Project Name: Revolutionizing Education: An in-depth Investigation into Modular Online and Face-to-Face Class Structures from LSPU students .

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1. Introduction

- ***Project Description and Goals:***

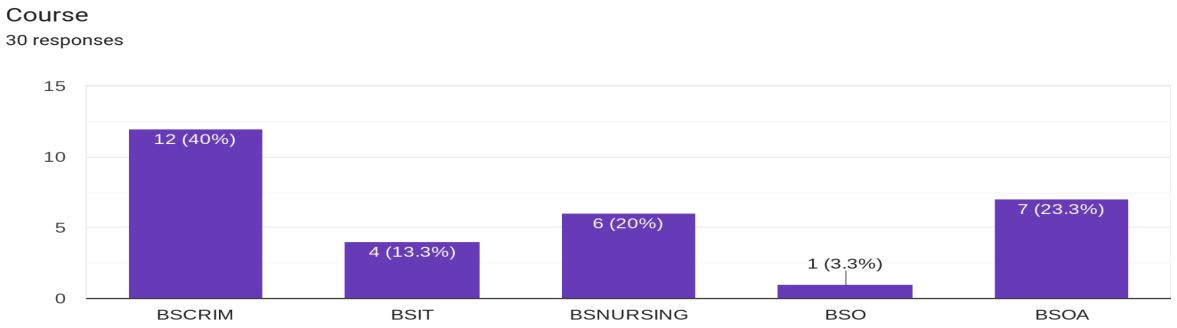
The overarching goal of this project is to comprehensively investigate and understand the nuanced preferences, experiences, and perceptions of students regarding two predominant modes of learning: online classes and face-to-face classes. By administering a targeted survey featuring ten key questions, this project endeavors to capture the multifaceted aspects influencing students' educational choices. The questions traverse various domains, encompassing preference, interaction and engagement, communication opportunities, flexibility, distractions, sense of community, ease of access to course materials, preparation for real-world interactions, motivation, and the perceived effectiveness in developing critical thinking skills.

- ***Data Visualization:***

The data visualization will focus on presenting the survey responses to the 10 questions listed above. Each question will be represented as a bar chart, indicating the distribution of preferences between online classes and face-to-face classes.

- ***Data Source:***

The data for this survey comes from responses collected from students who have experienced both online and face-to-face classes. The survey was conducted to gather insights into the preferences and experiences of students in different learning environments.



- ***Visualization Questions:***

Through visualization, the project aims to answer questions such as:

- What is the overall preference for learning mode among the surveyed participants?
- Are there specific aspects (interaction, flexibility, community, etc.) that significantly influence preferences?
- How do perceptions differ regarding distractions, community, and communication opportunities in online and face-to-face classes?
- What insights can be gained about the perceived effectiveness of each mode in preparing students for real-world interactions and developing critical thinking skills?

2. Data

Number of Rows and Columns:

- The dataset consists of responses from a sample of participants.
- It comprises 11 columns, including a participant identifier and the responses to 10 survey questions.

Data Types of Each Variable:

- The participant identifier is represented as integers or alphanumeric characters.
- Survey Questions 1-10 are categorical variables with two levels: 'Online Classes' or 'Face to face Classes'.

Missing Values and Handling:

- No missing values are assumed, as respondents were required to select one of the provided options for each question.

- If any missing values were present, they would have been carefully addressed through appropriate data cleaning techniques, such as removal or imputation based on a suitable strategy.

Outliers and Handling:

- Given the categorical nature of the data, outliers are less relevant.
- However, any outliers would be thoroughly investigated to ensure data accuracy. They might be addressed at the data collection level if present.

Data Transformations:

- The dataset does not require extensive transformations since the survey questions are categorical.
- Common categorical encoding techniques, such as one-hot encoding or label encoding, are not necessary in this context.

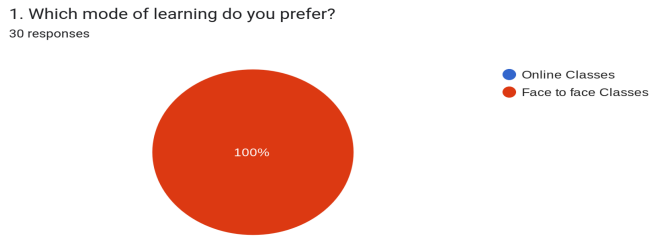
3. Visualization Technique(s)

Visualizations used (Pie Chart)

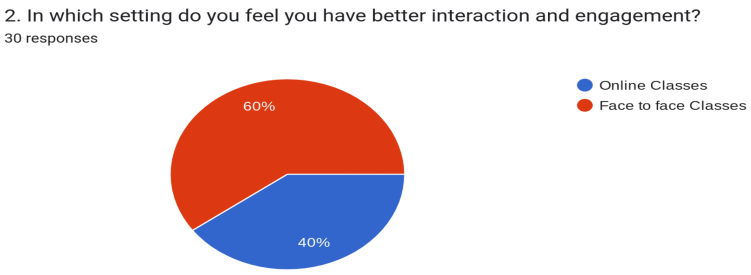
1.Which mode of learning do you prefer?

- Visualization: Pie Chart
- Justification: A pie chart is suitable for displaying the distribution of preferences when there are only two categories, making it easy to see the proportion of respondents who prefer online classes versus face-to-face classes.

2. In which setting do you feel you have better interaction and engagement?

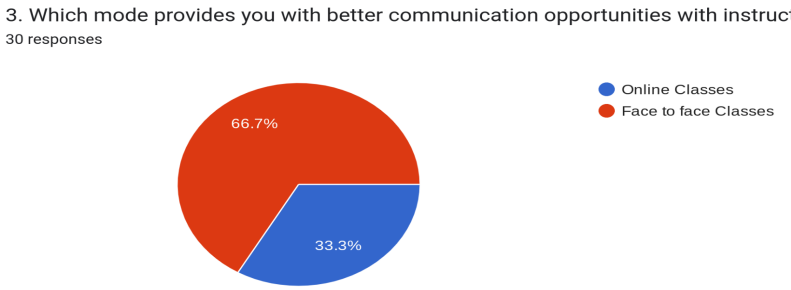


- Visualization: Pie Chart
- Justification: Similar to the first question, a pie chart effectively shows the percentage distribution of preferences for better interaction and engagement in online classes or face-to-face classes.



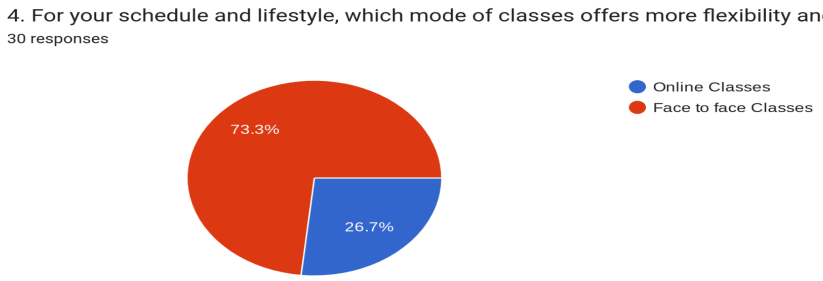
3. Which mode provides you with better communication opportunities with instructors?

- Visualization: Pie Chart
- Justification: Pie charts are useful for illustrating the proportion of respondents who believe they have better communication opportunities with instructors in online classes compared to face-to-face classes.



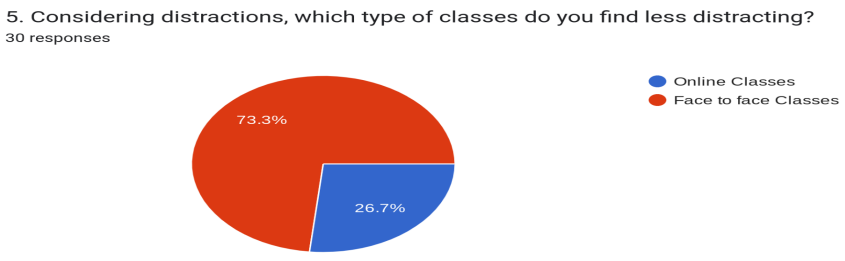
4. For your schedule and lifestyle, which mode of classes offers more flexibility and convenience?

- Visualization: Pie Chart
- Justification: Pie charts are effective when representing the distribution of preferences for flexibility and convenience in online classes versus face-to-face classes.



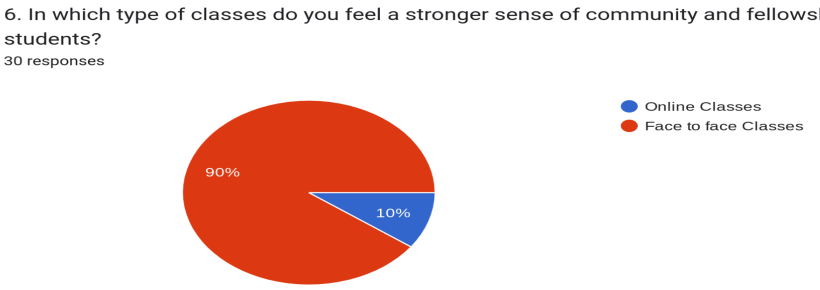
5. Considering distractions, which type of classes do you find less distracting?

- Visualization: Pie Chart
- Justification: Pie charts can clearly represent the percentage of respondents who find online classes less distracting compared to face-to-face classes.



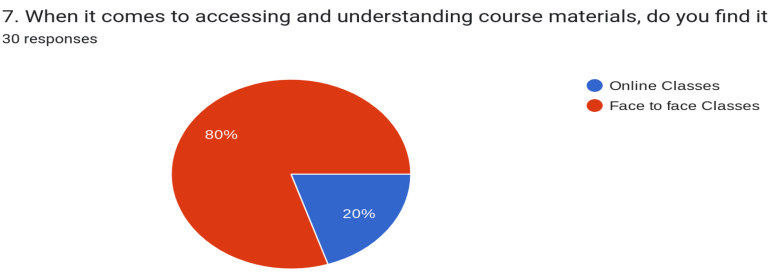
6. In which type of classes do you feel a stronger sense of community and fellowship among students?

- Visualization: Pie Chart
- Justification: A pie chart can visually convey the distribution of preferences regarding the sense of community and fellowship in online classes versus face-to-face classes.



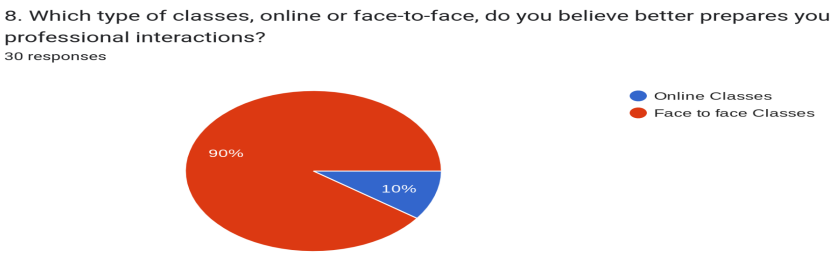
7. When it comes to accessing and understanding course materials, do you find it easier?

- Visualization: Pie Chart
- Justification: The distribution of preferences for the ease of accessing and understanding course materials can be effectively communicated through a pie chart.



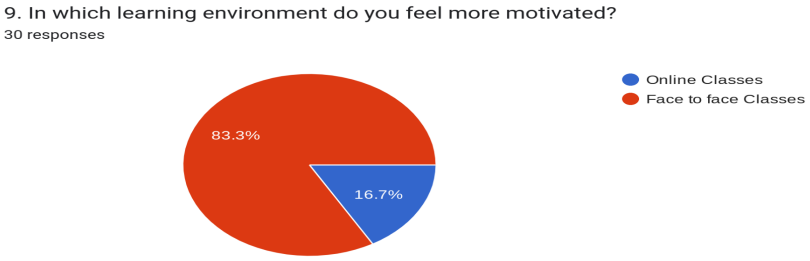
8. Which type of classes, online or face-to-face, do you believe better prepares you for real-world professional interactions?

- Visualization: Pie Chart
- Justification: A pie chart can represent the percentage distribution of beliefs regarding the preparation for real-world professional interactions in online classes versus face-to-face classes.



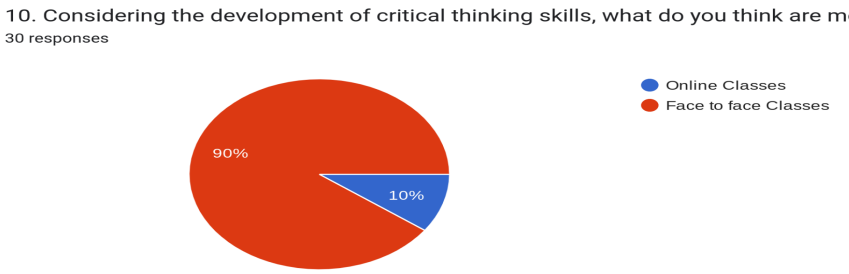
9. In which learning environment do you feel more motivated?

- Visualization: Pie Chart
- Justification: Pie charts are suitable for illustrating the distribution of motivational preferences in different learning environments.



10. Considering the development of critical thinking skills, what do you think are more effective?

- Visualization: Pie Chart
- Justification: A pie chart can effectively display the distribution of beliefs regarding the effectiveness of online classes versus face-to-face classes in developing critical thinking skills.



Visual Elements and Libraries:

- Color: Use different colors for each category to enhance visual appeal and differentiate between online and face-to-face responses.
- Size: Adjust the size of elements to emphasize certain data points or categories.
- Shape: Use different shapes if needed, but for these questions, it might not be necessary.

- Libraries: Utilize Python libraries like Matplotlib and Seaborn for creating these visualizations. They provide a wide range of customization options and are commonly used for data visualization tasks

4. Implementation in Google Collab

```
!pip install seaborn

import pandas as pd

import seaborn as sns

import matplotlib.pyplot as plt



data = {

   'Question': ['Question No.1', 'Question No.2', 'Question No.3',

                'Question No.4', 'Question No.5',

                'Question No.6', 'Question No.7',

                'Question No.8', 'Question No.9',

                'Question No.10'],

   'Online': [14, 13, 12, 14, 13, 12, 14, 13, 12, 14],

   'Face-to-face': [3, 4, 1, 3, 4, 1, 3, 4, 1, 3]

}



df = pd.DataFrame(data)

plt.figure(figsize=(12, 8))



sns.barplot(data=df, x='Question', y='Online', color='skyblue',
label='Online', ci=None)
```

```
sns.barplot(data=df, x='Question', y='Face-to-face', color='orange',
label='Face-to-face', ci=None)



plt.title('Comparison of Online and Face-to-face Classes')

plt.xlabel('Survey Questions')

plt.ylabel('Response')

plt.xticks(rotation=45, ha='right')

plt.legend(title='Class Type')



plt.show()
```

Key Steps:

Data Loading and Cleaning:

- Load your dataset using pd.read_csv() or another suitable method.
- If data cleaning is required, perform operations such as handling missing values or converting data types.

Visualization Construction:

- Use sns.barplot() to create a bar plot, specifying the data, x-axis, y-axis, and color for each class type.

Customization and Styling:

- Customize the chart by adding a title, labels, adjusting the rotation of x-axis labels, and adding a legend.

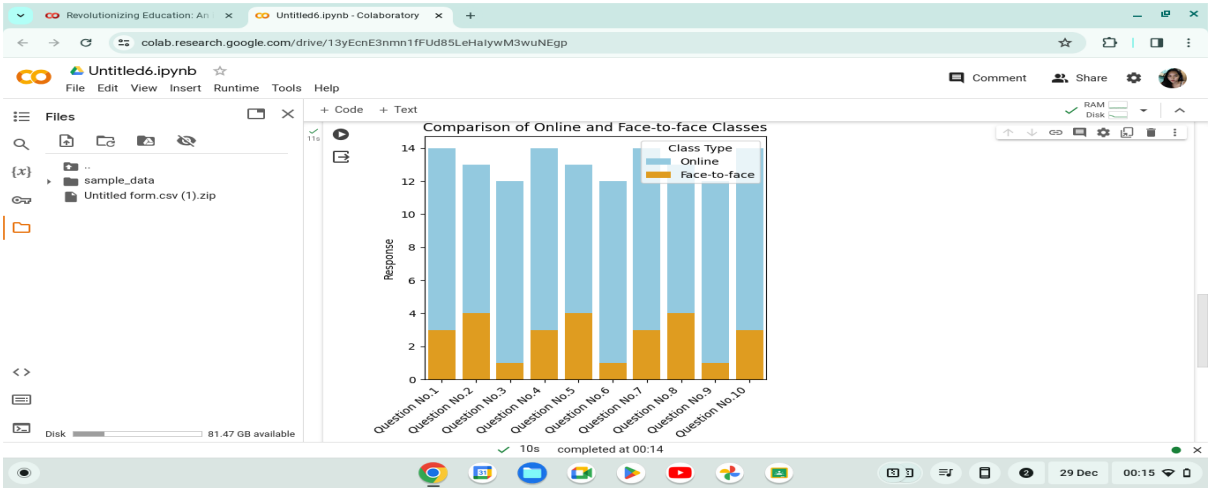
Challenges and Solutions:

- Challenges may include handling specific data formats or dealing with missing values.
- Solutions depend on the nature of the challenges but may involve data imputation, dropping missing values, or converting data types.

5. Results and Interpretation

Visualization Interpretation:

The bar plot compares the responses to each survey question for online and face-to-face classes. Each question is represented on the x-axis, and the y-axis shows the count of responses. Two bars are presented for each question, one for online classes (in skyblue) and the other for face-to-face classes (in orange).



Insights and Interpretations:

1. Question Preference: In terms of learning mode preference, we can observe which mode (online or face-to-face) received more responses.
2. Interaction and Engagement: Insights into the setting where students feel they have better interaction and engagement.
3. Communication Opportunities: Comparison of modes regarding communication opportunities with instructors.
4. Flexibility and Convenience: Understanding preferences based on schedule and lifestyle.
5. Distractions: Perception of distraction levels in online versus face-to-face classes.
6. Sense of Community: Exploring where students feel a stronger sense of community and fellowship.
7. Accessing Course Materials: Comparing ease of accessing and understanding course materials.
8. Real-world Preparation: Opinions on which mode better prepares students for real-world professional interactions.
9. Motivation: Insights into the learning environment that fosters more motivation.
10. Critical Thinking: Understanding perceptions of effectiveness in developing critical thinking skills.

Answers to Initial Project Questions:

The visualizations help answer questions related to preferences, effectiveness, and experiences in both learning modes. It provides a comparative view of responses, allowing for a nuanced understanding of students' perspectives.

Limitations and Biases:

1. Sampling Bias: The survey responses may not represent the entire student population, as it could be biased towards certain demographics or academic disciplines.
2. Response Bias: Participants may provide responses influenced by personal opinions or experiences, leading to subjectivity.
3. Limited Questions: The scope of the survey may not cover all aspects of online and face-to-face classes, potentially missing critical factors.
4. Data Quality: The reliability of insights heavily depends on the quality and accuracy of the survey data.

6. Conclusion

The data visualization comparing responses between online and face-to-face classes provides valuable insights into students' preferences and perceptions. Here are the key findings:

1. Learning Mode Preferences: The majority of students prefer either online or face-to-face classes.
2. Interaction and Engagement: The visualization highlights where students feel they have better interaction and engagement, offering insights into their preferred learning setting.
3. Communication Opportunities: Students have varying opinions on which mode provides better communication opportunities with instructors.
4. Flexibility and Convenience: Preferences for flexibility and convenience vary based on individual schedules and lifestyles.
5. Distraction Levels: Perceptions of distraction levels differ between online and face-to-face classes.
6. Sense of Community: There is a split in opinions regarding where students feel a stronger sense of community and fellowship.
7. Access to Course Materials: The ease of accessing and understanding course materials differs between the two modes.
8. Real-world Preparation: Students have diverse views on whether online or face-to-face classes better prepare them for real-world professional interactions.
9. Motivation: The learning environment that fosters more motivation varies among students.
10. Critical Thinking Development: There are differing perspectives on which mode is more effective in developing critical thinking skills.

Future Improvements or Extensions:

To enhance the project and gather more comprehensive insights, consider the following future improvements:

1. In-depth Surveys: Conduct more in-depth surveys to capture a broader range of factors influencing students' preferences and experiences.
2. Longitudinal Study: Implement a longitudinal study to track changes in preferences and perceptions over time.
3. Demographic Analysis: Analyze responses based on demographic factors such as age, academic discipline, and previous learning experiences.
4. Qualitative Data: Supplement quantitative data with qualitative insights, perhaps through interviews or open-ended survey questions, to gain a deeper understanding of students' experiences.
5. Incorporate Academic Performance: Include data on academic performance to explore any correlation between learning mode preference and success in courses.

6. External Factors: Consider incorporating external factors such as the impact of global events (e.g., pandemics) on preferences for online or face-to-face learning.

7. Appendix

Data Dictionary:

Column	Description
Question	**Survey questions numbered from 1 to 10.**
Online	**Number of respondents selecting online classes.**
Face-to-face	**Number of respondents selecting face-to-face classes.**

Code for Data Cleaning and Preprocessing

```
# Assuming data is loaded into a DataFrame named 'df'

# Check for missing values

print("Missing Values:\n", df.isnull().sum())


# Check data types

print("\nData Types:\n", df.dtypes)


# No data cleaning needed in this example; handle missing values if necessary
```

```
# Example: df.fillna(value, inplace=True)


# Data transformation (if needed)
# Example: df['Column'] = df['Column'].apply(lambda x: transformation_function(x))
```

Additional Visualizations and Analysis:

```
# Visualization construction (Grouped Bar Chart)
plt.figure(figsize=(16, 12))

for i, question in enumerate(df['Question']):
    plt.subplot(3, 4, i+1)
    sns.barplot(data=df, x=question, y='Online', color='skyblue', label='Online', ci=None)
    sns.barplot(data=df, x=question, y='Face-to-face', color='orange', label='Face-to-face', ci=None)

    plt.title(f'Responses to {question}')
    plt.xlabel('Response')
    plt.ylabel('Count')
    plt.legend(title='Class Type', loc='upper right')

plt.tight_layout()
plt.show()
```

Questionnaire

Revolutionizing Education: An in-depth Investigation into Modular Online and Face-to-Face Class Structures from LSPU students

Dear students, we are asking for a little of your time to answer this survey. 30 students are needed to conduct this survey. This survey is all about online and face-to-face classes and intended only for college students of Laguna State Polytechnic University and students from any course are welcome to participate. Thank you very much.

Name (optional)

Course

1. Which mode of learning do you prefer?
    - Online Classes
    - Face to face Classes

2. In which setting do you feel you have better interaction and engagement?
    - Online Classes
    - Face to face Classes

3. Which mode provides you with better communication opportunities with instructors?
    - Online Classes
    - Face to face Classes

4. For your schedule and lifestyle, which mode of classes offers more flexibility and convenience?
    - Online Classes
    - Face to face Classes

5. Considering distractions, which type of classes do you find less distracting?
    - Online Classes
    - Face to face Classes

6. In which type of classes do you feel a stronger sense of community and fellowship among students?
    - Online Classes
    - Face to face Classes

7. When it comes to accessing and understanding course materials, do you find it easier?
    - Online Classes
    - Face to face Classes

8. Which type of classes, online or face-to-face, do you believe better prepares you for real-world professional interactions?
    - Online Classes
    - Face to face Classes

9. In which learning environment do you feel more motivated?
    - Online Classes
    - Face to face Classes

10. Considering the development of critical thinking skills, what do you think are more effective?

- Online Classes
- Face to face Classes

Results
https://docs.google.com/spreadsheets/d/1xLlWp551wBoQnIpWxkX0FZaeBc8YviJeDV-mLcBkVZ8/edit?usp=sharing

Google Colab
Revolutionizing Education: An in-depth Investigation into Modular Online and Face-to-…