Global Student Migration & Higher Education Trends (2019-2023)

July 3, 2025

[1]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

[3]:
```
df = pd.read_csv('../data/global_student_migration.csv')
print(df.head())
print(df.info())
```

```
  student_id origin_country destination_country destination_city  \
0     S00001        Finland              Russia           Moscow
1     S00002             UK             Germany           Aachen
2     S00003        Ireland              Canada        Vancouver
3     S00004            UAE                  UK       Birmingham
4     S00005   South Africa             Germany        Stuttgart

                    university_name              course_name  \
0  Lomonosov Moscow State University         Computer Science
1                       RWTH Aachen        Civil Engineering
2    University of British Columbia                      Law
3          University of Birmingham             Data Science
4           University of Stuttgart  Business Administration

    field_of_study  year_of_enrollment scholarship_received  \
0      Engineering                2021                   No
1              Law                2023                  Yes
2             Arts                2019                   No
3  Social Sciences                2021                  Yes
4              Law                2020                  Yes

     enrollment_reason  graduation_year placement_status placement_country  \
0       Higher Ranking             2024           Placed            Russia
1    Job Opportunities             2024           Placed           Germany
2          Scholarship             2020       Not Placed               NaN
3      Quality of Life             2023           Placed                UK
4  Political Stability             2021           Placed           Germany

  placement_company  starting_salary_usd  gpa_or_score           visa_status  \
0         Microsoft                36416          3.92                Tier 4
```

```
1            Google                32956          2.60           Study Permit
2               NaN                    0          2.72                     F1
3             Apple                50892          3.71  Schengen Student Visa
4               IBM                54790          2.96  Schengen Student Visa

  post_graduation_visa language_proficiency_test  test_score
0          Work Permit                     TOEFL         7.8
1                  OPT                       PTE         7.9
2            Blue Card                       NaN         0.0
3                  PSW                       NaN         0.0
4                  OPT                       PTE         8.2
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5000 entries, 0 to 4999
Data columns (total 20 columns):
 #   Column                     Non-Null Count  Dtype
---  ------                     --------------  -----
 0   student_id                 5000 non-null   object
 1   origin_country             5000 non-null   object
 2   destination_country        5000 non-null   object
 3   destination_city           5000 non-null   object
 4   university_name            5000 non-null   object
 5   course_name                5000 non-null   object
 6   field_of_study             5000 non-null   object
 7   year_of_enrollment         5000 non-null   int64
 8   scholarship_received       5000 non-null   object
 9   enrollment_reason          5000 non-null   object
 10  graduation_year            5000 non-null   int64
 11  placement_status           5000 non-null   object
 12  placement_country          2509 non-null   object
 13  placement_company          2509 non-null   object
 14  starting_salary_usd        5000 non-null   int64
 15  gpa_or_score               5000 non-null   float64
 16  visa_status                5000 non-null   object
 17  post_graduation_visa       5000 non-null   object
 18  language_proficiency_test  4018 non-null   object
 19  test_score                 5000 non-null   float64
dtypes: float64(2), int64(3), object(15)
memory usage: 781.4+ KB
None
```

[5]:
```
df["placement_country"] = df["placement_country"].fillna("N/A")
df["placement_company"] = df["placement_company"].fillna("N/A")
```

[7]:
```
df["language_proficiency_test"] = df["language_proficiency_test"].fillna("None")
```

[9]:
```
# Missing values are checked for each column
print("Missing values:\n", df.isna().sum())
```

```
Missing values:
 student_id                  0
origin_country               0
destination_country          0
destination_city             0
university_name              0
course_name                  0
field_of_study               0
year_of_enrollment           0
scholarship_received         0
enrollment_reason            0
graduation_year              0
placement_status             0
placement_country            0
placement_company            0
starting_salary_usd          0
gpa_or_score                 0
visa_status                  0
post_graduation_visa         0
language_proficiency_test    0
test_score                   0
dtype: int64
```

[11]:
```
#Top 10 Countries Attracting the Most International Students
top_destinations = df["destination_country"].value_counts().head(10)
print(top_destinations)
```

```
destination_country
UAE             538
UK              526
Germany         518
Russia          515
South Africa    496
India           493
USA             485
Canada          483
Finland         474
Ireland         472
Name: count, dtype: int64
```

[13]:
```
#Number of Students by Country of Origin
origin_count = df["origin_country"].value_counts()
print(origin_count)
```

```
origin_country
Russia          532
Germany         531
Canada          517
Ireland         510
USA             504
UK              499
India           498
South Africa    493
Finland         465
UAE             451
Name: count, dtype: int64
```

[15]:
```
#Average GPA by Destination Country
avg_gpa_by_dest = df.groupby("destination_country")["gpa_or_score"].mean().
 ↪sort_values(ascending=False)
print(avg_gpa_by_dest.head(10))
```

```
destination_country
Canada          3.274410
UAE             3.267602
Ireland         3.256610
Finland         3.252257
Germany         3.247973
Russia          3.243961
India           3.240142
USA             3.237546
UK              3.226141
South Africa    3.222298
Name: gpa_or_score, dtype: float64
```

[17]:
```
#Average Starting Salaries by Destination Country
avg_salary_by_dest = df[df["placement_status"] == "Placed"].
 ↪groupby("placement_country")["starting_salary_usd"].mean().
 ↪sort_values(ascending=False)
print(avg_salary_by_dest.head(10))
```

```
placement_country
USA             92775.460251
Ireland         90760.754098
Finland         90555.716102
UK              90057.022059
Russia          89426.418251
South Africa    88818.207048
Germany         87821.224490
```

```
Canada          86882.739130
UAE             86745.419847
India           84594.488806
Name: starting_salary_usd, dtype: float64
```

[19]:
```
# Scholarship Distribution by Country of Origin
# This code calculates how many students received (or did not receive)␣
 ↪scholarships,
# grouped by their country of origin. It helps in understanding which countries␣
 ↪had
# higher access to scholarships.
scholarship_by_origin = df.groupby("origin_country")["scholarship_received"].
 ↪value_counts()
print(scholarship_by_origin)
```

```
origin_country  scholarship_received
Canada          Yes                    267
                No                     250
Finland         Yes                    233
                No                     232
Germany         No                     267
                Yes                    264
India           Yes                    252
                No                     246
Ireland         Yes                    294
                No                     216
Russia          No                     272
                Yes                    260
South Africa    Yes                    251
                No                     242
UAE             Yes                    238
                No                     213
UK              Yes                    254
                No                     245
USA             Yes                    264
                No                     240
Name: count, dtype: int64
```

[21]:
```
#Number of Placed vs. Not Placed Students
placement_stats = df["placement_status"].value_counts()
print(placement_stats)
```

```
placement_status
Placed        2509
Not Placed    2491
Name: count, dtype: int64
```

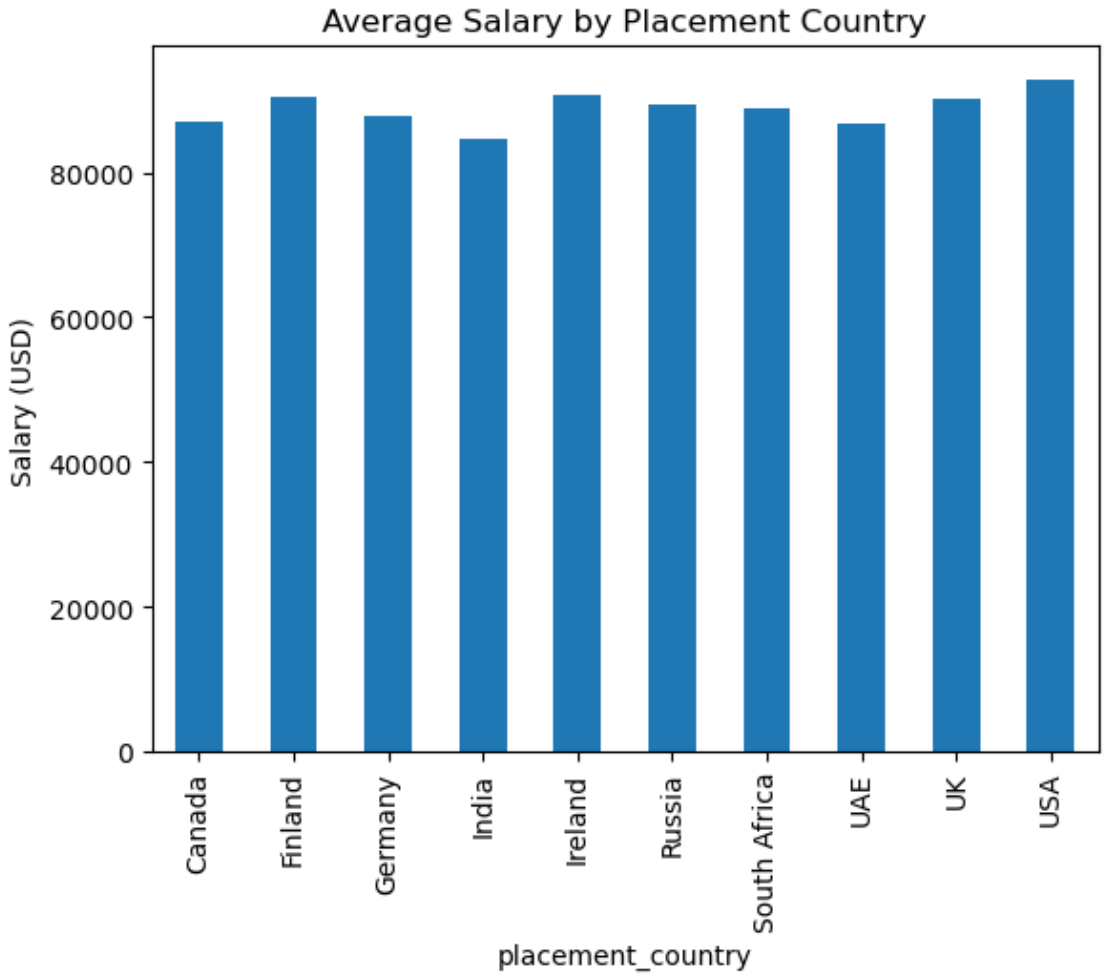
[23]:
```
#Top Universities by Number of Enrolled Students
top_universities = df["university_name"].value_counts().head(10)
print(top_universities)
```

```
university_name
University of Stuttgart                          90
Zayed University                                 89
Moscow Institute of Physics and Technology       87
Manipal Academy Dubai                            81
Bauman Moscow State Technical University         80
Heriot-Watt Dubai                                80
Rhodes University                                79
Heidelberg University                            78
UCLA                                             77
Novosibirsk State University                     76
Name: count, dtype: int64
```

[25]:
```
#Distribution of Enrollment Reasons
enrollment_reasons = df["enrollment_reason"].value_counts()
print(enrollment_reasons)
```

```
enrollment_reason
Quality of Life        1015
Higher Ranking         1004
Scholarship            1001
Job Opportunities       991
Political Stability     989
Name: count, dtype: int64
```

[27]:
```
#Average Salary by Placement Country
df[df["placement_status"] == "Placed"].
 ↪groupby("placement_country")["starting_salary_usd"].mean().plot(kind="bar")
plt.title("Average Salary by Placement Country")
plt.ylabel("Salary (USD)")
plt.show()
```



[29]:
```
#Number of Students by Year of Enrollment
enrollment_by_year = df["year_of_enrollment"].value_counts().sort_index()
print(enrollment_by_year)
```

```
year_of_enrollment
2019    1004
2020     992
2021     963
2022    1027
2023    1014
```

```
Name: count, dtype: int64
```

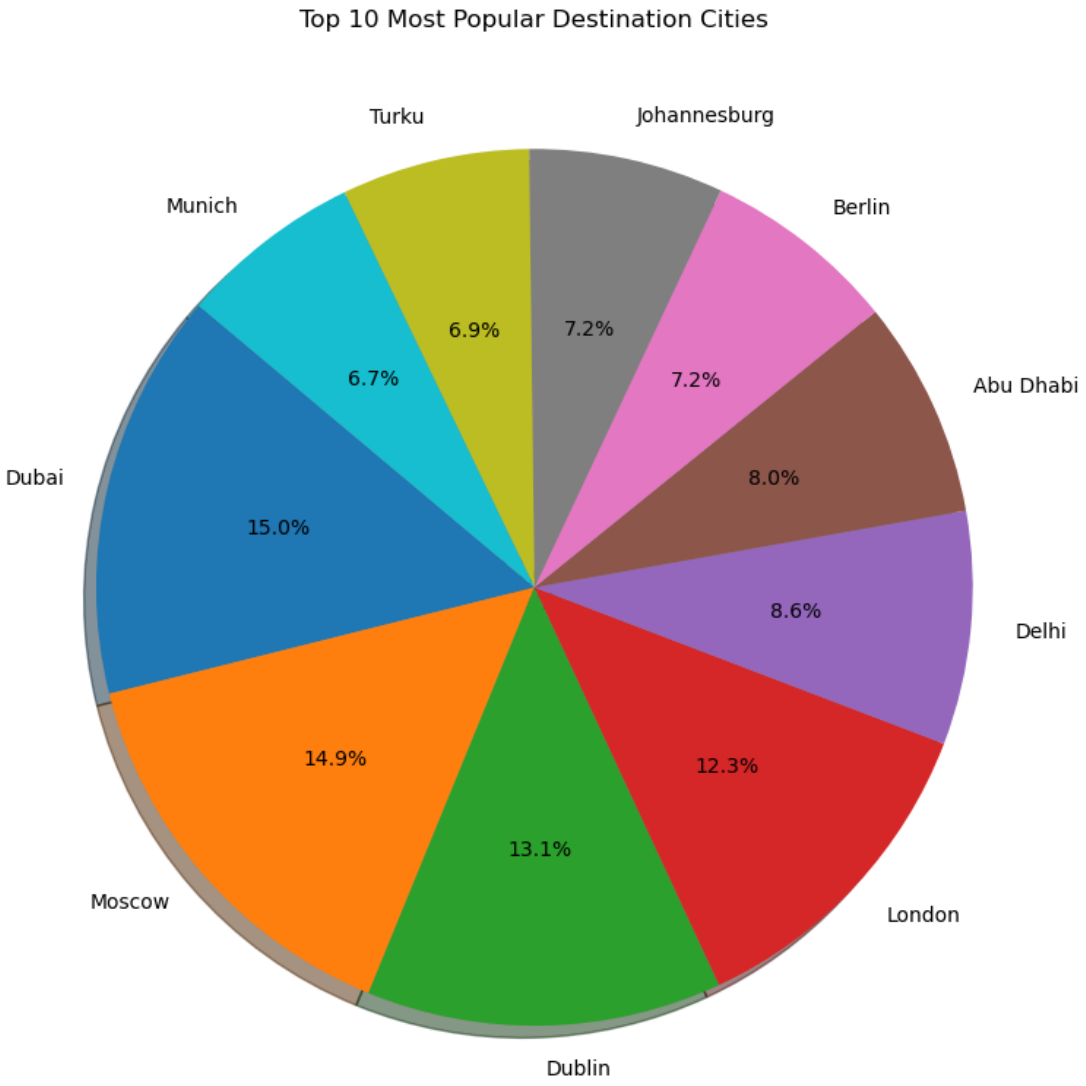
[31]:
```
#Top Companies by Average Starting Salary
top_salary_by_company = df[df["placement_status"] == "Placed"].
 ↪groupby("placement_company")["starting_salary_usd"].mean().
 ↪sort_values(ascending=False).head(10)
print(top_salary_by_company)
```

```
placement_company
Intel         93425.259259
Apple         93112.184615
Siemens       92735.790055
Amazon        91870.122642
IBM           89481.344262
SAP           88851.358696
Microsoft     87723.627273
Facebook      87301.368984
Deloitte      87296.857895
McKinsey      87274.224599
Name: starting_salary_usd, dtype: float64
```

[33]:
```
#Top 10 Most Popular Destination Cities
top_cities = df["destination_city"].value_counts().head(10)
print(top_cities)

plt.figure(figsize=(8, 8))
top_cities.plot(kind="pie", autopct="%1.1f%%", startangle=140, shadow=True)
plt.title("Top 10 Most Popular Destination Cities")
plt.ylabel("")
plt.tight_layout()
plt.show()
```

```
destination_city
Dubai            307
Moscow           305
Dublin           268
London           251
Delhi            176
Abu Dhabi        164
Berlin           147
Johannesburg     147
Turku            142
Munich           138
Name: count, dtype: int64
```



[35]:
```
#Distribution of Scholarships by Destination Country
scholarship_by_dest = df.groupby("destination_country")["scholarship_received"].
 ↪value_counts()
print(scholarship_by_dest)
```

```
destination_country  scholarship_received
Canada               Yes                    242
                     No                     241
Finland              Yes                    261
                     No                     213
Germany              No                     259
                     Yes                    259
```

```
India                No                    249
                     Yes                   244
Ireland              Yes                   237
                     No                    235
Russia               Yes                   278
                     No                    237
South Africa         Yes                   260
                     No                    236
UAE                  Yes                   285
                     No                    253
UK                   Yes                   270
                     No                    256
USA                  No                    244
                     Yes                   241
Name: count, dtype: int64
```

[37]:
```
#Average Test Scores by Test Type
avg_test_score = df.groupby("language_proficiency_test")["test_score"].mean().
 ↪sort_values(ascending=False)
print(avg_test_score)
```

```
language_proficiency_test
PTE          7.068869
Duolingo     7.041068
TOEFL        6.997358
IELTS        6.926866
None         0.000000
Name: test_score, dtype: float64
```

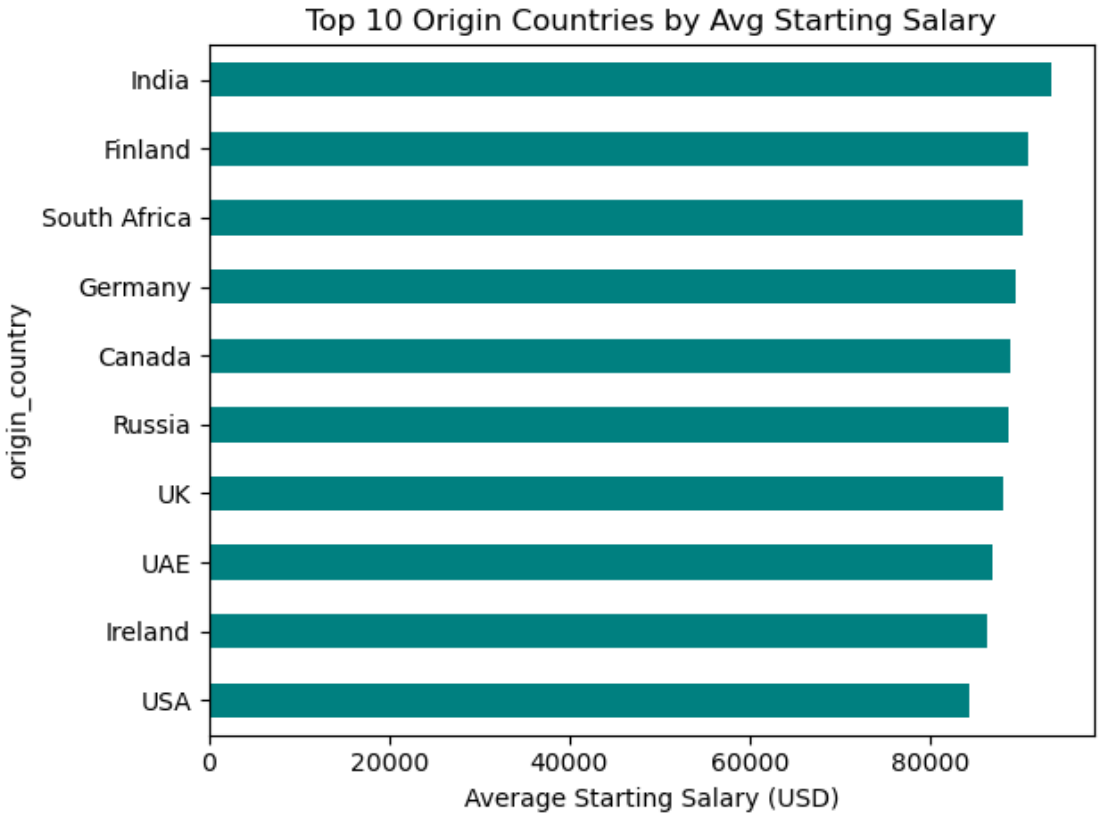
[39]:
```
#Student Count by Visa Type
visa_distribution = df["visa_status"].value_counts()
print(visa_distribution)
```

```
visa_status
Schengen Student Visa    863
Tier 4                   853
J1                       848
Student Visa             817
Study Permit             811
F1                       808
Name: count, dtype: int64
```

[41]:
```
#Top 10 Countries by Average Starting Salary (Origin)
top_salary_by_origin = df[df["placement_status"] == "Placed"].
 ↪groupby("origin_country")["starting_salary_usd"].mean().
 ↪sort_values(ascending=False).head(10)
print(top_salary_by_origin)
```

```
top_salary_by_origin.plot(kind='barh', color='teal')
plt.xlabel("Average Starting Salary (USD)")
plt.title("Top 10 Origin Countries by Avg Starting Salary")
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()
```

```
origin_country
India           93536.097959
Finland         90868.122363
South Africa    90228.273810
Germany         89489.572993
Canada          88879.947566
Russia          88795.625954
UK              88134.917695
UAE             87018.602679
Ireland         86377.764925
USA             84385.253165
Name: starting_salary_usd, dtype: float64
```



[43]:
```
#GPA vs Placement Status
gpa_by_placement = df.groupby("placement_status")["gpa_or_score"].mean()
print(gpa_by_placement)
```

```
placement_status
Not Placed    3.256544
Placed        3.237166
Name: gpa_or_score, dtype: float64
```

[45]:
```
#Post-Graduation Visa Distribution
#This counts the number of students by the type/status of visa they received␣
 ↪after graduation.
post_visa_distribution = df["post_graduation_visa"].value_counts()
print(post_visa_distribution)
```

```
post_graduation_visa
Blue Card          1029
Work Permit        1027
OPT                1012
Post-Study Visa     982
PSW                 950
Name: count, dtype: int64
```

[47]:
```
#Top Hiring Companies
#This lists the top 10 companies that hired the most students.
top_companies = df["placement_company"].value_counts().head(10)
print(top_companies)
```

```
placement_company
N/A          2491
Microsoft     220
Amazon        212
Google        203
Apple         195
Tesla         193
Deloitte      190
Intel         189
Facebook      187
McKinsey      187
Name: count, dtype: int64
```

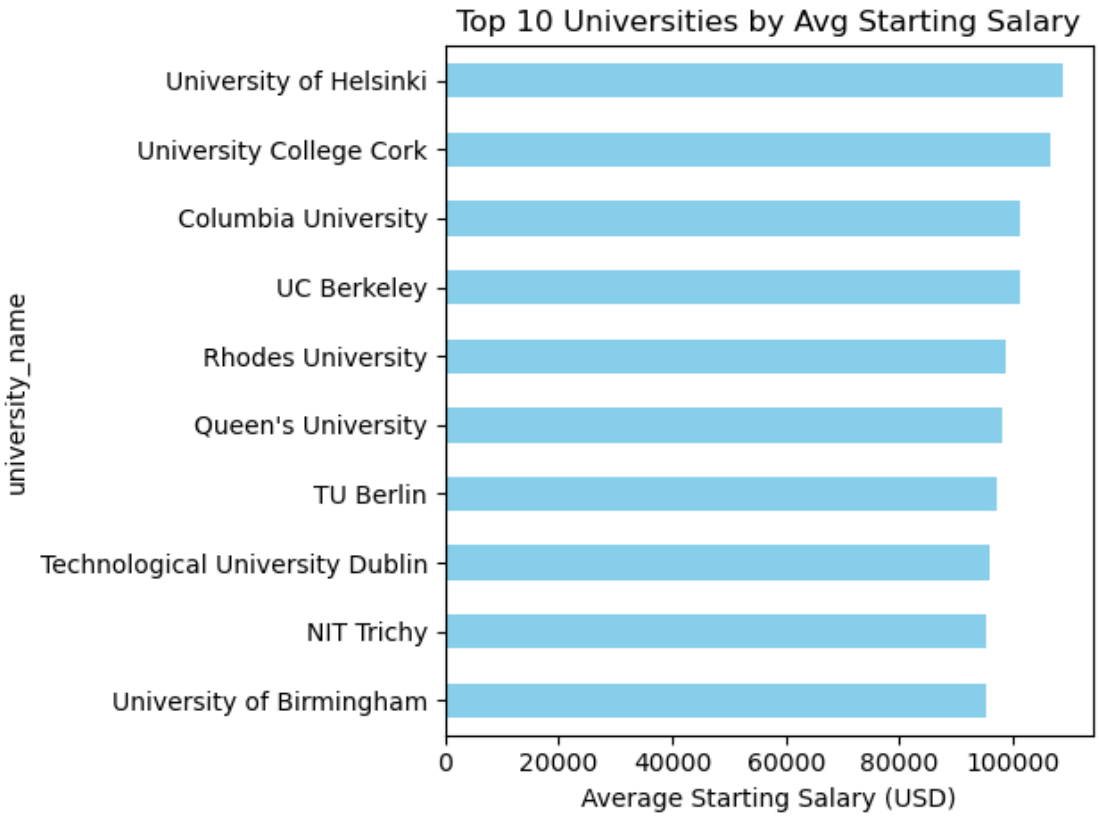
[49]:
```
test_by_placement = df.groupby("placement_status")["language_proficiency_test"].
 ↪value_counts()
print(test_by_placement)
```

```
placement_status  language_proficiency_test
Not Placed        Duolingo                    536
                  PTE                         504
                  None                        488
                  TOEFL                       484
                  IELTS                       479
Placed            IELTS                       526
                  TOEFL                       500
                  PTE                         495
                  Duolingo                    494
                  None                        494
Name: count, dtype: int64
```

[51]:
```
top_salary_by_univ = df[df["placement_status"] == "Placed"].
 ↪groupby("university_name")["starting_salary_usd"].mean().
 ↪sort_values(ascending=False).head(10)
print(top_salary_by_univ)

top_salary_by_univ.plot(kind='barh', color='skyblue')
plt.xlabel("Average Starting Salary (USD)")
plt.title("Top 10 Universities by Avg Starting Salary")
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()
```

```
university_name
University of Helsinki             108654.666667
University College Cork            106646.290323
Columbia University                101211.818182
UC Berkeley                        101132.321429
Rhodes University                   98721.314286
Queen's University                  98145.812500
TU Berlin                           97048.540541
Technological University Dublin     95842.233333
NIT Trichy                          95334.833333
University of Birmingham            95219.176471
Name: starting_salary_usd, dtype: float64
```


Top 10 Universities by Avg Starting Salary
university_name
University of Helsinki
University College Cork
Columbia University
UC Berkeley
Rhodes University
Queen's University
TU Berlin
Technological University Dublin
NIT Trichy
University of Birmingham
0
20000
40000
60000
80000
100000
Average Starting Salary (USD)

[53]:
```
# Most Popular Fields of Study
# It provides insight into educational trends and student interests.
top_fields = df["field_of_study"].value_counts()
print(top_fields)

plt.figure(figsize=(10, 6))
top_fields.plot(kind="bar", color="skyblue")
plt.title("Top 10 Most Popular Fields of Study")
plt.xlabel("Field of Study")
plt.ylabel("Number of Students")
plt.xticks(rotation=45)
plt.tight_layout()
plt.grid(axis="y", linestyle="--", alpha=0.7)
plt.show()
```

```
field_of_study
Social Sciences     645
Business            636
Engineering         634
Law                 633
Computer Science    630
Natural Sciences    629
Arts                600
Medicine            593
Name: count, dtype: int64
```