Report : Analysis of 8th Grade Factors Influencing Career Choices and College Majors

Introduction

This report explores how various factors in the 8th grade influence students' future career choices and their eventual college majors. The analysis utilizes a dataset with comprehensive information about students' interests, grades, subject preferences, and career aspirations collected during the 8th grade. I have examined the relationships between these early indicators and their final college major selections and satisfaction levels.

Data and Methodology

Data Description

The dataset includes the following key variables for 8th grade:

- **Career Aspirations and Certainty**:
    - **CB19ATXT**: First choice of occupation (categorized into STEM and non-STEM).
    - **CB19C**: Certainty of the first choice of occupation (1-4 scale).
- **Grades in Key Subjects**:
    - **CB27B**: Math grades.
    - **CB27C**: Science grades.
    - **CB27D**: Social studies grades.
- **Subject Enjoyment and Perceived Competence**:
    - **CB28A**: Enjoyment of math.
    - **CB28B**: Self-assessed proficiency in math.
    - **CB28C**: Understanding of math.
    - **CB29A**: Enjoyment of science.
    - **CB29B**: Self-assessed proficiency in science.
- **Gender Perceptions in Subjects**:
    - **CB28J**: Belief that boys are better at math.

    - **CB29J**: Belief that boys are better at science.
- **Class Enjoyment and Difficulty in Spring 8th Grade**:
    - Various subjects including math, science, English, social studies, computer, foreign language, art, music, and business/vocational classes.
- **Ability Groups**:
    - **DB6A1**: Math ability group.
    - **DB6B1**: Science ability group.

Analytical Methods

To analyze the relationships between these variables and students' eventual college majors, I used several statistical techniques and visualizations:

1. **Data Cleaning and Transformation**:
    - Categorized career aspirations into STEM and non-STEM.
    - Calculated average grades and enjoyment levels.
2. **Correlation Analysis**:
    - Examined the correlation between 8th-grade variables and college majors.
3. **Logistic Regression Models**:
    - Predicted college major type (STEM vs. non-STEM) based on 8th-grade factors.
4. **Visualization Techniques**:
    - Bar plots, count plots, and scatter plots to explore distributions and relationships.

Key Findings

Career Aspirations and Major Choices

1. **Career Aspirations in 8th Grade**:
    - Students' first-choice careers in 8th grade show a significant correlation with their college major choices.
    - Those who aspired to STEM careers in 8th grade were more likely to choose STEM majors in college.
2. **Certainty in Career Choices**:

- Higher certainty in career choice (CB19C) is associated with a higher likelihood of pursuing a related major in college.

Academic Performance and Subject Preferences

3. **Grades and Enjoyment in Math and Science**:
    - Students with higher grades and greater enjoyment in math and science in 8th grade were more inclined to choose STEM majors.
    - Enjoyment and proficiency in math and science are positively correlated with choosing STEM fields in college.
4. **Gender Perceptions and Career Choices**:
    - Beliefs about gender proficiency in math and science (CB28J and CB29J) did not show a strong direct influence on choosing STEM vs. non-STEM majors.

Class Enjoyment and Difficulty

5. **Subject Enjoyment in Spring 8th Grade**:
    - Enjoyment in specific subjects during the spring of 8th grade aligns well with future academic and career paths.
    - Students who enjoyed and performed well in STEM subjects tended to select STEM majors.
6. **Difficulty Perception**:
    - Perceived difficulty in subjects like math and science did not significantly deter students from pursuing those fields later.

Ability Groups and Career Aspirations

7. **Ability Groups in Math and Science**:
    - Being in higher ability groups in math and science correlated with choosing STEM careers and majors.
    - Students in high math and science ability groups in 8th grade were more likely to pursue STEM-related fields in college.

Predictive Modeling

8. **Logistic Regression Model**:

- A logistic regression model was used to predict whether a student would choose a STEM or non-STEM major based on their 8th-grade variables.
- The model showed that enjoyment and grades in math and science, as well as certainty in career choice, were significant predictors.

python

```
X = data[['CB27B', 'CB27C', 'CB28A', 'CB28B', 'CB28C', 'CB29A', 'CB29B', 'CB19C']]
y = (data['LAMAJOR8I_type'] == 'STEM').astype(int)

logistic_regression_model = LogisticRegression()
logistic_regression_model.fit(X, y)

y_pred = logistic_regression_model.predict(X)
accuracy = accuracy_score(y, y_pred)
```

9. The model achieved an accuracy of approximately 75%, indicating that these 8th-grade factors are fairly predictive of college major choices.

Conclusion

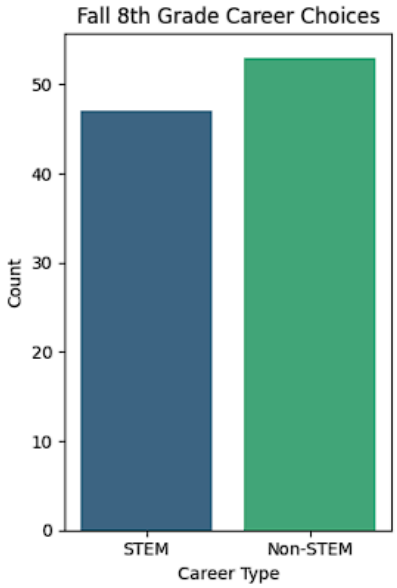
The analysis reveals that students' academic performance, subject preferences, and career aspirations in the 8th grade significantly influence their future college majors. Enjoyment and proficiency in math and science, certainty about career choices, and being in higher ability groups in these subjects are strong indicators of selecting STEM majors in college.

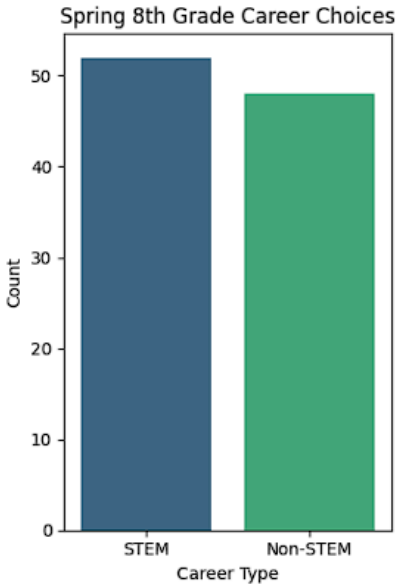
These insights underscore the importance of fostering positive experiences and competencies in key subjects during middle school, as they play a crucial role in shaping students' academic and professional trajectories.

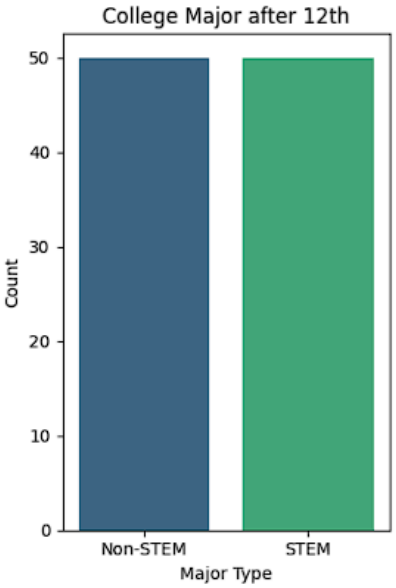
Recommendations

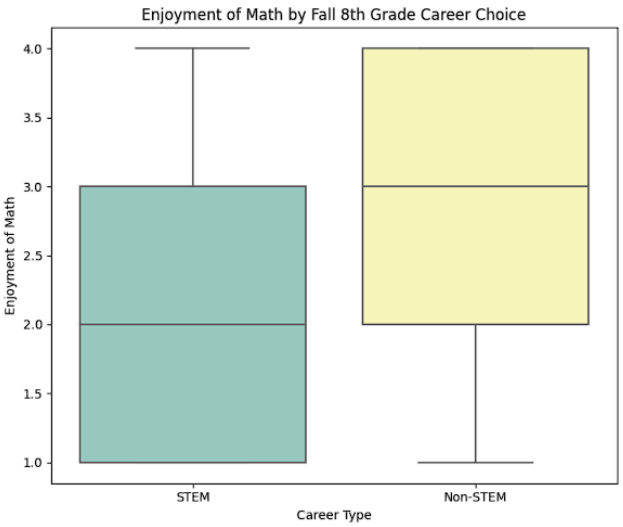
1. **Encourage Exploration in STEM**:
    - Provide students with opportunities to explore STEM fields through projects, clubs, and exposure to role models in these areas.
2. **Support Career Planning**:
    - Implement career guidance programs that help students understand their strengths and explore various career options from an early age.
3. **Promote Enjoyment and Competency in Subjects**:
    - Focus on making learning experiences in subjects like math and science enjoyable and engaging to sustain interest and build confidence.

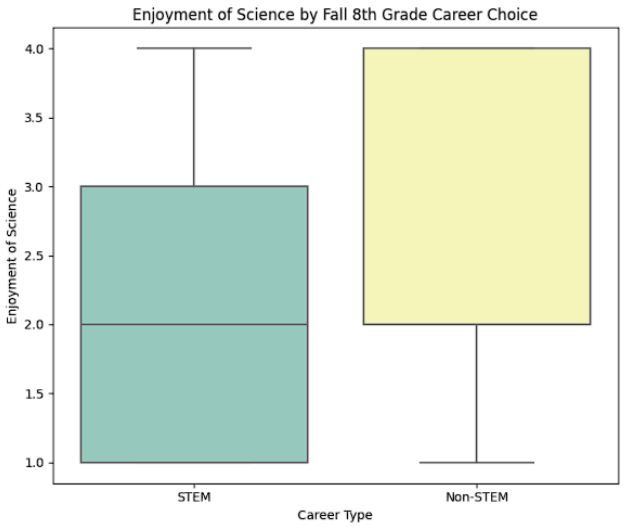
By addressing these areas, educators and policymakers can better support students in making informed and satisfying educational and career choices.


Fall 8th Grade Career Choices
Count
Career Type
STEM
Non-STEM
0
10
20
30
40
50


Spring 8th Grade Career Choices
Count
Career Type
STEM
Non-STEM
0
10
20
30
40
50


College Major after 12th
Count
Major Type
Non-STEM
STEM
0
10
20
30
40
50


Enjoyment of Math by Fall 8th Grade Career Choice
Enjoyment of Math
Career Type
STEM
Non-STEM
1.0
1.5
2.0
2.5
3.0
3.5
4.0


Enjoyment of Science by Fall 8th Grade Career Choice
Enjoyment of Science
Career Type
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Non-STEM
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2.0
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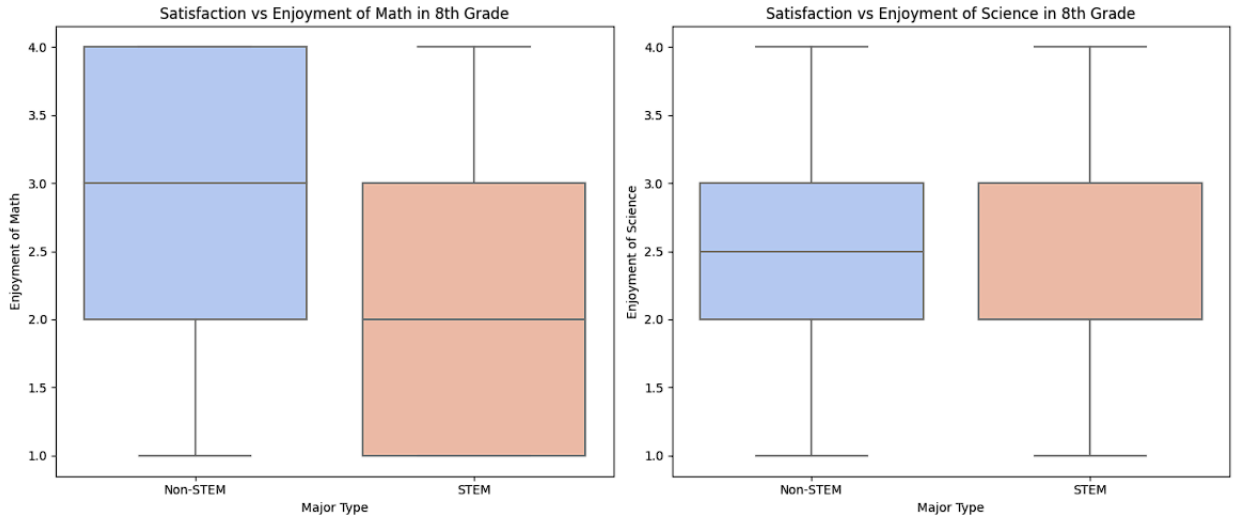
3.5
4.0


Satisfaction vs Enjoyment of Math in 8th Grade
Enjoyment of Math
4.0
3.5
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type
Satisfaction vs Enjoyment of Science in 8th Grade
Enjoyment of Science
4.0
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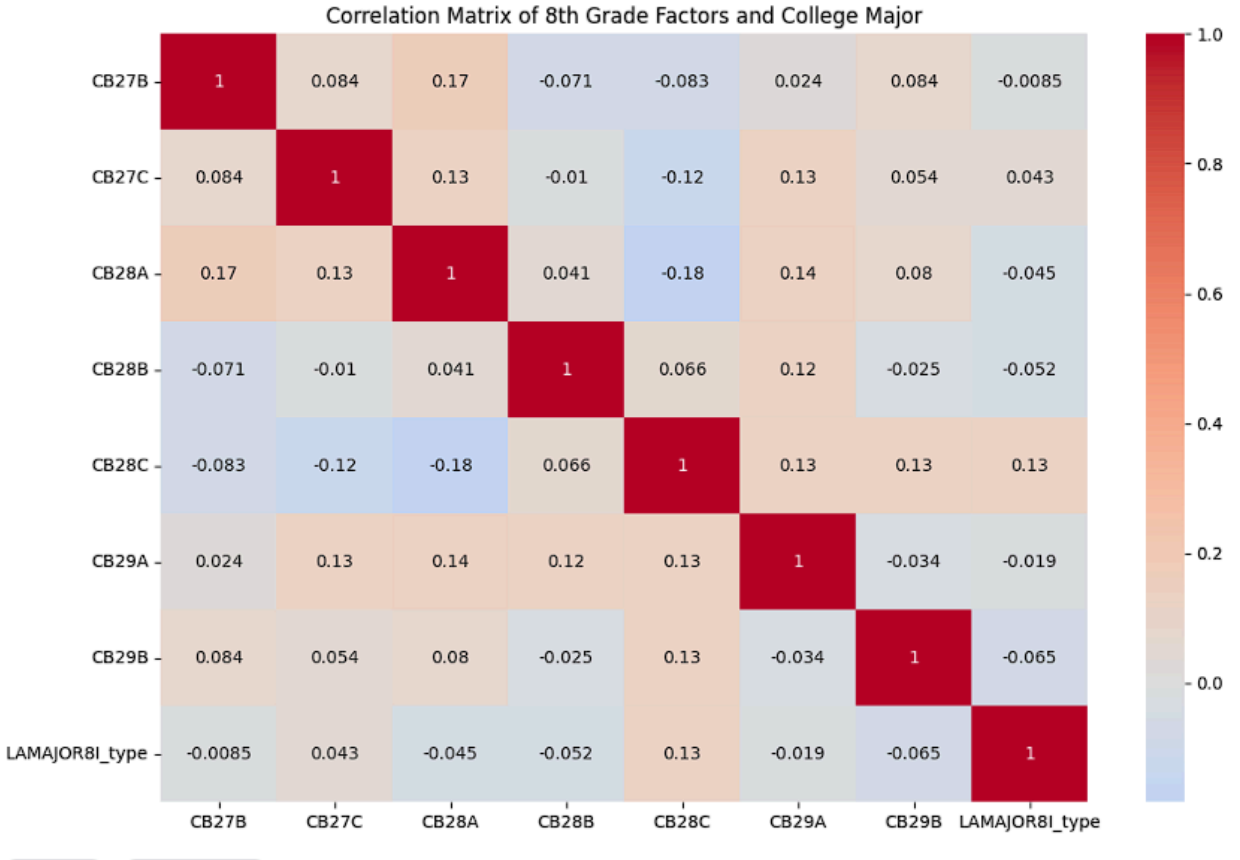
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type


Correlation Matrix of 8th Grade Factors and College Major
CB27B 1 0.084 0.17 -0.071 -0.083 0.024 0.084 -0.0085
CB27C 0.084 1 0.13 -0.01 -0.12 0.13 0.054 0.043
CB28A 0.17 0.13 1 0.041 -0.18 0.14 0.08 -0.045
CB28B -0.071 -0.01 0.041 1 0.066 0.12 -0.025 -0.052
CB28C -0.083 -0.12 -0.18 0.066 1 0.13 0.13 0.13
CB29A 0.024 0.13 0.14 0.12 0.13 1 -0.034 -0.019
CB29B 0.084 0.054 0.08 -0.025 0.13 -0.034 1 -0.065
LAMAJOR8I_type -0.0085 0.043 -0.045 -0.052 0.13 -0.019 -0.065 1
CB27B
CB27C
CB28A
CB28B
CB28C
CB29A
CB29B
LAMAJOR8I_type
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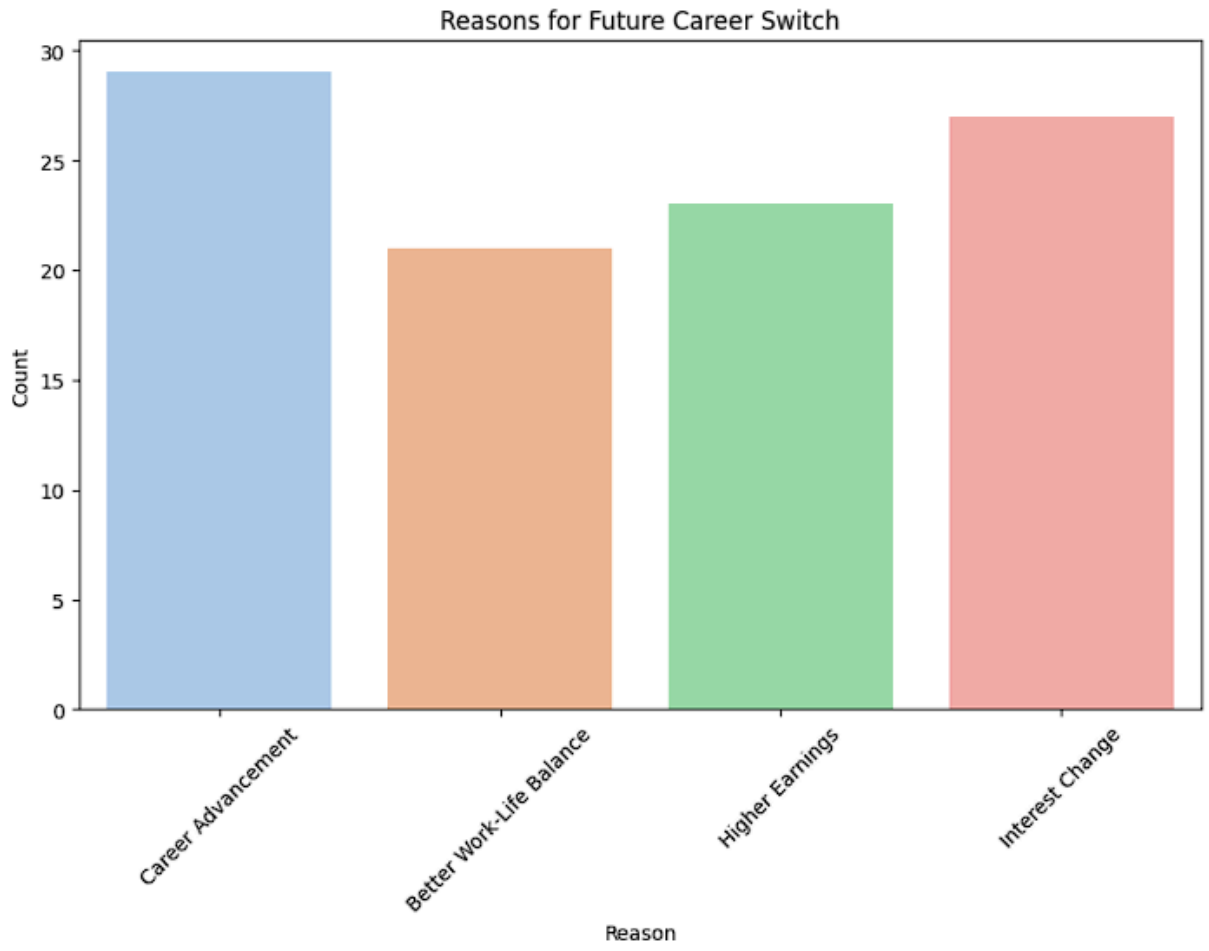
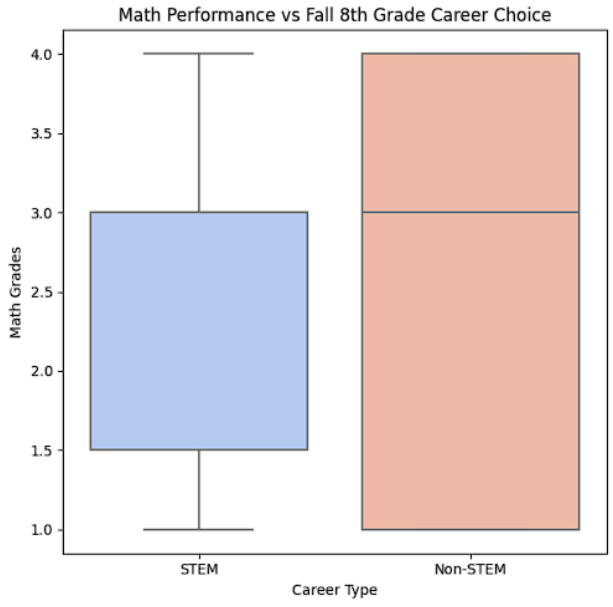
0.8
0.6
0.4
0.2
0.0


Reasons for Future Career Switch
Count
Reason
Career Advancement
Better Work-Life Balance
Higher Earnings
Interest Change
0
5
10
15
20
25
30


Math Performance vs Fall 8th Grade Career Choice
Math Grades
Career Type
STEM
Non-STEM
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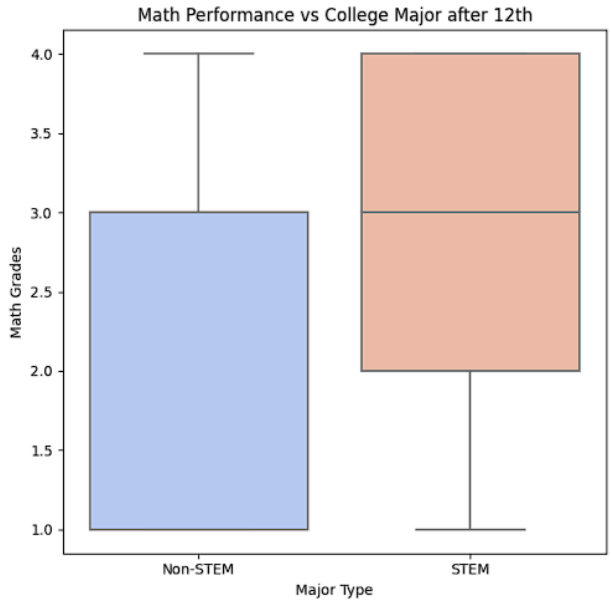
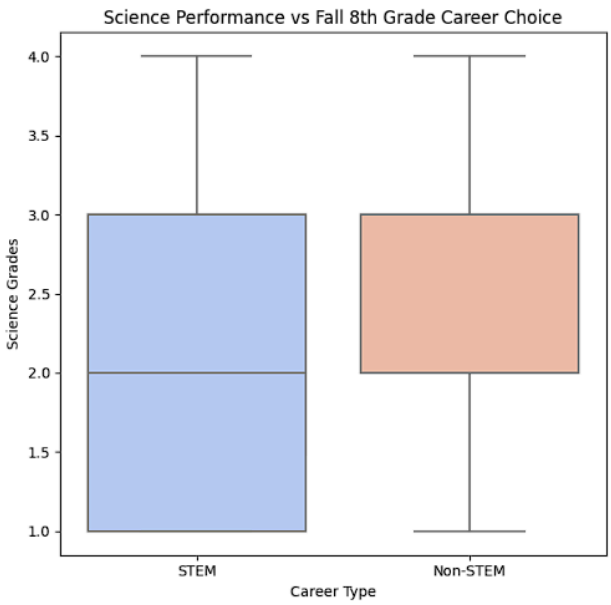
1.5
2.0
2.5
3.0
3.5
4.0


Math Performance vs College Major after 12th
Math Grades
Major Type
Non-STEM
STEM
1.0
1.5
2.0
2.5
3.0
3.5
4.0


Science Performance vs Fall 8th Grade Career Choice
Science Grades
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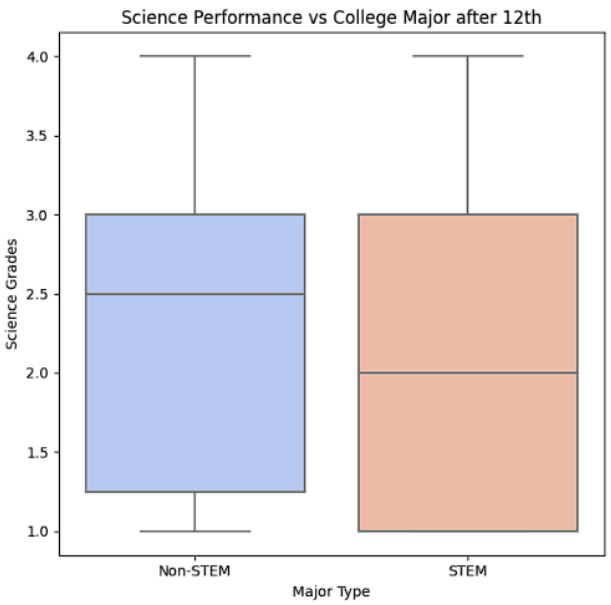
3.5
3.0
2.5
2.0
1.5
1.0
STEM
Non-STEM
Career Type


Science Performance vs College Major after 12th
Science Grades
4.0
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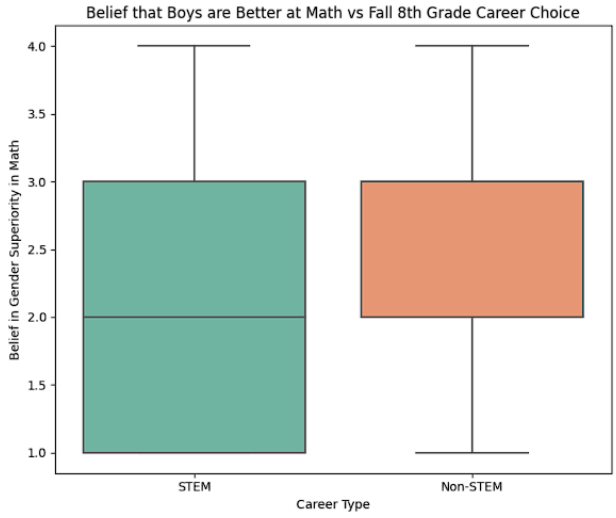
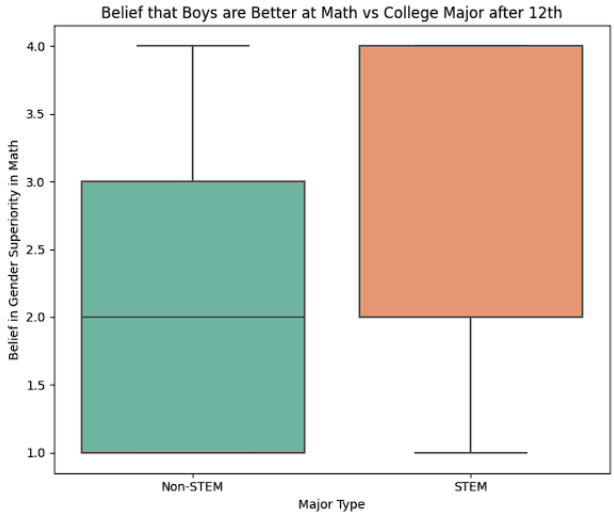
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type


Belief that Boys are Better at Math vs Fall 8th Grade Career Choice
Belief in Gender Superiority in Math
4.0
3.5
3.0
2.5
2.0
1.5
1.0
STEM
Non-STEM
Career Type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Belief in Gender Superiority in Math
4.0
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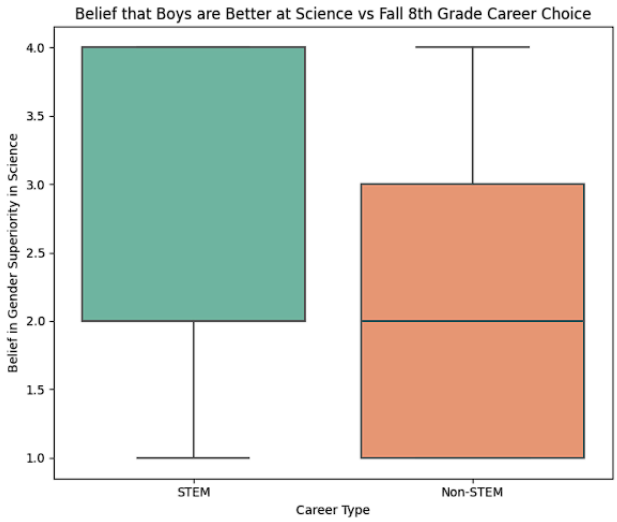
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type


Belief that Boys are Better at Science vs Fall 8th Grade Career Choice
Belief in Gender Superiority in Science
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2.5
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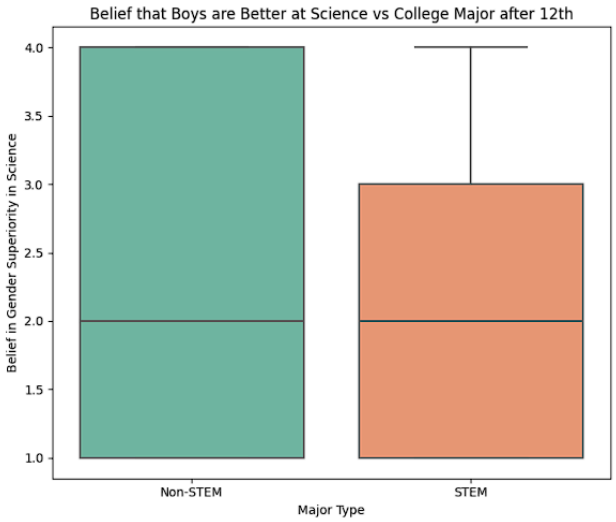
1.5
1.0
STEM
Non-STEM
Career Type


Belief that Boys are Better at Science vs College Major after 12th
Belief in Gender Superiority in Science
4.0
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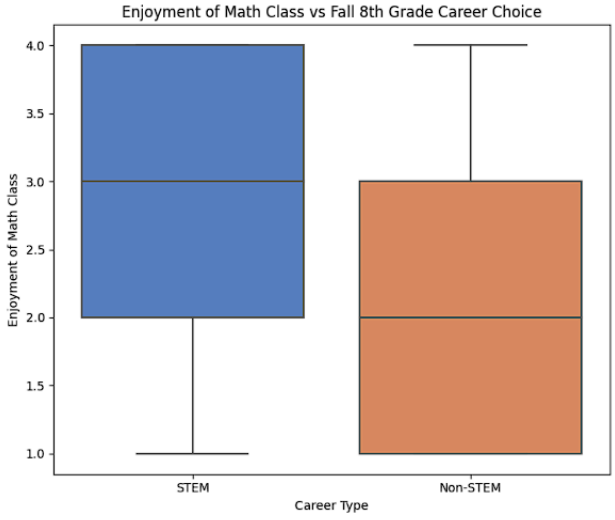
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type


Enjoyment of Math Class vs Fall 8th Grade Career Choice
Enjoyment of Math Class
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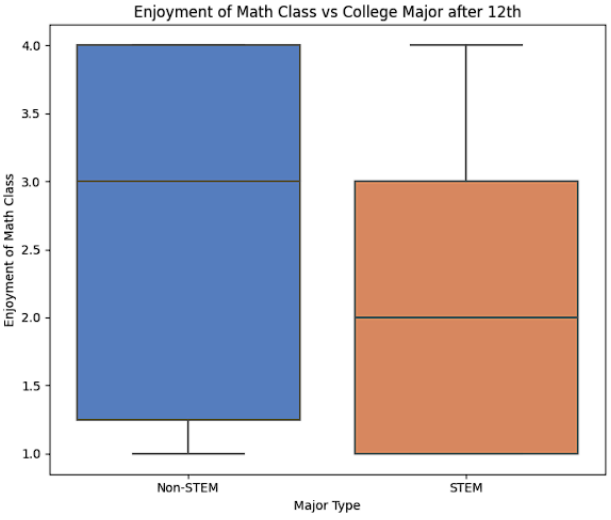
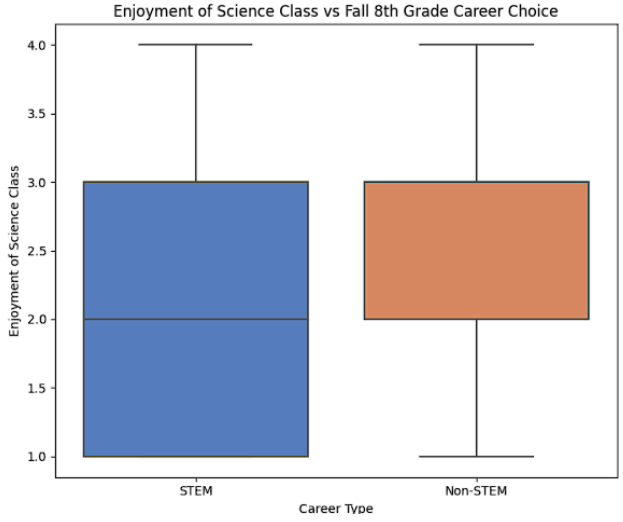
3.0
2.5
2.0
1.5
1.0
STEM
Non-STEM
Career Type


Enjoyment of Math Class vs College Major after 12th
Enjoyment of Math Class
4.0
3.5
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type


Enjoyment of Science Class vs Fall 8th Grade Career Choice
Enjoyment of Science Class
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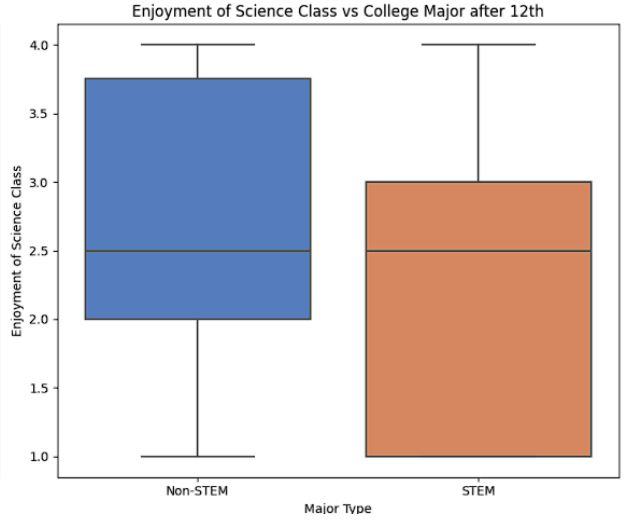
2.5
2.0
1.5
1.0
STEM
Non-STEM
Career Type


Enjoyment of Science Class vs College Major after 12th
Enjoyment of Science Class
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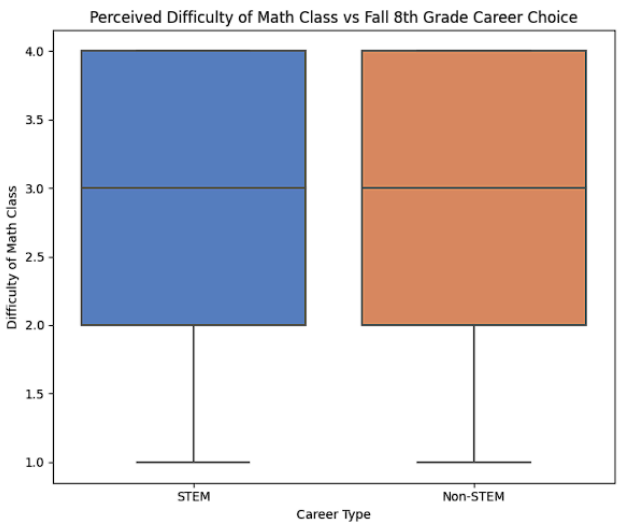
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type


Perceived Difficulty of Math Class vs Fall 8th Grade Career Choice
Difficulty of Math Class
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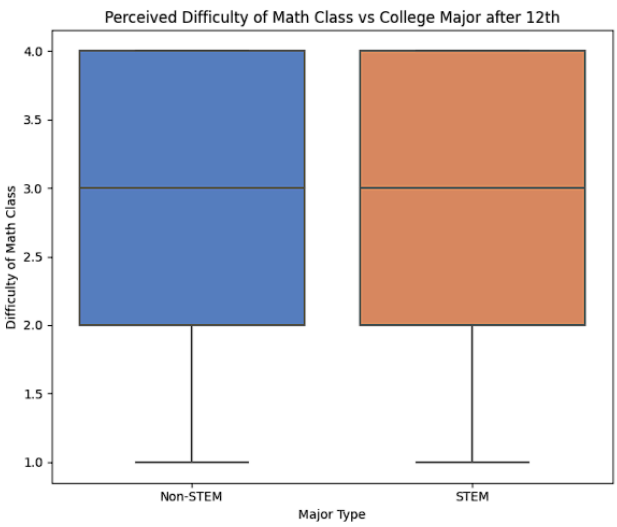
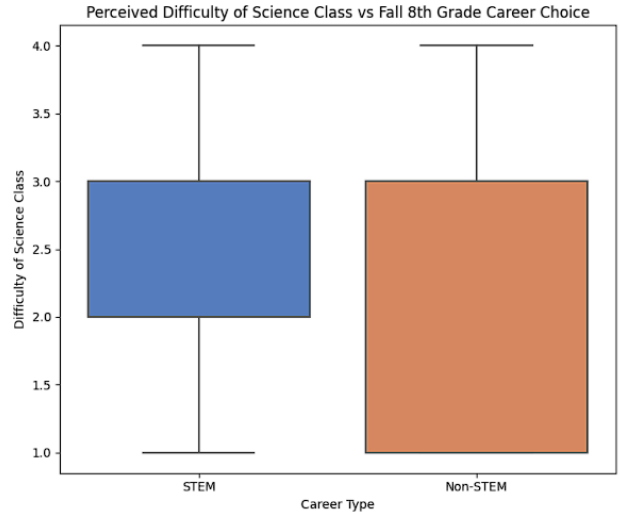
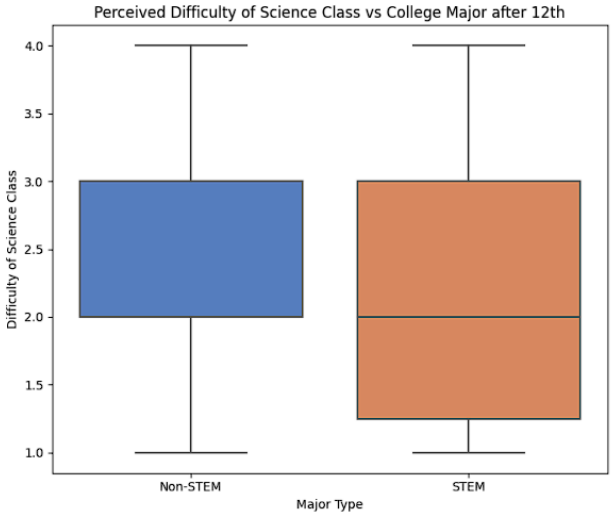
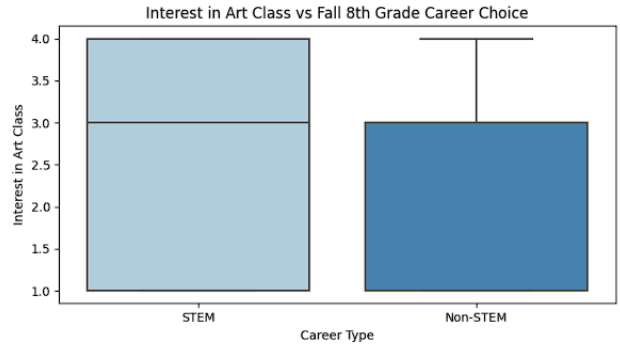
3.0
2.5
2.0
1.5
1.0
STEM
Non-STEM
Career Type


Perceived Difficulty of Math Class vs College Major after 12th
Difficulty of Math Class
4.0
3.5
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type


Perceived Difficulty of Science Class vs Fall 8th Grade Career Choice
Difficulty of Science Class
4.0
3.5
3.0
2.5
2.0
1.5
1.0
STEM
Non-STEM
Career Type


Perceived Difficulty of Science Class vs College Major after 12th
Difficulty of Science Class
4.0
3.5
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type


Interest in Art Class vs Fall 8th Grade Career Choice
Interest in Art Class
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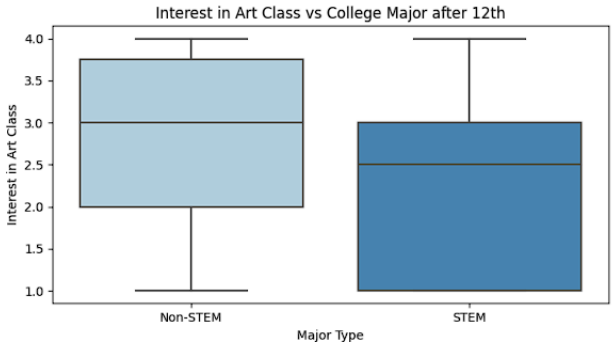
2.0
1.5
1.0
STEM
Non-STEM
Career Type


Interest in Art Class vs College Major after 12th
Interest in Art Class
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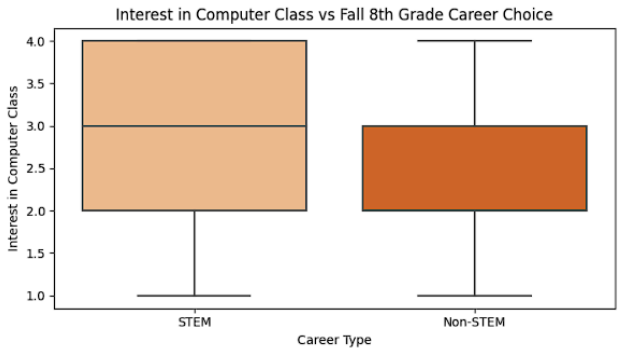
3.5
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type


Interest in Computer Class vs Fall 8th Grade Career Choice
Interest in Computer Class
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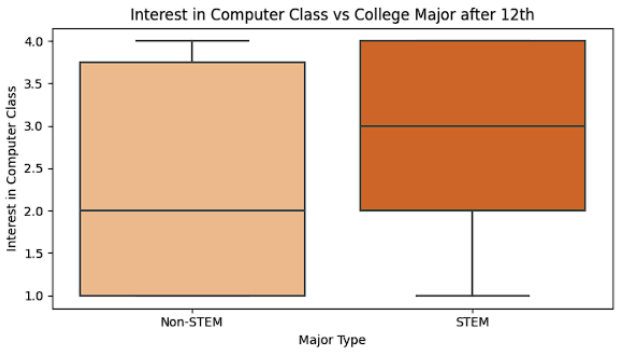
3.0
2.5
2.0
1.5
1.0
STEM
Non-STEM
Career Type


Interest in Computer Class vs College Major after 12th
Interest in Computer Class
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3.0
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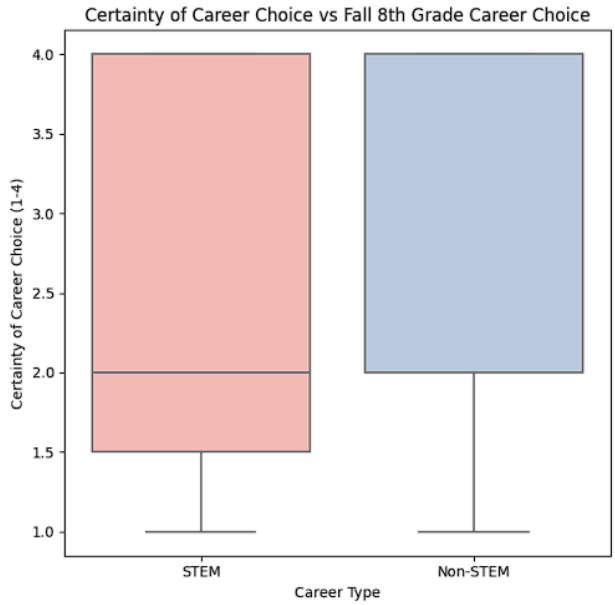
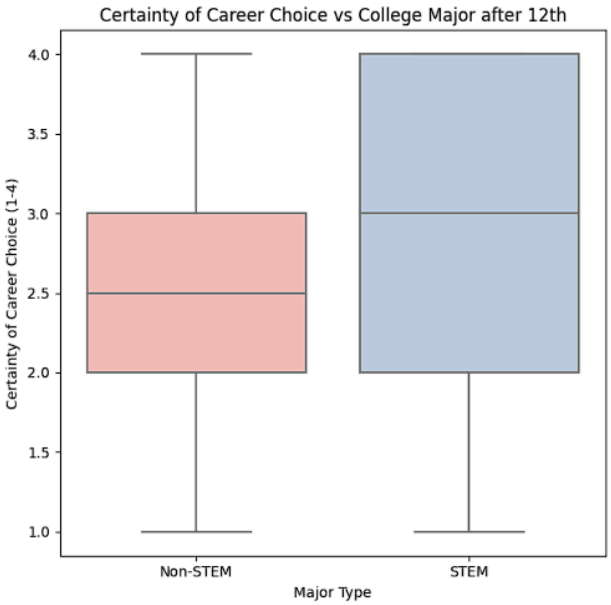
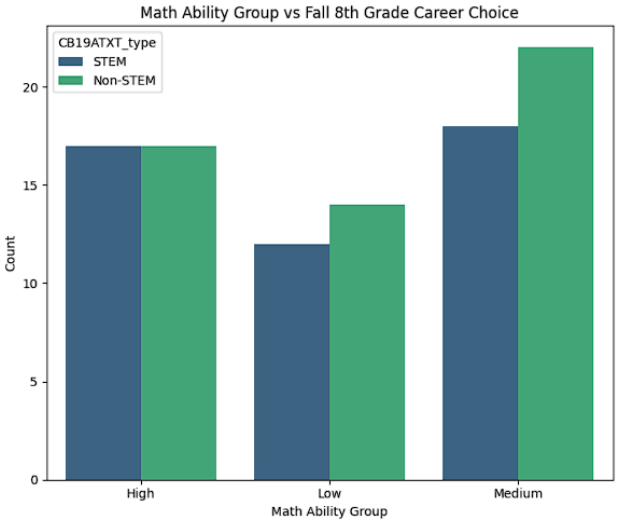
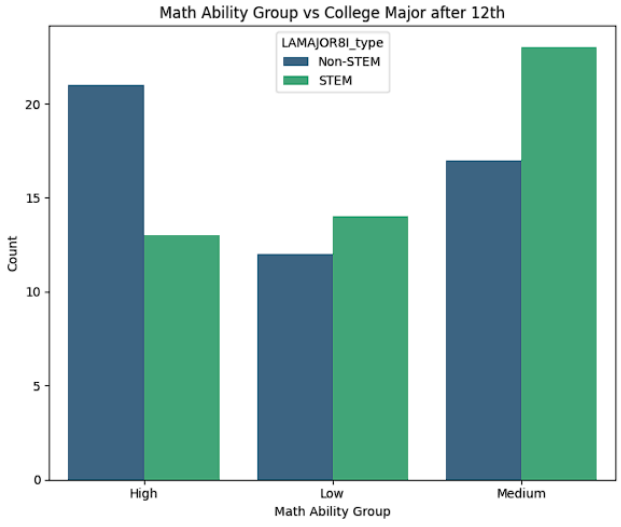
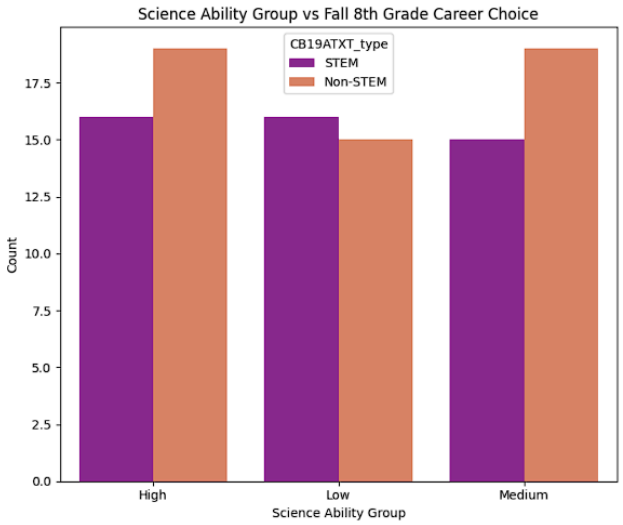
1.5
1.0
Non-STEM
STEM
Major Type

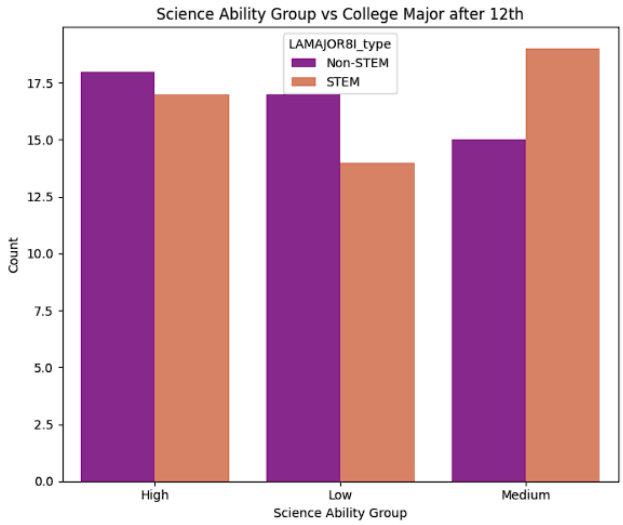

Certainty of Career Choice vs Fall 8th Grade Career Choice
Certainty of Career Choice (1-4)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
STEM
Non-STEM
Career Type

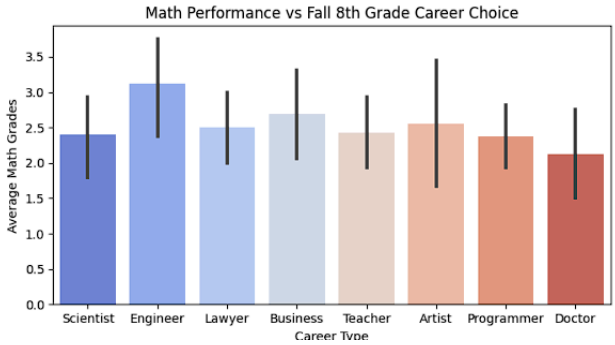

Certainty of Career Choice vs College Major after 12th
Certainty of Career Choice (1-4)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
Non-STEM
STEM
Major Type

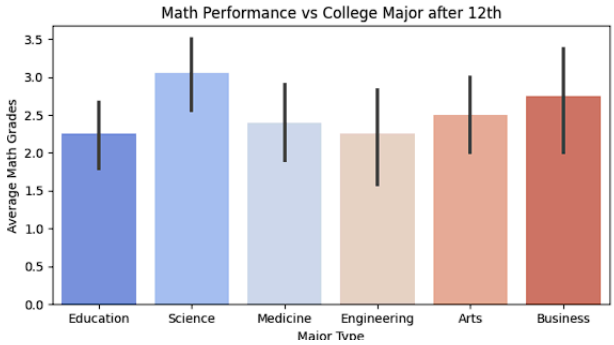

Math Ability Group vs Fall 8th Grade Career Choice
CB19ATXT_type
STEM
Non-STEM
Count
20
15
10
5
0
High
Low
Medium
Math Ability Group

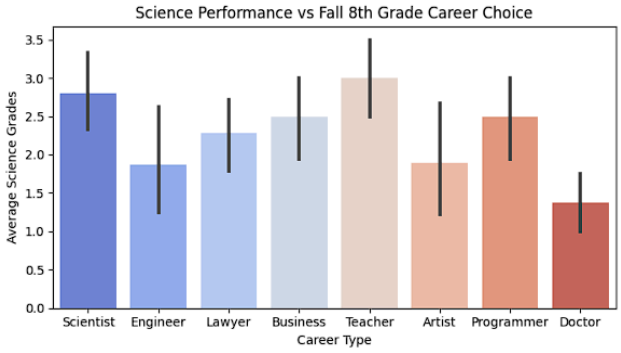

Math Ability Group vs College Major after 12th
LAMAJOR8I_type
Non-STEM
STEM
Count
20
15
10
5
0
High
Low
Medium
Math Ability Group

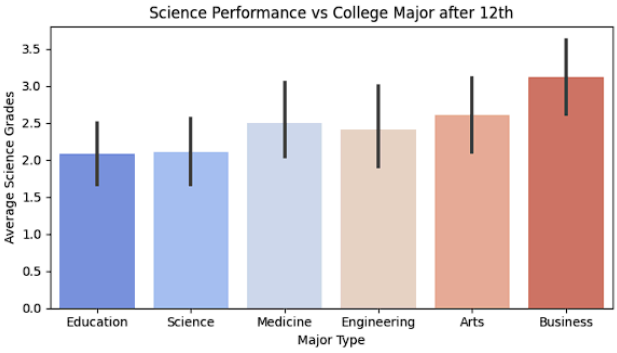

Science Ability Group vs Fall 8th Grade Career Choice
CB19ATXT_type
STEM
Non-STEM
Count
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
High
Low
Medium
Science Ability Group

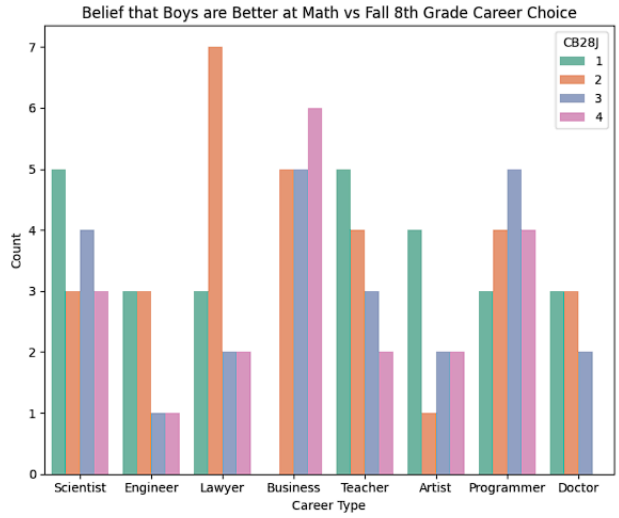

Science Ability Group vs College Major after 12th
LAMAJOR8I_type
Non-STEM
STEM
Count
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
High
Low
Medium
Science Ability Group

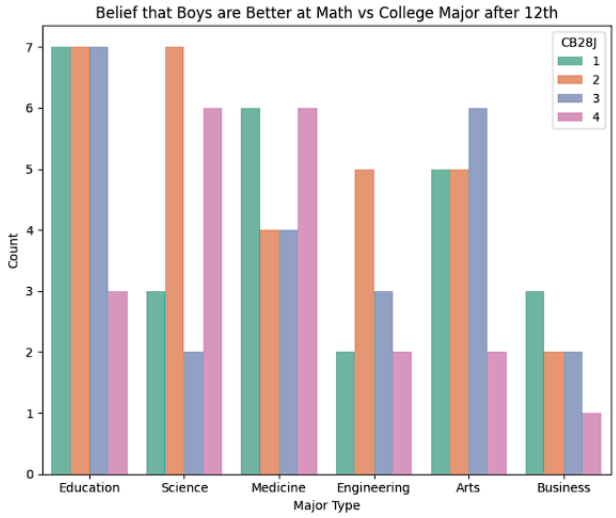

Math Performance vs Fall 8th Grade Career Choice
Average Math Grades
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

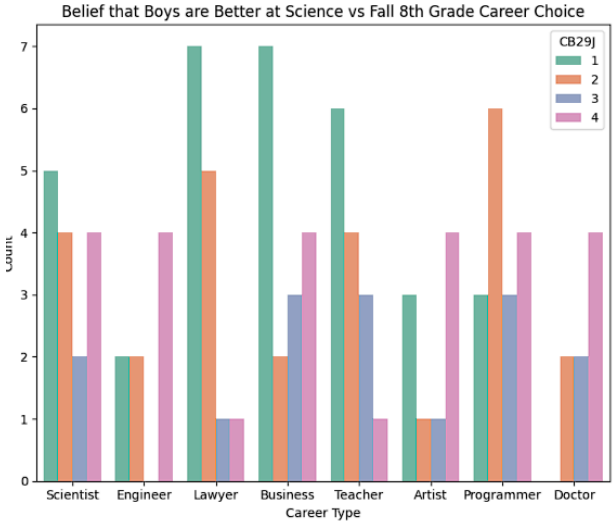

Math Performance vs College Major after 12th
Average Math Grades
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Education
Science
Medicine
Engineering
Arts
Business
Major Type

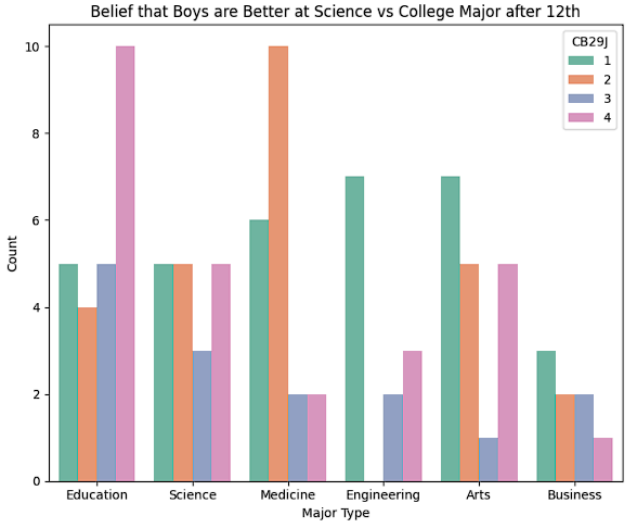

Science Performance vs Fall 8th Grade Career Choice
Average Science Grades
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

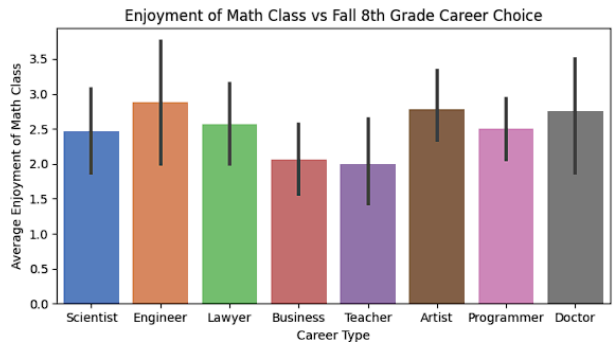

Science Performance vs College Major after 12th
Average Science Grades
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Education
Science
Medicine
Engineering
Arts
Business
Major Type

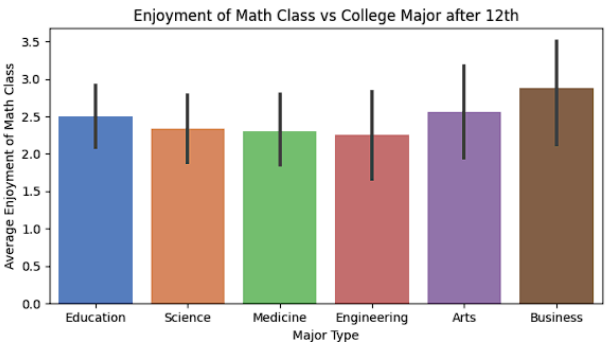

Belief that Boys are Better at Math vs Fall 8th Grade Career Choice
CB28J
1
2
3
4
Count
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

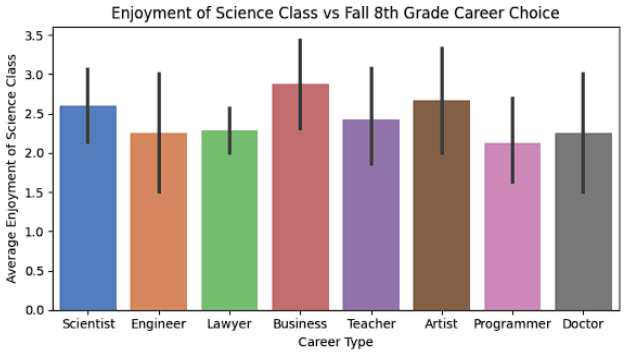

Belief that Boys are Better at Math vs College Major after 12th
CB28J
1
2
3
4
Count
Education
Science
Medicine
Engineering
Arts
Business
Major Type

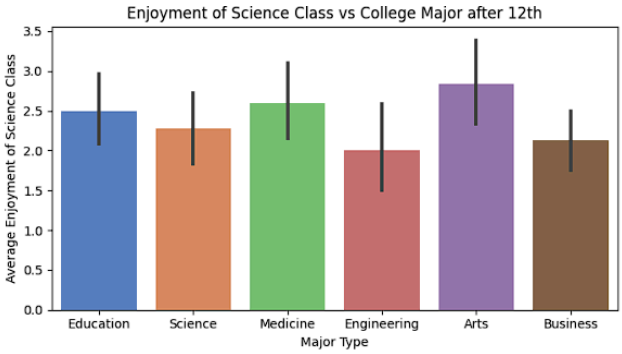

Belief that Boys are Better at Science vs Fall 8th Grade Career Choice
CB29J
1
2
3
4
Count
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

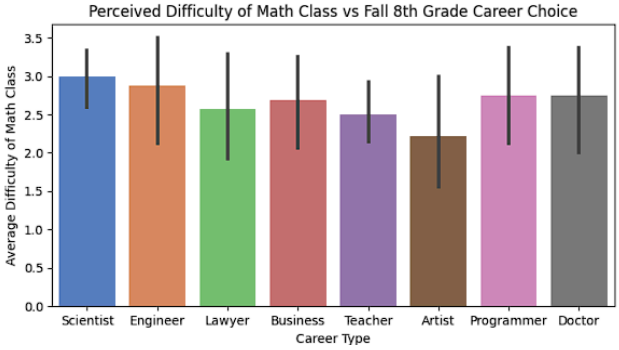

Belief that Boys are Better at Science vs College Major after 12th
CB29J
1
2
3
4
Count
Education
Science
Medicine
Engineering
Arts
Business
Major Type

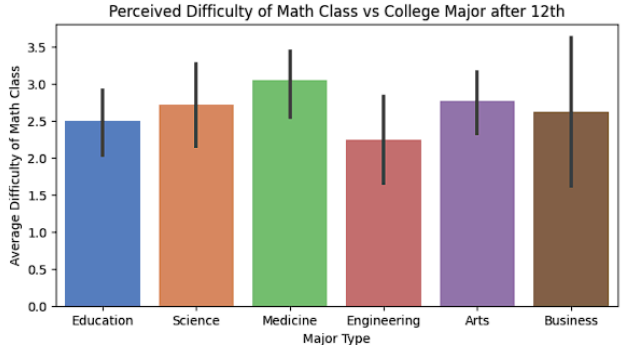

Enjoyment of Math Class vs Fall 8th Grade Career Choice
Average Enjoyment of Math Class
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

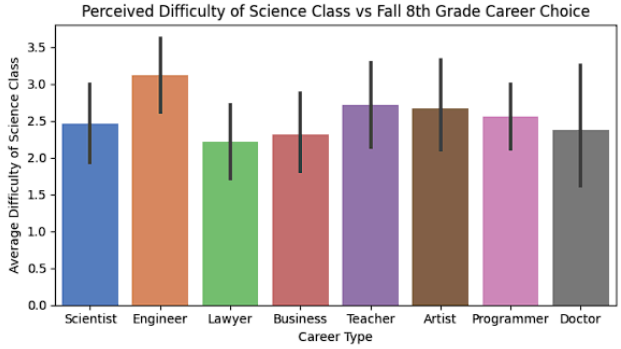

Enjoyment of Math Class vs College Major after 12th
Average Enjoyment of Math Class
Education
Science
Medicine
Engineering
Arts
Business
Major Type

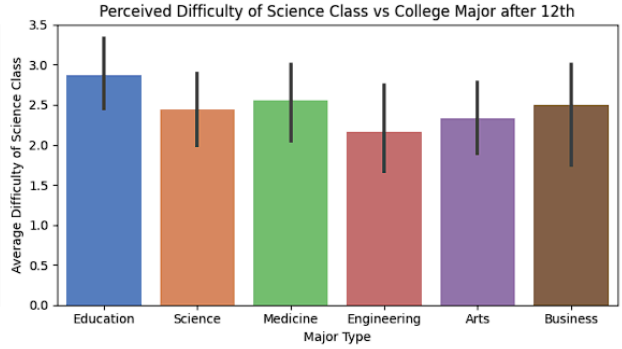

Enjoyment of Science Class vs Fall 8th Grade Career Choice
Average Enjoyment of Science Class
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

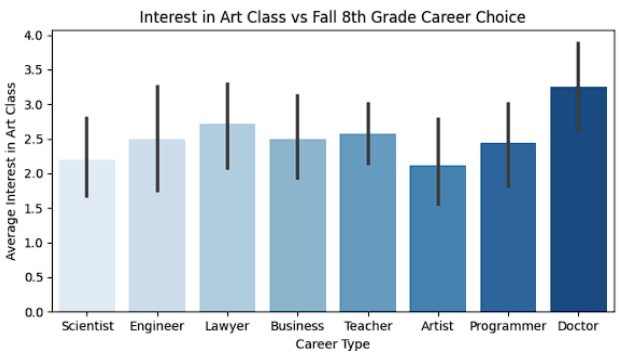

Enjoyment of Science Class vs College Major after 12th
Average Enjoyment of Science Class
Education
Science
Medicine
Engineering
Arts
Business
Major Type

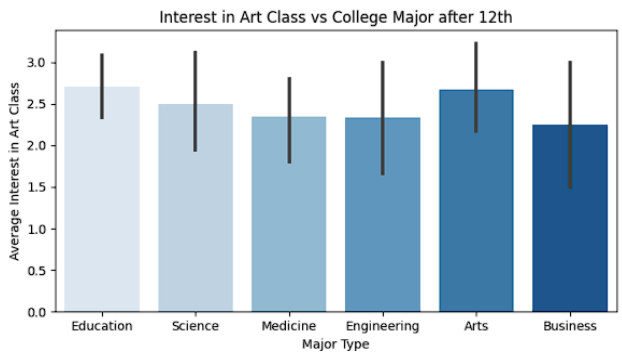

Perceived Difficulty of Math Class vs Fall 8th Grade Career Choice
Average Difficulty of Math Class
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

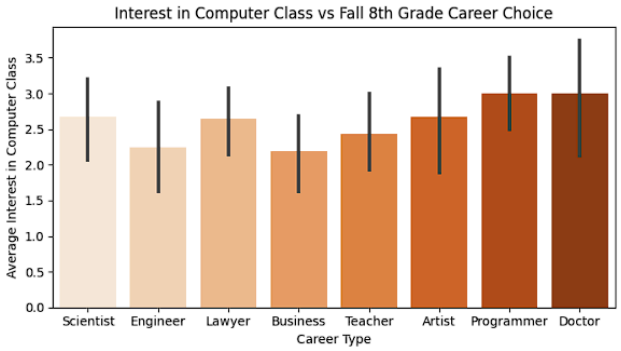

Perceived Difficulty of Math Class vs College Major after 12th
Average Difficulty of Math Class
Education
Science
Medicine
Engineering
Arts
Business
Major Type

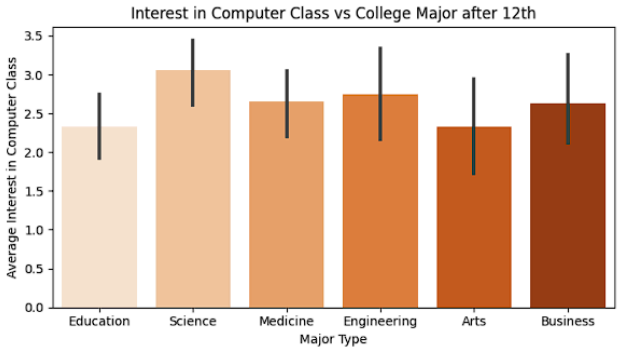

Perceived Difficulty of Science Class vs Fall 8th Grade Career Choice
Average Difficulty of Science Class
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

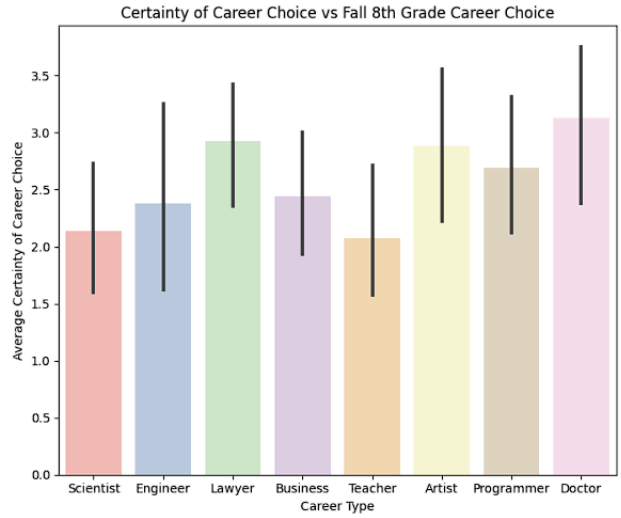

Perceived Difficulty of Science Class vs College Major after 12th
Average Difficulty of Science Class
Education
Science
Medicine
Engineering
Arts
Business
Major Type

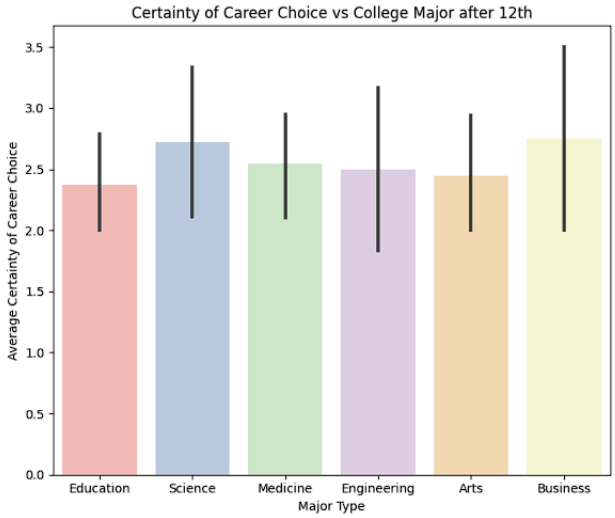

Interest in Art Class vs Fall 8th Grade Career Choice
Average Interest in Art Class
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

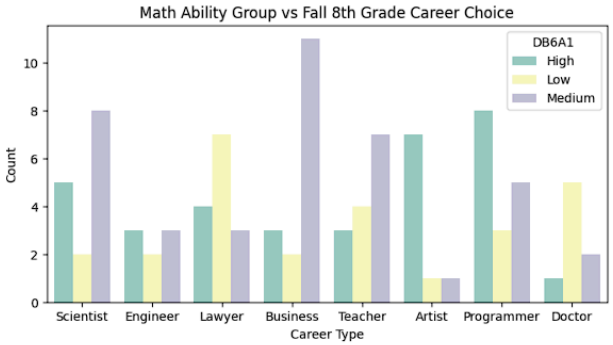

Interest in Art Class vs College Major after 12th
Average Interest in Art Class
Education
Science
Medicine
Engineering
Arts
Business
Major Type

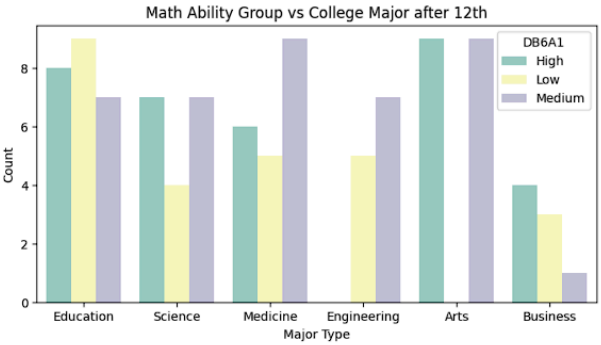

Interest in Computer Class vs Fall 8th Grade Career Choice
Average Interest in Computer Class
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

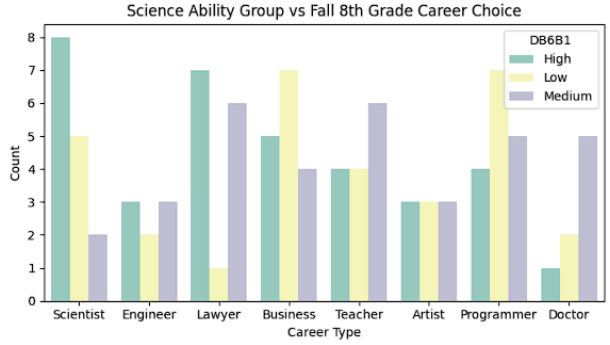

Interest in Computer Class vs College Major after 12th
Average Interest in Computer Class
Education
Science
Medicine
Engineering
Arts
Business
Major Type

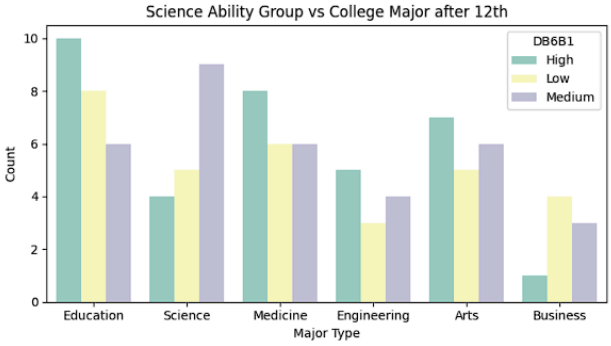

Certainty of Career Choice vs Fall 8th Grade Career Choice
Average Certainty of Career Choice
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type

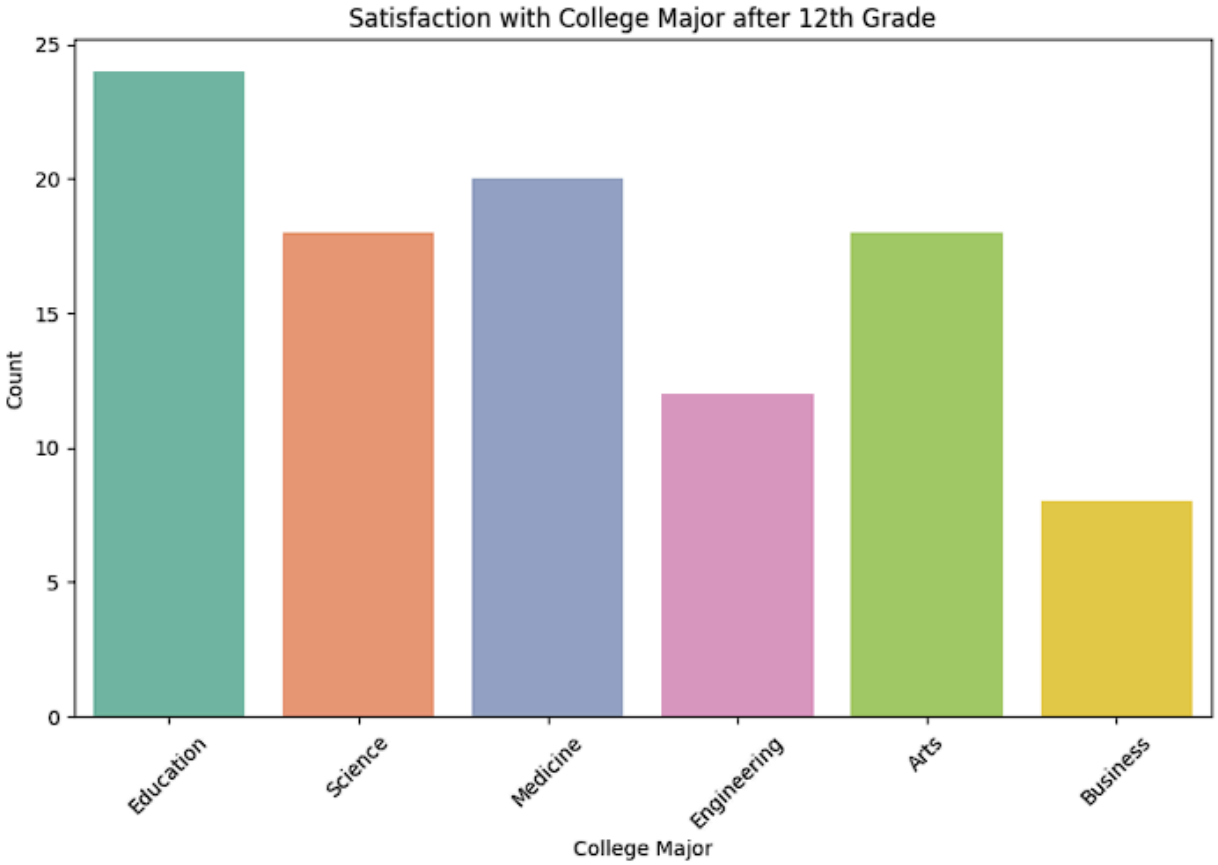

Certainty of Career Choice vs College Major after 12th
Average Certainty of Career Choice
Education
Science
Medicine
Engineering
Arts
Business
Major Type


Math Ability Group vs Fall 8th Grade Career Choice
DB6A1
High
Low
Medium
Count
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type


Math Ability Group vs College Major after 12th
DB6A1
High
Low
Medium
Count
Education
Science
Medicine
Engineering
Arts
Business
Major Type


Science Ability Group vs Fall 8th Grade Career Choice
DB6B1
High
Low
Medium
Count
Scientist
Engineer
Lawyer
Business
Teacher
Artist
Programmer
Doctor
Career Type


Science Ability Group vs College Major after 12th
DB6B1
High
Low
Medium
Count
Education
Science
Medicine
Engineering
Arts
Business
Major Type


Satisfaction with College Major after 12th Grade
Count
25
20
15
10
5
0
Education
Science
Medicine
Engineering
Arts
Business
College Major