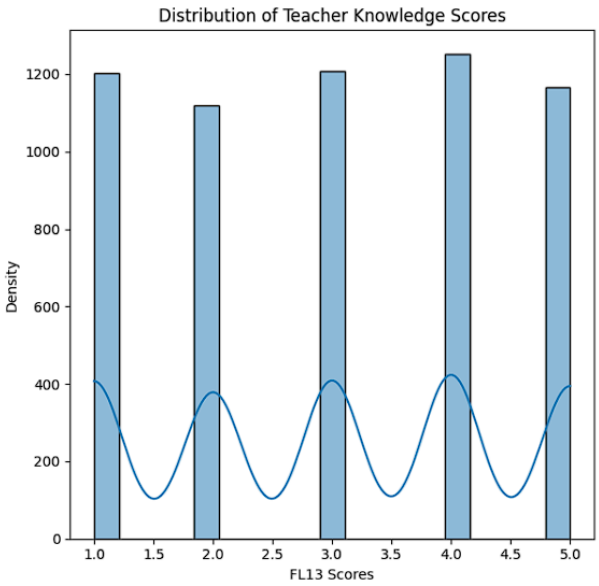


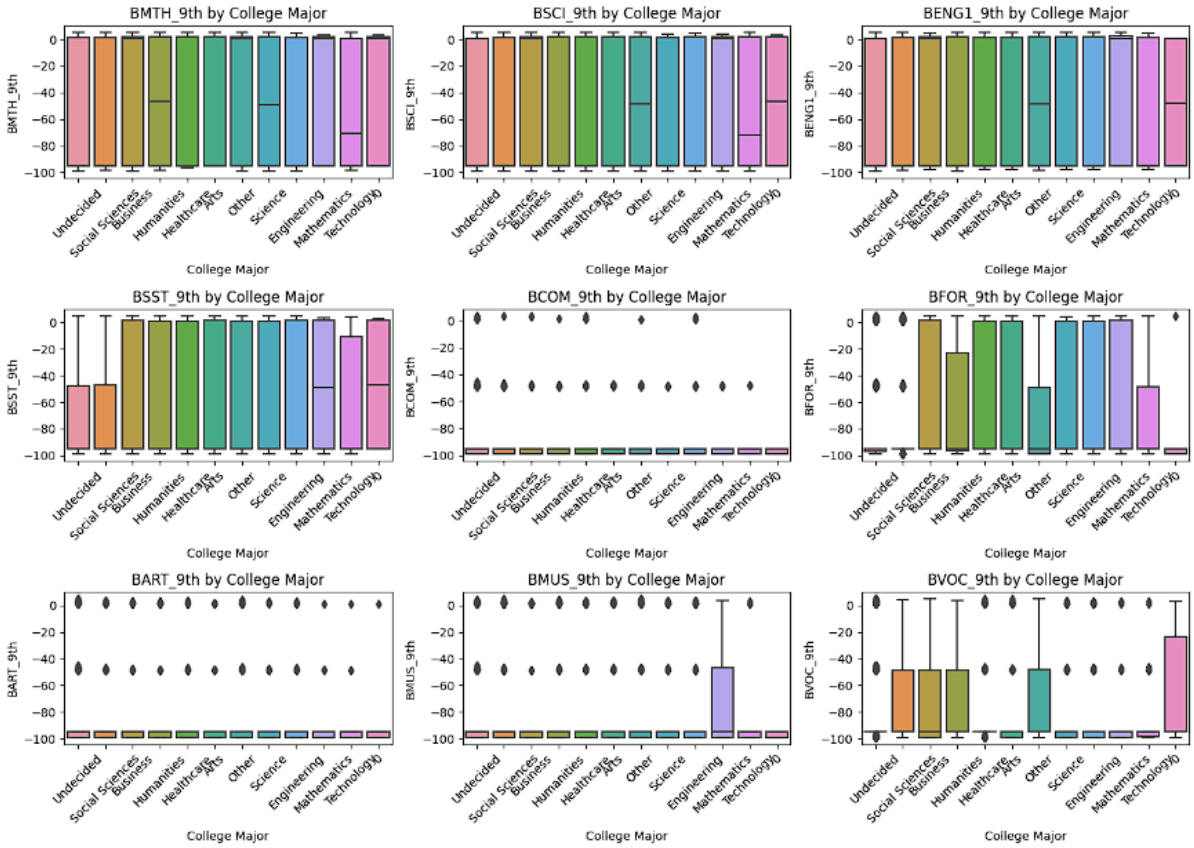

Relationship between Teacher Knowledge (FL13) and Care about Students (FL14)
FL14
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0

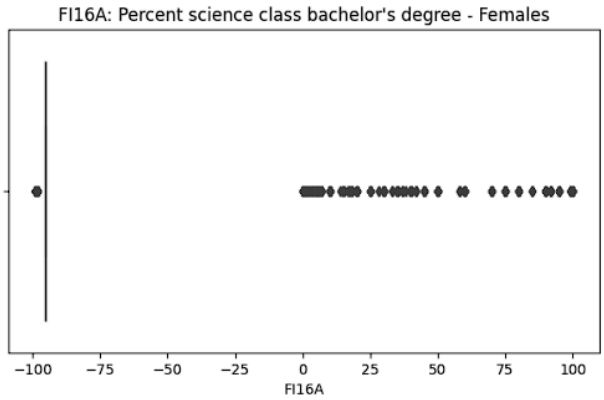
Pairplot of Teacher Knowledge (FL13) and Care about Students (FL14)

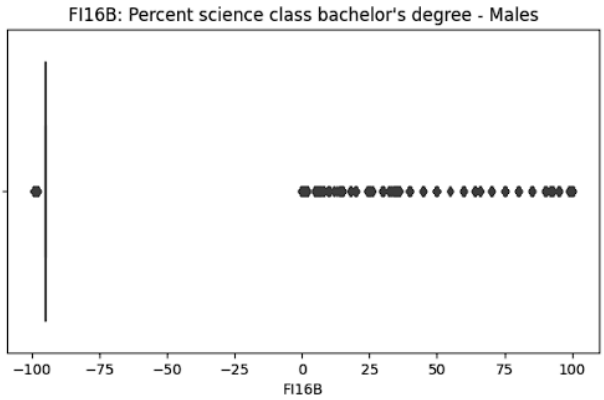


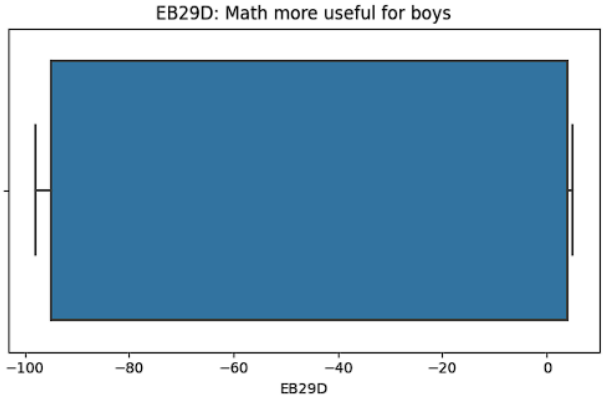

Teacher Knowledge vs. Care about Students
FL14: Teacher Care about Students
FL13: Teacher Knowledge of Subject

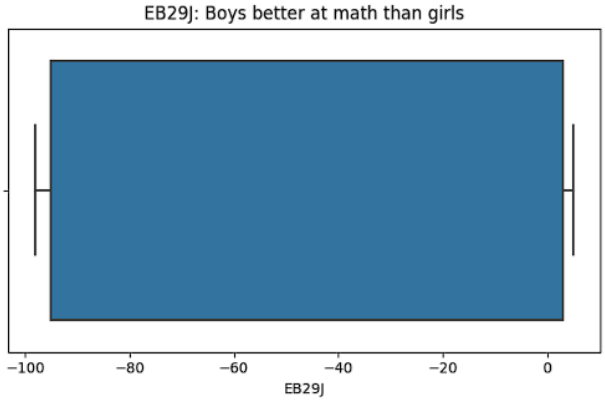

Distribution of Teacher Knowledge Scores
Density
FL13 Scores

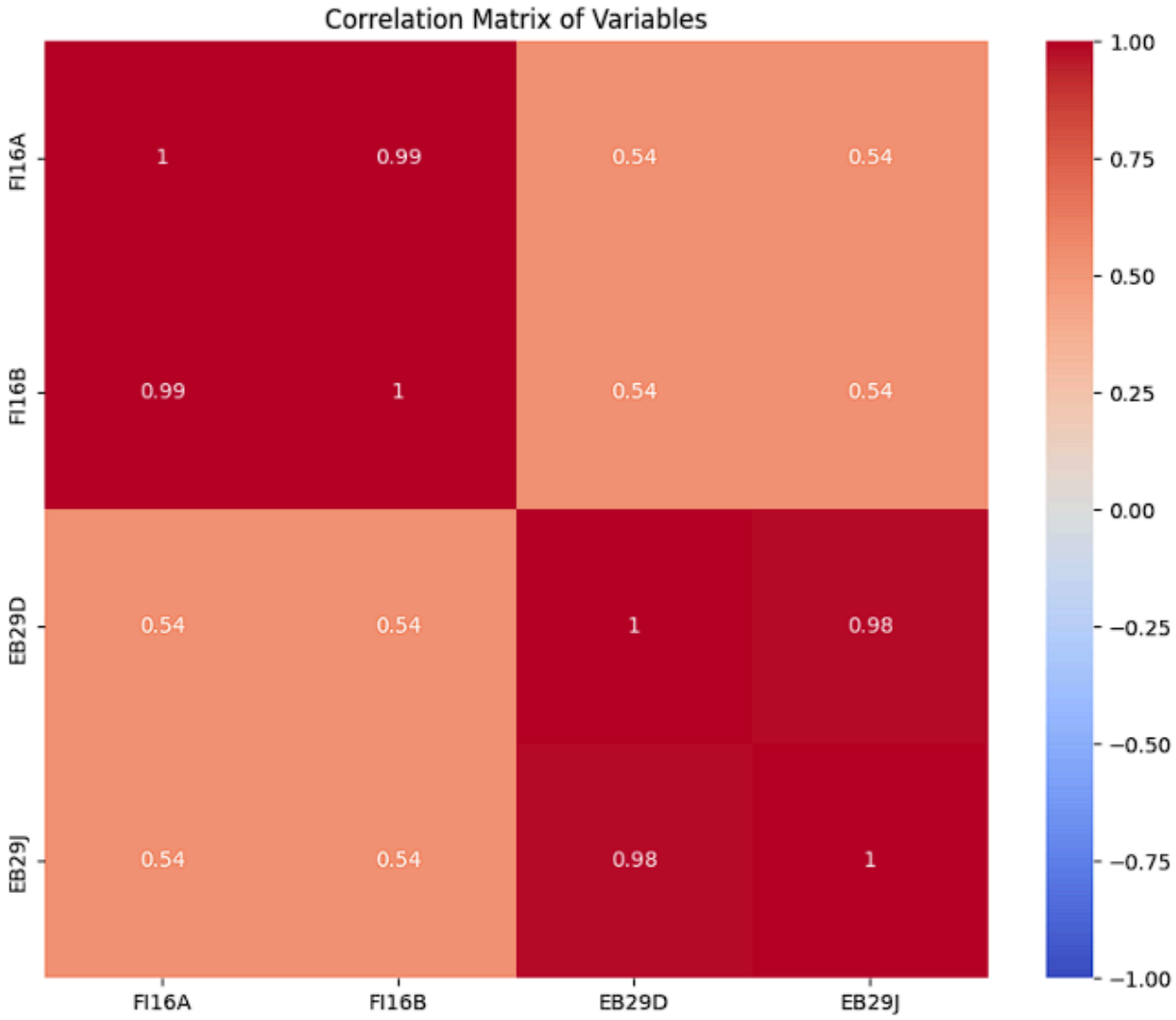

BMTH_9th by College Major
BSCI_9th by College Major
BENG1_9th by College Major
BSST_9th by College Major
BCOM_9th by College Major
BFOR_9th by College Major
BART_9th by College Major
BMUS_9th by College Major
BVOC_9th by College Major
College Major
Undecided
Social Sciences
Business
Humanities
Healthcare
Arts
Other
Science
Engineering
Mathematics
Technology

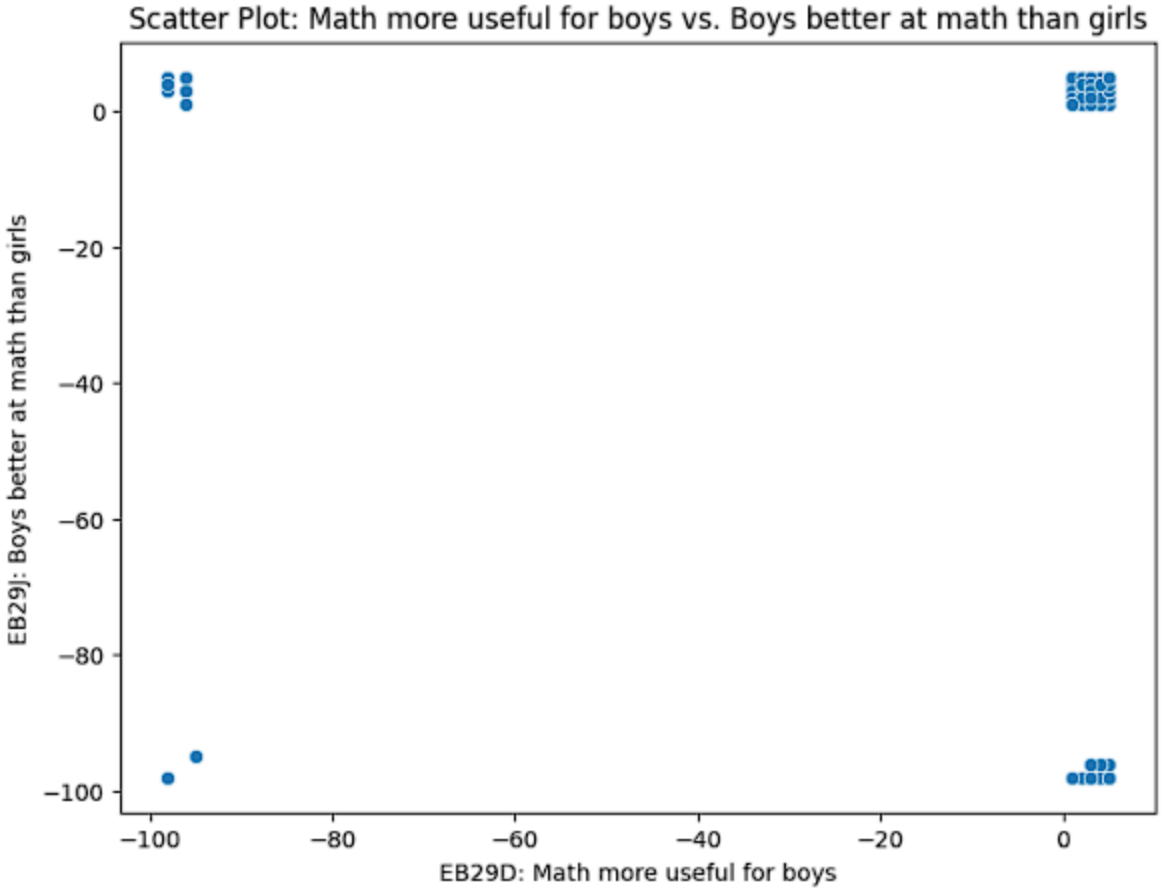

FI16A: Percent science class bachelor's degree - Females
−100
−75
−50
−25
0
25
50
75
100
FI16A


FI16B: Percent science class bachelor's degree - Males
−100
−75
−50
−25
0
25
50
75
100
FI16B


EB29D: Math more useful for boys
−100
−80
−60
−40
−20
0
EB29D


EB29J: Boys better at math than girls
−100
−80
−60
−40
−20
0
EB29J


Correlation Matrix of Variables
FI16A
FI16B
EB29D
EB29J
1
0.99
0.54
0.54
0.99
1
0.54
0.54
0.54
0.54
1
0.98
0.54
0.54
0.98
1
FI16A
FI16B
EB29D
EB29J
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00


Scatter Plot: Math more useful for boys vs. Boys better at math than girls
EB29J: Boys better at math than girls
EB29D: Math more useful for boys
0
−20
−40
−60
−80
−100
−100
−80
−60
−40
−20
0