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The Impact of Online Learning on Student's Academic Performance

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Abstract

The spread of online learning has grown exponentially at every academic level and in many countries in our COVID-19 world. Due to the relatively new nature of such widespread use of online learning, little analysis or studies have been conducted on whether student performance takes a toll through this different medium. This paper aims to propose a research project targeted to study the impact of online learning on the academic performance of Embry-Riddle Aeronautical University (ERAU) students, as compared to an in-person medium. The research will be conducted over a period of 2 years for 3 modules that are common for students across all courses. Data utilized in the study will be obtained through a survey, as well as academic performance data sourced from ERAU. The analysis will be conducted using T-test and Regression techniques to identify statistically significant impacts of student performance in online versus in-person classes. The results obtained can be an estimated general trend of student performance in various other universities which conduct a mix of in-class and online learning in this COVID-19 era. The results obtained will also serve as a framework, and as possible preliminary results for future academic research with regards to the proposed topic. The observed trend will benefit institutions in identifying the method of instruction in which they would need to refine, to raise the standards of different instructional methods to a parity.

Keywords: online learning, in-class, class delivery mode, t-test, regression

Introduction

The COVID-19 pandemic has not only changed the way people work but also how students conduct their studies. As national lockdowns are implemented, working and studying at home has become the norm, with some classes permanently moving to online-based learning (Davies, 2020). Even before the pandemic, online learning has been on the rise. The World Economic Forum (WEF) states that USD 18.99 billion was invested in education technology in 2019 (Li & Lalani, 2020), this would show that there is an evolving trend of shifting education towards an online learning environment. Thus, as home-based learning becomes the norm, disruptions to the regular school environment, as well as the various challenges of organizing online classes could affect the academic performance of students. This paper seeks to study the impact of online learning on the academic performance of university students and to determine whether education systems should increase the amount of online learning for traditional in-class subjects.

Literature Review

Previous Research

A study by Broadbent (2017) on liberal arts students at the University of Melbourne has shown a small positive correlation between effort put into the course and time management, on their overall academic performance. The limitation of the study however is that it only focuses on online courses, and thus, is not able to provide a comparison between the effectiveness of online and face-to-face courses.

A common finding among past studies also showed that students enrolled in online courses do not necessarily out-perform their peers in traditional courses during assessments, since they have generally been found to be comparable in content and experiences (Hurlbut,

2018). An alternative learning environment also did not reduce the overall learning experience, since most other factors, such as class sizes, class duration, course content, and academic requirements, remain the same (El Said, 2021).

There has been limited research on how the course effectiveness has on student performance, for both online and face-to-face courses (Hurlbut, 2018). There was also limited data over an extended period available about the effectiveness of online learning, having only been popularized and widely adapted recently due to the recent pandemic.

Perhaps the most important causal factor of differences between the academic performances, identified from past studies, is student engagement. A decrease in academic performance, in both online and face-to-face courses, has been attributed to a lack of student engagement, with the quality of faculty-student interactions and learning strategies, being among the variables with a high positive correlation (Dumford & Miller, 2018). Another study has shown that students who failed some modules interacted much less than their peers who passed (Davies & Graff, 2005). These studies support that quality of interaction is a variable that can be further researched.

Our Study

As previous studies do not demonstrate a clear direct correlation between online learning and student performance, therefore our study seeks to contribute to the literature by having a direct comparison between online and in-class settings, having chosen courses that have both traditional and online versions offered. Along with adopting some of the factors found in previous studies to be statistically significant, we seek to provide an overall conclusion on whether online learning creates a difference in student academic performance compared to

traditional in-class settings. This allows us to provide recommendations and further discussions on online learning based on the results of our study.

Measures

The study will involve multiple courses offered in Embry-Riddle Aeronautical University that are offered both in-class blended and online settings. Students of both groups would undergo the entire duration of the course in a semester, followed by a survey that seeks to gather information of the students' participation rates and perception of interaction quality between the faculty and each other. Multiple mediums of assessment will be utilized, including discussions, quizzes, research projects, and examinations to ensure that the overall grade would be as representative of the students' performance as possible.

While rubrics may vary between courses, each course will have the same rubrics regardless of its content delivery method. The survey results, along with students' overall grades, would be used to form correlations between the various variables and academic performance. This allows us to determine potential causal factors should differences in academic performances between both groups be observed and provide recommendations for the crafting of future courses. With that, we can gather data on the performance of students in both groups and assess if a switch to online learning has an impact on students' grades.

Research Methodology and Analysis Report

Research Questions

Has the increase in online learning made an impact on academic performance for university students? Is there a considerable difference in the performance of university students who attend online classes as compared to attending in-class lessons? Should education systems gear towards utilizing online learning more as a platform for learning?

Theoretical Framework

The purpose of this research is to find out whether online learning has a significant impact on student's academic performances compared to traditional classes.

Hypotheses

Null Hypothesis (H_0): There is no considerable difference in the academic performance of students between online and in-class students.

Alternative Hypothesis (H_a): There is a considerable difference in the performance of students between online and in-class students.

Study Design

This study will be conducted in a quantitative form through a cross-sectional study of students enrolled in Embry-Riddle Aeronautical University. Students subjected to the study will be taking either online or face-to-face classes of three different courses, over a period of two years. The three different courses are Principles of Management, Microeconomics, and English Composition. The primary type of data we would collect would be from a survey created by the research team. The secondary data would be obtained from the institution as such data is readily available. Descriptive statistics will be generated using t-test and regression analysis to determine the results.

Population and Sample

Our research population revolves around students from Embry-Riddle Aeronautical University (ERAU) who are enrolled in online and face-to-face classes for three different courses which are Principles of Management, Microeconomics, and English Composition. These three courses were selected as they were found to be the common modules undertaken by every student, regardless of their varying degree courses. These courses also have different methods of

learning, ensuring representation of various methods in the results. Principles of Management is more theory-based whereas English Composition requires a lot of analytical and writing skills. By including diverse types of courses in our study, we would be able to have a better and fairer comparison of the student's academic performance for both online and in-class lessons. Observations from a sample of 50 students from the online and in-class groups each across the three courses will be collected every term throughout the two years. These students are selected through Stratified Random Sampling, where each stratum is the individual modules that the students have taken and completed for both online and in-class. There will be a total of 300 observations per term, which will total 2,400 observations across eight academic terms in two years.

Variables and Measures

Our study aims to identify how various factors can significantly affect the GPA of each student through their school terms, with the focus on the impact of course delivery modes. Hence, the independent variables are course delivery method (online or in-class), perceived effectiveness and satisfaction in the engagement of each course, number of hours spent per week on studying for each course, type of each course content, number of years since each student's admission to Embry-Riddle Aeronautical University, and number of students in each course, for both online and in-class classes. In addition, the dependent variable is the GPA of each student enrolled in the three courses in the specified term, since this is the very effect that we are studying in this research.

Dependent Variable

The dependent variable is the GPA of each student of each of the specific courses in the specified term.

Independent Variables

Key Variable

The key independent variable is the course delivery method, whether the course is delivered in-person face-to-face or through an online medium, such as Zoom or self-directed learning in a learning management system.

Control Variables

The control variables in this study include:

- Perceived satisfaction in course engagement
- Perceived course effectiveness
- Hours spent per week studying for the course
- Type of course content (theoretical-based, practical-based)
- Number of years since student's admission to Embry-Riddle
- Number of students in a class

Equations

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon$$

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_1 X_2 + \beta_5 X_2 X_3 + \beta_6 X_1 X_3 + \varepsilon$$

Legend:

Y: GPA

β : Constant

ε : Error term from residuals

X1: Degree of perceived satisfaction

X2: Degree of perceived course effectiveness

X3: Degree of course engagement

X4: Hours spent per week on studying for the course

X5: Type of Course Content (theoretical-based, practical-based)

X6: Number of Years since student's Admission to Embry-Riddle

X7: Number of Students in a Class

Data Collection Methods

Primary data will be collated in the form of a questionnaire. The survey will be hosted on Qualtrics, with its dissemination method being an online link. The link will be distributed through email, to students who have completed Principles of Management, Microeconomics, and English Composition after approval has been given by the university.

Secondary data will be collected regarding student performance. Additionally, data containing the spread of online students versus in-class students will be requested. The secondary data can be obtained through liaison with the respective department, in the form of datasheets accessible through a Microsoft Excel Format. Upon receipt of the requested dataset, the secondary data will further provide more information on the students' academic performance.

There is a need for secondary data to reinforce our findings in primary data. Secondary data consists of GPA records collated by the institution, which comes across as credible. It will allow us to analyze if there is a visible difference between the trend observed in primary data, from the equation above, versus the trend recorded in the past. While the secondary data will not be able to cover all aspects of our research equation, such as variables X1 X2 X3, additional error-proof data of grades of individual assignments within the courses can help further concrete the trends observed with the primary data.

Data Analysis Methods

We would conduct a t-test of students' grades between online and in-class settings of the three courses to draw a direct comparison of course delivery through the three different courses. The p-value would allow us to determine whether there is a significant difference between online and in-class product delivery for the different courses.

We would then conduct a regression analysis to further compare the dependent variable against the independent variables. This would be followed by a second regression test to see the interactions between perceived satisfaction, effectiveness and engagement to the overall GPA. This allows us to identify the combination of variables with the highest impact on the student's grade. We would also use the p-value and t-stat to determine the statistical significance of the different variables to identify the possible root causes of the difference in grades if any.

Conclusion

In conclusion, the research will provide evidence in determining if there is a considerable difference in the academic performance of students between online and in-class students for three different types of courses. The data will be collected from a survey, as well as from the institution. The results will further provide observations of the relationship between student's academic performance (GPA) and the class delivery method, either in-class or online. The evidence will enable educational institutions to decide if education systems should gear towards utilizing online learning more as a platform for learning.

Our study does have limitations and one of them is that the study only involves ERAU and no other universities. Also, a bigger dataset would provide a fairer study as our preliminary study only involves 10 students. Another limitation is that online and in-class lessons for a course are not offered in the same term. Lastly, online and in-class instructors may have diverse

ways of conducting their lesson. Online instructors may not give detailed or sufficient feedback to the students compared to in-class instructors. With the limitations recognized, the findings from this research study can be used to support future research relating to this topic.

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Appendix

Qualtrics Survey Questions

1. What is your age?
2. Which ERAU campus are you from?
3. Which faculty are you from?
4. What is your course of study?
5. Are you a Full-time or Part-time student?
6. How many online courses are you taking this term?
7. How many hours do you spend in a week for online courses?
8. How many hours do you spend in a week for in-class courses?
9. Do you prefer online classes or face-to-face classes?
10. How many academic terms have you completed?
11. How effective do you think online classes are for you?
12. How engaged do you think online classes are for you?
13. How satisfied are you with online classes?
14. How effective do you think face-to-face classes is for you?
15. How engaged do you think face-to-face classes is for you?
16. How satisfied are you with face-to-face classes?
17. What is your CGPA?