

EFFECTIVENESS OF E-LEARNING AND ONLINE CLASSES DURING COVID-19

A PROJECT REPORT SUBMITTED IN PARTIAL FULFILMENT OF REQUIREMENT
FOR THE AWARD OF THE DEGREE

MASTER OF COMPUTER APPLICATIONS (MCA)

OF

MAHATMA GANDHI UNIVERSITY, KOTTAYAM

By

SHARON VARGHESE

Reg No: 20PMC154



MARIAN COLLEGE
KUTTIKANAM

(AUTONOMOUS)

MAKING COMPLETE

Marian College Kuttikkanam(Autonomous)

Peermade, Kerala – 685 531

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Under the guidance of,

Ms. Reny Jose

Professor

PG Department of Computer Applications

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This project is not complete if one fails to acknowledge all who have been instrumental in the successful completion of the project. If words were to be the symbol of undiluted feelings and token of gratitude then let the words play the heralding role of expressing my gratitude.

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I express my deep sense of gratitude to my internal project guide, Mr. Win Mathew John, Assistant Professor, PG Department of Computer Applications, for his profound guidance for the successful completion of this project.

With great enthusiasm I express my gratitude to all the faculty members of PG Department of Computer Application for their timely help and support.

Finally I express my deep appreciation to all my friends and family members for the moral support and encouragement they have given to complete this project successfully.

SHARON VARGHESE

ABSTRACT

EFFECTIVENESS OF E-LEARNING AND ONLINE CLASSES DURING COVID-19 using Machine Learning is a Machine Learning project in Data Science Stream.

The Covid-19 pandemic has affected the educational system worldwide and the system has now resorted to online modes of learning. This survey checks the effectiveness of such online classes and e-learning. The objective of the present study is to know how well online classes are performing during the pandemic crisis of Covid-19. The study tries to identify the perception of different categories of students towards e-learning and online classes during the Covid-19 lockdown phase.

The data required for the study are collected from primary and secondary sources. The data are collected through a self-administered, online circulated, structured questionnaire. This has fetched 260 responses and all the respondents are students who are using e-learning sources for attending their regular course of study during the Covid-19 pandemic.

The Dataset contains 13 questions with regard to the respondents' demographic details and their opinion on the effectiveness of online classes. The size of the dataset is around 56 KB.

The goal of this project is to create a Analysis that are able to. This project aims apply Python tool o get a visual understanding of the data and clean it to make it ready to apply machine learning. By performing several Algorithms for analysing and reach the optimal EFFECTIVENESS OF E-LEARNING AND ONLINE CLASSES DURING COVID-19.

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1. INTRODUCTION

1.1 OVERVIEW OF PROJECT

Data is the heart of machine learning. Predictive models use data for training which gives somewhat accurate results. Without data we can't train the model. Machine learning involves building these models from data and uses them to predict new data. Machine Learning is a subset of Artificial Intelligence. It gives system capability to learn wherein it automatically learns and improves its performance without being explicitly programmed. This survey checks the effectiveness of such online classes and e-learning using Machine Learning. This is a data science visualization project that aims to build . The objective of the present study is to know how well online classes are performing during the pandemic crisis of Covid-19. The study tries to identify the perception of different categories of students towards e-learning and online classes during the Covid-19 lockdown phase. The data required for the study are collected from primary and secondary sources. The data are collected through a self-administered, online circulated, structured questionnaire. This has fetched , responses and all the respondents are students who are using e-learning sources for attending their regular course of study during the Covid-19 pandemic. The Dataset contains 13 questions with regard to the respondents' demographic details and their opinion on the effectiveness of online classes. The size of the dataset is around 56 KB. The study applied Python tool to get a visual understanding of the data and clean it to make it ready to apply Machine Learning.

1.2 OBJECTIVE

This project will focus on visualizing and analysing EFFECTIVENESS OF E-LEARNING AND ONLINE CLASSES DURING COVID-19. Based on attributes such as Timestamp, Name, Gender, Name of the Institution, Educational Qualification , Familys Annual Income , which is better for quality education , level of satisfaction on E-learning and online classes , Mode/Medium of device used for attending online classes , offer the same student support services as that of traditional , guidelines are provided by your lecturer before , recharging an additional financial burden , financial aid from Govt./any other authority , Network/Internet Connection issues , Lack of familiarity to the use of technology , Lack of good infrastructural facilities , Mental/Psychological difficulty with sudden shifting , Lack of face-to-face interaction with teachers and friends , Lack of classroom atmosphere & background noises , suggestions. This project will utilize a dataset of 260 records. All those factors are visualised during the project. The project visualise EFFECTIVENESS OF E-LEARNING AND ONLINE CLASSES DURING COVID-19. What are the factors effects, all those things are visualized during the project. We will be using some common Python libraries, such as pandas, numpy, and matplotlib.

2. REVIEW OF LITERATURE

2.1 LITERATURE SURVEY

This provides a description of analysis of effectiveness of online education . In the recent time, the research on exploring students' perception and their expectation from e-learning has been on surge. Several studies indicate that most of the students enrolled in online courses are satisfied with the mode of learning. However, studies also reveal that perceptions of learners are affected by a host of factors

Factors such as age, gender, prior knowledge of computer literacy and learning styles of individual are the vital predictors of technology acceptance by students. There exists ample literature which discusses the theories of “technology acceptance” to study students' perception.

2.2 LIMITATION OF STUDY

It doesn't predict future prices of the houses mentioned by the customer. Due to this, the risk in investment in an apartment or an area increases considerably. To minimize this error, customers tend to hire an agent which again increases the cost of the process.. This practice leads to unwanted biases, errors and excessive medical costs which affects the quality of service provided to patients. Data mining have the potential to generate a knowledge-rich environment which can help to significantly improve the quality of decisions.

3. DATA COLLECTION

3.1 DATASET

The data set is through a self-administered, online circulated, structured questionnaire. This has fetched , responses and all the respondents are students who are using e-learning sources for attending their regular course of study during the Covid-19 pandemic. This data set is automatically extracted from Google forms. The dataset provides the information about Student's Overview of their education platform. It includes over 260 records and 19 attributes.

| Column | Non-Null Count | Dtype |
|--|----------------|--------|
| 0 Timestamp | 260 non-null | Object |
| 1 Name | 260 non-null | Object |
| 2 Gender | 260 non-null | Object |
| 3 Name of the Institution | 260 non-null | Object |
| 4 Educational Qualification | 260 non-null | Object |
| 5 Familys Annual Income | 260 non-null | Object |
| 6 which is better for quality education | 260 non-null | Object |
| 7 level of satisfaction on E-learning and online classes | 260 non-null | Object |
| 8 Mode/Medium of device used for attending online classes | 260 non-null | Object |
| 9 offer the same student support services as that of traditional | 260 non-null | Object |
| 10 guidelines are provided by your lecturer before | 260 non-null | Object |
| 11 recharging an additional financial burden | 260 non-null | Object |
| 12 financial aid from Govt./any other authority | 260 non-null | Object |
| 13 Network/Internet Connection issues | 260 non-null | Int64 |
| 14 Lack of familiarity to the use of technology | 260 non-null | Int64 |
| 15 Lack of good infrastructural facilities | 260 non-null | Int64 |
| 16 Mental/Psychological difficulty with sudden shifting | 260 non-null | Int64 |
| 17 Lack of face-to-face interaction with teachers and friends | 260 non-null | Int64 |
| 18 Lack of classroom atmosphere & background noises | 260 non-null | Int64 |
| 19 suggestions | 260 non-null | Object |

3.2 DATA PRE-PROCESSING

Data Cleaning and pre-processing is a critical first step in any data analysis. A dataset can be viewed as a collection of data objects, which are often also called as a records, points, vectors, patterns, events, cases, samples, observations, or entities.

Checking the data

Realistically, most of the data we will get, even from the government, can have errors, and it's important to identify these errors before spending time analysing the data.

Data Cleaning

If there is errors in the data set, we need to fix them before continued with Analysis. There are missing values in some variables. Based on the importance of the variables here we use mean for filling the missing values. We use `isnull()`, `any()` function to it. Find any missing values in a given dataset. Missing value is filled by using `mean()`.

Building Predictive Models

Now it's the time to make the next big step in our analysis which is splitting the data into training and test sets. A training set is the subset of the data that we use to train our models but the test set is a random subset of the data which are derived from the training set. We will use the test set to validate our models as un-foreseen data.

4. METHODOLOGY

4.1 TOOLS FOR DEVELOPMENT

PYTHON

Python is an Object-Oriented Programming Language and also a scripting language. With the help of Python, it is possible to develop graphical user interfaces, software applications, network, games, create a 3D model with a Python script in Blender, create a website and most importantly perform data analysis. Python also obeys logic of indentation, and it is very suitable for quickly implementing complex algorithms and it is scalable, means that it can process a large volume of data and is efficient during the time of data processing.

COLAB NOTEBOOK

Colab notebooks are Jupyter notebooks that run in the cloud and are highly integrated with Google Drive, making them easy to set up, access, and share. ... The following sections describe deploying Earth Engine in Google Colab and visualizing maps and charts using third-party Python packages.

4.2 LIBRARIES

To perform analysis, following software libraries are used:

Pandas

Numpy

Seaborn

Matplotlib

NumPy: NumPy is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with an extensive collection of high-level mathematical functions to operate on these arrays.

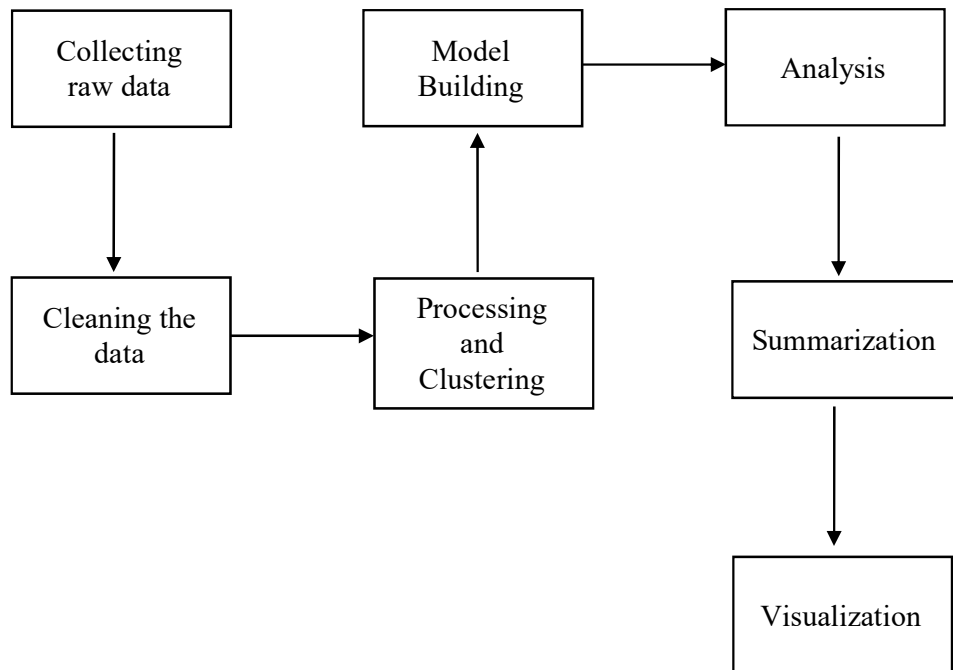
Pandas: In computer programming, pandas is a software library written for the Python programming language for data manipulation and analysis. In particular, it offers data structures and operations for manipulating numerical tables and time series.

Matplotlib: Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, wxPython, Qt, or GTK+.

Seaborn: Seaborn is a Python data visualization library based on matplotlib. It provides a high-level interface for drawing attractive and informative statistical graphics.

5. ARCHITECTURE

5.1 MODEL ARCHITECTURE



Model Building: The model building process involves setting up ways of collecting data, understanding and paying attention to what is important in the data to answer the questions you are asking, finding a statistical, mathematical or a simulation model to gain understanding and make predictions.

Clustering: Cluster Analysis in Data Mining means that to find out the group of objects which are similar to each other in the group but are different from the object in other groups.

6. SOURCE CODE WITH EXPLANATION

6.1 SOURCE CODE

```
import os, sys
from google.colab import drive
drive.mount('/content/drive')
os.chdir("/content/drive/My Drive/Colab Notebooks/")
sys.path.append("/content/drive/My Drive/Colab Notebooks/")
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
data=pd.read_csv("covid.csv")
import seaborn as sns
from sklearn.tree import plot_tree
from mpl_toolkits.mplot3d import Axes3D
data
```

View Data

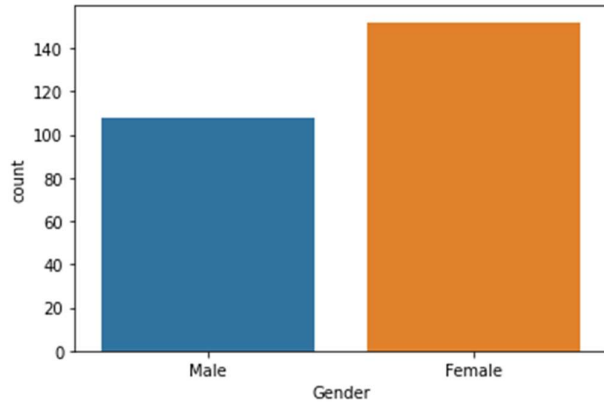
```
data.info()
```

| Column | Non-Null Count | Dtype |
|--|----------------|--------|
| 0 Timestamp | 260 non-null | Object |
| 1 Name | 260 non-null | Object |
| 2 Gender | 260 non-null | Object |
| 3 Name of the Institution | 260 non-null | Object |
| 4 Educational Qualification | 260 non-null | Object |
| 5 Family's Annual Income | 260 non-null | Object |
| 6 which is better for quality education | 260 non-null | Object |
| 7 level of satisfaction on E-learning and online classes | 260 non-null | Object |
| 8 Mode/Medium of device used for attending online classes | 260 non-null | Object |
| 9 offer the same student support services as that of traditional | 260 non-null | Object |
| 10 guidelines are provided by your lecturer before | 260 non-null | Object |
| 11 recharging an additional financial burden | 260 non-null | Object |
| 12 financial aid from Govt./any other authority | 260 non-null | Object |
| 13 Network/Internet Connection issues | 260 non-null | Int64 |
| 14 Lack of familiarity to the use of technology | 260 non-null | Int64 |
| 15 Lack of good infrastructural facilities | 260 non-null | Int64 |
| 16 Mental/Psychological difficulty with sudden shifting | 260 non-null | Int64 |
| 17 Lack of face-to-face interaction with teachers and friends | 260 non-null | Int64 |
| 18 Lack of classroom atmosphere & background noises | 260 non-null | Int64 |
| 19 suggestions | 260 non-null | Object |

Gender

```
data['Gender'].value_counts()
Female      152
Male        108
Name: Gender, dtype: int64
```

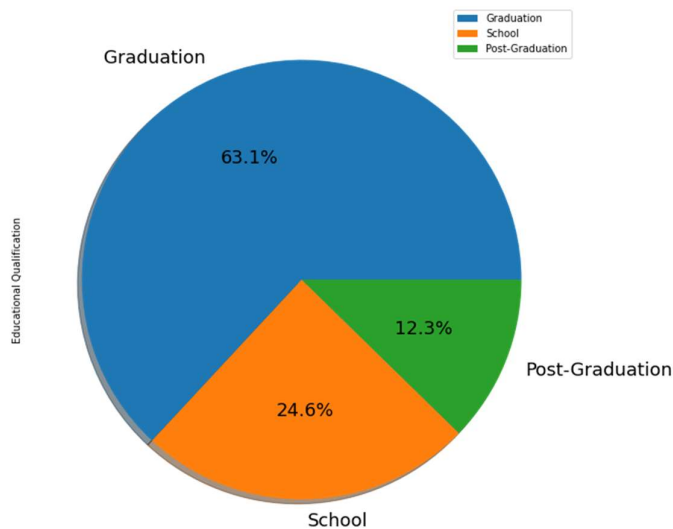
```
sns.countplot(data=data,x='Gender')
plt.show()
```



Educational Qualification

```
data['Educational Qualification'].value_counts()
Graduation      164
School           64
Post-Graduation  32
Name: Educational Qualification, dtype: int64
```

```
data['Educational Qualification'].value_counts().plot.pie(autopct='%1.1f%%',shadow=True,figsize=(20,10),fontsize=(18))
plt.legend()
plt.show()
```



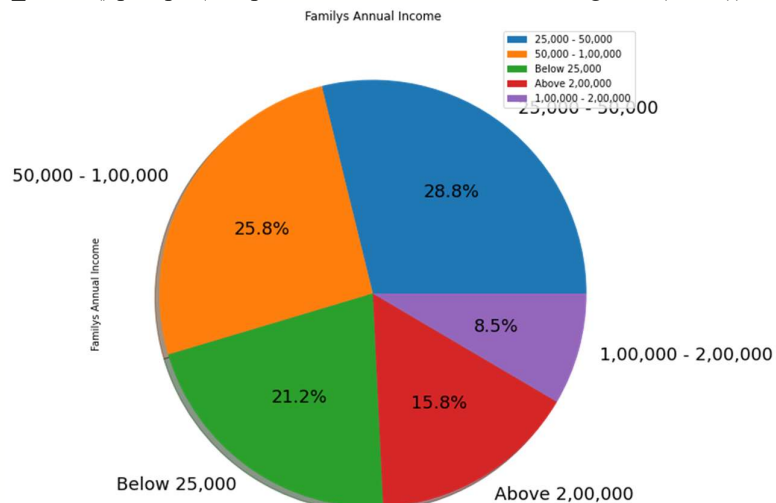
Familys Annual Income

```
data['Familys Annual Income'].value_counts()
```

```
25,000 - 50,000      75
50,000 - 1,00,000    67
Below 25,000         55
Above 2,00,000       41
1,00,000 - 2,00,000  22
```

Name: Familys Annual Income, dtype: int64

```
data['Familys Annual Income'].value_counts().plot.pie(autopct='%1.1f%%',shadow=True,figsize=(20,10))
plt.legend()
plt.title('Familys Annual Income')
plt.show()
```



Majority of the respondents belong to a low-income group category. Only a small number of respondents are having an annual family income above Rs.1,00,000.

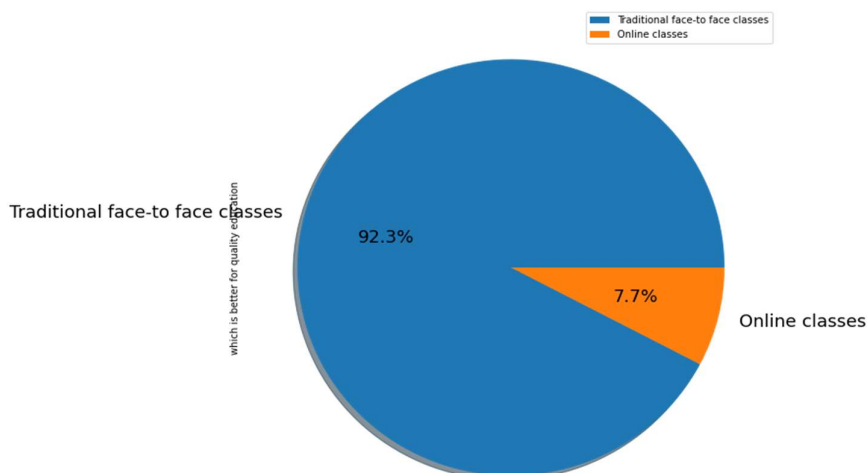
which is better for quality education

```
data['which is better for quality education'].value_counts()
```

```
Traditional face-to face classes    240
Online classes                      20
```

Name: which is better for quality education, dtype: int64

```
data['which is better for quality education'].value_counts().plot.pie(autopct='%1.1f%%',shadow=True,figsize=(20,10),
,fontsize=(18))
plt.legend().figsize=(30,20)
plt.show()
```



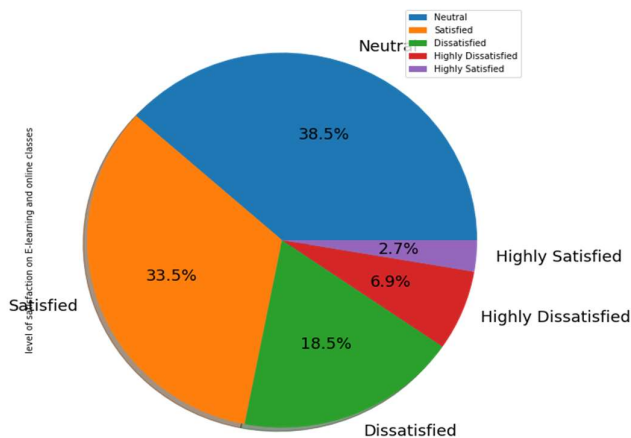
level of satisfaction on E-learning and online classes

```
data['level of satisfaction on E-learning and online classes'].value_counts()
```

```
Neutral      100
Satisfied    87
Dissatisfied  48
Highly Dissatisfied  18
Highly Satisfied  7
```

Name: level of satisfaction on E-learning and online classes, dtype: int64

```
data['level of satisfaction on E-learning and online classes'].value_counts().plot.pie(autopct='%1.1f%%',shadow=True,figsize=(20,10),fontsize=(18))
plt.legend()
plt.show()
```



While identifying the satisfaction level of the respondents with regard to e- learning and online classes, it is found that majority (100 respondents) are neutral in their opinion. 33.5% of the respondents are satisfied and 18.5% are dissatisfied towards online education. Only a small number of respondents are of extreme satisfaction and dissatisfaction with regard to e-learning.

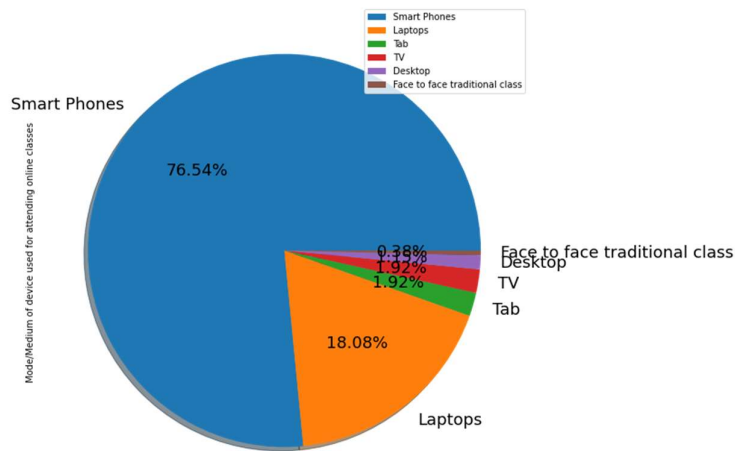
Mode/Medium of device used for attending online classes

```
data['Mode/Medium of device used for attending online classes '].value_counts()
```

```
Smart Phones  199
Laptops       47
TV            5
Tab           5
Desktop       3
Face to face traditional class  1
```

Name: Mode/Medium of device used for attending online classes , dtype: int64

```
data['Mode/Medium of device used for attending online classes '].value_counts().plot.pie(autopct='%1.2f%%',shadow=True,figsize=(20,10),fontsize=(18))
plt.legend().figsize=(30,20)
plt.show()
```



Majority of the respondents are using smart phones for attending the online classes (76.5%). 18.1% of the respondents use laptops and the rest of 5.4% use other mediums like TVs, desktops, tabs etc.

guidelines are provided by your lecturer before

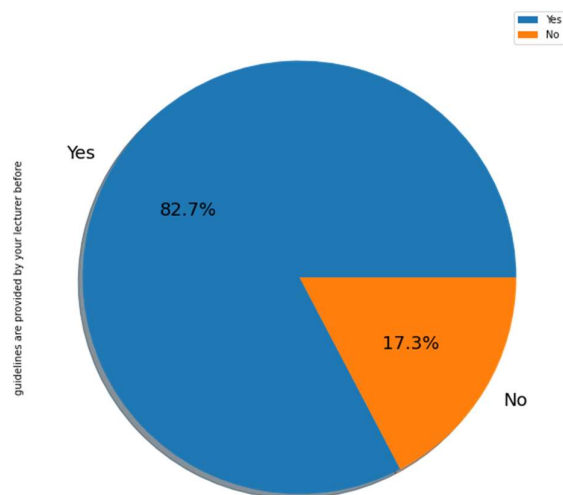
```
data['guidelines are provided by your lecturer before'].value_counts()
```

Yes 215

No 45

Name: guidelines are provided by your lecturer before, dtype: int64

```
data['guidelines are provided by your lecturer before'].value_counts().plot.pie(autopct='%1.1f%%',shadow=True,figsize=(20,10),fontSize=(18))
plt.legend()
plt.show()
```



Majority of the respondents are of the opinion that they are provided by necessary guidelines by the lecturers before the online sessions.

recharging an additional financial burden

```
data['recharging an additional financial burden'].value_counts()
```

```
Yes    158
```

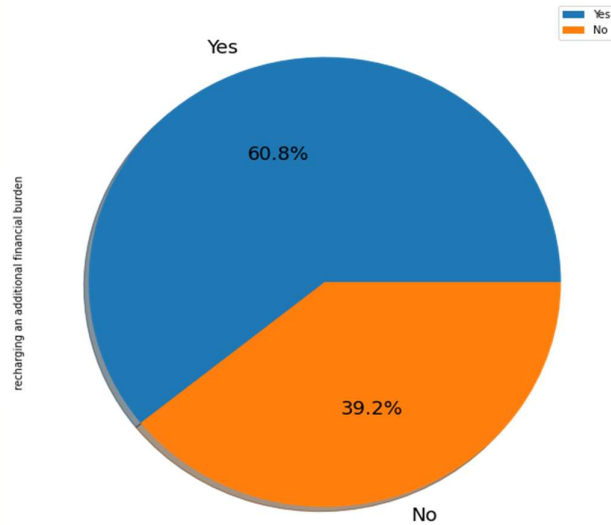
```
No     102
```

```
Name: recharging an additional financial burden, dtype: int64
```

```
data['recharging an additional financial burden'].value_counts().plot.pie(autopct='%1.1f%%',shadow=True,figsize=(20,10),fontsize=(18))
```

```
plt.legend().figsize=(30,20)
```

```
plt.show()
```



It is identified that data recharging tends to be an additional financial burden for most of the respondents for the access to online classes.

financial aid from Govt./any other authority

```
data['financial aid from Govt./any other authority'].value_counts()
```

```
No    242
```

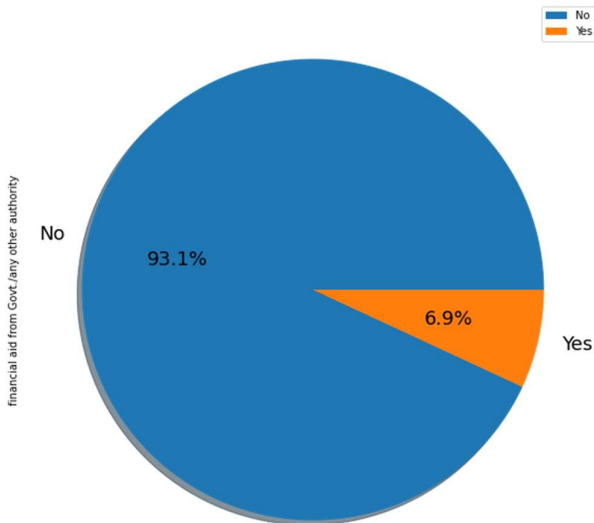
```
Yes    18
```

```
Name: financial aid from Govt./any other authority, dtype: int64
```

```
data['financial aid from Govt./any other authority'].value_counts().plot.pie(autopct='%1.1f%%',shadow=True,
```

```
plt.legend().figsize=(30,20)
```

```
plt.show()
```



The study found out that 93.1% of the respondents are not getting any sort of financial aid from Govt./any other authority for attending the online classes.

Rank the following statements (challenges faced by you) in the order in which they affect you the most, to the success of online classes:

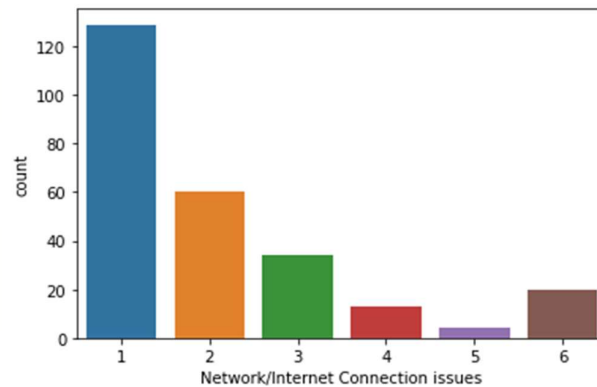
Network/Internet Connection issues

```
data['Network/Internet Connection issues'].value_counts()
```

```
1  129
2   60
3   34
6   20
4   13
5    4
```

Name: Network/Internet Connection issues, dtype: int64

```
sns.countplot(data=data,x='Network/Internet Connection issues')
plt.show()
```



The network/internet connection issues are identified as the major challenge faced by the respondents in attending online sessions.

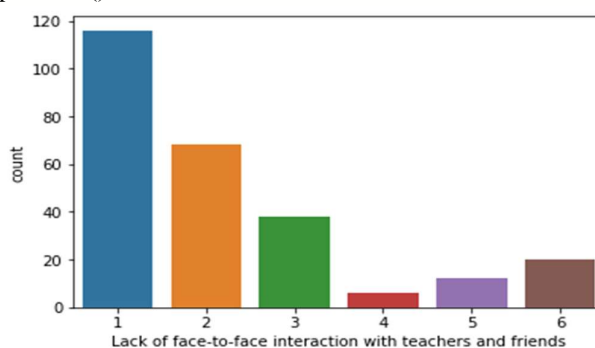
Lack of face-to-face interaction with teachers and friends

```
data['Lack of face-to-face interaction with teachers and friends'].value_counts()
```

```
1  116
2   68
3   38
6   20
5   12
4    6
```

Name: Lack of face-to-face interaction with teachers and friends, dtype: int64

```
sns.countplot(data=data,x='Lack of face-to-face interaction with teachers and friends')
plt.show()
```



The lack of face-to-face interaction with teachers and friends stands as the next major challenge

Lack of familiarity to the use of technology

```
data['Lack of familiarity to the use of technology'].value_counts()
```

```
2    97
```

```
1    87
```

```
6    30
```

```
3    30
```

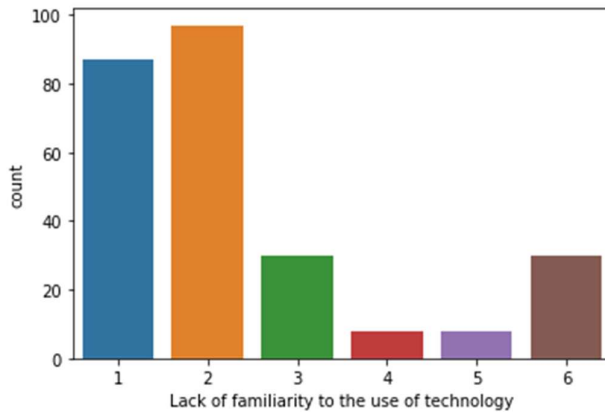
```
5     8
```

```
4     8
```

```
Name: Lack of familiarity to the use of technology, dtype: int64
```

```
sns.countplot(data=data,x='Lack of familiarity to the use of technology')
```

```
plt.show()
```



The responses show that the lack of familiarity to the use of technology is not a challenge faced by the students. Most of the students are capable of using latest technologies with ease

Lack of good infrastructural facilities

```
data['Lack of good infrastructural facilities'].value_counts()
```

```
1    111
```

```
2    68
```

```
3    33
```

```
6    19
```

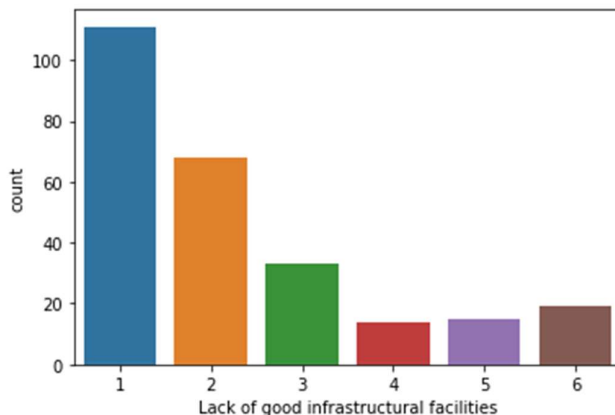
```
5    15
```

```
4    14
```

```
Name: Lack of good infrastructural facilities, dtype: int64
```

```
sns.countplot(data=data,x='Lack of good infrastructural facilities')
```

```
plt.show()
```



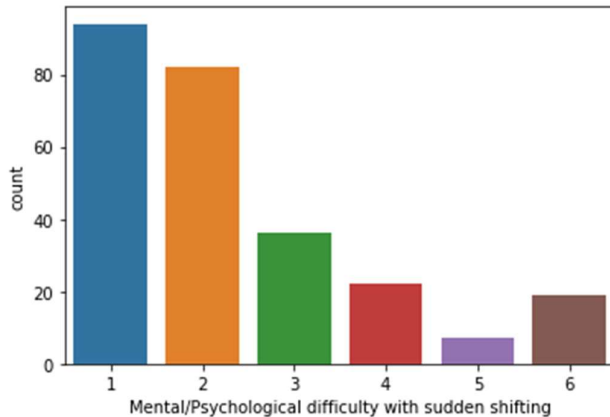
Mental/Psychological difficulty with sudden shifting

```
data['Mental/Psychological difficulty with sudden shifting'].value_counts()
```

```
1  94
2  82
3  36
4  22
6  19
5   7
```

```
Name: Mental/Psychological difficulty with sudden shifting, dtype: int64
```

```
sns.countplot(data=data,x='Mental/Psychological difficulty with sudden shifting')
plt.show()
```



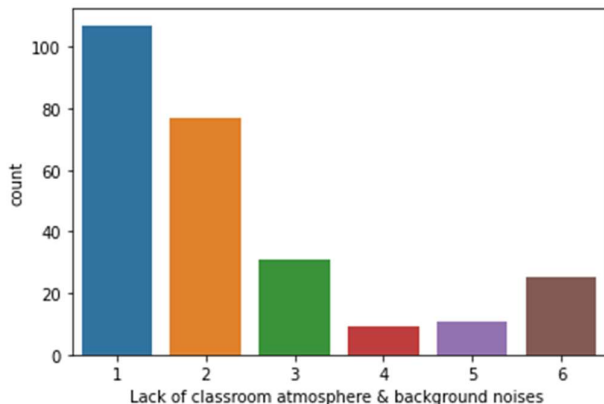
Lack of classroom atmosphere & background noises

```
data['Lack of classroom atmosphere & background noises '].value_counts()
```

```
1  107
2  77
3  31
6  25
5  11
4   9
```

```
Name: Lack of classroom atmosphere & background noises , dtype: int64
```

```
sns.countplot(data=data, x='Lack of classroom atmosphere & background noises ')
```



The lack of classroom atmosphere, background noises, disturbances from the surroundings, availability of good infrastructural facilities, and the psychological difficulty in adjusting with the sudden shift to online education tends to be the challenges faced by a small group of respondents.

Comparison

Educational Qualification V/S Gender

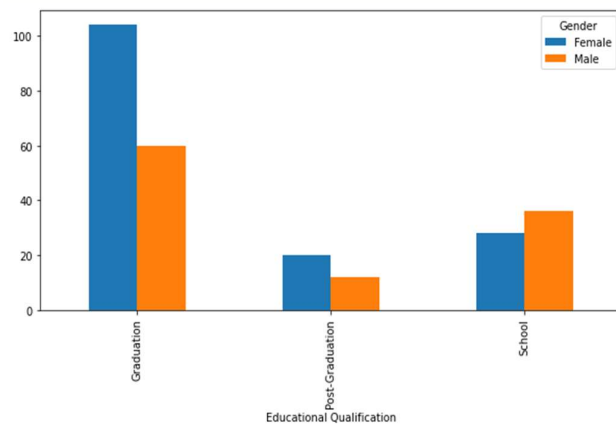
```
grouped = data.groupby("Gender")["Educational Qualification"]
grouped.apply(lambda x:x.value_counts())
```

Gender

| | | |
|--------|-----------------|-----|
| Female | Graduation | 104 |
| | School | 28 |
| | Post-Graduation | 20 |
| Male | Graduation | 60 |
| | School | 36 |
| | Post-Graduation | 12 |

Name: Educational Qualification, dtype: int64

```
data.groupby(['Educational Qualification','Gender']).size().unstack().plot(kind='bar',figsize=(10,5))
plt.show()
```



Gender V/S which is better for quality education

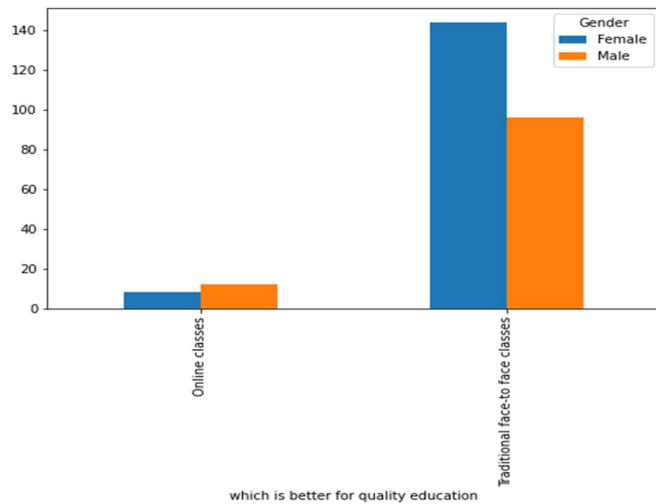
```
grouped = data.groupby("Gender")["which is better for quality education"]
grouped.apply(lambda x:x.value_counts())
```

Gender

| | | |
|--------|----------------------------------|-----|
| Female | Traditional face-to face classes | 144 |
| | Online classes | 8 |
| Male | Traditional face-to face classes | 96 |
| | Online classes | 12 |

Name: which is better for quality education, dtype: int64

```
data.groupby(['which is better for quality education','Gender']).size().unstack().plot(kind='bar',figsize=(8,5))
plt.show()
```



From the analysis, it is found that there is no significant relationship between gender of the respondents and their opinion on the mode of education for better quality learning. Irrespective of the gender of the respondents, majority of the respondents are of the opinion that traditional face-to-face education is better for quality education.

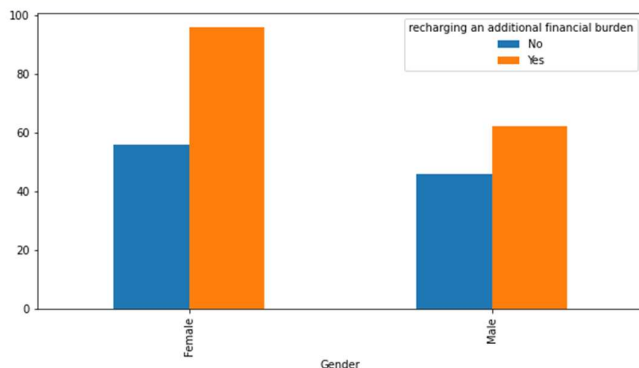
Gender V/S recharging an additional financial burden

```
grouped = data.groupby("Gender")["recharging an additional financial burden"]
grouped.apply(lambda x:x.value_counts())
```

```
Gender
Female    Yes  96
          No   56
Male      Yes  62
          No   46
```

Name: recharging an additional financial burden, dtype: int64

```
data.groupby(['Gender','recharging an additional financial burden']).size().unstack().plot(kind='bar',figsize=(10,5))
plt.show()
```



From the analysis, it is found that there is no significant relationship between gender of the respondents and their opinion in recharging an additional financial burden. Irrespective of the gender of the respondents, majority of the respondents are of the opinion that recharging is an additional financial burden.

Gender V/S financial aid from Govt./any other authority

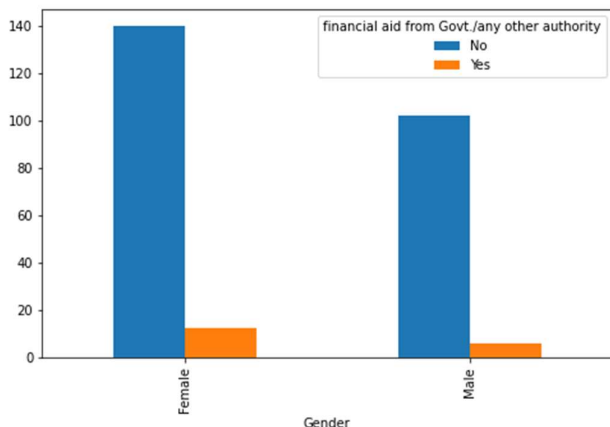
```
grouped = data.groupby("Gender")["financial aid from Govt./any other authority"]
grouped.apply(lambda x:x.value_counts())
```

Gender

| | | |
|--------|-----|-----|
| Female | No | 140 |
| | Yes | 12 |
| Male | No | 102 |
| | Yes | 6 |

Name: financial aid from Govt./any other authority, dtype: int64

```
data.groupby(['Gender','financial aid from Govt./any other authority']).size().unstack().plot(kind='bar',figsize=(8,5))
plt.show()
```



The figure depicts whether there is any association between the gender and their opinion on whether they get any financial aid from Govt./any other authority. From the analysis it is clear that majority of both male and female are of the opinion that they are not getting any sort of financial aid from authorities. So there is no association between gender of the respondents and their opinion. The chart represents.

Educational Qualification V/S which is better for quality education

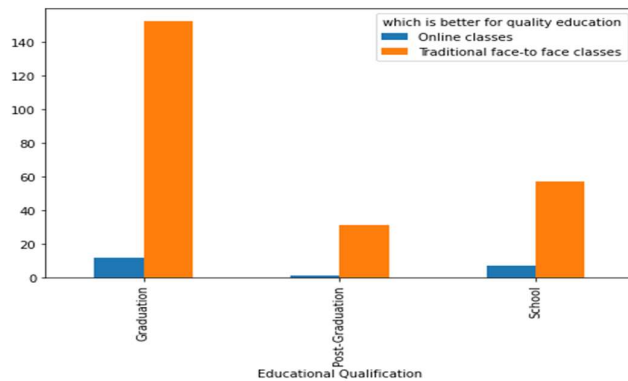
```
grouped = data.groupby("Educational Qualification")["which is better for quality education"]
grouped.apply(lambda x:x.value_counts())
```

Educational Qualification

| | | |
|-----------------|----------------------------------|-----|
| Graduation | Traditional face-to face classes | 152 |
| | Online classes | 12 |
| Post-Graduation | Traditional face-to face classes | 31 |
| | Online classes | 1 |
| School | Traditional face-to face classes | 57 |
| | Online classes | 2 |

Name: which is better for quality education, dtype: int64

```
data.groupby(['Educational Qualification','which is better for quality education']).size().unstack().plot(kind='bar',figsize=(8,5))
plt.show()
```



The analysis checks whether there is any association between educational qualification of the respondents and their opinion on the type of education for better quality learning. From the analysis it can be seen that irrespective of the educational qualification of the respondents, all are of the opinion that traditional classes are better of quality education and thus there is no association between educational qualification of the respondents and their opinion.

Gender V/S level of satisfaction on E-learning and online classes

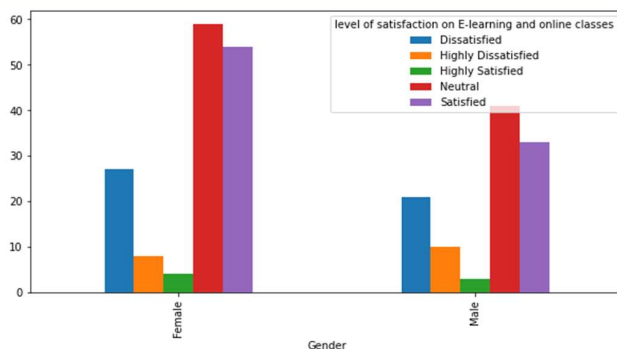
```
grouped = data.groupby("Gender")["level of satisfaction on E-learning and online classes"]
grouped.apply(lambda x:x.value_counts())
```

Gender

| | | |
|--------|---------------------|----|
| Female | Neutral | 59 |
| | Satisfied | 54 |
| | Dissatisfied | 27 |
| | Highly Dissatisfied | 8 |
| | Highly Satisfied | 4 |
| Male | Neutral | 41 |
| | Satisfied | 33 |
| | Dissatisfied | 21 |
| | Highly Dissatisfied | 10 |
| | Highly Satisfied | 3 |

Name: level of satisfaction on E-learning and online classes, dtype: int64

```
data.groupby(['Gender','level of satisfaction on E-learning and online classes']).size().unstack().plot(kind='bar',figsize=(10,5))
plt.show()
```



The figure shows the level of satisfaction on e-learning and online classes based on the gender of the respondents. The analysis shows that irrespective of the gender, majority of the respondents are neutral in their opinion. Relatively high number of respondents from both the gender are satisfied with the classes and then stands the dissatisfaction level of the respondents. Only a few respondents are having extreme satisfaction or dissatisfaction regarding the conduct of online classes. It is clear that there is no association between the satisfaction level of respondents with respect to their age.

Educational Qualification V/S level of satisfaction on E-learning and online classes

```
grouped = data.groupby("Educational Qualification")["level of satisfaction on E-learning and online classes"]
```

```
grouped.apply(lambda x:x.value_counts())
```

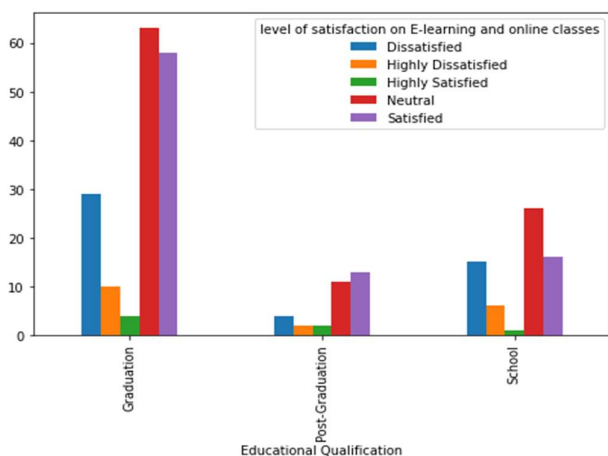
Educational Qualification

| | | |
|-----------------|---------------------|----|
| Graduation | Neutral | 63 |
| | Satisfied | 58 |
| | Dissatisfied | 29 |
| | Highly Dissatisfied | 10 |
| | Highly Satisfied | 4 |
| Post-Graduation | Satisfied | 13 |
| | Neutral | 11 |
| | Dissatisfied | 4 |
| | Highly Satisfied | 2 |
| | Highly Dissatisfied | 2 |
| School | Neutral | 26 |
| | Satisfied | 16 |
| | Dissatisfied | 15 |
| | Highly Dissatisfied | 6 |
| | Highly Satisfied | 1 |

Name: level of satisfaction on E-learning and online classes, dtype: int64

```
data.groupby(['Educational Qualification','level of satisfaction on E-learning and online classes']).size().unstack().plot(kind='bar',figsize=(8,5))
```

```
plt.show()
```



The figure shows the opinion of the respondents on their level of satisfaction on e-learning and online classes with regard to their educational qualification. Analysis shows that there is significant difference between the educational qualification and their opinion. It can be seen that unlike others, students pursuing post graduation are very much satisfied with the online classes. Students pursuing their schooling and graduation are more neutral in their opinion and they are dissatisfied when compared to postgraduate students. Thus it is clear that there is association between level of education of the respondents and their satisfaction level on e-learning and online classes.

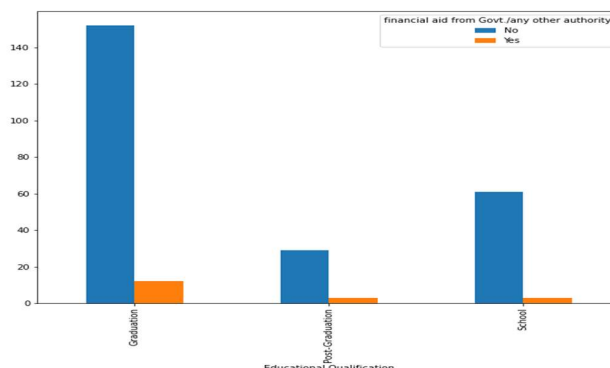
Educational Qualification V/S financial aid from Govt./any other authority

```
grouped = data.groupby("Educational Qualification")["financial aid from Govt./any other authority"]
grouped.apply(lambda x:x.value_counts())
```

```
Educational Qualification
Graduation      No  152
                  Yes  12
Post-Graduation No  29
                  Yes  3
School           No  61
                  Yes  3
```

Name: financial aid from Govt./any other authority, dtype: int64

```
data.groupby(['Educational Qualification','financial aid from Govt./any other authority']).size().unstack().plot(kind='bar',figsize=(10,8))
plt.show()
```



The figure shows the relationship between educational qualification of the respondents and their opinion on whether they get any financial aid from government or any other authority. From the analysis it is found that irrespective of the level of education majority the respondents opinioned that they are not getting any sort of financial aid. Thus there is no association between educational qualification and their opinion.

Educational Qualification V/S Mode/Medium of device used for attending online classes

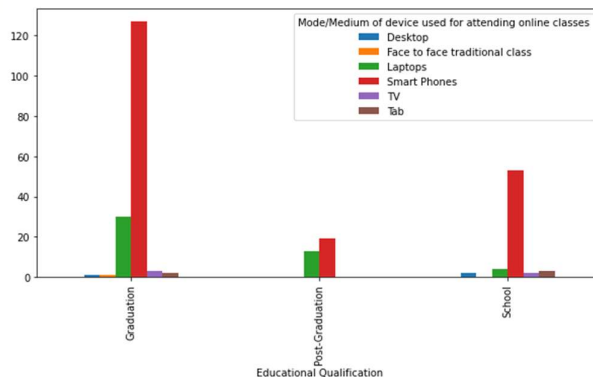
```
grouped = data.groupby("Educational Qualification")["Mode/Medium of device used for attending online classes "]
grouped.apply(lambda x:x.value_counts())
```

```
Educational Qualification
Graduation      Smart Phones  127
                  Laptops      30
                  TV           3
                  Tab          2
                  Desktop       1
                  Face to face traditional class  1
Post-Graduation Smart Phones  19
                  Laptops      13
School           Smart Phones  53
                  Laptops      4
                  Tab          3
                  TV           2
                  Desktop       2
```

Name: Mode/Medium of device used for attending online classes , dtype: int64

```
data.groupby(['Educational Qualification','Mode/Medium of device used for attending online classes ']).size().unstack().plot(kind='bar',figsize=(10,5))
```

```
plt.show()
```



The analysis shows the mode/medium of device used by the respondents for attending online classes on the basis of their educational qualification. Majority of the respondents from all the category uses smartphones for the purpose and next stands laptops. All other modes are used by only a small number of respondents from each category. It is clear that there is no association between the two factors.

Familys Annual Income v/s recharging an additional financial burden

```
grouped = data.groupby("Familys Annual Income")["recharging an additional financial burden"]
```

```
grouped.apply(lambda x:x.value_counts())
```

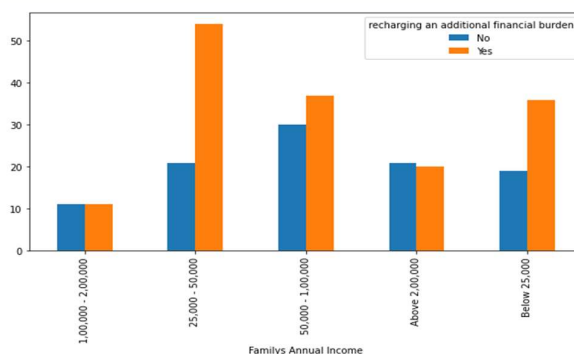
Familys Annual Income

| | | |
|---------------------|-----|----|
| 1,00,000 - 2,00,000 | No | 11 |
| | Yes | 11 |
| 25,000 - 50,000 | Yes | 54 |
| | No | 21 |
| 50,000 - 1,00,000 | Yes | 37 |
| | No | 30 |
| Above 2,00,000 | No | 21 |
| | Yes | 20 |
| Below 25,000 | Yes | 36 |
| | No | 19 |

Name: recharging an additional financial burden, dtype: int64

```
data.groupby(['Familys Annual Income','recharging an additional financial burden']).size().unstack().plot(kind='bar',figsize=(10,5))
```

```
plt.show()
```



The analysis shows that there is association between a family's annual income and their opinion on whether data recharging an additional burden for them. Low income group families, that is , families with an annual income between rs 100000 Opinioned that that are recharging is an additional financial burden for them and high income group that is families with an annual income above rs 100000 do not experience data recharging as an additional financial burden. It can be seen that there is significant difference in opinion among respondents of different income groups with regard to data recharging.

Gender V/S Network/Internet Connection issues

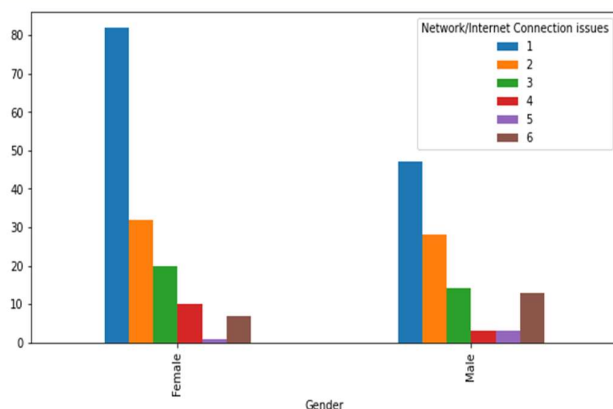
```
grouped = data.groupby("Gender")["Network/Internet Connection issues"]
grouped.apply(lambda x:x.value_counts())
```

Gender

| | | |
|--------|---|----|
| Female | 1 | 82 |
| | 2 | 32 |
| | 3 | 20 |
| | 4 | 10 |
| | 6 | 7 |
| | 5 | 1 |
| Male | 1 | 47 |
| | 2 | 28 |
| | 3 | 14 |
| | 6 | 13 |
| | 5 | 3 |
| | 4 | 3 |

Name: Network/Internet Connection issues, dtype: int64

```
data.groupby(['Gender','Network/Internet Connection issues']).size().unstack().plot(kind='bar',figsize=(10,5))
plt.show()
```



The figure shows the gender wise distribution of the opinion on network/connection issues as a challenge faced by the respondents during online classes. It is clear from the analysis that there is no significant difference between the gender of the respondents and their opinion. Therefore there is no association between the two factors.

Gender V/S Lack of familiarity to the use of technology

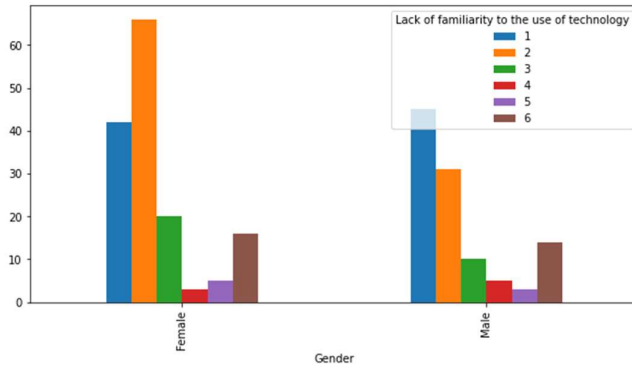
```
grouped = data.groupby("Gender")["Lack of familiarity to the use of technology"]
grouped.apply(lambda x:x.value_counts())
```

Gender

| | | |
|--------|---|----|
| Female | 2 | 66 |
| | 1 | 42 |
| | 3 | 20 |
| | 6 | 16 |
| | 5 | 5 |
| | 4 | 3 |
| Male | 1 | 45 |
| | 2 | 31 |
| | 6 | 14 |
| | 3 | 10 |
| | 4 | 5 |
| | 5 | 3 |

Name: Lack of familiarity to the use of technology, dtype: int64

```
data.groupby(['Gender','Lack of familiarity to the use of technology']).size().unstack().plot(kind='bar',figsize=(10,5))
plt.show()
```



The analysis shows the gender wise opinion of the respondents about the lack of familiarity to the use of technology. It is clear from the analysis that when compared to male respondents, female respondents are facing lack of familiarity of the technology as a major challenge while attending the online classes. Therefore there is association between the gender of the respondents and their opinion on lack of familiarity to the use of technology.

Gender V/S Lack of good infrastructural facilities

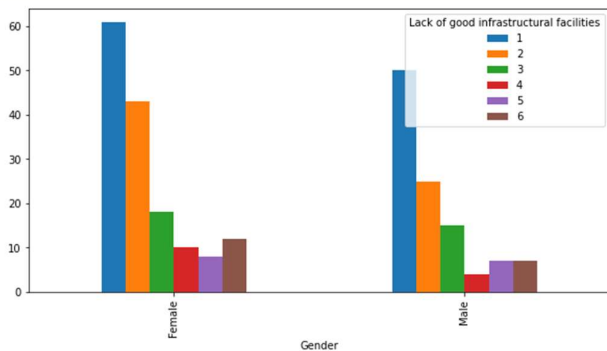
```
grouped = data.groupby("Gender")["Lack of good infrastructural facilities"]
grouped.apply(lambda x:x.value_counts())
```

Gender

| | | |
|--------|---|----|
| Female | 1 | 61 |
| | 2 | 43 |
| | 3 | 18 |
| | 6 | 12 |
| | 4 | 10 |
| | 5 | 8 |
| Male | 1 | 50 |
| | 2 | 25 |
| | 3 | 15 |
| | 6 | 7 |
| | 5 | 7 |
| | 4 | 4 |

Name: Lack of good infrastructural facilities, dtype: int64

```
data.groupby(['Gender','Lack of good infrastructural facilities']).size().unstack().plot(kind='bar',figsize=(10,5))
plt.show()
```



The figure shows the gender wise opinion on lack of good infrastructural facilities. From the analysis it is clear that there is not much difference between the opinion of the respondents with respect to their gender. Thus there is no association between the two factors.

Gender V/S Mental/Psychological difficulty with sudden shifting

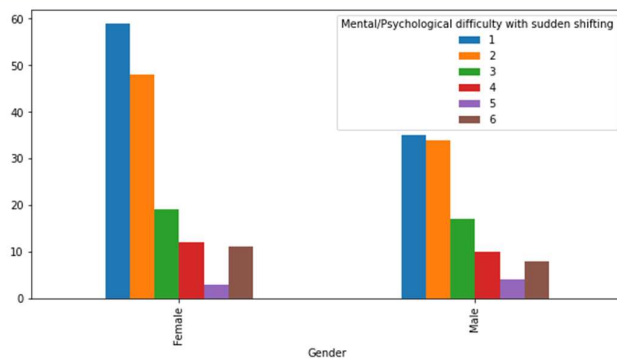
```
grouped = data.groupby("Gender")["Mental/Psychological difficulty with sudden shifting"]
grouped.apply(lambda x:x.value_counts())
```

Gender

| | | |
|--------|---|----|
| Female | 1 | 59 |
| | 2 | 48 |
| | 3 | 19 |
| | 4 | 12 |
| | 6 | 11 |
| | 5 | 3 |
| Male | 1 | 35 |
| | 2 | 34 |
| | 3 | 17 |
| | 4 | 10 |
| | 6 | 8 |
| | 5 | 4 |

Name: Mental/Psychological difficulty with sudden shifting, dtype: int64

```
data.groupby(['Gender','Mental/Psychological difficulty with sudden shifting']).size().unstack().plot(kind='bar',figsize=(10,5))
plt.show()
```



From the figure it is clear that irrespective of the gender of the respondents, both the categories are of the same opinion regarding their mental/psychological difficulty while having a sudden shift to online learning. Thus there is no association between the two factors.

Gender V/S Lack of face-to-face interaction with teachers and friends

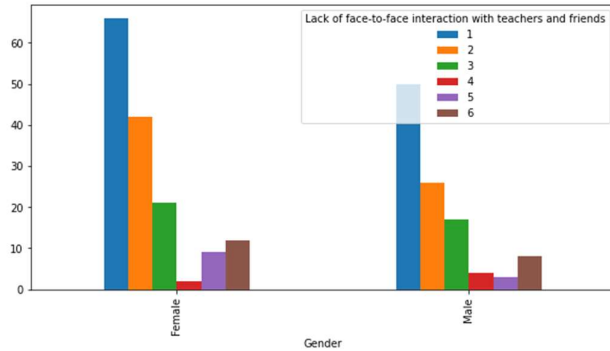
```
grouped = data.groupby("Gender")["Lack of face-to-face interaction with teachers and friends"]
grouped.apply(lambda x:x.value_counts())
```

Gender

| | | |
|--------|---|----|
| Female | 1 | 66 |
| | 2 | 42 |
| | 3 | 21 |
| | 6 | 12 |
| | 5 | 9 |
| | 4 | 2 |
| Male | 1 | 50 |
| | 2 | 26 |
| | 3 | 17 |
| | 6 | 8 |
| | 4 | 4 |
| | 5 | 3 |

Name: Lack of face-to-face interaction with teachers and friends, dtype: int64

```
data.groupby(['Gender','Lack of face-to-  
face interaction with teachers and friends']).size().unstack().plot(kind='bar',figsize=(10,5))  
plt.show()
```



The figure shows the gender wise opinion on whether lack of face-to-face interaction with teachers and friends is a major challenge during e-learning. From the analysis it is found that there is no significant difference between the opinion of the respondents with regard to their gender.

Gender V/S Lack of classroom atmosphere & background noises

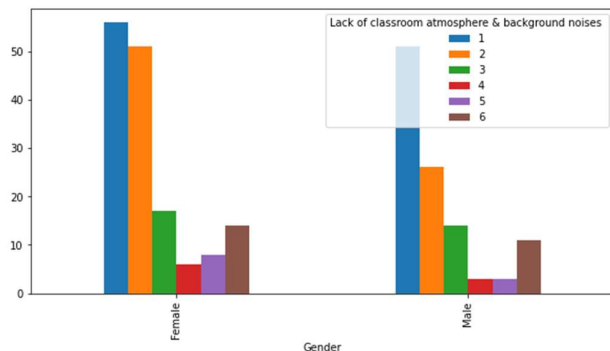
```
grouped = data.groupby("Gender")["Lack of classroom atmosphere & background noises "]  
grouped.apply(lambda x:x.value_counts())
```

Gender

| | | |
|--------|---|----|
| Female | 1 | 56 |
| | 2 | 51 |
| | 3 | 17 |
| | 6 | 14 |
| | 5 | 8 |
| | 4 | 6 |
| Male | 1 | 51 |
| | 2 | 26 |
| | 3 | 14 |
| | 6 | 11 |
| | 5 | 3 |
| | 4 | 3 |

Name: Lack of classroom atmosphere & background noises , dtype: int64

```
data.groupby(['Gender','Lack of classroom atmosphere & background noises ']).size().unstack().plot(kind='bar',figsize  
=(10,5))  
plt.show()
```



The figure shows the gender wise opinion of the respondents on whether lack of classroom atmosphere and background noises while attending the online classes is a major challenge for them. The analysis shows that there is no difference in opinion with respect to the gender of the respondents.

Educational Qualification V/S Network/Internet Connection issues

```
grouped = data.groupby("Educational Qualification")["Network/Internet Connection issues"]
```

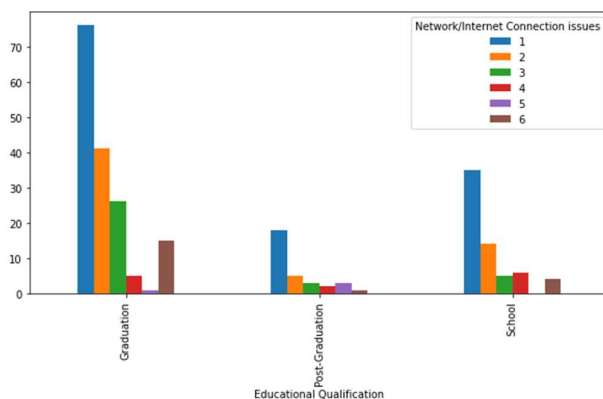
```
grouped.apply(lambda x:x.value_counts())
```

Educational Qualification

```
Graduation    1    76
              2    41
              3    26
              6    15
              4     5
              5     1
Post-Graduation 1    18
              2     5
              5     3
              3     3
              4     2
              6     1
School         1    35
              2    14
              4     6
              3     5
              6     4
```

Name: Network/Internet Connection issues, dtype: int64

```
data.groupby(["Educational Qualification", "Network/Internet Connection issues"]).size().unstack().plot(kind='bar', figsize=(10,5))
plt.show()
```



The figure shows the educational qualification of the respondents and their opinion on whether network issues are a major challenge for them while attending the online classes. The analysis shows that all the respondents are facing network/internet connection issues. From the graph, it is clear that respondents pursuing their graduation and schooling are facing more challenges with regard to connection issues. Opinions of students pursuing postgraduation are distributed along different rankings. But the difference cannot be inferred as significant. Thus there is no significant association between the educational qualification of the respondents and their opinion.

Educational Qualification V/S Lack of familiarity to the use of technology

```
grouped = data.groupby("Educational Qualification")["Lack of familiarity to the use of technology"]
```

```
grouped.apply(lambda x:x.value_counts())
```

Educational Qualification

```
Graduation    2    62
              1    55
              3    19
              6    18
              4     6
              5     4
Post-Graduation 1    12
              2     9
```

```

6 5
3 3
5 2
4 1
School 2 26
1 20
3 8
6 7
5 2
4 1

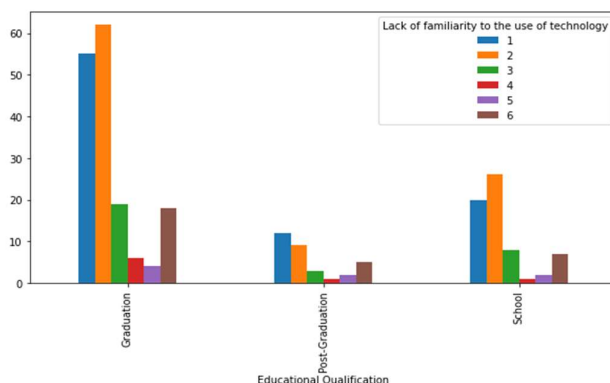
```

Name: Lack of familiarity to the use of technology, dtype: int64

```

data.groupby(['Educational Qualification','Lack of familiarity to the use of technology']).size().unstack().plot(kind='bar',figsize=(10,5))
plt.show()

```



The figure shows the educational qualification wise classification of the respondents' opinion on whether they are facing the challenge of lack of familiarity to the use of technology for attending the online classes. From the analysis it is clear that there is some sort of difference between the opinions of various categories of respondents. Most of the respondents pursuing postgraduation gave 1st ranking to lack of familiarity to the use of technology while those pursuing graduation and schooling ranked this challenge as 2nd. It can be inferred that there is slight differences in opinion with respect to educational qualification.

Educational Qualification V/S Lack of good infrastructural facilities

```

grouped = data.groupby("Educational Qualification")["Lack of good infrastructural facilities"]
grouped.apply(lambda x:x.value_counts())

```

Educational Qualification

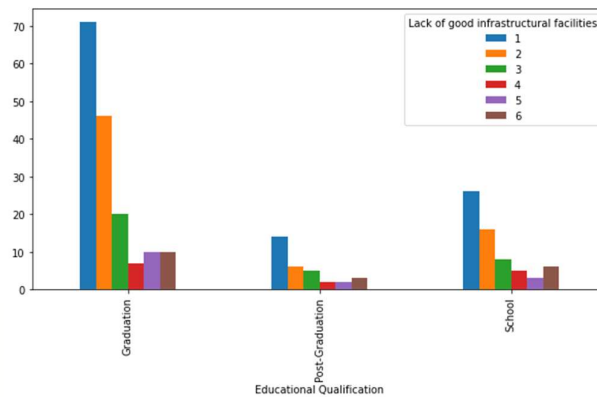
```

Graduation 1 71
           2 46
           3 20
           6 10
           5 10
           4 7
Post-Graduation 1 14
               2 6
               3 5
               6 3
               5 2
               4 2
School 1 26
       2 16
       3 8
       6 6
       4 5
       5 3

```

Name: Lack of good infrastructural facilities, dtype: int64


```
data.groupby(['Educational Qualification','Lack of good infrastructural facilities']).size().unstack().plot(kind='bar',figs
ize=(10,5))
plt.show()
```



The figure represents the respondents' educational qualification and their respective opinion on whether they face lack of good infrastructural facilities as a challenge while attending the online classes. From the analysis it is clear that there is no significant difference between the opinion of the respondents with respect to their educational qualifications.

Educational Qualification V/S Mental/Psychological difficulty with sudden shifting

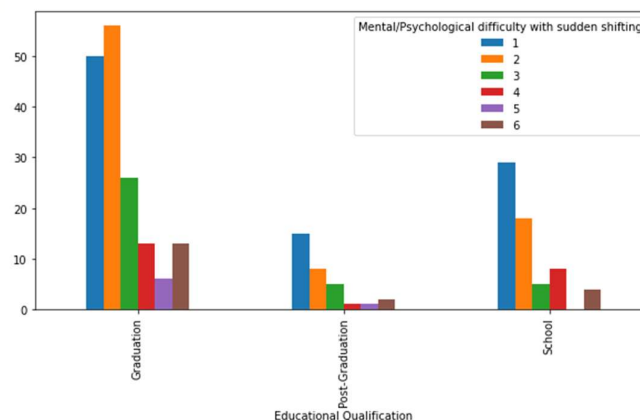
```
grouped = data.groupby("Educational Qualification")["Mental/Psychological difficulty with sudden shifting"]
grouped.apply(lambda x:x.value_counts())
```

Educational Qualification

| | | |
|-----------------|---|----|
| Graduation | 2 | 56 |
| | 1 | 50 |
| | 3 | 26 |
| | 6 | 13 |
| | 4 | 13 |
| | 5 | 6 |
| Post-Graduation | 1 | 15 |
| | 2 | 8 |
| | 3 | 5 |
| | 6 | 2 |
| | 5 | 1 |
| | 4 | 1 |
| School | 1 | 29 |
| | 2 | 18 |
| | 4 | 8 |
| | 3 | 5 |
| | 6 | 4 |
| | | |

Name: Mental/Psychological difficulty with sudden shifting, dtype: int64

```
data.groupby(['Educational Qualification','Mental/Psychological difficulty with sudden shifting']).size().unstack().plot
(kind='bar',figsize=(10,5))
plt.show()
```



The figure represents the respondents' educational qualification and their opinion on whether they possess a mental/psychological difficulty with the sudden shift to online classes. The analysis shows that students pursuing their graduation do not possess such difficulties while school students and a small number of postgraduation students have some sort of mental difficulty while having a sudden shift towards online learning. Thus there is association between the educational qualification of the respondents and their opinion.

Educational Qualification V/S Lack of face-to-face interaction with teachers and friends

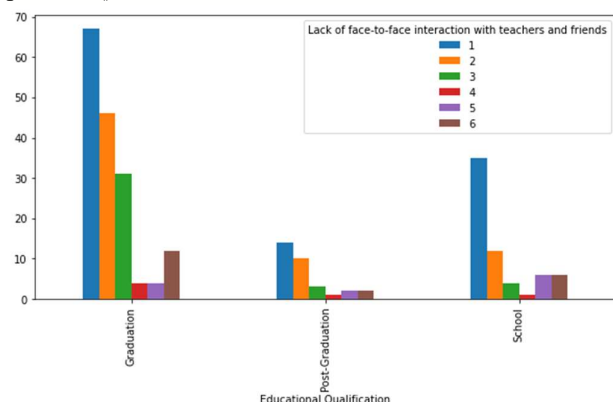
```
grouped = data.groupby("Educational Qualification")["Lack of face-to-face interaction with teachers and friends"]
grouped.apply(lambda x:x.value_counts())
```

Educational Qualification

| | | |
|-----------------|---|----|
| Graduation | 1 | 67 |
| | 2 | 46 |
| | 3 | 31 |
| | 6 | 12 |
| | 5 | 4 |
| | 4 | 4 |
| Post-Graduation | 1 | 14 |
| | 2 | 10 |
| | 3 | 3 |
| | 6 | 2 |
| | 5 | 2 |
| | 4 | 1 |
| School | 1 | 35 |
| | 2 | 12 |
| | 6 | 6 |
| | 5 | 6 |
| | 3 | 4 |
| | 4 | 1 |

Name: Lack of face-to-face interaction with teachers and friends, dtype: int64

```
data.groupby(['Educational Qualification','Lack of face-to-face interaction with teachers and friends']).size().unstack().plot(kind='bar',figsize=(10,5))
plt.show()
```



The figure shows the educational qualification of the respondents and their opinion on whether lack of face-to-face interaction with teachers and friends stands as a challenge during the online classes. From the analysis it is found that there is no difference in opinion with respect to the educational qualification of the respondents.

Educational Qualification V/S Lack of classroom atmosphere & background noises

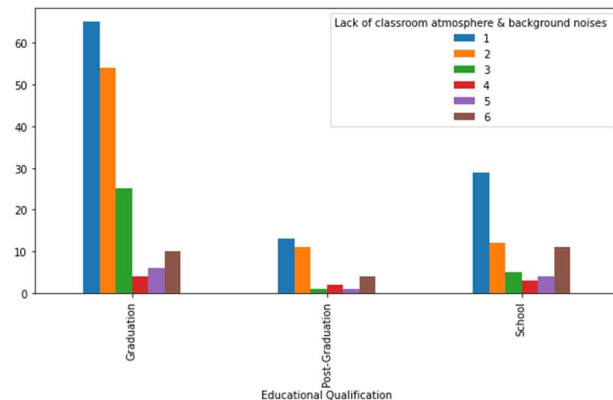
```
grouped = data.groupby("Educational Qualification")["Lack of classroom atmosphere & background noises "]
grouped.apply(lambda x:x.value_counts())
```

Educational Qualification

| | | |
|-----------------|---|----|
| Graduation | 1 | 65 |
| | 2 | 54 |
| | 3 | 25 |
| | 6 | 10 |
| | 5 | 6 |
| | 4 | 4 |
| Post-Graduation | 1 | 13 |
| | 2 | 11 |
| | 6 | 4 |
| | 4 | 2 |
| | 5 | 1 |
| | 3 | 1 |
| School | 1 | 29 |
| | 2 | 12 |
| | 6 | 11 |
| | 3 | 5 |
| | 5 | 4 |
| | 4 | 3 |

Name: Lack of classroom atmosphere & background noises , dtype: int64

```
data.groupby(['Educational Qualification','Lack of classroom atmosphere & background noises ']).size().unstack().plot(kind='bar',figsize=(10,5))
plt.show()
```



The figure shows the educational qualification of the respondents and their opinion on whether lack of classroom atmosphere and background noises while attending online classes stands as a major challenge for them. The analysis shows that there is no significant difference between the opinion of the respondents with respect to their educational qualifications

7. RESULT AND INTERPRETATION

7.1 ANALYSIS AND FINDINGS

The major findings of the study are mentioned below:

- Demographic features of the sample respondents
 1. 58.85% of the respondents are female and 41.15% are male.
 2. Majority of the respondents are attending the online classes in order to complete their regular graduation courses (52%).
 3. Majority of the respondents belong to a low-income group category. Only a small number of respondents are having an annual family income above Rs.1,00,000.
 - Out of the 260 respondents, 240 (92.3%) are of the opinion that traditional face-to-face classes are better for quality education when compared to online classes. Only 20 (7.7%) respondents prefer online education in this regard.
 - While identifying the satisfaction level of the respondents with regard to e-learning and online classes, it is found that majority (100 respondents) are neutral in their opinion. 33.5% of the respondents are satisfied and 18.5% are dissatisfied towards online education. Only a small number of respondents are of extreme satisfaction and dissatisfaction with regard to e-learning.
 - Majority of the respondents are using smart phones for attending the online classes (76.5%). 18.1% of the respondents use laptops and the rest of 5.4% use other mediums like TVs, desktops, tabs etc.
 - The study found out that online classes do not offer the same student services as that of traditional face-to-face classes.
 - Majority of the respondents are of the opinion that they are provided by necessary guidelines by the lecturers before the online sessions.
 - It is identified that data recharging tends to be an additional financial burden for most of the respondents for the access to online classes.
 - The study found out that 93.1% of the respondents are not getting any sort of financial aid from Govt./any other authority for attending the online classes.
 - The study comes across many challenges faced by the students to the success of online classes:
 1. The network/internet connection issues are identified as the major challenge faced by the respondents in attending online sessions.
 2. The lack of face-to-face interaction with teachers and friends stands as the next major challenge.
 3. The lack of classroom atmosphere, background noises, disturbances from the surroundings, availability of good infrastructural facilities, and the psychological difficulty in adjusting with the sudden shift to online education tends to be the challenges faced by a small group of respondents.
 4. The responses show that the lack of familiarity to the use of technology is not a challenge faced by the students. Most of the students are capable of using latest technologies with ease.
- Association between the demographic details of the respondents and their opinions:
- There is no association between the demographic details of the respondents and their opinion on the type of education for quality learning, opinion on whether they get any sort of financial aid from the authorities and the level of satisfaction of the respondents with respect to online classes.
 - There is association between educational qualification of the respondents and their opinion on the satisfaction level with regard to online classes. Students pursuing postgraduation are more satisfied with online classes when compared to students pursuing graduation and schooling.
 - There is no association between the gender of the respondents and their satisfaction with regard to e-learning and online classes.

SUGGESTIONS

1. Provide some opportunity to facilitate face to face interaction between teachers and students and should include some student-oriented sessions.
2. Try to upload the recorded version of class, then everyone can make use of it.
3. Make sure that all students are online and should collect feedback of the students.
4. Reduce the class hours because increasing class hour creates mental strike, phone battery weakage, increases headache, tension, laziness and reduce memory power.
5. Govt. should supply laptops and other electronic devices at low cost to those who don't have access to online classes.

8. CONCLUSION

8.1 CONCLUSION

At the end of the EFFECTIVENESS OF E-LEARNING AND ONLINE CLASSES DURING COVID-19 data analysis project, I observed how to create data visualizations. We made use of packages like count.plot, pie.plot and bar.plot that allowed me to plot various types of visualizations that pertained to several frames. With this, we could conclude how effective was Online classes for Students during Covid-19 pandemic. The Covid - 19 pandemic has shattered our educational system and as a result our educational institutions fast resorted to online mode of learning as a quick solution. The study analysed the impact of e-learning on students and tried to find out the most challenging aspects related to e-learning. Comparisons of various factors and challenges with respect to demographic factors of the respondents revealed that online education is not as much effective as traditional classes though it provided a greater relief during the unusual phase of Covid-19 pandemic. Online classes and e-learning is yet to be made effective and progressed to cater to the needs of students and teachers. Finally, we made comparisons With graph of students who provided me with the details of how various factors affected Students from different background.

9. BIBLIOGRAPHY

9.1 BIBLIOGRAPHY

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