

Evaluation of Students' Performance in different learning environments: Face-to-face (prior-pandemic), Completely Online (peri-pandemic), Blended (post-pandemic)(Covid-19 pandemic time-based analysis)

Sridharan Govindarajan, Helen E Higson
Aston University, Birmingham, United Kingdom

Research Domains

Learning, teaching and assessment (LTA)

Abstract

The COVID-19 pandemic has greatly altered the educational landscape, forcing educational institutions to undergo a rapid digital transformation, insisting that teachers and students adapt to new learning methods. Though online learning provisions were prevalent even before the pandemic (prior-pandemic) as an additional support to face-to-face learning, full-time virtual learning during pandemic (peri-pandemic) has exposed the digital poverty across the learning ecosystem. Attempting to shift back to normality (post-pandemic), the learning system is now in a blended state, adaptable for any future events. Therefore, it is essential to understand whether the expected learning outcomes are still accomplished during these three phases of pandemic. This research, which is just underway, aims to analyse, evaluate, and compare the performance factors of students in prior-pandemic, peri-pandemic and post-pandemic times by investigating the academic data of final-year undergraduates studying STEM subjects in a research active university in the UK, and presenting the findings.

Full paper

This paper investigates the far-reaching effects created by the pandemic in the learning ecosystem, especially how it impacted students' performance. The educational data generated from several types of learning interactions before, during and after Covid-19 are very relevant for understanding the Mobilities in Higher Education through learning analytics.

An article by Howard, et. al. (2021), presents a detailed analysis of the impact of learning during the pandemic in England. They say there are obstructions to teaching and learning practices in trying to adapt to a completely distance learning model. There were other challenges in terms of remote learning setup, strained academic support and family interventions. There has been an increase in asynchronous access to virtual learning environment (VLE), but at the same time students from disadvantaged background, who were active in attending classroom lectures and accessing recorded course materials during face-to-face learning, viewed significantly fewer recordings during pandemic (Summers, et. al., 2022). Though E-learning has many advantages (Gherhes, et al., 2021), it prevents the necessary collaboration with teachers and socialising with peers. The blended learning approach is emerging as an alternative solution to the new normal way in the learning sector (Dziuban, et. al., 2018) to overcome COVID-19 pandemic like challenges.

This paper seeks answers these questions,

1. How did students perform before, during and after pandemic learning methods?
2. What are the factors (similarities or differences) that affected the learning gains or losses that occurred during each period?
3. Which of the inferences from the research are critical considerations that could contribute to the improvement of learning processes?

The digital footprints created in the learning system by students and staff can be pruned through data mining techniques (Al-Hagery, et.al., 2020) to identify hidden patterns. One of the widely-used techniques for data mining is clustering that groups related data together based on parameters of interest, for example grouping students' attributes related to academic outcomes (Govindasamy & Velmurugan, 2018). It is often useful to apply machine learning

classifiers on the individual groups obtained from clustering, to search the clusters further for insights (Ghorbani & Ghousi, 2020), for instance finding the highly correlated attributes affecting students' performance.

The research is planned to be completed over the next three months using quantitative methods (educational data mining) and machine learning (clustering and classification) with python packages for computations. The data analysed will be students' academic and demographic information, virtual learning, and library management logs for the last three years, representing the pre-pandemic, peri-pandemic, and post pandemic time periods.

The analysis will involve Data masking using Anonymisation technique that transforms data to different value sets without loss of actual meaning such; Data imputation through hot deck Substitution that replaces missing records with a closely matching value, and Feature Engineering of variables that act as input to machine learning models. The researcher will develop models using various clustering techniques, and a time series analysis of modelled clusters and features will be performed to provide visual insights and recommendations.

This research has significant potential to uncover the influential factors that affected the educational attainment of students in a stressed and recovering learning eco-system. It is expected that the research outcomes will recommend innovative approaches for achieving excellence in teaching and learning, and providing students with information to make the best choices about their education.

References

Al-Hagery, M. A., Alzaid, M. A., Alharbi, T. S., & Alhanaya, M. A. (2020). Data mining methods for detecting the most significant factors affecting students' performance. *International Journal of Information Technology and Computer Science*, 12, 1-13. doi:10.5815/ijitcs.2020.05.01

Dziuban, C., Graham, C. R., Moskal, P. D., Norberg, A., & Sicilia, N.

(2018). Blended learning: the new normal and emerging technologies. *International Journal of Educational Technology in Higher Education*, 15. doi: 10.1186/s41239-017-0087-5

Gherhes,, V., Stoian, C. E., F̃arcas,iu, M. A., & Stanici, M. (2021). E-learning vs. face-to-face learning: Analyzing students' preferences and behaviors. *Sustainability*, 13, 4381. doi: 10.3390/su13084381

Ghorbani, R., & Ghousi, R. (2020). Comparing different resampling methods in predicting students' performance using machine learning techniques. *IEEE Access*, 8, 67899-67911. doi: 10.1109/access.2020.2986809

Govindasamy, K., & Velmurugan, T. (2018). Analysis of student academic performance using clustering techniques. *International Journal of Pure and Applied Mathematics*, 119, 309323.

Howard, E., Khan, A., & Lockyer, C. (2021). Learning during the pandemic: review of research from England. Retrieved from <https://www.gov.uk/government/publications/learning-during-the-pandemic/learning-during-the-pandemic-review-of-research-from-england>

Summers, R., Higson, H., & Moores, E. (2022). The impact of disadvantage on higher education engagement during different delivery modes: a pre- versus peri-pandemic comparison of learning analytics data. *Assessment & Evaluation in Higher Education*, 1-11. doi: 10.1080/02602938.2021.2024793