A Comprehensive Study of Online vs Offline Mode of Education

A Dissertation Report Submitted as Minor Project in Partial Fulfillment of the Requirements for the Degree of

BACHELOR OF COMPUTER APPLICATION

Submitted By

Sampurna Patra – 15201222118
Satyam Das - 15201222086
Soumyodeep Manna - 15201222071
Trishna Chakraborty - 15201222075

Session: 2022-2025

Under The Supervision Of

Subhendu Saha
Suman Das
Asst. Professor
Department Of BCA
Techno India (Hooghly Campus)

Techno India (Hooghly Campus)
Dharampur, Shantiniketan, Near Khadina more
G.T. Road, Chinsurah, Hooghly-712101
Phone: 033-2680-2389 / 6565
Website: www.technoindiahooghly.org Email: info@technoindiahooghly.org

Acknowledgment

We hereby declare that the **Dissertation Report** as a Minor project in partial fulfillment of the requirement for the award degree of **BACHELOR OF COMPUTER APPLICATION** at **Techno India (Hooghly Campus)** is an authenticated work carried out under the guidance of **Prof. Subhendu Saha** and **Prof. Suman Das.**

It is our pleasure to be indebted to various people, who directly or indirectly contributed to the development of this work and who influenced our thinking, behavior, and acts during study.

We express sincere gratitude to our respected **Principal Sir** for providing us an opportunity to undergo this project at **TECHNO INDIA (HOOGHLY CAMPUS).**

We are also thankful to our guides **Prof. Subhendu Saha** and **Prof. Suman Das** for their support, cooperation, and motivation provided to us during the training for constant inspiration, presence, and blessings.

Lastly, we would like to thank the almighty and our parents for their moral support and our friends with whom we shared our day-to-day experience and received lots of suggestions that improved our quality of work.

Date: -

Name of the students: - **Signature of the Students:**

Sampurna Patra
Satyam Das
Soumyodeep Manna
Trishna Chakraborty

Techno India Hooghly - Campus
Dharampur, Shantiniketan, Near Khadinamore
G. T. Road, Chinsurah, Hooghly - 712101
Phone: (033) 2680-2389 / 6565
E-mail: info@technoindiahooghly.org
Website: www.technoindiahooghly.org

Certificate

This is to certify that the Dissertation entitled **"Online vs Offline Education using Machine Learning Algorithms" Submitted by Satyam Das, Roll No: 15201222086**, as Assigned Project (Minor) for the partial fulfillment of Bachelor of Computer Application is worth acceptance.

(Asst. Prof. Subhendu Saha)
(Asst. Prof. Suman Das)

(Asst. Prof. Tapan Chakraborty)
Head of the Department, BCA

Dr. Soumya Mukherjee
Principal, Techno India (Hooghly Campus)

Declaration

We, Sampurna Patra, Satyam Das, Trishna Chakraborty, and Soumyodeep Manna, candidates for the BCA final year examination at Techno College Hooghly, hereby declare that this dissertation and the work described herein are our own, except where otherwise acknowledged. The dissertation does not contain material that has been used previously to any substantial extent for a comparable purpose.

We acknowledge that an AI-assisted platform, ChatGPT, was utilized for assistance in some portions of this project, and such use is duly noted within the text.

We also authorize that the content of our dissertation be made available to the students and staff of the University.

Sampurna Patra
Satyam Das
Soumyodeep Manna
Trishna Chakraborty

Proforma Page

Candidate Name: Sampurna Patra, Satyam Das, Trishna Chakraborty, Soumyodeep Manna

Title of the Project: A Comprehensive Study of Online vs Offline mode of Education using machine learning algorithms.

Examination and Year: BCA Final Year Examination, 2024

Word Count for the Dissertation: 5278

Project Originator: The candidate

Project Supervisor: Subhendu Saha, Suman Das

Original Aims of the Project: The primary objective of this project was to find the online or offline which mode of education which one is more effective.

Work Completed: During this project,

Special Difficulties: None.

Table of contents

Abstract

The rapid advancement of technology has significantly impacted the educational landscape, leading to the widespread adoption of online education. This research paper aims to compare and contrast online and offline education in terms of accessibility, quality of instruction, student engagement, and learning outcomes Online education in the era of advanced technology has helped a lot during COVID-19.

The study employs a mixed-methods approach, combining quantitive data from surveys and academic performance metrics with qualitative insights from interviews and focus groups Findings suggest that while online education offers greater flexibility and accessibility, it faces challenges related to student engagement and the digital divide.

Conversely, offline education provides more opportunities for social interaction and hands-on learning but can be limited by geographical and temporal constraints. We are researching how online education can help if any pandemic situation occurs in the future.

The paper concludes with recommendations for integrating the strengths of both modalities to create a hybrid educational model that maximizes learning outcomes and addresses the diverse needs of students.

We are mainly doing research work on all the students from classes one to twelve who have taken online classes during the COVID-19 pandemic phase.

Literature Review

- ***Means, Bakia, & Murphy (2014) - Learning Online: What Research Tells Us About Whether, When, and How:*** The development and efficacy of online learning in K–12, higher education, and informal learning settings are examined in this book. It highlights how crucial it is to comprehend the interactions among learner characteristics, implementation tactics, and the technology itself. The popularity of competency-based learning, MOOCs, and adaptable training are noteworthy themes. Despite the potential of online learning, the authors contend that successful implementations that are tailored to the particular environment are more important than merely depending on technology. Along with highlighting the financial ramifications, the book urges further study into efficient methods and expandable solutions to improve the results of online education.

- ***Hodges et al. (2020) - The Difference Between Emergency Remote Teaching and Online Learning:*** This article makes a distinction between carefully thought-out online education and emergency remote teaching (ERT), which is a short-term option used during emergencies like COVID-19. It emphasizes how ERT frequently falls short of the pedagogical preparation and rigor found in high-quality online learning programs. The authors emphasize that for online education to be sustainable, educators must create long-term plans that integrate good instructional design concepts.

- ***Allen & Seaman (2017) - Digital Learning Compass: Distance Education Enrollment Report 2017:*** The increasing popularity of distance learning in American higher education is documented in this paper. According to important data, more students are signing up for online courses due to their accessibility and flexibility. It also talks about the institutional difficulties in expanding online learning without sacrificing quality. The report emphasizes the significance of creating strong online learning support networks.

- ***Xia et al. (2020) - Challenges of Online Learning Amid COVID-19: College Students' Perspective:*** This study examines the challenges that college students encountered during the epidemic, including issues with self-regulation, lack of interaction, and technology constraints. The study highlights how crucial it is to address these issues with institutional support, fair access to technology, and mental health resources. To lessen the drawbacks of entirely online education, it promotes blended learning strategies.

- ***Praveen Singh - The Rise of Hybrid Education Models for Learning Solutions:*** This article explores how changing educational demands have led to the development of hybrid education approaches that combine online and in-person instruction. While maintaining the advantages of in-person connection, hybrid models provide flexibility and accommodate a range of learning preferences. Since hybrid models use technology to enhance conventional teaching techniques, Singh contends that they could be the way of the future for education.

- ***ScienceDirect Article: Online and Hybrid Learning Trends:*** This article examines worldwide patterns in hybrid and online learning, emphasizing innovations in technology such as artificial intelligence and adaptive learning platforms. It draws attention to how educational paradigms are changing to become more competency-based and individualized, and it demonstrates how analytics can help to improve learning results.

Introduction

Education is a cornerstone of personal and societal development, and its delivery methods have significantly evolved over the years. In recent decades, the proliferation of technology has given rise to online education, offering an alternative to the traditional offline classroom setting. Both online and offline education systems have distinct characteristics, advantages, and challenges that influence learning outcomes and accessibility.

The shift towards online education has accelerated, particularly in response to global events like the COVID-19 pandemic, showcasing its potential to bridge geographical barriers and provide flexible learning opportunities. However, offline education, with its face-to-face interactions and structured environment, continues to hold value as a time-tested method fostering social connections and hands-on learning experiences.

This research paper explores the comparative effectiveness of online and offline education by examining factors such as accessibility, quality of learning, cost, student engagement, and long-term impact on skills development. By analyzing the strengths and limitations of both modalities, this study aims to provide insights into how they can complement each other to create a more inclusive and efficient educational ecosystem.

Methodology

Comparing offline and online teaching methods reveals differences in effectiveness, engagement, and adaptability. Offline teaching excels in personal interaction and structured learning, while online teaching offers unparalleled flexibility and resource access.

The debate between offline and online teaching methods is not about selecting a superior option, but rather about finding the right balance and approach for different educational contexts.

As the educational landscape continues to evolve, stakeholders in the educational sector must remain adaptable and open to these changes. A balanced, context-specific approach is crucial for meeting learners' diverse and dynamic needs in the modern world.

Online education has limited face-to-face interaction, though group discussions and chat features help bridge the gap. It includes digital learning platforms like Zoom, and Google Meet, asynchronous learning flexibility, which means students can access recorded lectures, videos, and resources at their convenience, global accessibility technology-enabled instruction, Digital assessments, and automated grading systems.

Offline teaching methods remain prevalent, especially in the foundational levels of education. Characterized primarily by face-to-face interactions in physical classroom settings, these methods emphasize direct teacher-student engagement.

While structurally sound and effective in certain contexts, the traditional approach faces challenges such as limited flexibility in learning pace and style, and potential logistical constraints like limited access to diverse resources and less individualized attention for students. It includes Labs, workshops, and group projects to foster experiential learning. Immediate feedback and discussion between students and teachers. Use of chalkboards, whiteboards, physical textbooks, and printed materials.

Activities like role-plays, debates, and presentations for skill-building. Proctored physical examinations, Physical resource availability, and Synchronous communication. Each methodology offers unique advantages and challenges, with increasing convergence through hybrid learning models.

Theoretical Background

Python libraries facilitate data handling and allow us to accomplish both simple and complex operations with just one line of code.
Pandas is a package that facilitates loading data frames in a 2D array format and offers several functions for handling analytic jobs simultaneously.
Numpy: Numpy arrays are quite quick and can do a lot of calculations quickly.
One tool for creating visuals is ***Matplotlib/Seaborn.***
Sklearn: Several libraries with pre-implemented functions to carry out tasks ranging from data preprocessing to model construction and evaluation are included in this module.

The Principal Component Analysis (PCA) technique was introduced by the mathematician Karl Pearson in 1901. It works on the condition that while the data in a higher dimensional space is mapped to data in a lower dimension space, the variance of the data in the lower dimensional space should be maximum.

- Principal Component Analysis (PCA) is a statistical procedure that uses an orthogonal transformation that converts a set of correlated variables to a set of uncorrelated variables. PCA is the most widely used tool in exploratory data analysis and machine learning for predictive models. Moreover,
- Principal Component Analysis (PCA) is an unsupervised learning algorithm technique used to examine the interrelations among a set of variables. It is also known as a general factor analysis where regression determines a line of best fit.
- The main goal of Principal Component Analysis (PCA) is to reduce the dimensionality of a dataset while preserving the most important patterns or relationships between the variables without any prior knowledge of the target variables.

Step-By-Step Explanation of PCA (Principal Component Analysis)

Step 1: Standardization

First, we need to standardize our dataset to ensure that each variable has a mean of 0 and a standard deviation of 1.

$$Z = \frac{X - \mu}{\sigma}$$

Here,

- μ is the mean of independent features $\mu = \{\mu_1, \mu_2, \mu_3 \ldots \mu_m\}$
- σ is the standard deviation of independent features $= \{\sigma_1, \sigma_2, \sigma_3 \ldots \sigma_m\}$

Step2: Covariance Matrix Computation

Covariance measures the strength of joint variability between two or more variables, indicating how much they change about each other. To find the covariance we can use the formula:

$$\text{cov}(x_1, x_2) = \frac{\sum_{i=1}^{n} (x_{1i} - x_1)(x_{2i} - x_2)}{n-1}$$

The value of covariance can be positive, negative, or zero.

- Positive: As the x_1 increases x_2 also increases.
- Negative: As the x_1 increases x_2 also decreases.
- Zeros: No direct relation

Step 3: Compute Eigenvalues and Eigenvectors of Covariance Matrix to Identify Principal Components

Let A be a square n X n matrix and X be a non-zero vector for which

$$AX = \lambda X$$

for some scalar values λ. Then λ is known as the eigenvalue of matrix A and X is known as the eigenvector of matrix A for the corresponding eigenvalue.
It can also be written as :

$$AX - \lambda X = 0$$
$$(A - \lambda I)X = 0$$

Where I am the identity matrix of the same shape as matrix A. The above conditions will be true only if $(A - \lambda I)$ is non-invertible (i.e. singular matrix). That means,

$$| A - \lambda I | = 0$$

From the above equation, we can find the eigenvalues \lambda, and therefore corresponding eigenvector can be found using the equation $AX = \lambda X$.

- Cumulative contribution, also known as cumulative explained variance, is the overall percentage of the original dataset's volatility that can be accounted for by a specific number of primary components.
  PC1 is the principal component that explains the most variance, followed by PC2, which explains the second-largest amount, and so on.
  By gradually adding up the variance explained by each primary component in order, the cumulative contribution is determined.

- The correlation's absolute value between a primary component and an original variable is known as absolute loading (or absolute component loading). That is to say, it shows the extent to which a variable contributes to a certain major component, whether or not the connection is positive.
  Greater absolute loading values signify the variable's greater impact on the major component.
  Calculation: Determine a variable's loading coefficient for a certain major component. Determine its absolute value (if there is a negative sign, delete it).
- ***Sorting,*** as used in main Component Analysis (PCA), is the process of placing main components in descending order according to the variation they explain.

Importance

For this research survey was carried out positively because the questionnaire is the best way to collect data.

A survey is an instrument of research that contains several questions to collect data from respondents.

Online and offline education each have some importance: Online education has it's

Flexibility: Students can attend classes from anywhere, which can help them balance work, family, and education.

Cost: Online classes are often less expensive than offline classes.

Course variety: Online education offers a wider range of courses.

Networking: Online learning can provide opportunities to network with students from around the world. Offline education has

Structured environment: Offline classes can help students stay focused and reduce distractions.

Face-to-face interaction: Offline classes can help improve communication skills and social connections.

Individual attention: Students can receive more individual attention in offline classes.

Potential focus area:-

Effectiveness: Comparing learning outcomes and academic performance in online and offline settings.

Accessibility: Exploring the reach of each mode, especially in underserved or remote areas.

Learner Engagement: Analyzing how engagement differs in virtual vs. physical classrooms.

Technological Influence: Evaluating the role of technology in enhancing or hindering education.

Adaptability and Challenges: Understanding how students and educators adapt to each mode and the challenges they face.

Hybrid Models: Investigating the potential benefits of combining online and offline education methods

Objective

A research paper on online vs. offline education *may have different goals, but some basic ones include:*

To contrast and evaluate the learner experiences, accessibility, and efficacy of online and offline learning, emphasizing the benefits, drawbacks, and consequences of contemporary educational methods. The goal of this project is to establish a hybrid educational model that maximizes learning outcomes and meets the various demands of students by developing and evaluating machine learning models. The goal is to produce a dependable and accurate outcome by employing a full suite of predictive features. during the COVID-19 epidemic. The majority of people have switched from offline to online functioning. Although students are having a difficult time adjusting to an online method, both options are now available.

Data Collection

This study employed a combination of physical and online methods to gather data relevant to the research paper on online vs offline education. The process included both primary data collection through physical surveys and secondary data gathering using online resources.

- **Physical Data Collection**

Data was collected physically by distributing surveys and conducting interviews with students, teachers, and parents in local educational institutions. We have gathered lots of data from our locality such as:-(Chandannagar, Chinsurah, Bandel, Nadia's, etc.) The following steps were undertaken:

Target Population: Participants included students from [specific schools/colleges], their teachers, and parents.
Instruments Used: Questionnaires were prepared, focusing on [specific aspects, e.g., engagement, effectiveness, accessibility].
Sampling: A [sampling technique, e.g., random or purposive] method was used to ensure diverse and representative participation.
Procedure: Surveys were distributed in person, and interviews were conducted face-to-face at [specific locations].

- **Online Data Collection**

To complement the primary data, online data was collected using Google for secondary sources and information. The following steps were undertaken:

Search Strategy: Google was used to search for peer-reviewed articles, reports, and statistical data relevant to the topic. Specific search terms included ["online education vs offline education," "student engagement in online learning," etc.].
Sources: Data was extracted from credible sources, including educational journals, official government reports, and reputable websites.
Validation: Care was taken to cross-check information and ensure the reliability of online sources.
By combining physical and online methods, this study ensured a holistic approach to data collection, providing both quantitative and qualitative insights into the research topic.

We have collected the data through those Google form links:
https://forms.gle/p75Vo9DZHbEWYbSw8
https://forms.gle/HW2w879uEfwsnJ1i7
https://forms.gle/izbyEkMdioDqRXLx6

In the following question set, there are 5 parameters (Highly agree, Agree, Neither agree nor disagree, Disagree, Highly disagree) which has been used for training and validating.

***The questions are as follows**:*

1. *Online mode of education is better than offline mode of education. (* অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।*)*
2. *Online mode education is effective for your child.* (অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)
3. *3. Your child faces any problem in converting the offline mode of education to an online mode of education.* (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়।)
4. *Online mode of education affects on mental or physical health of your child.* (অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে।)
5. *Your child faces any problems with the online mode of education during covid-19 phase.* (কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল।)
6. *How do you rate your child becoming phone addicted during the online mode of education?* (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে।)
7. *Children follow disciplines during the online mode of education.* (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়।)
8. *Children are getting lazy during the online mode of education.* (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে।)
9. *During the online mode of education children are doing their work at their flexible time so they can be more creative or involve themselves in some extra activity.* (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে।)
10. *Your child is facing problems asking doubts during the online mode of education.* (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে।)
11. *Online education affects on economic status of a student's guardian.* (শিক্ষার্থীদের অভিভাবকদের অর্থনৈতিক অবস্থা অনলাইন শিক্ষার ওপর প্রভাব ফেলে।)
12. *Your child is facing a problem studying from online study materials (like:- PDF).* (আপনার সন্তান অনলাইন অধ্যয়নের উপকরণ থেকে পড়াশোনা করতে সমস্যার সম্মুখীন হচ্ছে (like:- PDF)।)
13. *Your child is addicted to gaming during the online mode of education.* (অনলাইন শিক্ষার সময় আপনার সন্তান গেমিং-এ আসক্ত হচ্ছে।)
14. *Your child is addicted to social media platforms (like Facebook, Instagram, YouTube).* (আপনার সন্তান সোশ্যাল মিডিয়া প্ল্যাটফর্মে আসক্ত হচ্ছে (like:-Facebook, Instagram, YouTube)।)
15. *Your child is addicted to OTT platforms and cartoons.* (আপনার সন্তান ওটিটি প্ল্যাটফর্ম এবং কার্টুনে আসক্ত হচ্ছে।)
16. *Online class records are helpful for your child's studies.* (অনলাইন ক্লাসের রেকর্ড আপনার সন্তানের পড়াশোনার জন্য সহায়ক।)

17. *Exams should be conducted through online mode.* (অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত।)

18. *Your child is attentive in online classes.* (আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী।)

19. *In the online mode of education teacher student interaction is better than offline mode of education.* (অনলাইন শিক্ষা পদ্ধতিতে অফলাইন শিক্ষা পদ্ধতির তুলনায় শিক্ষকদের সাথে যোগাযোগ ভালো হয়।)

20. *Your child is not getting bored during online classes.* (অনলাইন ক্লাসের সময় আপনার সন্তান বিরক্ত হচ্ছে না।)

21. *Group study is helpful in offline mode of education.* (অফলাইন শিক্ষা পদ্ধতিতে দলগত অধ্যয়ন সহায়ক।)

22. *You live in a corporation/Municipality/Panchayat)* (আপনি বাস করেন।)

23. *According to your location, please rate your internet connection.* (আপনার অবস্থান অনুযায়ী, দয়া করে আপনার ইন্টারনেট সংযোগের মূল্যায়ন করুন।)

24. *Your child faces any problems with the offline mode of education after the pandemic phase.* (মহামারী পর্বের পর আপনার সন্তান অফলাইন শিক্ষা পদ্ধতির সঙ্গে মানিয়ে নিতে সমস্যার সম্মুখীন হয়েছিল।)

25. *A proper school environment is better for your child's education.* (অনলাইন শিক্ষার তুলনায় বিদ্যালয়ের উপযুক্ত পরিবেশ আপনার সন্তানের শিক্ষার জন্য ভালো।)

26. *Your child is being distracted during the offline mode of education.* (অনলাইন শিক্ষার সময় আপনার সন্তান অমনোযোগী হয়ে পড়ছে।)

27. *Online mode of education can be brought into the Indian education system.* (ভারতীয় শিক্ষা ব্যবস্থায় অনলাইন শিক্ষা ব্যবস্থা আনা যেতে পারে।)

Data Analysis

Data analysis is the process of examining data using visual methods. It is employed to find patterns and trends or to verify hypotheses using graphical representations and statistical summaries. Here, we will examine how to assess the data's skewness and imbalance.

In [39]:

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
mydf=pd.read_csv('null_check.csv')
print("dataFrame")
print(mydf)
```

```
2                    Neither agree nor disagree
3                                         Agree
4                                         Agree
..                                          ...
482                                 Highly agree
483                              Highly disagree
484                              Highly disagree
485                                    Disagree
486                  Neither agree nor disagree

     5. Your child faced  problem(s) to adapt the online mode of education during covid-19 phase.( কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে  সমস্যার সম্মুখীন হয়েছিল)    \
0                                         Agree
1                                   Highly agree
2                    Neither agree nor disagree
3                                         Agree
4                    Neither agree nor disagree
..                                          ...
482                                    Disagree
483                                    Disagree
```

In [40]:
```
1 mydf.head(10)
```

Out[40]:

1. Online mode of education is better than offline mode of education. (অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	19. I online mode educatio teach studer interactio is bett tha offlir mode educatio (অনলাই শিক্ষ পদ্ধতি অফলাই শিক্ষ পদ্ধতি তুলনা শিক্ষকদে সা যোগাযো ভালো হয়
Disagree	Neither agree nor disagree	Agree	Agree	Agree	Agree	Neither agree nor disagree	Agree	Agree	Agree	...	Disagree	Neither agree nor disagree	Disagr
Highly disagree	Highly agree	Highly agree	Highly agree	Highly agree	Agree	Highly disagree	Highly agree	Highly disagree	Highly agree	...	Highly agree	Highly disagree	High disagr
Disagree	Disagree	Agree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	...	Neither agree nor disagree	Neither agree nor disagree	Neith agree n disagr
Neither agree nor disagree	Neither agree nor disagree	Agree	Agree	Agree	Agree	Disagree	Agree	Agree	Agree	...	Disagree	Disagree	Disagr
Neither agree nor disagree	Neither agree nor disagree	Agree	Agree	Neither agree nor disagree	Agree	Neither agree nor disagree	Agree	Agree	Neither agree nor disagree	...	Highly agree	Agree	Agr
Neither agree nor disagree	Agree	Disagree	Neither agree nor disagree	Agree	Neither agree nor disagree	Agree	Agree	Agree	Agree	...	Agree	Neither agree nor disagree	Disagr
Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	...	Agree	Agree	Agr
Disagree	Neither agree nor disagree	Agree	Agree	Highly agree	Agree	Neither agree nor disagree	Agree	Neither agree nor disagree	Highly agree	...	Disagree	Disagree	High disagr
Neither agree nor disagree	Neither agree nor disagree	Agree	Disagree	Disagree	Disagree	Disagree	Disagree	Neither agree nor disagree	Disagree	...	Neither agree nor disagree	Neither agree nor disagree	Disagr
Highly disagree	Neither agree nor disagree	Highly disagree	Agree	Neither agree nor disagree	Highly agree	Neither agree nor disagree	Agree	Neither agree nor disagree	Neither agree nor disagree	...	Highly agree	Neither agree nor disagree	High agr

rows × 26 columns

In [41]:

```
mydf.replace(to_replace="Highly agree", value=1,inplace=True)
mydf.replace(to_replace="Agree", value=0.75,inplace=True)
mydf.replace(to_replace="Neither agree nor disagree", value=0.5,inplace=True)
mydf.replace(to_replace="Disagree", value=0.2,inplace=True)
mydf.replace(to_replace="Highly disagree", value=0,inplace=True)
mydf.replace(to_replace="Very High",value=1,inplace=True)
mydf.replace(to_replace="High", value=0.75,inplace=True)
mydf.replace(to_replace="Neither high nor low", value=0.5,inplace=True)
mydf.replace(to_replace="low", value=0.2,inplace=True)
mydf.replace(to_replace="Very Low", value=0,inplace=True)
mydf.to_csv('null_check1.csv',index=False)
```

In [42]:

```
mydf=pd.read_csv('null_check1.csv')
mydf.head(500)
```

Out[42]:

1. Online mode of education is better than offline mode of education. (অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	19. I onlin mode c educatio teache studer interactio is bette tha offlin mode c educatior (অনলাই শিক্ষ পদ্ধতিতে অফলাই শিক্ষ পদ্ধতি তুলনা শিক্ষকদে সাে যোগাযো ভালো হয়
0.2	0.5	0.75	0.75	0.75	0.75	0.5	0.75	0.75	0.75	...	0.20	0.50	0.2
0.0	1.0	1.00	1.00	1.00	0.75	0.0	1.00	0.00	1.00	...	1.00	0.00	0.0
0.2	0.2	0.75	0.50	0.50	0.50	0.5	0.50	0.50	0.50	...	0.50	0.50	0.5
0.5	0.5	0.75	0.75	0.75	0.75	0.2	0.75	0.75	0.75	...	0.20	0.20	0.2
0.5	0.5	0.75	0.75	0.50	0.75	0.5	0.75	0.75	0.50	...	1.00	0.75	0.7
...	...	...	...	...	...	...	...	...	...	...	...	...	.
0.2	0.5	1.00	1.00	0.20	0.75	0.0	0.75	0.20	0.75	...	0.50	NaN	0.7
0.2	0.2	1.00	0.00	0.20	0.50	0.2	0.75	NaN	0.75	...	0.50	NaN	0.7
0.2	0.0	1.00	0.00	0.20	0.75	0.2	0.75	0.75	0.75	...	0.50	NaN	0.7
0.2	0.2	1.00	0.20	0.20	0.75	0.2	0.75	1.00	0.75	...	0.75	NaN	0.7
0.2	0.2	1.00	0.50	0.20	0.75	0.2	0.75	1.00	0.75	...	0.50	NaN	0.7

ows × 26 columns

In [43]:

```
newdf1=mydf.copy()
print("after remove the rows contating null value")
ndf1=newdf1.dropna()
print(ndf1)
```

```
3                                1.00
4                                0.75
..                                ...
472                              0.00
473                              0.75
474                              0.50
475                              0.75
478                              0.20

      23. According to your location, please rate your internet connection.(  আপনার অবস্থান অনুযায়ী, দয়া করে আপনার ইন্টারনেট সংযোগের মূল্যায়ন করুন )  \
0                                0.50
1                                0.75
2                                0.50
3                                0.75
4                                0.75
..                                ...
472                              1.00
473                              0.20
474                              0.75
```

In [44]:
```
1 ndf1.head(500)
```

Out[44]:

	1. Online mode of education is better than offline mode of education. (অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অভিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	
0	0.2	0.50	0.75	0.75	0.75	0.75	0.50	0.75	0.75	0.75	...	0.2	0.50	
1	0.0	1.00	1.00	1.00	1.00	0.75	0.00	1.00	0.00	1.00	...	1.0	0.00	
2	0.2	0.20	0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	...	0.5	0.50	
3	0.5	0.50	0.75	0.75	0.75	0.75	0.20	0.75	0.75	0.75	...	0.2	0.20	
4	0.5	0.50	0.75	0.75	0.50	0.75	0.50	0.75	0.75	0.50	...	1.0	0.75	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
472	1.0	1.00	0.50	0.20	0.00	0.00	1.00	0.20	1.00	0.00	...	1.0	1.00	
473	0.2	0.20	0.75	0.75	0.00	0.75	0.20	0.75	1.00	1.00	...	1.0	0.00	
474	0.5	0.50	0.20	0.75	0.00	1.00	0.75	1.00	0.75	0.20	...	0.5	0.50	
475	0.2	0.75	0.50	0.50	0.00	1.00	0.00	1.00	0.75	0.50	...	0.0	0.20	
478	0.0	0.20	1.00	0.50	0.20	0.75	0.20	0.75	1.00	0.75	...	0.0	0.00	

477 rows × 26 columns

In [45]:

```
print("replaceing null value with mean value")
medf=mydf.fillna(mydf.mean())
print(medf)
```

```
483                 0.50
484                 0.50
485                 0.20
486                 0.50

     27. Online mode of education can be brought in Indian education system.( ভারতীয় শিক্ষা ব্যবস্থায় অনলাইন শিক্ষা ব্যবস্থা আনা যেতে পারে )
0                   0.20
1                   0.00
2                   0.50
3                   0.50
4                   0.75
..                   ...
482                 0.50
483                 0.00
484                 0.00
485                 0.00
486                 0.00

[487 rows x 26 columns]
```

In [46]:

```
medf.head(500)
```

Out[46]:

	1. Online mode of education is better than offline mode of education. (অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	ec	inb	i	ed	(	ও	অ	শি	মে	ডা
0	0.2	0.5	0.75	0.75	0.75	0.75	0.5	0.75	0.750000	0.75	...	0.20	0.500000												
1	0.0	1.0	1.00	1.00	1.00	0.75	0.0	1.00	0.000000	1.00	...	1.00	0.000000												
2	0.2	0.2	0.75	0.50	0.50	0.50	0.5	0.50	0.500000	0.50	...	0.50	0.500000												
3	0.5	0.5	0.75	0.75	0.75	0.75	0.2	0.75	0.750000	0.75	...	0.20	0.200000												
4	0.5	0.5	0.75	0.75	0.50	0.75	0.5	0.75	0.750000	0.50	...	1.00	0.750000												
...	...	...	...	...	...	...	...	...	...	...	...	...	...												
482	0.2	0.5	1.00	1.00	0.20	0.75	0.0	0.75	0.200000	0.75	...	0.50	0.380713												
483	0.2	0.2	1.00	0.00	0.20	0.50	0.2	0.75	0.559897	0.75	...	0.50	0.380713												
484	0.2	0.0	1.00	0.00	0.20	0.75	0.2	0.75	0.750000	0.75	...	0.50	0.380713												
485	0.2	0.2	1.00	0.20	0.20	0.75	0.2	0.75	1.000000	0.75	...	0.75	0.380713												
486	0.2	0.2	1.00	0.50	0.20	0.75	0.2	0.75	1.000000	0.75	...	0.50	0.380713												

487 rows × 26 columns

In [47]:
```
print("delete duplicate values")
me1df=medf.drop_duplicates()
print(me1df)
me1df.head(500)
```

0	0.2	0.5	0.75	0.75	0.75	0.75	0.5	0.75	0.750000	0.75	...	0.20	0.500000
1	0.0	1.0	1.00	1.00	1.00	0.75	0.0	1.00	0.000000	1.00	...	1.00	0.000000
2	0.2	0.2	0.75	0.50	0.50	0.50	0.5	0.50	0.500000	0.50	...	0.50	0.500000
3	0.5	0.5	0.75	0.75	0.75	0.75	0.2	0.75	0.750000	0.75	...	0.20	0.200000
4	0.5	0.5	0.75	0.75	0.50	0.75	0.5	0.75	0.750000	0.50	...	1.00	0.750000
...	...	...	...	...	...	...	...	...	...	...	...	...	...
482	0.2	0.5	1.00	1.00	0.20	0.75	0.0	0.75	0.200000	0.75	...	0.50	0.380713
483	0.2	0.2	1.00	0.00	0.20	0.50	0.2	0.75	0.559897	0.75	...	0.50	0.380713
484	0.2	0.0	1.00	0.00	0.20	0.75	0.2	0.75	0.750000	0.75	...	0.50	0.380713
485	0.2	0.2	1.00	0.20	0.20	0.75	0.2	0.75	1.000000	0.75	...	0.75	0.380713
486	0.2	0.2	1.00	0.50	0.20	0.75	0.2	0.75	1.000000	0.75	...	0.50	0.380713

477 rows × 26 columns

In [48]:
```
me1df.shape
```

Out[48]: (477, 26)

In [49]:
```
me1df.columns
```

Out[49]:
```
Index(['1. Online mode of education is better than offline mode of education.( অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)',
       ' 2. Online mode of education is effective for your child.( অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর। ) ',
       ' 3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অন
লাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)  ',
       ' 4. Online mode of education effects on mental or physical health of your child( অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক
স্বাস্থ্যের উপর প্রভাব ফেলে)',
       ' 5. Your child faced  problem(s) to adapt the online mode of education during covid-19 phase.( কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন
শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে  সমস্যার সম্মুখীন হয়েছিল) ',
       ' 6. Your child is become phone addicted during online mode of education.( অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে ) ',
       ' 7. Children follow disciplines during online mode of education. ( অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা  পরায়ণ হয় ) ',
       ' 8. Children are getting lazy during online mode of education. ( অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে )',
       ' 9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselv
es on some extra activity. ( অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত
ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে )',
       ' 10. Your child is facing problem asking doubts during online mode of education.( আপনার সন্তান অনলাইন শিক্ষার সময়  সমস্যার সম্মুখীন হচ্ছে)
',
       ' 11. Economic status of student's guardian effects on  Online education .(  শিক্ষার্থীদের অভিভাবকদের অর্থনৈতিক অবস্থা অনলাইন শিক্ষার  ওপর
প্রভাব ফেলে) ',
       ' 12. Your child is facing problem to study from online study materials (like:- PDF). ( আপনার সন্তান অনলাইন অধ্যয়নের উপকরণ থেকে প
ড়াশোনা করতে সমস্যার সম্মুখীন হচ্ছে (like:- PDF).  ',
       ' 13. Your child is being addicted to gaming during online mode of education.(  অনলাইন শিক্ষার সময় আপনার সন্তান গেমিং-এ আসক্ত হচ্ছে ) ',
       ' 14. Your child is being addicted to social-media platforms (like:-Facebook, Instagram, YouTube). ( আপনার সন্তান সোশ্যাল মিডিয়া প্ল্যাটফর্মে
আসক্ত হচ্ছে (like:-Facebook, Instagram, YouTube).  ',
       ' 15. Your child is being addicted to OTT platforms and cartoons. ( আপনার সন্তান ওটিটি প্ল্যাটফর্ম এবং কার্টুনে আসক্ত হচ্ছে ) ',
       ' 16. Online class records are helpful for your child's studies. ( অনলাইন ক্লাসের রেকর্ড আপনার সন্তানের পড়াশোনার জন্য সহায়ক)  ',
       ' 17. Exams should be conducted through online mode.( অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)  ',
       ' 18. Your child is attentive in online classes.( আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী ) ',
       ' 19. In online mode of education teacher student interaction is better than offline mode of education. ( অনলাইন শিক্ষা পদ্ধতিতে অফলাইন
শিক্ষা পদ্ধতির তুলনায় শিক্ষকদের সাথে যোগাযোগ ভালো হয় ) ',
       ' 20. Your child is not getting bored during online classes.(  অনলাইন ক্লাসের সময় আপনার সন্তান বিরক্ত হচ্ছে না )  ',
       ' 21. Group study is helpful in offline mode of education.(  অফলাইন শিক্ষা পদ্ধতিতে দলগত অধ্যয়ন সহায়ক ) ',
       ' 23. According to your location, please rate your internet connection.(  আপনার অবস্থান অনুযায়ী, দয়া করে আপনার ইন্টারনেট সংযোগের
মূল্যায়ন করুন ) ',
       ' 24. Your child faced any problem to adapt offline mode of education after pandemic phase. (  মহামারী পর্বের পর আপনার সন্তান অফলাইন
শিক্ষা পদ্ধতির সঙ্গে মানিয়ে নিতে  সমস্যার সম্মুখীন হয়েছিল) ',
       ' 25. Proper school environment is better for your child education in compare to online mode of education.( অনলাইন শিক্ষার তুলনায় বিদ্যাল
য়ের উপযুক্ত পরিবেশ আপনার সন্তানের শিক্ষার জন্য ভালো ) ',
       ' 26. Your child is being distracted during online mode of education.( অনলাইন শিক্ষার সময় আপনার সন্তান অমনোযোগী হয়ে পড়ছে ) ',
       ' 27. Online mode of education can be brought in Indian education system.(  ভারতীয় শিক্ষা ব্যবস্থায় অনলাইন শিক্ষা ব্যবস্থা আনা যেতে পারে )  '],
      dtype='object')
```

In [50]:
```
1 me1df.describe()
```

Out[50]:

	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	19. In online mode of education teacher student interaction is better than offline mode of education. (অনলাইন শিক্ষা পদ্ধতিতে অফলাইন শিক্ষা পদ্ধতির তুলনায় শিক্ষকদের সাথে যোগাযোগ ভালো হয়)	c
	477.000000	477.000000	477.000000	477.000000	477.000000	477.000000	477.000000	477.000000	477.000000	...	477.000000	477.000000	477.000000	4
	0.412683	0.563522	0.643177	0.518973	0.671384	0.405660	0.706604	0.561467	0.603983	...	0.321069	0.378526	0.333857	
	0.289054	0.281839	0.280906	0.325640	0.289711	0.283027	0.257500	0.280755	0.273621	...	0.311528	0.281768	0.298088	
	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.000000	
	0.200000	0.200000	0.500000	0.200000	0.500000	0.200000	0.750000	0.200000	0.200000	...	0.000000	0.200000	0.200000	
	0.500000	0.750000	0.750000	0.750000	0.750000	0.200000	0.750000	0.750000	0.750000	...	0.200000	0.200000	0.200000	
	0.750000	0.750000	0.750000	0.750000	1.000000	0.750000	0.750000	0.750000	0.750000	...	0.500000	0.500000	0.500000	
	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	...	1.000000	1.000000	1.000000	

ıns

Implementation

- **Load Dataset:** Import the relevant dataset containing information on both online and offline education modes. Then use data handling libraries like pandas in Python to read data from CSV files. Then perform initial exploration of the dataset, including:
    - Checking the number of rows and columns
    - Examining the data types of each column
    - Identifying missing values and outliers
    - Visualizing the distribution of numerical variables
    - Analysing the correlation between variables

```
In [39]:
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
mydf=pd.read_csv('null_check.csv')
print("dataFrame")
print(mydf)
```

```
2                    Neither agree nor disagree
3                                         Agree
4                                         Agree
..                                          ...
482                                 Highly agree
483                              Highly disagree
484                              Highly disagree
485                                    Disagree
486                  Neither agree nor disagree

     5. Your child faced  problem(s) to adapt the online mode of education during covid-19 phase.( কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে  সমস্যার সম্মুখীন হয়েছিল)    \
0                                         Agree
1                                   Highly agree
2                    Neither agree nor disagree
3                                         Agree
4                    Neither agree nor disagree
..                                          ...
482                                    Disagree
483                                    Disagree
```

In [40]:
```
1 mydf.head(10)
```

Out[40]:

1. Online mode of education is better than offline mode of education. (অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	19. I onlir mode educatic teach stude Interactic is bett tha offlir mode educatio (অনলাই শিশ পদ্ধতি অফলাই শিশ পদ্ধতি তুলনা শিক্ষকদে সা যোগাযো ভালো হয়
Disagree	Neither agree nor disagree	Agree	Agree	Agree	Agree	Neither agree nor disagree	Agree	Agree	Agree	...	Disagree	Neither agree nor disagree	Disagr
Highly disagree	Highly agree	Highly agree	Highly agree	Highly agree	Agree	Highly disagree	Highly agree	Highly disagree	Highly agree	...	Highly agree	Highly disagree	High disagr
Disagree	Disagree	Agree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	...	Neither agree nor disagree	Neither agree nor disagree	Neith agree n disagr
Neither agree nor disagree	Neither agree nor disagree	Agree	Agree	Agree	Agree	Disagree	Agree	Agree	Agree	...	Disagree	Disagree	Disagr
Neither agree nor disagree	Neither agree nor disagree	Agree	Agree	Neither agree nor disagree	Agree	Neither agree nor disagree	Agree	Agree	Neither agree nor disagree	...	Highly agree	Agree	Agr
Neither agree nor disagree	Agree	Disagree	Neither agree nor disagree	Agree	Neither agree nor disagree	Agree	Agree	Agree	Agree	...	Agree	Neither agree nor disagree	Disagr
Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	...	Agree	Agree	Agr
Disagree	Neither agree nor disagree	Agree	Agree	Highly agree	Agree	Neither agree nor disagree	Agree	Neither agree nor disagree	Highly agree	...	Disagree	Disagree	High disagr
Neither agree nor disagree	Neither agree nor disagree	Agree	Disagree	Disagree	Disagree	Disagree	Disagree	Neither agree nor disagree	Disagree	...	Neither agree nor disagree	Neither agree nor disagree	Disagr
Highly disagree	Neither agree nor disagree	Highly disagree	Agree	Neither agree nor disagree	Highly agree	Neither agree nor disagree	Agree	Neither agree nor disagree	Neither agree nor disagree	...	Highly agree	Neither agree nor disagree	High agr

rows × 26 columns

- **String Replacement:** For analysis and uniformity, standardize text data. Better data consistency can therefore be achieved by substituting uniform float values for irregular or undesirable string patterns. *As follows:- As we have 5 parameters* (*Highly agree, Agree, Neither agree nor disagree, Disagree, Highly disagree*), so we replace them with o to 1 float values (1, 0.75, 0.5, 0.2, 0)

In [41]:
```
mydf.replace(to_replace="Highly agree", value=1,inplace=True)
mydf.replace(to_replace="Agree", value=0.75,inplace=True)
mydf.replace(to_replace="Neither agree nor disagree", value=0.5,inplace=True)
mydf.replace(to_replace="Disagree", value=0.2,inplace=True)
mydf.replace(to_replace="Highly disagree", value=0,inplace=True)
mydf.replace(to_replace="Very High",value=1,inplace=True)
mydf.replace(to_replace="High", value=0.75,inplace=True)
mydf.replace(to_replace="Neither high nor low", value=0.5,inplace=True)
mydf.replace(to_replace="low", value=0.2,inplace=True)
mydf.replace(to_replace="Very Low", value=0,inplace=True)
mydf.to_csv('null_check1.csv',index=False)
```

In [42]:
```
mydf=pd.read_csv('null_check1.csv')
mydf.head(500)
```

Out[42]:

1. Online mode of education is better than offline mode of education. (অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	19. I onlin mode c educatio teache studer interactio is bette tha offlin mode c educatior (অনলাই শিক্ষ পদ্ধতিতে অফলাই শিক্ষ পদ্ধতি তুলনা শিক্ষকদে সাে যোগাযোগ ভালো হয়
0.2	0.5	0.75	0.75	0.75	0.75	0.5	0.75	0.75	0.75	...	0.20	0.50	0.2
0.0	1.0	1.00	1.00	1.00	0.75	0.0	1.00	0.00	1.00	...	1.00	0.00	0.0
0.2	0.2	0.75	0.50	0.50	0.50	0.5	0.50	0.50	0.50	...	0.50	0.50	0.5
0.5	0.5	0.75	0.75	0.75	0.75	0.2	0.75	0.75	0.75	...	0.20	0.20	0.2
0.5	0.5	0.75	0.75	0.50	0.75	0.5	0.75	0.75	0.50	...	1.00	0.75	0.7
...	...	...	...	...	...	...	...	...	...	...	...	...	.
0.2	0.5	1.00	1.00	0.20	0.75	0.0	0.75	0.20	0.75	...	0.50	NaN	0.7
0.2	0.2	1.00	0.00	0.20	0.50	0.2	0.75	NaN	0.75	...	0.50	NaN	0.7
0.2	0.0	1.00	0.00	0.20	0.75	0.2	0.75	0.75	0.75	...	0.50	NaN	0.7
0.2	0.2	1.00	0.20	0.20	0.75	0.2	0.75	1.00	0.75	...	0.75	NaN	0.7
0.2	0.2	1.00	0.50	0.20	0.75	0.2	0.75	1.00	0.75	...	0.50	NaN	0.7

ows × 26 columns

- **Null Value Check & Remove:** Missing values in the dataset can be found and handled with functions like isnull() and isna(). After that, eliminate any rows or columns that have missing values.

In [43]:
```
newdf1=mydf.copy()
print("after remove the rows contating null value")
ndf1=newdf1.dropna()
print(ndf1)

```

```
3                                1.00
4                                0.75
..                                ...
472                              0.00
473                              0.75
474                              0.50
475                              0.75
478                              0.20

     23. According to your location, please rate your internet connection.( আপনার অবস্থান অনুযায়ী, দয়া করে আপনার ইন্টারনেট সংযোগের মূল্যায়ন করুন )  \
0                                0.50
1                                0.75
2                                0.50
3                                0.75
4                                0.75
..                                ...
472                              1.00
473                              0.20
474                              0.75
```

In [44]:
```
1 ndf1.head(500)
```

Out[44]:

	1. Online mode of education is better than offline mode of education. (অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	
0	0.2	0.50	0.75	0.75	0.75	0.75	0.50	0.75	0.75	0.75	...	0.2	0.50	
1	0.0	1.00	1.00	1.00	1.00	0.75	0.00	1.00	0.00	1.00	...	1.0	0.00	
2	0.2	0.20	0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	...	0.5	0.50	
3	0.5	0.50	0.75	0.75	0.75	0.75	0.20	0.75	0.75	0.75	...	0.2	0.20	
4	0.5	0.50	0.75	0.75	0.50	0.75	0.50	0.75	0.75	0.50	...	1.0	0.75	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
472	1.0	1.00	0.50	0.20	0.00	0.00	1.00	0.20	1.00	0.00	...	1.0	1.00	
473	0.2	0.20	0.75	0.75	0.00	0.75	0.20	0.75	1.00	1.00	...	1.0	0.00	
474	0.5	0.50	0.20	0.75	0.00	1.00	0.75	1.00	0.75	0.20	...	0.5	0.50	
475	0.2	0.75	0.50	0.50	0.00	1.00	0.00	1.00	0.75	0.50	...	0.0	0.20	
478	0.0	0.20	1.00	0.50	0.20	0.75	0.20	0.75	1.00	0.75	...	0.0	0.00	

477 rows × 26 columns

- **Null Value replaced with mean value:** Determine the average value for numerical columns that contain missing data. The computed mean is then used to fill in the missing numbers.

In [45]:
```
print("replaceing null value with mean value")
medf=mydf.fillna(mydf.mean())
print(medf)
```

```
483                                0.50
484                                0.50
485                                0.20
486                                0.50

     27. Online mode of education can be brought in Indian education system.( ভারতীয় শিক্ষা ব্যবস্থায় অনলাইন শিক্ষা ব্যবস্থা আনা যেতে পারে )
0                                  0.20
1                                  0.00
2                                  0.50
3                                  0.50
4                                  0.75
..                                  ...
482                                0.50
483                                0.00
484                                0.00
485                                0.00
486                                0.00

[487 rows x 26 columns]
```

In [46]:
```
medf.head(500)
```

Out[46]:

	1. Online mode of education is better than offline mode of education. (অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	
0	0.2	0.5	0.75	0.75	0.75	0.75	0.5	0.75	0.750000	0.75	...	0.20	0.500000	
1	0.0	1.0	1.00	1.00	1.00	0.75	0.0	1.00	0.000000	1.00	...	1.00	0.000000	
2	0.2	0.2	0.75	0.50	0.50	0.50	0.5	0.50	0.500000	0.50	...	0.50	0.500000	
3	0.5	0.5	0.75	0.75	0.75	0.75	0.2	0.75	0.750000	0.75	...	0.20	0.200000	
4	0.5	0.5	0.75	0.75	0.50	0.75	0.5	0.75	0.750000	0.50	...	1.00	0.750000	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
482	0.2	0.5	1.00	1.00	0.20	0.75	0.0	0.75	0.200000	0.75	...	0.50	0.380713	
483	0.2	0.2	1.00	0.00	0.20	0.50	0.2	0.75	0.559897	0.75	...	0.50	0.380713	
484	0.2	0.0	1.00	0.00	0.20	0.75	0.2	0.75	0.750000	0.75	...	0.50	0.380713	
485	0.2	0.2	1.00	0.20	0.20	0.75	0.2	0.75	1.000000	0.75	...	0.75	0.380713	
486	0.2	0.2	1.00	0.50	0.20	0.75	0.2	0.75	1.000000	0.75	...	0.50	0.380713	

487 rows × 26 columns

- **Delete Duplicate Values:** Find and eliminate duplicate data rows or records. To remove duplicates, use suitable functions such as drop_duplicates().

```
In [47]:
print("delete duplicate values")
me1df=medf.drop_duplicates()
print(me1df)
me1df.head(500)
```

0	0.2	0.5	0.75	0.75	0.75	0.75	0.5	0.75	0.750000	0.75	...	0.20	0.500000
1	0.0	1.0	1.00	1.00	1.00	0.75	0.0	1.00	0.000000	1.00	...	1.00	0.000000
2	0.2	0.2	0.75	0.50	0.50	0.50	0.5	0.50	0.500000	0.50	...	0.50	0.500000
3	0.5	0.5	0.75	0.75	0.75	0.75	0.2	0.75	0.750000	0.75	...	0.20	0.200000
4	0.5	0.5	0.75	0.75	0.50	0.75	0.5	0.75	0.750000	0.50	...	1.00	0.750000
...	...	...	...	...	...	...	...	...	...	...	...	...	...
482	0.2	0.5	1.00	1.00	0.20	0.75	0.0	0.75	0.200000	0.75	...	0.50	0.380713
483	0.2	0.2	1.00	0.00	0.20	0.50	0.2	0.75	0.559897	0.75	...	0.50	0.380713
484	0.2	0.0	1.00	0.00	0.20	0.75	0.2	0.75	0.750000	0.75	...	0.50	0.380713
485	0.2	0.2	1.00	0.20	0.20	0.75	0.2	0.75	1.000000	0.75	...	0.75	0.380713
486	0.2	0.2	1.00	0.50	0.20	0.75	0.2	0.75	1.000000	0.75	...	0.50	0.380713

477 rows × 26 columns

- **Size of the Dataset:** As certain the cleaned dataset's row and column counts. Print the dataset's size and dimensions.

In [48]:
```
1 me1df.shape
```

Out[48]: (477, 26)

In [49]:
```
1 me1df.columns
```

Out[49]:
```
Index(['1. Online mode of education is better than offline mode of education.( অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)',
       ' 2. Online mode of education is effective for your child.( অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর। ) ',
       ' 3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অন
লাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)  ',
       ' 4. Online mode of education effects on mental or physical health of your child( অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক
স্বাস্থ্যের উপর প্রভাব ফেলে)',
       ' 5. Your child faced  problem(s) to adapt the online mode of education during covid-19 phase.( কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন
শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে  সমস্যার সম্মুখীন হয়েছিল) ',
       ' 6. Your child is become phone addicted during online mode of education.( অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে ) ',
       ' 7. Children follow disciplines during online mode of education. ( অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা  পরায়ণ হয় ) ',
       ' 8. Children are getting lazy during online mode of education. ( অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে )',
       ' 9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselv
es on some extra activity. ( অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত
ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে )',
       ' 10. Your child is facing problem asking doubts during online mode of education.( আপনার সন্তান অনলাইন শিক্ষার সময়  সমস্যার সম্মুখীন হচ্ছে)
',
       ' 11. Economic status of student's guardian effects on  Online education .(  শিক্ষার্থীদের অভিভাবকদের অর্থনৈতিক অবস্থা অনলাইন শিক্ষার  ওপর
প্রভাব ফেলে) ',
       ' 12. Your child is facing problem to study from online study materials (like:- PDF). ( আপনার সন্তান অনলাইন অধ্যয়নের উপকরণ থেকে প
ড়াশোনা করতে সমস্যার সম্মুখীন হচ্ছে (like:- PDF).  ',
       ' 13. Your child is being addicted to gaming during online mode of education.(  অনলাইন শিক্ষার সময় আপনার সন্তান গেমিং-এ আসক্ত হচ্ছে ) ',
       ' 14. Your child is being addicted to social-media platforms (like:-Facebook, Instagram, YouTube). ( আপনার সন্তান সোশ্যাল মিডিয়া প্ল্যাটফর্মে
আসক্ত হচ্ছে (like:-Facebook, Instagram, YouTube).  ',
       ' 15. Your child is being addicted to OTT platforms and cartoons. ( আপনার সন্তান ওটিটি প্ল্যাটফর্ম এবং কার্টুনে আসক্ত হচ্ছে ) ',
       ' 16. Online class records are helpful for your child's studies. ( অনলাইন ক্লাসের রেকর্ড আপনার সন্তানের পড়াশোনার জন্য সহায়ক)  ',
       ' 17. Exams should be conducted through online mode.( অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)  ',
       ' 18. Your child is attentive in online classes.( আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী ) ',
       ' 19. In online mode of education teacher student interaction is better than offline mode of education. ( অনলাইন শিক্ষা পদ্ধতিতে অফলাইন
শিক্ষা পদ্ধতির তুলনায় শিক্ষকদের সাথে যোগাযোগ ভালো হয় ) ',
       ' 20. Your child is not getting bored during online classes.(  অনলাইন ক্লাসের সময় আপনার সন্তান বিরক্ত হচ্ছে না )  ',
       ' 21. Group study is helpful in offline mode of education.(  অফলাইন শিক্ষা পদ্ধতিতে দলগত অধ্যয়ন সহায়ক ) ',
       ' 23. According to your location, please rate your internet connection.(  আপনার অবস্থান অনুযায়ী, দয়া করে আপনার ইন্টারনেট সংযোগের
মূল্যায়ন করুন ) ',
       ' 24. Your child faced any problem to adapt offline mode of education after pandemic phase. (  মহামারী পর্বের পর আপনার সন্তান অফলাইন
শিক্ষা পদ্ধতির সঙ্গে মানিয়ে নিতে  সমস্যার সম্মুখীন হয়েছিল) ',
       ' 25. Proper school environment is better for your child education in compare to online mode of education.( অনলাইন শিক্ষার তুলনায় বিদ্যাল
য়ের উপযুক্ত পরিবেশ আপনার সন্তানের শিক্ষার জন্য ভালো ) ',
       ' 26. Your child is being distracted during online mode of education.( অনলাইন শিক্ষার সময় আপনার সন্তান অমনোযোগী হয়ে পড়ছে ) ',
       ' 27. Online mode of education can be brought in Indian education system.(  ভারতীয় শিক্ষা ব্যবস্থায় অনলাইন শিক্ষা ব্যবস্থা আনা যেতে পারে )  '],
      dtype='object')
```

In [50]:
```
1 me1df.describe()
```

Out[50]:

	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	19. In online mode of education teacher student interaction is better than offline mode of education. (অনলাইন শিক্ষা পদ্ধতিতে অফলাইন শিক্ষা পদ্ধতির তুলনায় শিক্ষকদের সাথে যোগাযোগ ভালো হয়)	c
	477.000000	477.000000	477.000000	477.000000	477.000000	477.000000	477.000000	477.000000	477.000000	...	477.000000	477.000000	477.000000	4
	0.412683	0.563522	0.643177	0.518973	0.671384	0.405660	0.706604	0.561467	0.603983	...	0.321069	0.378526	0.333857	
	0.289054	0.281839	0.280906	0.325640	0.289711	0.283027	0.257500	0.280755	0.273621	...	0.311528	0.281768	0.298088	
	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	0.000000	
	0.200000	0.200000	0.500000	0.200000	0.500000	0.200000	0.750000	0.200000	0.200000	...	0.000000	0.200000	0.200000	
	0.500000	0.750000	0.750000	0.750000	0.750000	0.200000	0.750000	0.750000	0.750000	...	0.200000	0.200000	0.200000	
	0.750000	0.750000	0.750000	0.750000	1.000000	0.750000	0.750000	0.750000	0.750000	...	0.500000	0.500000	0.500000	
	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	...	1.000000	1.000000	1.000000	

ins

- **PCA:** To improve model performance when working with a high number of features, use PCA to minimize the dataset's dimensionality. Determine the key characteristics that influence the data's variance. When training machine learning models, use the condensed feature set.

In [51]:
```
1 from sklearn.preprocessing import StandardScaler
2 from sklearn.decomposition import PCA
```

In [52]:
```
1 scaler = StandardScaler()
2 scaled_data = scaler.fit_transform(me1df)
```

In [53]:
```
1 pca = PCA(n_components=None)
2 pca.fit(scaled_data)
```

In [54]:
```
explained_variance=pca.explained_variance_ratio_
```

In [55]:
```
components=pca.components_
```

In [56]:
```
pca_df = pd.DataFrame(components,columns=me1df.columns)
explained_variance_df=pd.DataFrame(explained_variance,columns=['explained variance'])
```

In [57]:
```
pca_df.shape

```

Out[57]: (26, 26)

In [58]:
```
scaled_data.shape
```

Out[58]: (477, 26)

In [59]:
```


print(pca_df)#PCA Components
```

```
    1. Online mode of education is better than offline mode of education.( অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)  \
0                                           -0.233341
1                                            0.250648
2                                           -0.059033
3                                           -0.035952
4                                           -0.144793
5                                           -0.144544
6                                           -0.015787
7                                           -0.106680
8                                           -0.014541
9                                           -0.264253
10                                           0.110984
11                                          -0.277123
12                                          -0.147811
13                                           0.133469
14                                          -0.348796
15                                           0.045547
16                                           0.067373
17                                          -0.072179
```

In [60]:
```
pca_df.head(500)
```

Out[60]:

	1. Online mode of education is better than offline mode of education. (অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	n edu (অ পা অ শিক্ষ যো ভা
0	-0.233341	-0.237517	0.147137	0.239310	0.150426	0.251381	-0.190272	0.218260	-0.167128	0.240814	...	-0.188664	-0.236572	-0.
1	0.250648	0.263097	0.099903	0.113474	-0.036784	0.218473	0.154272	0.099210	0.211988	0.050542	...	0.190405	0.208173	0.
2	-0.059033	0.021767	-0.284728	0.044337	-0.135733	-0.031725	-0.071520	0.036271	-0.126877	-0.215933	...	-0.138726	-0.033883	-0.
3	-0.035952	-0.032574	0.261893	0.183585	0.477659	-0.188793	0.234042	-0.018919	0.005800	0.260378	...	0.024379	-0.013675	0.
4	-0.144793	-0.059081	-0.167049	-0.012748	-0.027286	0.156338	0.181392	0.296744	0.298414	-0.088433	...	-0.168154	-0.084000	0.
5	-0.144544	-0.099090	0.415279	-0.014997	-0.280168	0.027606	-0.206232	0.125852	-0.245474	0.066848	...	0.057451	0.047555	-0.
6	-0.015787	-0.051788	-0.213014	-0.008173	0.216968	0.086760	0.080225	-0.046850	0.010492	-0.172713	...	-0.352755	-0.161856	0.
7	-0.106680	0.008198	0.131979	-0.051034	-0.327112	-0.015431	-0.306624	0.014104	-0.046562	-0.026807	...	-0.069922	-0.080743	0.
8	-0.014541	0.092912	0.325755	0.010707	-0.067891	0.001716	-0.203812	0.282563	0.519439	0.111599	...	-0.185025	-0.048304	-0.
9	-0.264253	-0.384576	-0.104001	-0.070514	-0.017933	-0.023028	0.126431	0.138915	0.234064	0.089336	...	0.453332	-0.023593	0.
10	0.110984	0.067052	0.100736	-0.226319	-0.043444	-0.257165	0.099965	-0.371167	0.259032	-0.003857	...	-0.220291	-0.309681	-0.
11	-0.277123	-0.194564	-0.211705	0.054974	-0.395114	-0.031048	0.236668	-0.073657	0.325266	0.083970	...	-0.158106	0.109910	-0.
12	-0.147811	-0.152403	0.410283	-0.406859	0.113282	0.100380	0.375677	-0.152560	-0.063204	0.091899	...	-0.254366	0.075112	0.
13	0.133469	0.078367	-0.023906	0.126743	-0.065254	-0.005930	0.460561	0.381282	-0.097129	0.069037	...	0.055977	0.208423	-0.
14	-0.348796	-0.207110	-0.092499	-0.061569	0.121793	-0.060531	-0.016197	-0.240498	-0.166634	-0.070096	...	0.229628	0.245209	-0.
15	0.045547	-0.052704	0.267532	0.435200	-0.405046	0.193363	0.348865	-0.307020	-0.164200	-0.212231	...	-0.077273	-0.033674	0.
16	0.067373	0.043423	-0.200024	-0.371224	-0.133048	-0.064813	0.168581	0.321893	-0.375842	0.191990	...	-0.265389	-0.072531	0.
17	-0.072179	0.075566	-0.067167	0.236278	0.198410	0.172141	-0.189638	-0.072264	0.041914	0.047565	...	-0.393238	0.515268	0.
18	0.136833	0.145915	0.156738	-0.385532	-0.105990	0.088390	-0.041162	0.090717	-0.008895	-0.083719	...	0.137204	0.192150	0.
19	0.160697	0.180222	-0.196895	0.026059	-0.032001	0.262656	-0.011166	-0.323498	0.016896	0.499331	...	0.149291	-0.189964	-0.
20	0.018045	-0.149897	-0.120828	-0.083410	-0.161753	0.296072	-0.059389	-0.112843	0.043279	0.435366	...	0.001320	-0.051360	-0.
21	-0.099561	0.028008	0.000242	-0.241282	-0.014796	0.089644	-0.103763	-0.188271	0.144423	0.012450	...	-0.072306	0.457213	-0.
22	-0.069697	0.195338	-0.085814	0.095977	-0.180999	-0.366191	-0.003501	-0.013046	-0.135210	0.427919	...	-0.100457	0.199875	0.
23	-0.473254	0.568003	0.018653	-0.014694	0.035443	0.020167	0.030036	0.004706	0.019021	-0.087577	...	0.151000	-0.193754	0.
24	-0.455516	0.360465	0.007684	0.032278	-0.010684	0.024537	0.148150	-0.010955	-0.054410	0.065958	...	-0.030179	-0.034082	-0.
25	-0.032497	0.086653	-0.036220	-0.188563	0.085750	0.601899	0.040012	-0.008682	-0.077729	-0.105961	...	0.047956	-0.043160	-0.

26 rows × 26 columns

In [61]:
```
print(explained_variance_df)#explained Variance Ratios
```

	explained variance
0	0.315150
1	0.089038
2	0.060863
3	0.050501
4	0.040055
5	0.037278
6	0.035012
7	0.033636
8	0.029029
9	0.028614
10	0.027264
11	0.025537
12	0.023332
13	0.022316
14	0.021365
15	0.020159
16	0.019498
17	0.018620
18	0.016572
19	0.015420
20	0.015083
21	0.013359
22	0.012280
23	0.010568
24	0.010138
25	0.009309

In [62]:
```
abs_loadings = pca_df.abs()
print(abs_loadings)
```

2	0.071920
3	0.234042
4	0.181392
5	0.206232
6	0.080225
7	0.306624
8	0.203812
9	0.128431
10	0.099965
11	0.236668
12	0.375677
13	0.460561
14	0.016197
15	0.348865
16	0.168581
17	0.189638
18	0.041162
19	0.011166
20	0.059389
21	0.103763

In [63]:
```
top_n = 2
top_features = {}
for i in range(abs_loadings.shape[1]):
 top_features[f'pc{i}'] = abs_loadings.iloc[:,i].nlargest(top_n).index.tolist()
 for pc, features in top_features.items():
  pass
 print(f"{pc}:{features}")
```

```
pc0:[23, 24]
pc1:[23, 9]
pc2:[5, 12]
pc3:[15, 12]
pc4:[3, 15]
pc5:[25, 22]
pc6:[13, 12]
pc7:[13, 10]
pc8:[8, 16]
pc9:[19, 20]
pc10:[11, 9]
pc11:[10, 16]
pc12:[24, 25]
pc13:[25, 23]
pc14:[22, 3]
pc15:[16, 13]
pc16:[9, 17]
pc17:[17, 21]
pc18:[14, 13]
pc19:[4, 14]
pc20:[7, 3]
pc21:[5, 7]
pc22:[6, 4]
pc23:[18, 2]
pc24:[21, 17]
pc25:[20, 19]
```

In [64]:
```
cumulative_contributions = abs_loadings.sum(axis=1)
```

In [65]:
```
s_c = cumulative_contributions.sort_values(ascending=False)
```

In [66]:
```
print("cumulative_contributions")
print(s_c)
```

```
cumulative_contributions
0    4.825344
1    4.675624
15   4.193783
14   4.132967
2    4.111655
10   4.075042
11   4.023073
17   4.022059
12   3.988028
16   3.969251
13   3.895416
22   3.865020
3    3.863956
19   3.851996
18   3.802739
20   3.731661
8    3.722221
4    3.619198
9    3.606813
6    3.578038
21   3.516599
5    3.403672
7    3.390326
24   3.230073
25   3.205734
23   3.190665
dtype: float64
```

In [67]:
```
most_imp_feature = s_c.idxmax()
h_c = s_c.max()
```

In [68]:
```
print(f"\n most img feature: {most_imp_feature} with contribution: {h_c}")
```

```
most img feature: 0 with contribution: 4.825343505300405
```

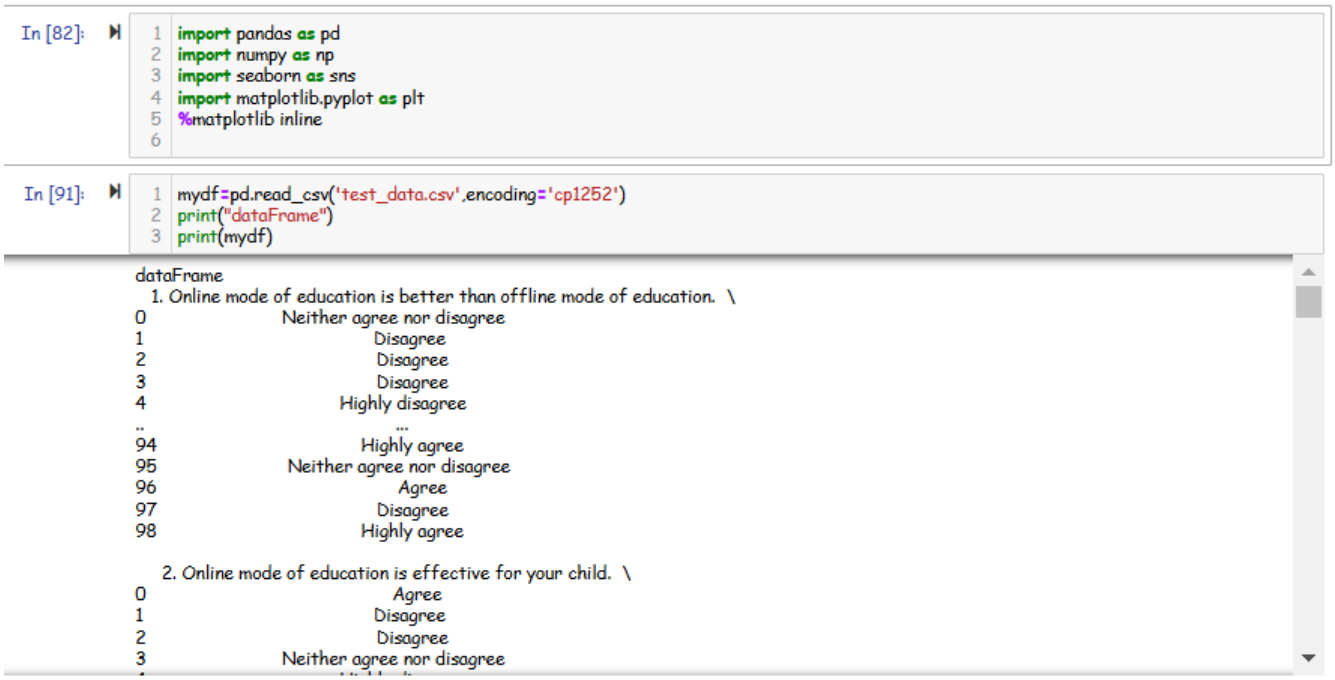
Testing:

Evaluating a system, product, or procedure to make sure it satisfies requirements and performs as intended is known as testing. Error detection and correction, performance verification, and quality assurance are all part of it. A wide range of industries, including software development, manufacturing, healthcare, and education, rely on testing.

- ***Load Dataset***:- Bring in a dataset with information about both online and offline teaching approaches. Data from CSV files can then be read using Python's pandas and other data-handling modules. After that, carry out preliminary dataset exploration, including:

Analyzing the data types of each column, determining the number of rows and columns, spotting outliers and missing values, and visualizing the distribution of numerical variables

Examining the relationship between variables.



```
In [82]:
1 import pandas as pd
2 import numpy as np
3 import seaborn as sns
4 import matplotlib.pyplot as plt
5 %matplotlib inline
6
```

```
In [91]:
1 mydf=pd.read_csv('test_data.csv',encoding='cp1252')
2 print("dataFrame")
3 print(mydf)
```

```
dataFrame
   1. Online mode of education is better than offline mode of education.  \
0                        Neither agree nor disagree
1                                          Disagree
2                                          Disagree
3                                          Disagree
4                                   Highly disagree
..                                              ...
94                                  Highly agree
95                       Neither agree nor disagree
96                                           Agree
97                                         Disagree
98                                  Highly agree

    2. Online mode of education is effective for your child.  \
0                                           Agree
1                                         Disagree
2                                         Disagree
3                        Neither agree nor disagree
```

In [92]:
```
1 mydf.head(10)
```

Out[92]:

	1. Online mode of education is better than offline mode of education.	2. Online mode of education is effective for your child.	3. Your child faces problem(s) to convert the offline mode of education to online mode of education.	4. Online mode of education effects on mental or physical health of your child	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.	6. Your child is become phone addicted during online mode of education.	7. Children follow disciplines during online mode of education.	8. Children are getting lazy during online mode of education.	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity.	10. Your child is facing problem asking doubts during online mode of education.	...	17. Exams should be conducted through online mode.	18. Your child is attentive in online classes.	19 onl mode educat teac stud interact is bet th offl mode educati
0	Neither agree nor disagree	Agree	Neither agree nor disagree	Neither agree nor disagree	Highly disagree	Highly agree	Disagree	Agree	Agree	Disagree	...	Highly disagree	Neither agree nor disagree	Neit agree disag
1	Disagree	Disagree	Agree	Agree	Highly disagree	Agree	Neither agree nor disagree	Highly agree	Highly disagree	Highly agree	...	Highly disagree	Neither agree nor disagree	Hig disag
2	Disagree	Disagree	Agree	Agree	Highly disagree	Highly agree	Disagree	Highly agree	Agree	Agree	...	Disagree	Disagree	Ag
3	Disagree	Neither agree nor disagree	Agree	Highly agree	Highly disagree	Highly agree	Disagree	Highly agree	Highly agree	Agree	...	Highly disagree	Neither agree nor disagree	Hig disag
4	Highly disagree	Highly disagree	Highly agree	Highly agree	Highly disagree	Highly agree	Highly disagree	Highly agree	Agree	Neither agree nor disagree	...	Highly disagree	Agree	Hig disag
5	Highly disagree	Disagree	Disagree	Highly agree	Highly disagree	Highly agree	Disagree	Agree	Neither agree nor disagree	Agree	...	Highly disagree	Neither agree nor disagree	Neit agree disag
6	Disagree	Disagree	Agree	Neither agree nor disagree	Highly disagree	Agree	Highly disagree	Agree	Agree	Agree	...	Disagree	Neither agree nor disagree	Disag
7	Neither agree nor disagree	Agree	Neither agree nor disagree	Agree	Highly disagree	Agree	Agree	Highly agree	Highly agree	Neither agree nor disagree	...	Neither agree nor disagree	Agree	Ag
8	Highly agree	Agree	Neither agree nor disagree	Agree	Highly disagree	Highly agree	Highly agree	Highly agree	Agree	Agree	...	Neither agree nor disagree	Agree	Disag
9	Neither agree nor disagree	Neither agree nor disagree	Agree	Agree	Highly disagree	Disagree	Agree	Disagree	Neither agree nor disagree	Disagree	...	Neither agree nor disagree	Agree	Disag

10 rows × 26 columns

- **String Replacement:** For analysis and uniformity, standardize text data. Better data consistency can therefore be achieved by substituting uniform float values for irregular or undesirable string patterns. *As follows:- As we have 5 parameters* (*Highly agree, Agree, Neither agree nor disagree, Disagree, Highly disagree*), so we replace them with o to 1 float values (1, 0.75, 0.5, 0.2, 0)

In [129]:
```
mydf.replace(to_replace="Highly agree ", value=1,inplace=True)
mydf.replace(to_replace="Agree ", value=0.75,inplace=True)
mydf.replace(to_replace="Neither agree nor disagree ", value=0.5,inplace=True)
mydf.replace(to_replace="Disagree ", value=0.2,inplace=True)

mydf.replace(to_replace="Highly disagree(", value=0,inplace=True)
mydf.replace(to_replace="Very High ",value=1,inplace=True)
mydf.replace(to_replace="High ", value=0.75,inplace=True)
mydf.replace(to_replace="Neither high nor low ", value=0.5,inplace=True)
mydf.replace(to_replace="low ", value=0.2,inplace=True)
mydf.replace(to_replace="Very Low ", value=0,inplace=True)
mydf.to_csv('test_check.csv',index=False)
```

In [130]:
```
mydf=pd.read_csv('test_check.csv')
mydf.head(500)
```

Out[130]:

	1. Online mode of education is better than offline mode of education.	2. Online mode of education is effective for your child.	3. Your child faces problem(s) to convert the offline mode of education to online mode of education.	4. Online mode of education effects on mental or physical health of your child	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.	6. Your child is become phone addicted during online mode of education.	7. Children follow disciplines during online mode of education.	8. Children are getting lazy during online mode of education.	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity.	10. Your child is facing problem asking doubts during online mode of education.	...	17. Exams should be conducted through online mode.	18. Your child is attentive in online classes.	1 or moc educa tea stu interac is be t of moc educat
0	0.50	0.75	0.50	0.50	0.00	1.00	0.20	0.75	0.75	0.20	...	0.00	0.50	
1	0.20	0.20	0.75	0.75	0.00	0.75	0.50	1.00	0.00	1.00	...	0.00	0.50	
2	0.20	0.20	0.75	0.75	0.00	1.00	0.20	1.00	0.75	0.75	...	0.20	0.20	
3	0.20	0.50	0.75	1.00	0.00	1.00	0.20	1.00	1.00	0.75	...	0.00	0.50	
4	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.75	0.50	...	0.00	0.75	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
94	1.00	0.75	0.50	1.00	0.75	1.00	0.20	1.00	0.50	0.75	...	0.50	0.20	
95	0.50	0.50	0.50	0.50	0.20	0.75	0.50	0.75	0.75	0.20	...	0.75	0.50	
96	0.75	0.20	0.50	0.75	0.20	0.75	0.75	0.75	0.75	0.75	...	0.20	0.20	
97	0.20	0.20	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	...	0.20	0.75	
98	1.00	1.00	0.20	0.20	0.20	0.50	0.50	0.75	0.75	0.20	...	1.00	1.00	

99 rows × 26 columns

- **Null Value Check & Remove:** Missing values in the dataset can be found and handled with functions like isnull() and isna(). After that, eliminate any rows or columns that have missing values.

In [131]:
```
newdf1=mydf.copy()
print("after remove the rows containing null value")
ndf1=newdf1.dropna()
print(ndf1)
```

```
after remove the rows containing null value
   1. Online mode of education is better than offline mode of education.  \
0                                                0.50
1                                                0.20
2                                                0.20
3                                                0.20
4                                                0.00
..                                                ...
94                                               1.00
95                                               0.50
96                                               0.75
97                                               0.20
98                                               1.00

    2. Online mode of education is effective for your child.  \
0                                                0.75
1                                                0.20
2                                                0.20
3                                                0.50
```

In [132]:
```
ndf1.head(100)
```

Out[132]:

	1. Online mode of education is better than offline mode of education.	2. Online mode of education is effective for your child.	3. Your child faces problem(s) to convert the offline mode of education to online mode of education.	4. Online mode of education effects on mental or physical health of your child	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.	6. Your child is become phone addicted during online mode of education.	7. Children follow disciplines during online mode of education.	8. Children are getting lazy during online mode of education.	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity.	10. Your child is facing problem asking doubts during online mode of education.	...	17. Exams should be conducted through online mode.	18. Your child is attentive in online classes.	1 o mo educa tea stu Interac is b of mo educa
0	0.50	0.75	0.50	0.50	0.00	1.00	0.20	0.75	0.75	0.20	...	0.00	0.50	
1	0.20	0.20	0.75	0.75	0.00	0.75	0.50	1.00	0.00	1.00	...	0.00	0.50	
2	0.20	0.20	0.75	0.75	0.00	1.00	0.20	1.00	0.75	0.75	...	0.20	0.20	
3	0.20	0.50	0.75	1.00	0.00	1.00	0.20	1.00	1.00	0.75	...	0.00	0.50	
4	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.75	0.50	...	0.00	0.75	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
94	1.00	0.75	0.50	1.00	0.75	1.00	0.20	1.00	0.50	0.75	...	0.50	0.20	
95	0.50	0.50	0.50	0.50	0.20	0.75	0.50	0.75	0.75	0.20	...	0.75	0.50	
96	0.75	0.20	0.50	0.75	0.20	0.75	0.75	0.75	0.75	0.75	...	0.20	0.20	
97	0.20	0.20	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	...	0.20	0.75	
98	1.00	1.00	0.20	0.20	0.20	0.50	0.50	0.75	0.75	0.20	...	1.00	1.00	

99 rows × 26 columns

- **Null Value replaced with mean value:** Determine the average value for numerical columns that contain missing data. The computed mean is then used to fill in the missing numbers.

```
In [139]:
print("replaceing null value with mean value")
medf=mydf.fillna(mydf.mean())
print(medf)
```

```
replaceing null value with mean value
    1. Online mode of education is better than offline mode of education.  \
0                                                0.50
1                                                0.20
2                                                0.20
3                                                0.20
4                                                0.00
..                                                ...
94                                               1.00
95                                               0.50
96                                               0.75
97                                               0.20
98                                               1.00

    2. Online mode of education is effective for your child.  \
0                                                0.75
1                                                0.20
2                                                0.20
3                                                0.50
```

- **Delete Duplicate Values:** Find and eliminate duplicate data rows or records. To remove duplicates, use suitable functions such as drop_duplicates().

```
In [140]:
print("delete duplicate values")
me1df=medf.drop_duplicates()
print(me1df)
me1df.head(500)
```

```
delete duplicate values
    1. Online mode of education is better than offline mode of education.  \
0                                                0.50
1                                                0.20
2                                                0.20
3                                                0.20
4                                                0.00
..                                                ...
94                                               1.00
95                                               0.50
96                                               0.75
97                                               0.20
98                                               1.00

    2. Online mode of education is effective for your child.  \
0                                                0.75
1                                                0.20
2                                                0.20
```

- **Size of the Dataset:** As certain the cleaned dataset's row and column counts. Print the dataset's size and dimensions.

```
In [134]: 1 meldf.shape
Out[134]: (97, 26)
```

```
In [135]: 1 meldf.columns
Out[135]: Index(['1. Online mode of education is better than offline mode of education.',
       ' 2. Online mode of education is effective for your child.',
       ' 3. Your child faces problem(s) to convert the offline mode of education to online mode of education. ',
       ' 4. Online mode of education effects on mental or physical health of your child',
       ' 5. Your child faced  problem(s) to adapt the online mode of education during covid-19 phase.',
       ' 6. Your child is become phone addicted during online mode of education.',
       ' 7. Children follow disciplines during online mode of education. ',
       ' 8. Children are getting lazy during online mode of education. ',
       ' 9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themsel
ves on some extra activity.',
       ' 10. Your child is facing problem asking doubts during online mode of education.',
       ' 11. Economic status of studentƒ??s guardian effects on  Online education .',
       ' 12. Your child is facing problem to study from online study materials (like:- PDF). ',
       ' 13. Your child is being addicted to gaming during online mode of education.',
       ' 14. Your child is being addicted to social-media platforms.',
       ' 15. Your child is being addicted to OTT platforms and cartoons. ',
       ' 16. Online class records are helpful for your childƒ??s studies.',
       ' 17. Exams should be conducted through online mode.',
       ' 18. Your child is attentive in online classes.',
       ' 19. In online mode of education teacher student interaction is better than offline mode of education.',
       ' 20. Your child is not getting bored during online classes.',
       ' 21. Group study is helpful in offline mode of education.',
       '23. According to your location, please rate your internet connection.',
       ' 24. Your child faced any problem to adapt offline mode of education after pandemic phase.',
       ' 25. Proper school environment is better for your child education in compare to online mode of education.',
       ' 26. Your child is being distracted during online mode of education.',
       ' 27. Online mode of education can be brought in Indian education system.'],
      dtype='object')
```

```
In [136]: 1 meldf.describe()
```

Out[136]:

	1. Online mode of education is better than offline mode of education.	2. Online mode of education is effective for your child.	3. Your child faces problem(s) to convert the offline mode of education to online mode of education.	4. Online mode of education effects on mental or physical health of your child	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.	6. Your child is become phone addicted during online mode of education.	7. Children follow disciplines during online mode of education.	8. Children are getting lazy during online mode of education.	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity.	10. Your child is facing problem asking doubts during online mode of education.	...	17. Exams should be conducted through online mode.	18. Your child is attentive in online classes.	e In e
count	97.000000	97.000000	97.000000	97.000000	97.000000	97.000000	97.000000	97.000000	97.000000	97.000000	...	97.000000	97.000000	9
mean	0.451546	0.523196	0.603093	0.663918	0.300515	0.727320	0.439175	0.729697	0.642784	0.698969	...	0.422680	0.546907	
std	0.339765	0.324925	0.273749	0.299262	0.384701	0.297299	0.321716	0.278263	0.267705	0.249372	...	0.367921	0.292423	
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000	
25%	0.200000	0.200000	0.500000	0.500000	0.000000	0.500000	0.200000	0.750000	0.500000	0.750000	...	0.200000	0.200000	
50%	0.500000	0.500000	0.750000	0.750000	0.000000	0.750000	0.200000	0.750000	0.750000	0.750000	...	0.200000	0.500000	
75%	0.750000	0.750000	0.750000	0.750000	0.750000	1.000000	0.750000	1.000000	0.750000	0.750000	...	0.750000	0.750000	
max	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	...	1.000000	1.000000	

8 rows × 26 columns

- **PCA:** To improve model performance when working with a high number of features, use PCA to minimize the dataset's dimensionality. Determine the key characteristics that influence the data's variance. When training machine learning models, use the condensed feature set.

```
In [137]:
from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA

In [138]:
scaler = StandardScaler()
scaled_data = scaler.fit_transform(meldf)

In [141]:
pca = PCA(n_components=None)
pca.fit(scaled_data)

In [142]:
explained_variance=pca.explained_variance_ratio_

In [143]:
components=pca.components_

In [144]:
pca_df = pd.DataFrame(components,columns=meldf.columns)
explained_variance_df=pd.DataFrame(explained_variance,columns=['explained variance'])

In [145]:
pca_df.shape

Out[145]: (26, 26)

In [146]:
scaled_data.shape

Out[146]: (97, 26)

In [147]:
print(pca_df)#PCA Components

    1. Online mode of education is better than offline mode of education.  \
0                                          -0.228182
1                                           0.186168
2                                           0.030292
3                                          -0.156911
4                                           0.312890
5                                          -0.241569
6                                          -0.080657
7                                          -0.116128
8                                          -0.032847
9                                          -0.239468
10                                          0.145551
11                                          0.004893
12                                          0.007001
13                                         -0.088624
14                                          0.142203
15                                         -0.107617
16                                          0.091413
17                                          0.342094
```

In [148]:
```
pca_df.head(500)
```

Out[148]:

	1. Online mode of education is better than offline mode of education.	2. Online mode of education is effective for your child.	3. Your child faces problem(s) to convert the offline mode of education to online mode of education.	4. Online mode of education effects on mental or physical health of your child	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.	6. Your child is become phone addicted during online mode of education.	7. Children follow disciplines during online mode of education.	8. Children are getting lazy during online mode of education.	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity.	10. Your child is facing problem asking doubts during online mode of education.	...	17. Exams should be conducted through online mode.	18. Your child is attentive in online classes.	c mo educ te st Intera is l c mo educ
0	-0.228182	-0.222592	0.012250	0.252836	-0.099050	0.257802	-0.216963	0.259406	-0.131810	0.187039	...	-0.258114	-0.211200	-0.2
1	0.186168	0.204438	0.274282	0.190855	0.203300	0.129904	0.187508	0.141413	0.222857	0.272533	...	0.153632	0.118516	0.2
2	0.030292	0.111999	-0.030853	0.032720	-0.374596	0.092307	-0.012045	0.153926	0.070813	-0.179980	...	0.138823	0.253545	0.0
3	-0.156911	-0.013703	0.508561	0.058562	-0.207239	-0.110802	-0.205620	-0.194886	-0.069965	0.016953	...	-0.208960	-0.028064	0.0
4	0.312890	0.028422	-0.201149	-0.159566	0.223210	-0.150561	-0.166303	0.043152	0.251340	-0.114193	...	-0.099150	-0.265633	-0.1
5	-0.241569	-0.288854	-0.322629	0.171893	-0.006724	0.032636	0.084358	-0.101857	0.116168	-0.128125	...	-0.005846	0.066618	0.3
6	-0.060657	0.201880	-0.073023	0.000989	-0.329197	0.112638	-0.371759	-0.018552	0.396235	0.074336	...	-0.282438	-0.204307	-0.0
7	-0.116128	0.105200	0.166349	0.057968	-0.083185	-0.315748	-0.045006	-0.305681	-0.029122	0.122621	...	0.163204	0.035096	-0.1
8	-0.032847	-0.062264	-0.086806	0.024003	0.141588	-0.181790	-0.148135	-0.043894	-0.207569	0.322571	...	-0.067058	0.044701	-0.1
9	-0.239468	-0.338539	-0.115200	0.022208	0.101181	0.152547	-0.113740	-0.001659	0.453114	0.072556	...	-0.024355	0.356672	0.0
10	0.145551	0.065630	0.151784	-0.078882	-0.271633	-0.167939	0.189119	-0.161857	0.380078	0.201282	...	-0.175051	0.172391	-0.1
11	0.004893	-0.197792	0.063326	-0.262871	0.054796	0.067006	-0.328569	0.061101	-0.258099	0.191510	...	0.179347	0.355109	-0.0
12	0.007001	-0.159225	0.086659	-0.215572	0.229857	-0.137835	0.135943	0.064386	0.002445	0.132332	...	-0.097378	-0.269004	-0.1
13	-0.088624	0.069924	0.174866	-0.409121	0.215275	-0.044023	-0.252739	0.038628	-0.078590	-0.258053	...	-0.218902	0.034756	0.1
14	0.142203	-0.193643	-0.116776	-0.159028	0.085478	-0.194899	-0.097203	0.310454	0.296501	0.260276	...	0.123762	-0.130112	0.0
15	-0.107617	0.291301	0.246500	0.395111	0.490055	0.115469	-0.291724	0.149897	0.171146	-0.173813	...	0.024704	0.075685	-0.0
16	0.091413	-0.253392	0.311573	-0.184431	0.051216	0.143796	0.198563	-0.063195	0.210423	-0.360299	...	-0.005590	0.117512	-0.3
17	0.342094	0.188233	-0.239842	-0.068173	0.093354	0.109427	-0.234991	-0.219883	-0.072590	0.188037	...	-0.208944	0.467736	-0.0
18	0.543670	-0.235709	0.212571	0.110255	-0.229741	0.315866	-0.122278	0.215045	-0.120082	-0.005398	...	0.144876	-0.093874	-0.0
19	-0.004284	0.201438	-0.155682	-0.160084	0.130335	0.615804	0.149979	-0.411017	-0.034944	0.077226	...	-0.019849	-0.232274	-0.0
20	0.007265	-0.090271	0.228238	-0.190808	0.061943	0.075582	-0.217273	-0.297507	0.183117	0.122851	...	0.278624	-0.190618	0.4
21	0.075019	0.298703	-0.029971	-0.170212	-0.134438	-0.023102	0.028463	0.294690	-0.051597	-0.008528	...	-0.293183	0.000120	0.4
22	0.147699	-0.356537	0.149382	0.078696	0.072306	0.101234	0.070169	-0.180426	-0.048434	0.128610	...	-0.439782	-0.005961	0.2
23	0.302389	-0.117976	-0.046801	0.325043	0.148369	-0.220502	0.055023	-0.139028	-0.041757	-0.255976	...	-0.317452	0.073642	0.1
24	0.192807	-0.014866	-0.092963	0.333201	-0.024401	-0.138227	-0.167025	-0.259960	0.012483	0.114595	...	0.194103	-0.187529	-0.0
25	0.122718	-0.104612	-0.130281	-0.020914	-0.125953	-0.052178	-0.358979	-0.162269	0.007005	-0.397431	...	0.169765	-0.068761	0.0

26 rows × 26 columns

In [151]:

```
top_n = 2
top_features = {}
for i in range(abs_loadings.shape[1]):
 top_features[f'pc{i}'] = abs_loadings.iloc[:,i].nlargest(top_n).index.tolist()
 for pc, features in top_features.items():
  pass
 print(f"{pc}:{features}")
```

```
pc0:[18, 17]
pc1:[22, 9]
pc2:[3, 5]
pc3:[13, 15]
pc4:[15, 2]
pc5:[19, 18]
pc6:[6, 25]
pc7:[19, 14]
pc8:[9, 6]
pc9:[25, 16]
pc10:[13, 7]
pc11:[25, 12]
pc12:[24, 13]
pc13:[24, 21]
pc14:[16, 9]
pc15:[8, 6]
pc16:[22, 23]
pc17:[17, 9]
pc18:[20, 21]
pc19:[5, 10]
pc20:[5, 6]
pc21:[2, 12]
pc22:[3, 12]
pc23:[4, 7]
pc24:[11, 19]
pc25:[22, 21]
```

In [150]:

```
abs_loadings = pca_df.abs()
print(abs_loadings)
```

```
    1. Online mode of education is better than offline mode of education.  \
0                                            0.228182
1                                            0.186168
2                                            0.030292
3                                            0.156911
4                                            0.312890
5                                            0.241569
6                                            0.080657
7                                            0.116128
8                                            0.032847
9                                            0.239468
10                                           0.145551
11                                           0.004893
12                                           0.007001
13                                           0.088624
14                                           0.142203
15                                           0.107617
16                                           0.091413
17                                           0.342094
```

In [151]:

```
top_n = 2
top_features = {}
for i in range(abs_loadings.shape[1]):
 top_features[f'pc{i}'] = abs_loadings.iloc[:,i].nlargest(top_n).index.tolist()
 for pc, features in top_features.items():
  pass
 print(f"{pc}:{features}")
```

```
pc0:[18, 17]
pc1:[22, 9]
pc2:[3, 5]
pc3:[13, 15]
pc4:[15, 2]
pc5:[19, 18]
pc6:[6, 25]
pc7:[19, 14]
pc8:[9, 6]
pc9:[25, 16]
pc10:[13, 7]
pc11:[25, 12]
pc12:[24, 13]
pc13:[24, 21]
pc14:[16, 9]
pc15:[8, 6]
pc16:[22, 23]
pc17:[17, 9]
pc18:[20, 21]
pc19:[5, 10]
pc20:[5, 6]
pc21:[2, 12]
pc22:[3, 12]
pc23:[4, 7]
pc24:[11, 19]
pc25:[22, 21]
```

In [152]:

```
cumulative_contributions = abs_loadings.sum(axis=1)
```

In [153]:

```
s_c = cumulative_contributions.sort_values(ascending=False)
```

In [154]:

```
print("cumulative_contributions")
print(s_c)
```

```
cumulative_contributions
1    4.647924
0    4.576965
14   4.493587
17   4.452810
4    4.416396
10   4.362792
20   4.240537
11   4.210150
8    4.203162
23   4.201133
15   4.197683
16   4.195585
18   4.160851
3    4.036699
21   4.033294
12   4.025410
25   4.017165
9    3.981707
2    3.981467
7    3.977277
6    3.947012
22   3.880356
19   3.836223
13   3.819700
5    3.726919
24   3.634956
dtype: float64
```

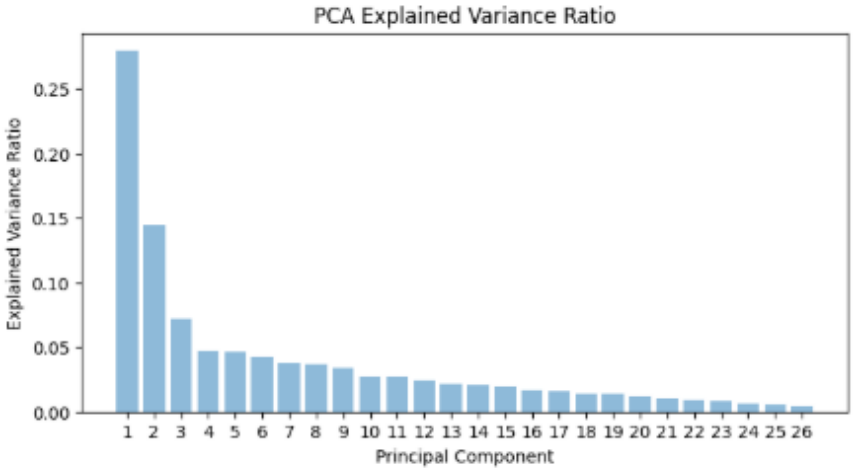
In [155]:
```
most_imp_feature = s_c.idxmax()
h_c = s_c.max()
```

In [159]:
```
print(f"\n most imp feature: {most_imp_feature} with contribution: {h_c}")
```

```
most imp feature: 1 with contribution: 4.647924209608608
```

In [157]:
```
from sklearn.datasets import load_iris
```

In [158]:
```
import matplotlib.pyplot as plt
# Assuming explained_variance_df is already a one-dimensional list or Series
x = len(explained_variance)  # Define 'x' based on the length of explained_variance_df
plt.figure(figsize=(8, 4))
plt.bar(range(1, x + 1),explained_variance, alpha=0.5)
plt.xlabel('Principal Component')
plt.ylabel('Explained Variance Ratio')
plt.title('PCA Explained Variance Ratio')
plt.xticks(range(1, x + 1))
plt.show()
```



Evaluation

From the above accuracies, we can say that the Logistic Regression and support vector classifier are satisfactory as the gap between the training and the validation accuracy is low.

Two tasks are involved in this code snippet: displaying the explained variance ratio of principle components and utilizing loadings from PCA to determine the contribution of the most significant feature.

In [63]:
```
top_n = 2
top_features = {}
for i in range(abs_loadings.shape[1]):
 top_features[f'pc{i}'] = abs_loadings.iloc[:,i].nlargest(top_n).index.tolist()
 for pc, features in top_features.items():
  pass
 print(f"{pc}:{features}")
```

```
pc0:[23, 24]
pc1:[23, 9]
pc2:[5, 12]
pc3:[15, 12]
pc4:[3, 15]
pc5:[25, 22]
pc6:[13, 12]
pc7:[13, 10]
pc8:[8, 16]
pc9:[19, 20]
pc10:[11, 9]
pc11:[10, 16]
pc12:[24, 25]
pc13:[25, 23]
pc14:[22, 3]
pc15:[16, 13]
pc16:[9, 17]
pc17:[17, 21]
pc18:[14, 13]
pc19:[4, 14]
pc20:[7, 3]
pc21:[5, 7]
pc22:[6, 4]
pc23:[18, 2]
pc24:[21, 17]
pc25:[20, 19]
```

Finding the Most Important Feature and Calculating Cumulative Contributions.

To analyze the PCA loadings matrix and determine which characteristic contributes most to all principal components.

cumulative_contributions: abs_loadings: The absolute values of PCA loadings for each feature across all components. Sum ***(axis=1):*** Totals each feature's absolute loadings across components, indicating the features' combined impact.

Sorting (s_c): This method ranks characteristics according to their significance by sorting the contributions in descending order. Prints the sorted contributions along with the contribution's most important characteristic. This procedure helps with feature selection or interpretation by determining which feature has the biggest impact on the PCA.

Purpose :

It helps choose the ideal number of components by providing a visual representation of the amount of variance explained by each major component.

Visualization:

The *explained_variance* values are plotted as a bar chart, where each bar represents a primary component.

Customization:
For clarity, assign names and label the axes.
Make sure the primary component indices are visible by using sticks.
Significance: Assists in determining the number of components to keep for significant dimensionality reduction by displaying the variance recorded by each component.

```
In [51]:
from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA

In [52]:
scaler = StandardScaler()
scaled_data = scaler.fit_transform(meldf)

In [53]:
pca = PCA(n_components=None)
pca.fit(scaled_data)

In [54]:
explained_variance=pca.explained_variance_ratio_

In [55]:
components=pca.components_

In [56]:
pca_df = pd.DataFrame(components,columns=meldf.columns)
explained_variance_df=pd.DataFrame(explained_variance,columns=['explained variance'])

In [57]:
pca_df.shape

Out[57]: (26, 26)

In [58]:
scaled_data.shape

Out[58]: (477, 26)

In [59]:


print(pca_df)#PCA Components
```

```
16                                0.067373
17                               -0.072179
18                                0.136833
19                                0.160697
20                                0.018045
21                               -0.099561
22                               -0.069697
23                               -0.473254
24                               -0.455516
25                               -0.032497

    2. Online mode of education is effective for your child.( অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর। )  \
0                                -0.237517
1                                 0.263097
2                                 0.021767
3                                -0.032574
4                                -0.059081
5                                -0.099090
6                                -0.051788
```

In [60]:

```
1 pca_df.head(500)
```

Out[60]:

	1. Online mode of education is better than offline mode of education. (অফলাইন শিক্ষার চেয়ে অনলাইন শিক্ষা ব্যবস্থা ভালো।)	2. Online mode of education is effective for your child.(অনলাইন শিক্ষা পদ্ধতি আপনার সন্তানের জন্য কার্যকর।)	3. Your child faces problem(s) to convert the offline mode of education to online mode of education. (আপনার সন্তান অফলাইন শিক্ষাকে অনলাইন শিক্ষায় রূপান্তরিত করতে সমস্যার সম্মুখীন হয়)	4. Online mode of education effects on mental or physical health of your child(অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)	5. Your child faced problem(s) to adapt the online mode of education during covid-19 phase.(কোভিড-19 পর্যায়ে আপনার সন্তান অনলাইন শিক্ষা পদ্ধতির সঙ্গে খাপ খাইয়ে নিতে সমস্যার সম্মুখীন হয়েছিল)	6. Your child is become phone addicted during online mode of education. (অনলাইন শিক্ষার সময় আপনার সন্তান ফোনে আসক্ত হয়ে পড়েছে)	7. Children follow disciplines during online mode of education. (অনলাইন শিক্ষার সময় শিশুরা শৃঙ্খলা পরায়ণ হয়)	8. Children are getting lazy during online mode of education. (অনলাইন শিক্ষার মাধ্যমে শিশুরা অলস হয়ে যাচ্ছে)	9. During online mode of education as children are doing their work at their flexible time so they can be more creative or involve themselves on some extra activity. (অনলাইন শিক্ষার সময় শিশুরা তাদের নমনীয় সময়ে তাদের কাজ করেছে যাতে তারা আরও সৃজনশীল হতে পারে বা কিছু অতিরিক্ত ক্রিয়াকলাপে নিজেকে জড়িত করতে পারে)	10. Your child is facing problem asking doubts during online mode of education. (আপনার সন্তান অনলাইন শিক্ষার সময় সমস্যার সম্মুখীন হচ্ছে)	...	17. Exams should be conducted through online mode.(অনলাইন পদ্ধতিতে পরীক্ষা নেওয়া উচিত)	18. Your child is attentive in online classes.(আপনার সন্তান অনলাইন ক্লাসে বেশি মনোযোগী)	
0	-0.233341	-0.237517	0.147137	0.239310	0.150426	0.251381	-0.190272	0.218260	-0.167128	0.240814	...	-0.188664	-0.236572	-0.
1	0.250648	0.263097	0.099903	0.113474	-0.036784	0.218473	0.154272	0.099210	0.211988	0.050542	...	0.190405	0.208173	0.
2	-0.059033	0.021767	-0.284728	0.044337	-0.135733	-0.031725	-0.071520	0.036271	-0.126877	-0.215933	...	-0.138726	-0.033883	-0.
3	-0.035952	-0.032574	0.261893	0.183585	0.477659	-0.188793	0.234042	-0.018919	0.005800	0.260378	...	0.024379	-0.013675	0.
4	-0.144793	-0.059081	-0.167049	-0.012748	-0.027286	0.156338	0.181392	0.298744	0.298414	-0.088433	...	-0.168154	-0.084000	0.
5	-0.144544	-0.099090	0.415279	-0.014997	-0.280168	0.027606	-0.206232	0.125852	-0.245474	0.066848	...	0.057451	0.047555	-0.
6	-0.015787	-0.051788	-0.213014	-0.008173	0.216988	0.086760	0.080225	-0.046850	0.010492	-0.172713	...	-0.352755	-0.161856	0.
7	-0.106680	0.008198	0.131979	-0.051034	-0.327112	-0.015431	-0.306624	0.014104	-0.046562	-0.026807	...	-0.069922	-0.080743	0.
8	-0.014541	0.092912	0.325755	0.010707	-0.067891	0.001716	-0.203812	0.282563	0.519439	0.111599	...	-0.185025	-0.048304	-0.
9	-0.264253	-0.384576	-0.104001	-0.070514	-0.017933	-0.023028	0.128431	0.138915	0.234064	0.089336	...	0.453332	-0.023593	0.
10	0.110984	0.067052	0.100736	-0.226319	-0.043444	-0.257165	0.099965	-0.371167	0.259032	-0.003857	...	-0.220291	-0.309881	-0.
11	-0.277123	-0.194564	-0.211705	0.054974	-0.395114	-0.031048	0.236668	-0.073657	0.325266	0.083970	...	-0.158106	0.109910	-0.
12	-0.147811	-0.152403	0.410283	-0.406859	0.113282	0.100380	0.375677	-0.152560	-0.063204	0.091899	...	-0.254366	0.075112	0.
13	0.133469	0.078367	-0.023906	0.126743	-0.065254	-0.005930	0.460561	0.381282	-0.097129	0.069037	...	0.055977	0.208423	-0.
14	-0.348796	-0.207110	-0.092499	-0.081569	0.121793	-0.060531	-0.016197	-0.240498	-0.166634	-0.070096	...	0.229628	0.245209	-0.
15	0.045547	-0.052704	0.267532	0.435200	-0.405046	0.193363	0.348865	-0.307020	-0.164200	-0.212231	...	-0.077273	-0.033674	0.
16	0.067373	0.043423	-0.200024	-0.371224	-0.133048	-0.064813	0.168581	0.321893	-0.375842	0.191990	...	-0.265389	-0.072531	0.
17	-0.072179	0.075566	-0.087167	0.236278	0.198410	0.172141	-0.189638	-0.072264	0.041914	0.047565	...	-0.393238	0.515268	0.
18	0.136833	0.145915	0.156738	-0.385532	-0.105990	0.088390	-0.041162	0.090717	-0.008895	-0.083719	...	0.137204	0.192150	0.
19	0.160697	0.180222	-0.196895	0.026059	-0.032001	0.262856	-0.011166	-0.323498	0.016898	0.499331	...	0.149291	-0.189964	-0.
20	0.018045	-0.149897	-0.120828	-0.083410	-0.161753	0.296072	-0.059389	-0.112843	0.043279	0.435366	...	0.001320	-0.051380	-0.
21	-0.099561	0.028008	0.000242	-0.241282	-0.014796	0.069844	-0.103763	-0.188271	0.144423	0.012450	...	-0.072306	0.457213	-0.
22	-0.069697	0.195338	-0.085814	0.095977	-0.180999	-0.366191	-0.003501	-0.013046	-0.135210	0.427919	...	-0.100457	0.199875	0.
23	-0.473254	0.568003	0.018653	-0.014694	0.035443	0.020167	0.030036	0.004706	0.019021	-0.087577	...	0.151000	-0.193754	0.
24	-0.455516	0.360465	0.007684	0.032278	-0.010684	0.024537	0.148150	-0.010955	-0.054410	0.065958	...	-0.030179	-0.034082	-0.
25	-0.032497	0.086653	-0.036220	-0.188563	0.085750	0.601899	0.040012	-0.008682	-0.077729	-0.105961	...	0.047956	-0.043160	-0.

26 rows × 26 columns

In [61]:
```
print(explained_variance_df)#explained Variance Ratios
```

```
    explained variance
0             0.315150
1             0.089038
2             0.060863
3             0.050501
4             0.040055
5             0.037278
6             0.035012
7             0.033636
8             0.029029
9             0.028614
10            0.027264
11            0.025537
12            0.023332
13            0.022316
14            0.021365
15            0.020159
16            0.019498
17            0.018620
18            0.016572
19            0.015420
20            0.015083
21            0.013359
22            0.012280
23            0.010568
24            0.010138
25            0.009309
```

In [62]:
```
abs_loadings = pca_df.abs()
print(abs_loadings)
```

```
    18                                                0.156738
    19                                                0.196895
    20                                                0.120828
    21                                                0.000242
    22                                                0.085814
    23                                                0.018653
    24                                                0.007684
    25                                                0.036220

        4. Online mode of education effects on mental or physical health of your child( অনলাইন শিক্ষার পদ্ধতি আপনার সন্তানের মানসিক বা শারীরিক স্বাস্থ্যের উপর প্রভাব ফেলে)  \
    0                                                 0.239310
    1                                                 0.113474
    2                                                 0.044337
    3                                                 0.183585
    4                                                 0.012748
    5                                                 0.014997
    6                                                 0.008173
    7                                                 0.051034
    8                                                 0.010707
```

In [64]:
```
cumulative_contributions = abs_loadings.sum(axis=1)
```

In [65]:
```
s_c = cumulative_contributions.sort_values(ascending=False)
```

In [66]:
```
print("cumulative_contributions")
print(s_c)
```

```
cumulative_contributions
0    4.825344
1    4.675624
15   4.193783
14   4.132967
2    4.111655
10   4.075042
11   4.023073
17   4.022059
12   3.988028
16   3.969251
13   3.895416
22   3.865020
3    3.863956
19   3.851996
18   3.802739
20   3.731661
8    3.722221
4    3.619198
9    3.606813
6    3.578038
21   3.516599
5    3.403672
7    3.390326
24   3.230073
25   3.205734
23   3.190665
dtype: float64
```

In [67]:
```
most_imp_feature = s_c.idxmax()
h_c = s_c.max()
```

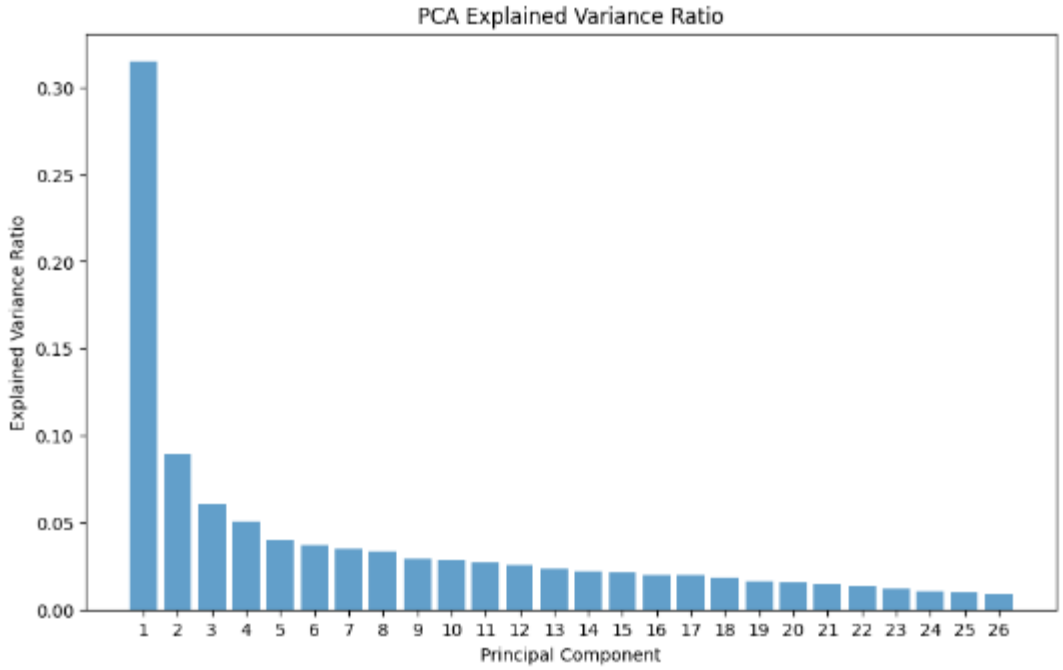
In [68]:
```
print(f"\n most img feature: {most_imp_feature} with contribution: {h_c}")
```

```
most img feature: 0 with contribution: 4.825343505300405
```

In [69]:
```
from sklearn.datasets import load_iris
```

In [ ]:
```
import matplotlib.pyplot as plt
# Assuming explained_variance_df is already a one-dimensional list or Series
x = len(explained_variance_df)  # Define 'x' based on the length of explained_variance_df
plt.figure(figsize=(10, 6))
plt.bar(range(1, x + 1), explained_variance_df, alpha=0.7)
plt.xlabel('Principal Component')
plt.ylabel('Explained Variance Ratio')
plt.title('PCA Explained Variance Ratio')
plt.xticks(range(1, x + 1))
plt.show()


```


PCA Explained Variance Ratio
Explained Variance Ratio
0.00
0.05
0.10
0.15
0.20
0.25
0.30
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Principal Component

Conclusions

This chapter summarizes the key findings of the research and their implications. It highlights the primary factors identified through Principal Component Analysis (PCA) that influence. The conclusion also reflects on the study's limitations and suggests areas for future research.
The two main features we found from this model are -
In PCA the most important feature with contribution is 0 with a contribution of 4.825
In testing, the most important feature with contribution is 1 with a contribution of 4.647

The analysis of this research suggests that neither online nor offline education can be deemed universally superior. Instead, each mode has its unique strengths that cater to different learning needs and scenarios. The optimal approach would be to create a hybrid educational model that combines the best aspects of both methods—leveraging the accessibility of online platforms and the immersive, interactive nature of offline classrooms. This integration could significantly enhance educational outcomes by addressing diverse learning preferences and logistical limitations.

Concluding Remarks

The research concludes that the future of education should not exclusively lean towards either online or offline methods but rather a fusion of both to maximize benefits and minimize limitations. This study emphasizes the need for continued exploration of adaptive learning environments that are inclusive and resilient against unforeseen challenges.

Note:

Our main purpose in doing this research is so that in the future when there is an epidemic like COVID-19 then everyone can easily accept the online system. This will support students and educators in maintaining educational continuity without compromising quality, regardless of external disruptions.

Future scope of the work

It's critical to identify areas that require additional investigation or where present patterns may change while thinking about the future scope of work for a research paper on online vs. offline education. The following are some possible avenues for further investigation:

Hybrid Educational Models

Learning that is blended: Look into how online and offline learning can coexist peacefully, particularly in different contexts like urban and rural areas.

The efficacy of skill-based learning Examine how practical or skill-oriented fields like engineering, medicine, and the arts are affected by hybrid models.

New Technologies for Distance Learning

AI and Personalization: Research how AI can be used to customize learning materials to meet the needs of specific students.

Virtual reality (VR) and augmented reality (AR) in education: Examine how these immersive technologies can replicate in-person instruction.

Trends in Gamification: Analyze how gamified methods impact retention and motivation.

Fairness and Availability

Examine ways to close the digital divide, which is the lack of access to online learning caused by financial, geographical, or technological constraints.

Special Requirements Inclusion: Examine how online learning environments can benefit students with disabilities more than conventional classroom settings.

Student Involvement and Academic Results

Cognitive Retention: Examine the differences in long-term retention rates between learners who learn online and offline.

Behavioral Insights: Examine how participation, attention spans, and teamwork differ in online and offline settings.

Models of Education After a Pandemic

Adoption Trends: Record how preferences have changed between online and offline since the pandemic.

Research the efficacy of online learning in preserving continuity in times of crisis, such as pandemics or natural disasters.

Cost-Effectiveness and Economic Impacts: Compare the costs of running traditional classrooms vs introducing online learning on a large scale.

EdTech Industry Growth: Forecast the effects of the growing popularity of online learning on the market for educational technology.

Internationalization and Cultural Backgrounds

Examine how online learning either facilitates or hinders cross-cultural communication in today's interconnected society.

Content Localization: Examine how online learning resources might be tailored to meet local requirements.

Training and Adaptation of Teachers

Digital Pedagogy: Evaluate if effective online education requires teacher expertise in technology.

Reference

- *Means, B., Bakia, M., & Murphy, R. (2014). Learning Online: What Research Tells Us About Whether, When and How. Routledge.*
- *Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The Difference Between Emergency Remote Teaching and Online Learning. Educause Review.*
- *Allen, I. E., & Seaman, J. (2017). Digital Learning Compass: Distance Education Enrollment Report 2017. Babson Survey Research Group.*

- *https://www.sciencedirect.com/science/article/pii/S266637402030011X*

- ***The Rise of Hybrid Education Models for Learning Solutions By Praveen Singh*** *https://cxotoday.com/story/the-rise-of-hybrid-education-models-for learning-solutions*

- ***Challenges of online learning amid the COVID-19: College students' perspective***
  Yuefan Xia , Yawen Hu , Chenyi Wu , Ling Yang , Man Lei

  https://pmc.ncbi.nlm.nih.gov/articles/PMC9815150/