



**Shikshan Prasarak Santha's  
Padmabhushan Vasantraodada Patil Mahavidyalaya  
Kavathe Mahankal  
DEPARTMENT OF STATISTICS**



**Case Study Report on  
“Effect of Online Learning on Student Performance”**

**Submitted to**

**Department of Statistics,  
P. V. P. Mahavidyalaya,  
Kavathe Mahankal**

**By**

**Miss. Desai Sanika Rajkumar  
Miss. Garad Diksha Sanjay  
Miss. Khandekar Anushka Sambhaji**

**As a partial fulfillment of the SEC-I (P): Practical on Data Analysis  
Using MS-Excel – I for B.Sc. II (Semester III)**

***Under the guidance of***

**Dr. A. M. Suryawanshi  
Assistant Professor,  
Department of Statistics,  
P. V. P. Mahavidyalaya,  
Kavathe Mahankal**

**2025-2026**

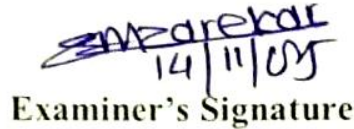
# CERTIFICATE

This is to certify that *Miss. Desai Sanika Rajkumar, Miss. Garad Diksha Sanjay and Miss. Khandekar Anushka Sambhaji* of B.Sc. II (Semester III), P. V. P. Mahavidyalaya, Kavathe Mahankal have successfully completed the case study report entitled “*Effect of Online Learning on Student Performance*” based on SEC-I (P): Practical on Data Analysis Using MS-Excel – I, as prescribed by the curriculum of Shivaji University, Kolhapur, under my supervision and guidance during the academic year 2025 – 2026.



Guide

Department of Statistics  
P. V. P. Mahavidyalaya,  
Kavathe Mahankal



14/11/25

Examiner's Signature



Head

Department of Statistics  
P.V.P. Mahavidyalaya,  
Kavathe Mahankal, Dist. Sangli  
Department of Statistics  
P. V. P. Mahavidyalaya,  
Kavathe Mahankal

**Place:** Kavathe Mahankal

**Date:** 10/11/2025

## DECLARATION

We hereby declare that the Case Study Report entitled “*Effect of Online Learning on Student Performance*” submitted in partial fulfillment of the requirements of SEC-I (P): Practical on Data Analysis Using MS-Excel – I for B.Sc. II (Semester III) is our original work carried out under the guidance of Dr. A. M. Suryawanshi, Assistant Professor, Department of Statistics, P. V. P. Mahavidyalaya, Kavathe Mahankal.

We further declare that this report has not been previously submitted to any other university or institution for any other degree.

**Place:** Kavathe Mahankal

**Date:** 10/11/2025

Sr. No	Seat No.	Name of the Student
1.	318889	Miss. Desai Sanika Rajkumar
2.	318910	Miss. Garad Diksha Sanjay
3.	318858	Miss. Khandekar Anushka Sambhaji

# INDEX

<b>Sr. No.</b>	<b>Content</b>	<b>Page No.</b>
1	Abstract	5
2	Introduction	5
3	Objectives	6
4	Hypotheses	6
5	Methodology	6
6	Statistical analysis	7-9
7	Conclusions	10
8	References	10
9	Questionnaire	10

## **Abstract:**

The sudden shift to online learning during recent years has significantly changed the educational landscape. This case study aims to analyze the impact of online learning on students' academic performance using data collected from undergraduate students. Statistical tools in MS-Excel, such as descriptive statistics, graphical analysis, and paired t-test were applied to evaluate differences in performance before and after adopting online learning methods. The results indicate that while online learning provides flexibility and accessibility, it also poses challenges in engagement and consistency, which influence overall performance.

## **Introduction:**

Online learning has emerged as a vital mode of education, especially following the COVID-19 pandemic. It allows students to access lectures and study materials remotely, offering flexibility and convenience. However, concerns have been raised regarding its effectiveness compared to traditional classroom teaching. This case study explores how online learning affects students' performance in terms of marks, attendance, and participation. We used MS-Excel to handle, summarize, and interpret the data efficiently.

In recent years, digital education platforms have become an integral part of higher education systems. Online classes provide opportunities for self-paced learning, interactive tools, and access to diverse educational resources. They also help overcome geographical barriers, enabling students to continue their studies uninterrupted during unforeseen circumstances such as lockdowns or natural disruptions.

At the same time, the transition to online learning has posed challenges such as reduced face-to-face interaction, technical difficulties, and varied levels of digital literacy among students. Therefore, it is essential to analyze whether this mode of learning truly enhances academic performance and engagement.

This case study aims to evaluate the effectiveness of online learning among undergraduate students by comparing academic results and attendance records before and after its implementation. The analysis, conducted using MS-Excel, provides valuable insights into how digital education influences student outcomes and learning behavior.

## **Objectives:**

1. To study the academic performance of students in online learning environments.
2. To compare students' performance before and during online learning.
3. To apply statistical tools using MS-Excel to assess the impact of online learning.

## **Hypotheses:**

The null and alternative Hypotheses are:

$H_0$ : There is no significant difference in students' performance between online and offline learning modes.

$H_1$ : There is a significant difference in students' performance between online and offline learning modes.

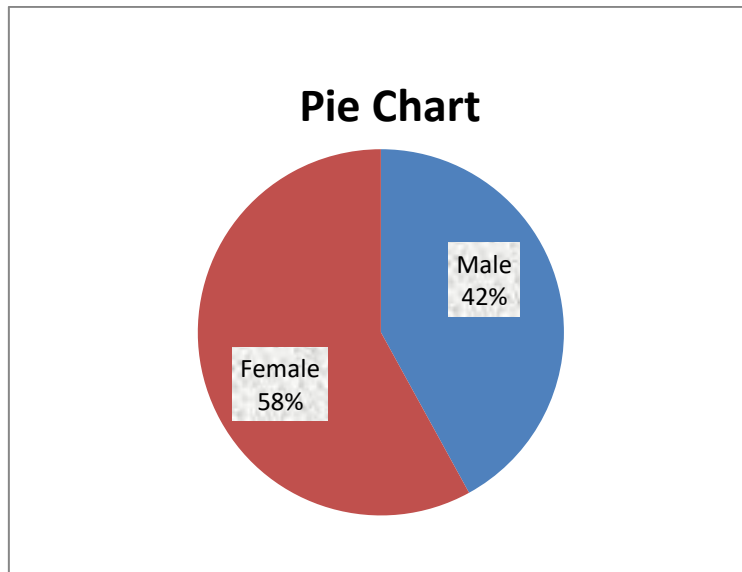
## **Methodology:**

A sample of 50 undergraduate students from college students was selected using a simple random sampling method. Data on their marks (before and during online learning), attendance percentage were collected through a structured questionnaire. The data were entered and analyzed using MS-Excel functions such as AVERAGE(), STDEV(), and T.TEST(). Graphs and charts (bar charts, pie charts) were used for visual interpretation.

## Statistical Analysis:

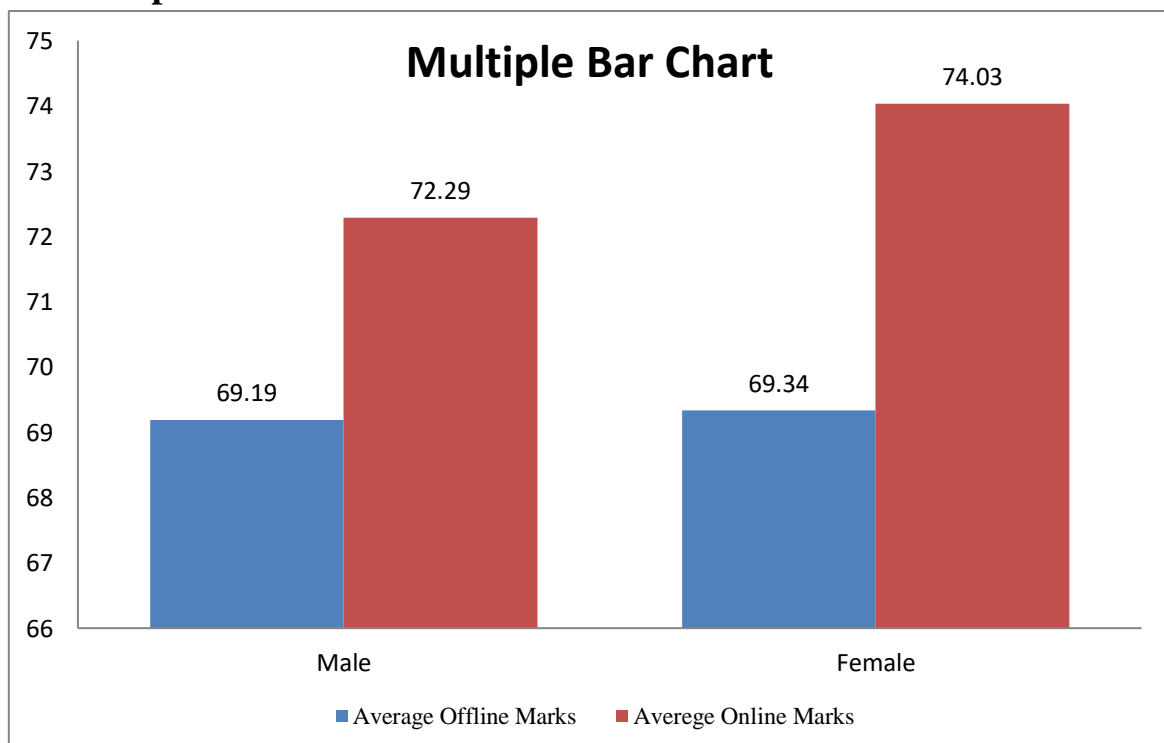
### 1) Graphical representation:

#### A. Pie chart



**Interpretation:** The pie chart represents the gender wise distribution of students who participated in the study on the effect of online learning on student performance. Male and female students constitute 42% and 58% of the total participants respectively. The data indicates that female students form the majority of the sample population. This suggests that the findings of the study may slightly reflect the learning experiences and performance trends of female students more strongly than those of male students.

#### B. Multiple Bar charts



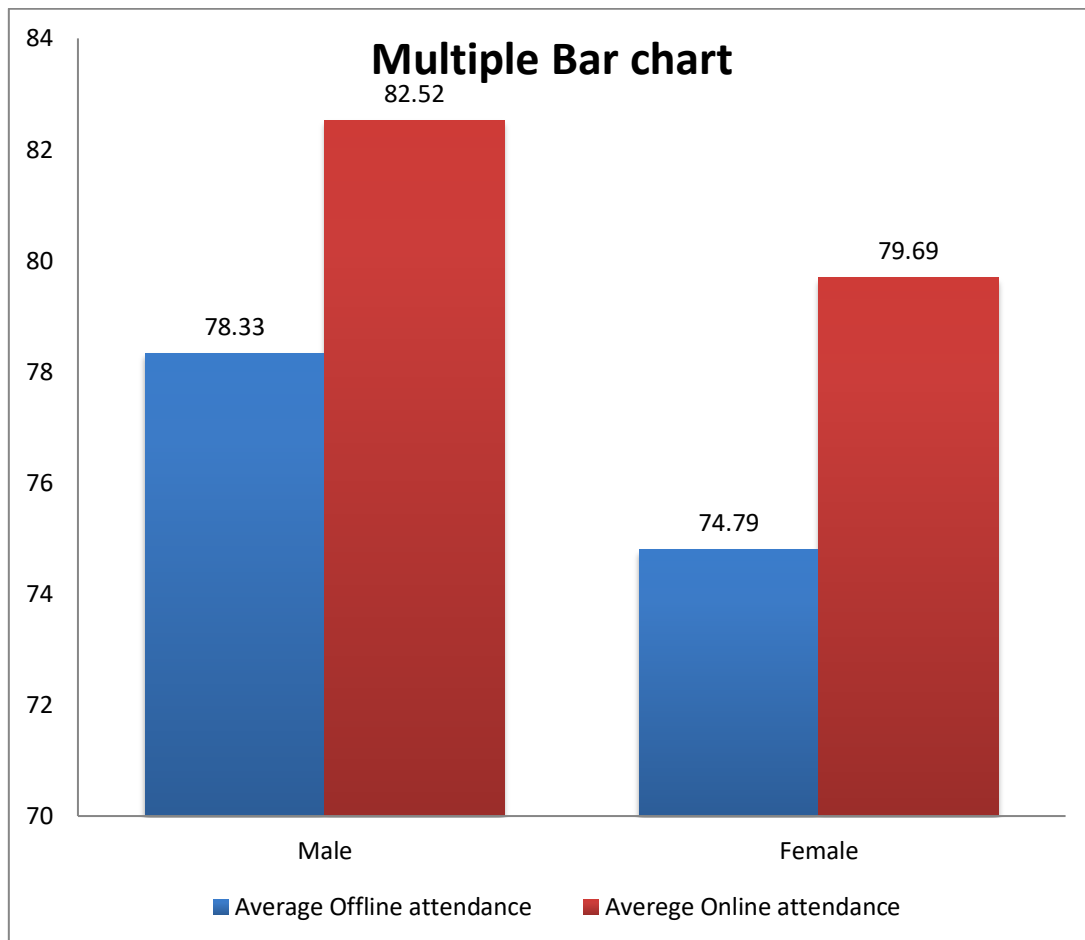
**Interpretation:**

The above chart compares average offline and online marks by gender. Both male and female students performed better in online learning.

Male students: 69.19 (offline) to 72.29 (online)

Female students: 69.34 (offline) to 74.03 (online)

Overall, online learning led to improved performance for all students, with female students showing slightly greater progress than males.



**Interpretation:**

The above chart compares average offline and online attendance of male and female students. Overall, both groups showed higher attendance in online learning. Male students had slightly better attendance rates than females in both modes, indicating that online classes improved participation and consistency across all students.

## 2) Descriptive Statistics: Mean, Median, Mode, Variance and Standard Deviation to summarize student performance.

Measure	Excel Function	Offline Marks	Online Marks
Mean	=AVERAGE(Marks)	69.28	73.3
Median	=MEDIAN(Marks)	69.5	73
Mode	=MODE(Marks)	74	77
Variance	=VAR.S(marks)	32.78	49.03
Standard deviation	=STDEV.S(marks)	5.73	7.00

### Interpretation:

The descriptive analysis provides an overview of students' performance in both offline and online learning environments.

- ❖ The mean marks increased from 69.28 (offline) to 73.3 (online), indicating an overall improvement in average performance during online learning.
- ❖ The median and mode values also increased (from 69.5 to 73 and from 74 to 77, respectively), showing that the central tendency of scores shifted upward, suggesting that most students performed better online.
- ❖ The variance and standard deviation values (49.03 and 7.00 in online mode, compared to 32.78 and 5.73 offline) indicate slightly greater variability in online marks. This suggests that while many students benefited from online learning, a few may have experienced mixed outcomes.

### 3) Comparative analysis: Paired t-test to compare offline and online marks

A paired t-test was performed using Excel (T.TEST function).

Excel function: =T.TEST(offline marks, online marks, two tailed, 1)

p-value = 1.37744E-09

Significance Level ( $\alpha$ ) = 0.05

### Interpretation:

Since p-value of paired t-test is less than 0.05 (significance level). Hence we reject the null hypothesis and conclude that there is a significant difference in students' performance between online and offline learning modes. i.e. The online learning improved student performance.

## Conclusions:

The analysis shows that online learning significantly improved student performance compared to traditional classroom learning. Mean, median, and mode values increased, and the t-test confirmed a statistically significant difference, indicating real improvement rather than chance variation.

Both male and female students performed better and had higher attendance in online classes, with female students showing slightly greater progress. Although some variability was observed, overall results highlight that online learning enhanced academic outcomes, engagement, and flexibility.

Thus, online learning proves to be an effective and adaptable supplement to traditional education, supporting improved performance and participation when implemented with proper structure and resources.

Hence a blended learning approach with improved digital literacy, interactive tools, regular feedback, and reliable internet access can enhance the overall effectiveness of online education.

## References:

1. Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, 49(1), 5–22.
2. Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). E-Learning, Online Learning, and Distance Learning Environments: Are They the Same? *The Internet and Higher Education*, 14(2), 129–135.
3. UNESCO (2020). *Education in a Post-COVID World: Nine Ideas for Public Action*. Paris: UNESCO.

## Questionnaire:

1. Name of Student: \_\_\_\_\_
2. Gender:  Male  Female
3. Age: \_\_\_\_\_ years
4. Course / Class: \_\_\_\_\_
5. Device used for online learning:  
 Smartphone  Laptop  Tablet  Desktop
6. Marks before online learning (Offline): \_\_\_\_\_ %
7. Marks during online learning (Online): \_\_\_\_\_ %
8. Attendance before online learning: \_\_\_\_\_ %
9. Attendance during online learning: \_\_\_\_\_ %