Project Tittle: Empowering Education (Understanding of Technology in Education)

Analysis phase

Problem Statement Through data collection, analysis and visualization our project has explored the impact of technology on learning By understanding how technology influences education, we aim to identify strategies to enhance learning experiences and empower educators and learners.

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

In [2]:
```
df = pd.read_csv('Responses.csv')
df.head()
```

Out[2]:

	Student Name	Department	Roll Number	Year/Part	Gender	Overall Perception	Understanding of Technology	Access to Technology	Engag... Le...
0	Waqar	Statistics	92	Third Year	Male	Positive	Mostly	Easy	
1	Tariq	Law	393792	Fourth Year	Male	Positive	Mostly	Moderate	\
2	Yaseen	International Relations	127	Fourth Year	Male	Positive	Mostly	Moderate	\
3	Shahzeb	Psychology	21	Third Year	Male	Positive	Mostly	Easy	
4	Abdul Sattar Jamali	Software Engineering	5	Third Year	Male	Positive	Mostly	Moderate	\

In [3]:
```
df.tail()
```

Out[3]:

	Student Name	Department	Roll Number	Year/Part	Gender	Overall Perception	Understanding of Technology	Access to Technology	Enga... L...
31	Eesha fatima	Biochemistry	33	Fourth Year	Female	Neutral	Mostly	Moderate	
32	Duaa Mansur	BS Data Science	37	Third Year	Female	Positive	Completely	Easy	
33	Wajeeha Mujeeb	City and Regional Planning	2	Third Year	Female	Positive	Mostly	Moderate	
34	Aima Hassan	Engineering	36	Fourth Year	Female	Positive	Mostly	Moderate	
35	Ali Hassan	P Science	13	Third Year	Male	Positive	Completely	Easy	

Analysis basis on the 'Gender' column

In [4]:
```
# Check the unique values in the 'Gender' column
gender_counts = df['Gender'].value_counts()

# Calculate the percentage of each gender
gender_percentages = gender_counts / len(df) * 100

# Display the analysis
print("Gender Analysis:")
print(gender_counts)
print("\nPercentage of Each Gender:")
print(gender_percentages)
```

```
Gender Analysis:
Gender
Male      18
Female    18
Name: count, dtype: int64

Percentage of Each Gender:
Gender
Male      50.0
Female    50.0
Name: count, dtype: float64
```

Q1: Overall Perception: How do you perceive the impact of technology in your education?

Analyze the distribution of responses (Positive, Neutral, Negative) to understand the general perception of technology's impact on education among students

In [5]:
```
# Check the unique values in the 'Overall Perception' column
perception_counts = df['Overall Perception'].value_counts()

# Calculate the percentage of each response
perception_percentages = perception_counts / len(df) * 100
```

```
# Display the analysis
print("Perception Analysis:")
print(perception_counts)
print("\nPercentage of Each Response:")
print(perception_percentages)
```

```
Perception Analysis:
Overall Perception
Positive    30
Neutral      5
Negative     1
Name: count, dtype: int64

Percentage of Each Response:
Overall Perception
Positive    83.333333
Neutral     13.888889
Negative     2.777778
Name: count, dtype: float64
```

Q2: Understanding of Technology: How well do you understand the technology used for learning?

Look at the distribution of responses (Completely, Mostly, Somewhat, Minimally, Not at all) to measuring students' understanding of the technology used for learning.

In [6]:
```
# Check the unique values in the 'Understanding of Technology' column
understanding_counts = df['Understanding of Technology'].value_counts()

# Calculate the percentage of each response
understanding_percentages = understanding_counts / len(df) * 100

# Display the analysis
print("Understanding of Technology Analysis:")
print(understanding_counts)
print("\nPercentage of Each Response:")
print(understanding_percentages)
```

```
Understanding of Technology Analysis:
Understanding of Technology
Mostly        26
Completely     6
Minimaly       4
Name: count, dtype: int64

Percentage of Each Response:
Understanding of Technology
Mostly        72.222222
Completely    16.666667
Minimaly      11.111111
Name: count, dtype: float64
```

Q3: Access to Technology: How would you rate your access to technology for educational purposes?

Explore the distribution of responses (Easy, Moderate, Difficult) to assess students' access to technology for educational purposes.

In [7]:
```
# Check the unique values in the 'Access to Technology' column
access_counts = df['Access to Technology'].value_counts()

# Calculate the percentage of each response
access_percentages = access_counts / len(df) * 100

# Display the analysis
print("Access to Technology Analysis:")
print(access_counts)
print("\nPercentage of Each Response:")
print(access_percentages)
```

```
Access to Technology Analysis:
Access to Technology
Easy        19
Moderate    17
Name: count, dtype: int64

Percentage of Each Response:
Access to Technology
Easy        52.777778
Moderate    47.222222
Name: count, dtype: float64
```

Q4: Engagement with Learning Tools: How often do you actively engage with educational technology tools outside of regular classroom hours?

Analyze the frequency distribution of responses (Daily, Weekly, Monthly, Rarely) to understand how often students engage with educational technology tools outside of regular classroom hours.

In [8]:
```
# Check the unique values in the 'Engagement with Learning Tools' column
engagement_counts = df['Engagement with Learning Tools'].value_counts()

# Calculate the percentage of each response
engagement_percentages = engagement_counts / len(df) * 100

# Display the analysis
print("Engagement with Learning Tools Analysis:")
print(engagement_counts)
print("\nPercentage of Each Response:")
print(engagement_percentages)
```

```
Engagement with Learning Tools Analysis:
Engagement with Learning Tools
Daily     17
Weekly    11
Rarely     8
Name: count, dtype: int64

Percentage of Each Response:
Engagement with Learning Tools
Daily     47.222222
Weekly    30.555556
Rarely    22.222222
Name: count, dtype: float64
```

Q5: Preference for Digital Learning: How much do you prefer learning through digital tools compared to traditional methods?

Examine the distribution of responses (Prefer, Strongly Prefer, Neutral, Disprefer, Strongly Disprefer) to determine students' preferences for learning through digital tools compared to traditional methods.

In [9]:
```
# Check the unique values in the 'Preference for Digital Learning' column
preference_counts = df['Preference for Digital Learning'].value_counts()

# Calculate the percentage of each response
preference_percentages = preference_counts / len(df) * 100

# Display the analysis
print("Preference for Digital Learning Analysis:")
print(preference_counts)
print("\nPercentage of Each Response:")
print(preference_percentages)
```

```
Preference for Digital Learning Analysis:
Preference for Digital Learning
Strongly Prefer    16
Prefer             15
Neutral             5
Name: count, dtype: int64

Percentage of Each Response:
Preference for Digital Learning
Strongly Prefer    44.444444
Prefer             41.666667
Neutral            13.888889
Name: count, dtype: float64
```

perform a chi-square test for independence between Gender and another categorical variable which is Access to Technology.

The chi-square test is a statistical test used to determine whether there is a significant association between two categorical variables. It compares the observed frequencies in a contingency table to the expected frequencies if the variables were independent. The result of the test helps us understand if the relationship between the variables is likely due to chance or if it is statistically significant.

A contingency table, or crosstab, is a statistical table that displays the frequencies of two categorical variables. It is used in chi-square tests to examine whether there is an association between the two variables.

The pd.crosstab() function is available in the Pandas library and is used to calculate the frequencies between two variables. For chi-square tests, we use this table to see if there is a significant association between the two variables or no

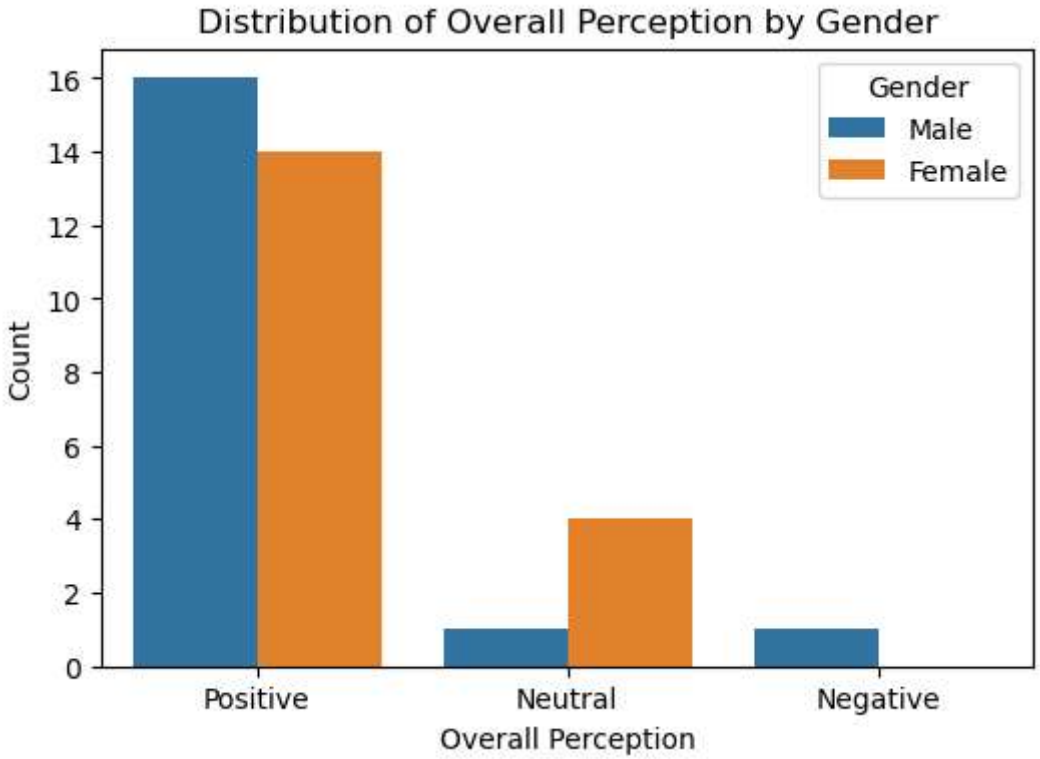
In [10]:
```
import scipy.stats as stats
# Perform chi-square test for independence
chi2, p, _, _ = stats.chi2_contingency(pd.crosstab(df['Gender'], df['Access to Technol
```

```
# Output the test statistic and p-value
print(f"Chi-square: {chi2}, p-value: {p}")

# Interpret the results
alpha = 0.05
if p < alpha:
    print("Reject the null hypothesis: There is a significant difference between Gende
else:
    print("Fail to reject the null hypothesis: There is no significant difference betw
```

```
Chi-square: 0.44582043343653255, p-value: 0.5043264757421703
Fail to reject the null hypothesis: There is no significant difference between Gender
and Access to Technology.
```

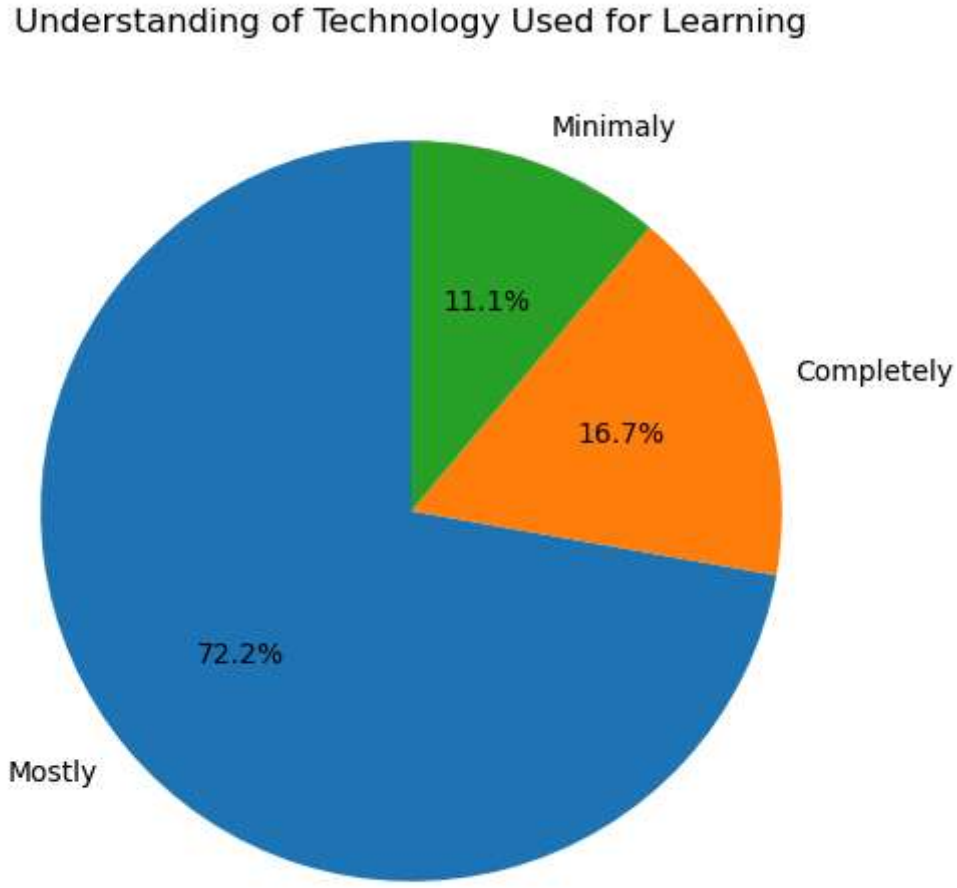
Data Visualization Phase

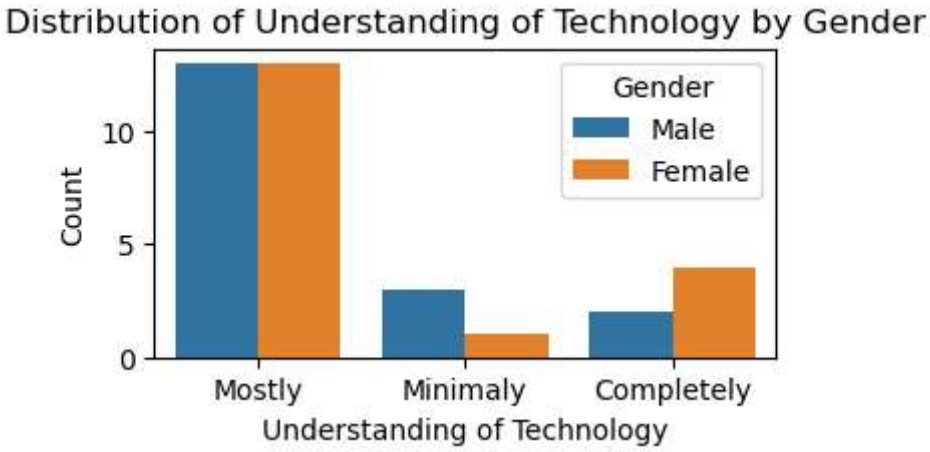
In [11]:
```
plt.figure(figsize=(6, 4))
sns.countplot(x='Overall Perception', hue='Gender', data=df)
plt.xlabel('Overall Perception')
plt.ylabel('Count')
plt.title('Distribution of Overall Perception by Gender')
plt.legend(title='Gender', loc='upper right')
plt.show()
```



In [12]:
```
# Understanding of Technology (Pie Chart)
plt.figure(figsize=(8, 6))
understanding_counts = df['Understanding of Technology'].value_counts()
plt.pie(understanding_counts, labels=understanding_counts.index, autopct='%1.1f%%', st
plt.title('Understanding of Technology Used for Learning')
plt.show()

plt.figure(figsize=(4, 2))
sns.countplot(x='Understanding of Technology', hue='Gender', data=df)
plt.xlabel('Understanding of Technology')
```

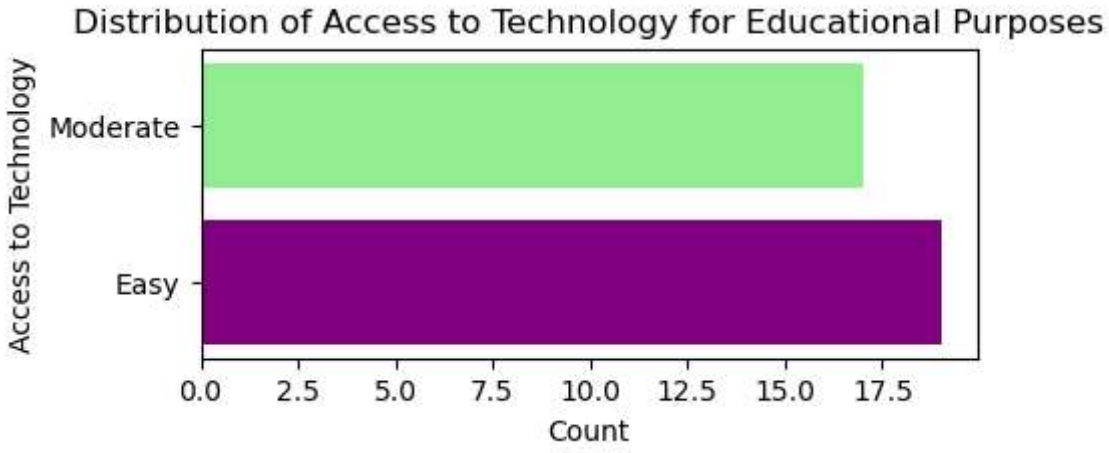
```
plt.ylabel('Count')
plt.title('Distribution of Understanding of Technology by Gender')
plt.legend(title='Gender', loc='upper right')
plt.show()
```

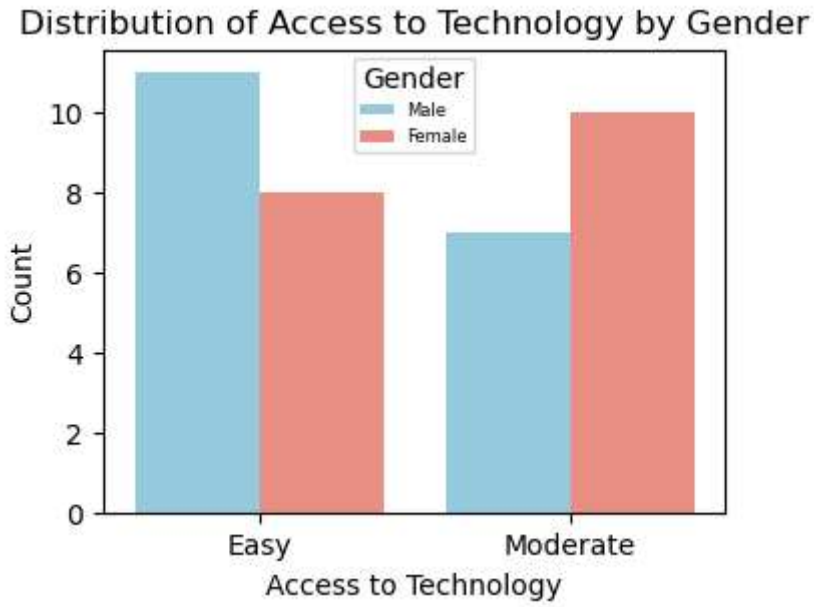




In [13]:
```
# Define colors for each bar
colors = ['purple', 'lightgreen']

# Plotting the horizontal bar chart
plt.figure(figsize=(5, 2))
plt.barh(access_counts.index, access_counts.values, color=colors)
plt.xlabel('Count')
plt.ylabel('Access to Technology')
```

```
plt.title('Distribution of Access to Technology for Educational Purposes')
plt.show()

# Define a custom color palette
custom_palette = {'Male': 'skyblue', 'Female': 'salmon'}

# Create the countplot with the custom palette
plt.figure(figsize=(4, 3))
sns.countplot(x='Access to Technology', hue='Gender', data=df, palette=custom_palette)
plt.xlabel('Access to Technology')
plt.ylabel('Count')
plt.title('Distribution of Access to Technology by Gender')
plt.legend(title='Gender', loc='upper center', prop={'size': 6})
plt.show()
```

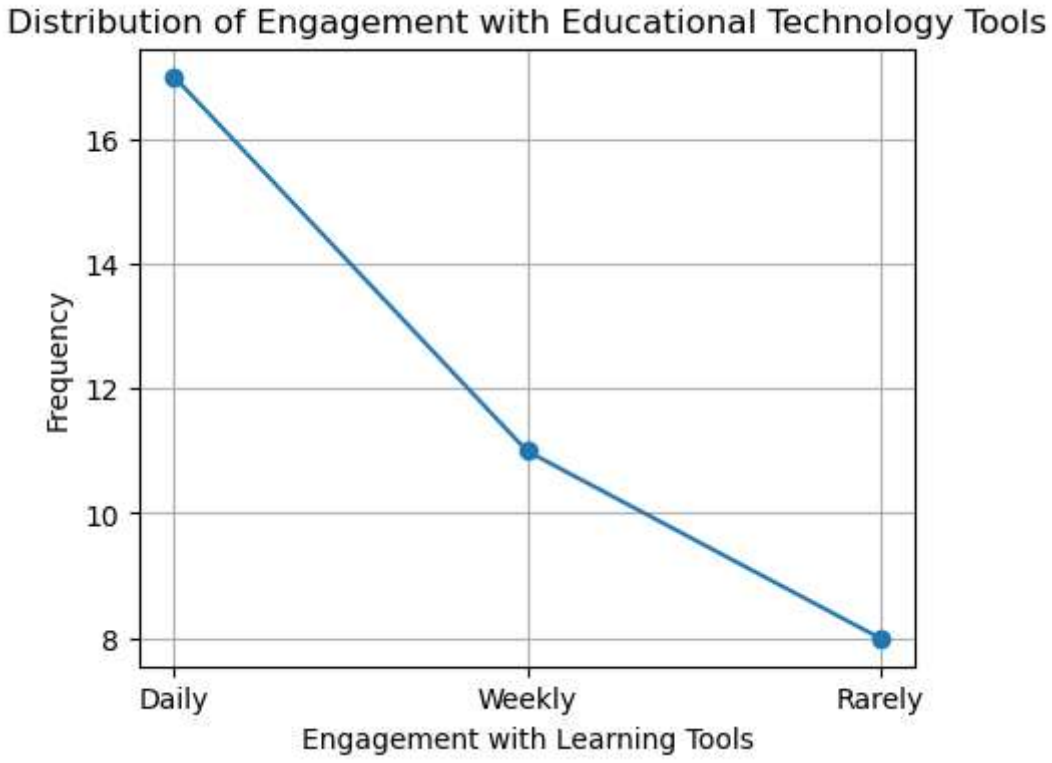


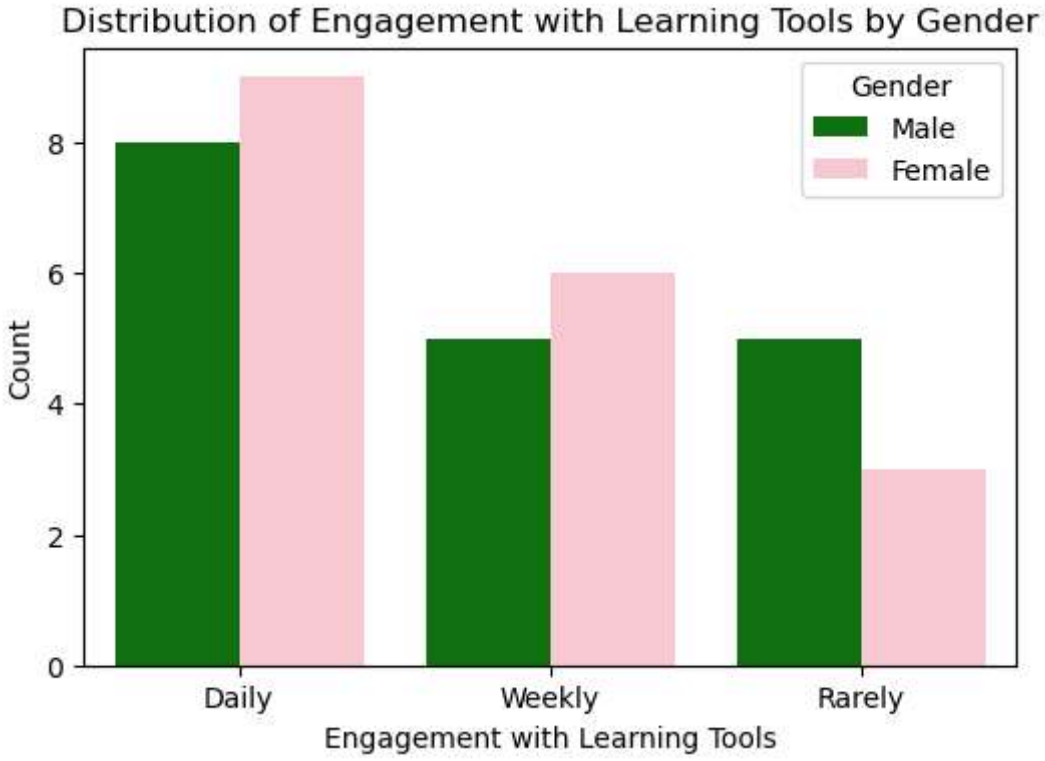


In [14]:

```
# Plotting the line chart
plt.figure(figsize=(5, 4))
plt.plot(engagement_counts.index, engagement_counts.values, marker='o')
plt.xlabel('Engagement with Learning Tools')
plt.ylabel('Frequency')
plt.title('Distribution of Engagement with Educational Technology Tools')
plt.grid(True)  # Add grid lines
plt.show()

# Define a custom color palette
```

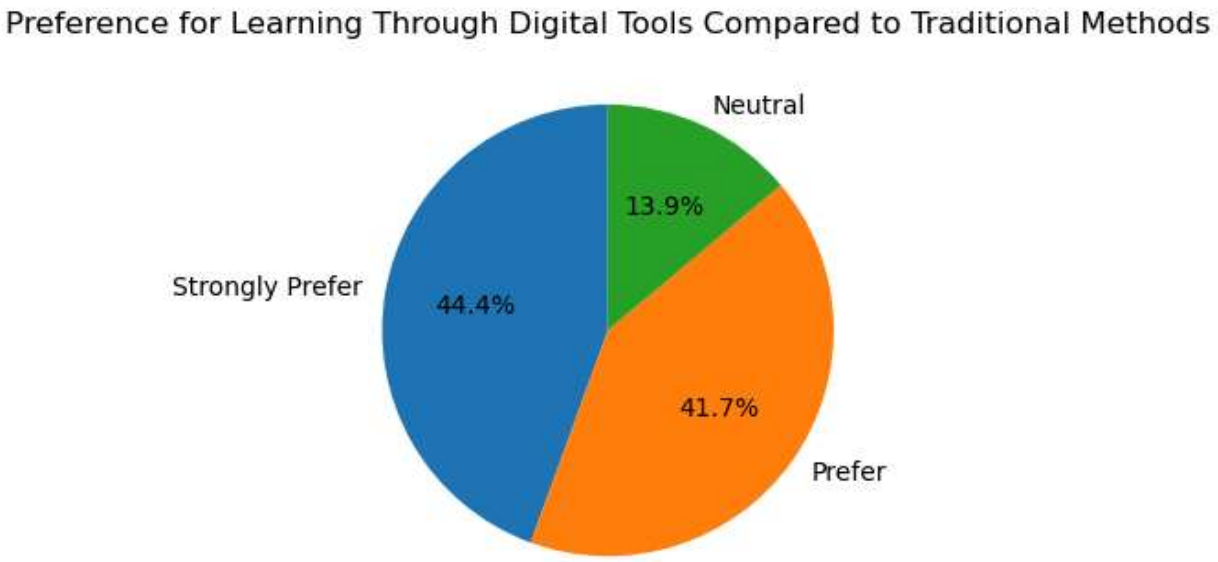
```
custom_palette = {'Male': 'green', 'Female': 'pink'}
plt.figure(figsize=(6, 4))
sns.countplot(x='Engagement with Learning Tools', hue='Gender', data=df,palette=custom
plt.xlabel('Engagement with Learning Tools')
plt.ylabel('Count')
plt.title('Distribution of Engagement with Learning Tools by Gender')
plt.legend(title='Gender', loc='upper right')
plt.show()
```

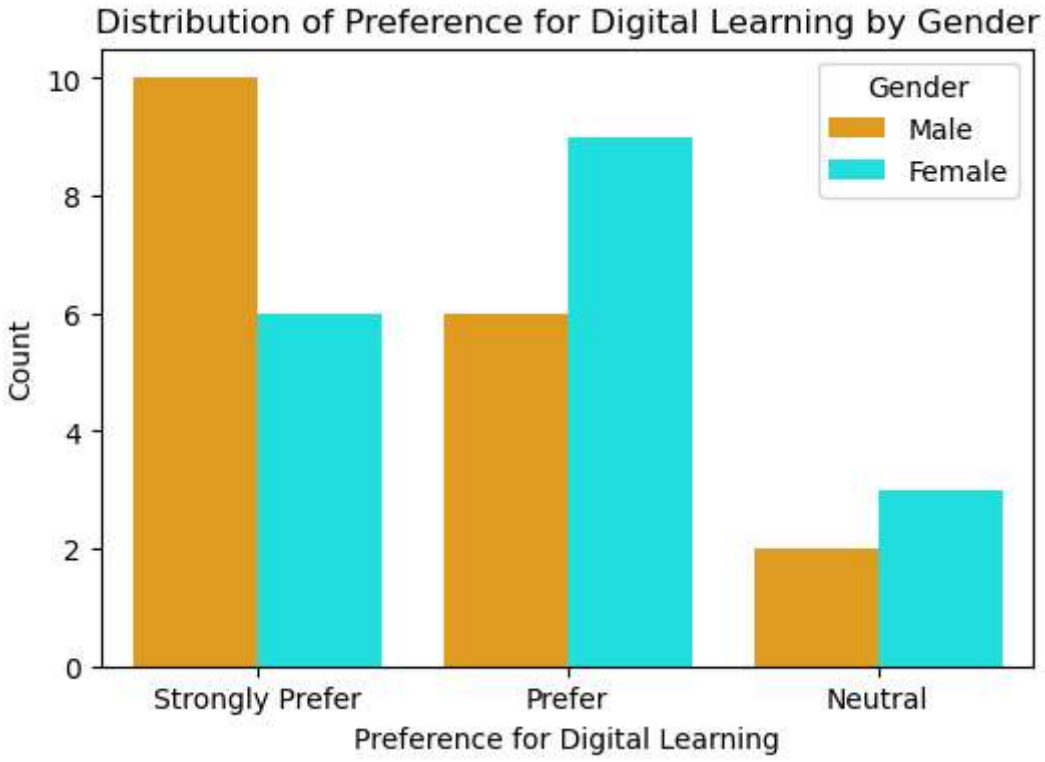




In [15]:
```
# Preference for Digital Learning (Pie Chart)
plt.figure(figsize=(6, 4))
```

```
preference_counts = df['Preference for Digital Learning'].value_counts()
plt.pie(preference_counts, labels=preference_counts.index, autopct='%1.1f%%', startang
plt.title('Preference for Learning Through Digital Tools Compared to Traditional Metho
plt.show()

# Define a custom color palette
custom_palette = {'Male': 'orange', 'Female': 'aqua'}
plt.figure(figsize=(6, 4))
sns.countplot(x='Preference for Digital Learning', hue='Gender', data=df,palette=custo
plt.xlabel('Preference for Digital Learning')
plt.ylabel('Count')
plt.title('Distribution of Preference for Digital Learning by Gender')
plt.legend(title='Gender', loc='upper right')
plt.show()
```





In [ ]: