Online Vs Offline School and the Effects on Exam Scores

Gavin Ricks | SBX Summer Program | Center for Broadening Participation in Computing

Introduction & Background

As technology becomes increasingly embedded into our daily lives, online learning has become more common in our schools, especially following the COVID-19 outbreak. A clearer comparison of online and offline learning can help us to understand what learning method is associated with better exam performance.

There is a small amount of conclusive data on this issue from previous studies. Using the course-provided dataset, this analysis aims to give a concrete answer to this complex problem. WIth a dataset of 1,000 students, we are able to provide a clearer comparison of online and offline learning outcomes.

RESEARCH QUESTION

Do students learning online achieve significantly different exam scores than students learning offline?

HYPOTHESIS

- Alternative – Students using offline learning earn significantly higher exam scores than students using online learning.
- Null– Students using offline learning earn similar exam scores than the students learning online.

Method

DATA SOURCE

"Online vs Offline Learning" – A course-provided dataset containing 1,000 student records.

VARIABLES USED

- Learning_Mode (Online/Offline)
- Subject (English, Math, Science, Programming, History)
- Study_Hours
- Retention_Score (40–100)
- Focus_Level (40–100)
- Exam_Score (0–100).

ANALYTIC APPROACH

A t-test was used to compare the mean exam scores of offline and online students to find if they are statistically significant.

TOOLS USED

Python — pandas, numpy, scipy.stats, matplotlib, seaborn

Results

Figure 1. Distribution of Exam Scores

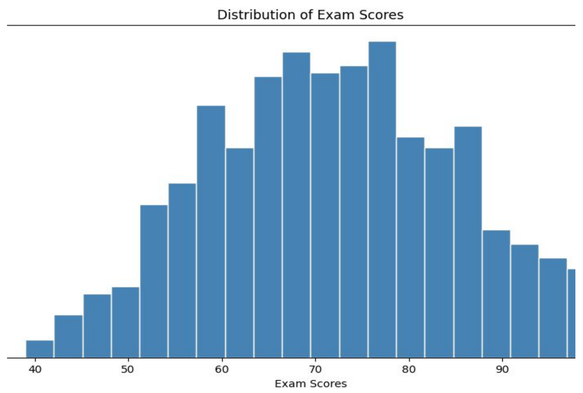
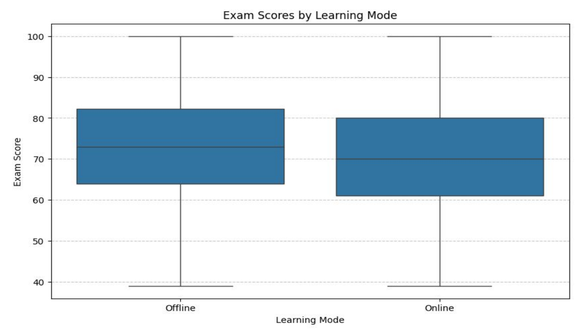


Figure 2. Exam Score by Learning Mode



t-statistic = -3.579
p-value = 0.00036

Discussion

- **Primary Finding:** Statistical analysis shows that offline learning yields significantly higher exam scores than online learning.
- **Hypothesis Supported:** My results support the alternative hypothesis that students using offline learning methods perform better academically.
- **Contrast with Existing Research:** Existing research often shows a negligible difference between offline and online performance, though this is frequently attributed to small sample sizes in previous studies.
- **External Variables:** State-to-state variations in US school curricular, such as differing liberal or conservative education policies, could act as confounding variables and influence exam scores

LIMITATIONS

Because this data is synthetic this finding can possibly be misleading due to the data being artificially made. The school curriculum varies significantly from state to state in the United States.

Conclusion

I aimed to answer the question of if students earned significantly different exam scores based on their learning method. We then found that offline learning yielded statistically significantly higher exam scores than online learning. I suggest diving deeper into different state curriculum and the effects on exam scores.

References

Dataset: Whitney N. (2026). online vs offline learning dataset .csv

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