

Study and Analysis of COVID-19 Impacts on the Performance of College Students and Courses

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Received: 21 November 2021; **Accepted:** 15 December 2021; **Published:** 31 January 2022

Abstract:

The COVID-19 pandemic has transformed every domain of the world including the education. The main objective of this research is to analyse and study the impacts of COVID-19 pandemic on the performance of the students and courses. The analysis is performed based on three category of teaching mode namely face to face, face to face combined with online and completely online. The appropriate statistical tool, testing of hypothesis using ANOVA table is applied for this research work. Three salient factors of this analysis is to compare the students' performance based on the different mode of teaching for all target students, course wise impact of teaching and students who have come across all the 3 modes of teaching. Analysis of student's performance is imperative at this stage, since this helps to bring out fruitful outcome with respect to education.

Keywords:

Pandemic Impact, ANOVA test, E-learning, F2F learning, Higher Education

1. Introduction

The introduction of your article is organized as a funnel that begins with a definition of why the experiment is being performed and ends with a specific statement of your research approach. And it highlights controversial and diverging hypotheses when necessary.

Life style has been changed rapidly before 2020 and after 2020, one of the most important aspect to change is a virus which shocked the entire world. There are Six Corona virus species are known to cause human diseases, four viruses (229E, OC43, NL63 and HKU1) cause common cold symptoms which are immuno-competent by individuals based on their body level [23]. The other two SARS-CoV and MERS-CoV are respiratory syndrome which are linked to fatal illness [8] which emerged in

2003 and 2012 respectively. The first case of COVID-19 was reported in the last quarter of 2019, when a cluster of patients was reported by officials in Wuhan city, China [13].

In this pandemic situation, each and every person faces difficulty both physically and psychologically. In spite of these difficulties, providing quality education to students is the most challenging task faced by academicians. Online teaching is the only scope of education in this pandemic period. During the first quarter of 2020, most of the mode of studying started to shift from traditional to online teaching mode. This bequeathed a way for most of the educators to search for many online tools capabilities to help the students to observe more knowledge in a better way. As there is uncertainty about the end of this pandemic as new variant of COVID-19 started to spread in many European countries [15] this induces the techno-stress level of both educators and pupil [4,11,16,17,18,25].

Before pandemic the usage of online tools was very limited by the educators, which has a positive and negative impact on the performance of students. During face to face teaching and learning process, there exhibits a good interaction between the educator and pupil, where each and every doubt raised by the pupils were addressed using the traditional chalk and talk method. More examples were illustrated to make the pupils to understand better. With respect to online teaching, students face many problems such as technical difficulties, lack of concentration, communication and many more. Even though using the online teaching method has course content, class size and assessment plans remain static when compared with in campus education, but the performance of the students varies.

In this research we used the data of student's performance from face to face, online and hybrid teaching modes and evaluated the performance of students using different parameters. This research concentrates on the students' performance based on different categories and provides evidence to find the significant difference in different modes of teaching, course wise, mode of teaching and general performance in these mode of teaching. The mean of the students' performance in each category of these mode of teaching is analyzed using ANOVA table and the corresponding results are brought out applying testing of hypothesis.

This paper work consists of 6 sections. Section 2 provides the literature review related to the area of work. Section 3 deals with the analysis of three modes of teaching by students, courses and students with common courses Section 4 provides the conclusion of the research work.

2. Literature Review

There is very less literature available in the same area of study since the research is based on Covid-19 impacts. A research was conducted to identify three key reasons for rejecting online teaching. the shortcomings of online learning, inadequate self-regulation, and their lack of time and professional knowledge. The pandemic had given more hardship which makes the students to be more resistant to online learning at home. A survey was conducted to evaluate the feedback of Chinese parents and majority of them were holding a negative impression on online teaching and preferred traditional way of teaching mode. The outcome of their research suggested that the implementation of online learning during the pandemic has been problematic and challenging for families [6].

An online survey was conducted to evaluate the teachers and students experience on online teaching mode. Most of the students have negative impact toward poor connectivity, technical problems and getting disconnected, distraction at home and no proper structured learning environment. When it comes to positive side it's better for them to study from any environment which saves their time and helps them to revise the topics by watching the recorded videos [10].

A research study was carried to examine the attitude of Pakistani higher education students towards compulsory digital and distance learning university courses amid Covid-19. The researchers used the demographic data using Likert scale and recorded the percentage of student's response. According to their study, most of the students had proper internet facility and are well qualified to use technology for online classes even then most respondents felt that conventional classes were more effective as compared to online learning [21].

The main aim of a research conducted is to examine the determinants resulting in students' perceived learning outcomes and their influence on student satisfaction. The data was collected from undergraduate students in both South Korea and India to gain a cross-country study. Around 50% of students responded that they do not have an online experience [12].

The researchers speak about the video based learning and its impact on students during this COVID-19 pandemic. Data has been collected from University students who took part in full semester video-based learning. It has been observed there is moderate effect based on gender and video-based learning positively fits into the student's perception [9].

A study initiated in Jakarta Province, Indonesia to identify the factors of technostress on teaching. The impact is not only on lectures health but also an issues for the management [24,25]. The outcome of this research provides essential points that techno-complexity is precisely the only factor for technostress in turn which increases the workload of teachers [19].

In this pandemic not only the virus spreader to the entire whole but also spreads the psychological stress which revived by a study conducted by china. As a result, they found out that the students are bored with online learning; put a load on parent's low income, emotional disturbances caused by too many assignments [1,5].

In this study the researchers summarize the responses from online instructors and their difficulties over online teaching and learning process. Monitoring students behaviour during online classes are the major challenges. Students explored the utility and reliability of the online tools [2,3,14,20,22]. As a conclusion, the researcher specifies 30% of the instructors are under psychological pressure and 70% agrees that the workload has been increased. Online teaching and learning has some positive impact on students such that they can study without any limitations. [7].

In general, the online mode of education has more negative impacts on the student and the teaching community and with very minor positive implications. The education fraternity has to use this pandemic situation in a positive way to explore more in the teaching-learning process.

3. Analysis of Different Modes of Teaching

For this analysis, three different modes of teaching are discussed, which are represented as F2F, F2FONLINE and ONLINE. Here, the first mode of teaching F2F

refers to face to face mode of teaching. The second mode of teaching F2FONLINE mode of teaching gives the combined results of both face to face and online method of teaching process. The third mode of teaching taken for discussion is purely based on online mode of teaching.

3.1. Analysis of Students' Performance for Different Modes of Teaching

This section discusses the students' performance in three different modes of teaching. The first research question investigated here is to check if there is a significant difference among the means of student's performance in three different modes of teaching.

3.1.1. Analysis of Variance

Testing of hypothesis using ANOVA table is carried out for this analysis. Research hypothesis considered is that the mean score performance of the different mean students' performance in F2F is equal to mean students' performance in F2FONLINE and also is equal to the mean students' performance in online.

In order to test the hypothesis, the mean score of students' performance in three modes of teaching (F2F, F2FONLINE and ONLINE), single factor ANOVA was performed.

The below given Table 1, describes that the decision is to reject the null hypothesis. There is a statistically significant difference between our group means. We can see that the significance value is below 0.05, ($F(2, 228) = 4.99, p < 0.001$). It was seen that at least one mean is different from other. To determine that, it is required to follow up with multiple comparisons.

Table 1. ANOVA.

Source of Variation	SS	df	MS	F	P-value
Between Groups	1990.452	2	995.226	4.994817	0.007533
Within Groups	45429.4	228	199.2517		
Total	47419.85	230			

3.1.2. Paired Sample t-Test

A paired-samples t-test was conducted to compare the mean score among the three means of students' performance in three different modes of Teaching.

Table 2. Paired Samples Statistics.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	F2F	60.8155	40	12.87485	2.03569
	F2FONLINE	69.1428	40	13.18360	2.08451
Pair 2	F2F	61.3491	31	11.32407	2.03386
	ONLINE	69.6226	31	8.89729	1.59800
Pair 3	F2FONLINE	70.2351	67	13.81102	1.68728
	ONLINE	67.6704	67	11.93571	1.45818

3.1.3. Paired Samples Correlation Test

The following table illustrates the paired samples correlation test for three modes of teaching.

Table 3. Paired Samples Correlations.

		N	Correlation	Sig.
Pair 1	F2F - F2FONLINE	40	.686	.000
Pair 2	F2F - ONLINE	31	.500	.004
Pair 3	F2FONLINE -ONLINE	67	.501	.000

3.1.4. Paired Sample Test on Confidence Interval of the Difference

Table 4 describes the mean, standard deviation, standard error mean and confidence interval of the difference at 95% for the pairs of three modes of teaching.

Table 4. Paired Samples Test.

		Paired Differences			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference
					Lower
Pair 1	F2F - F2FONLINE	-8.32730	10.32855	1.63309	-11.63053
Pair 2	F2F - ONLINE	-8.27352	10.32750	1.85487	-12.06167
Pair 3	F2FONLINE -ONLINE	2.56475	12.95868	1.58315	-.59612

3.1.5. Paired Samples Two-Tailed Test

For the pairs of three modes of teaching, Table 5 illustrates the two tailed test.

Table 5. Paired Samples Test.

		Paired Differences	t	df	Sig. (2-tailed)
		95% Confidence Interval of the Difference			
		Upper			
Pair 1	F2F - F2FONLINE	-5.02407	-5.099	39	.000
Pair 2	F2F - ONLINE	-4.48536	-4.460	30	.000
Pair 3	F2FONLINE -ONLINE	5.72562	1.620	66	.110

3.1.6. Analysis of All Tests

Based on the analysis performed in the above sections, the following observations are established.

F2F and F2FONLINE students' scores performances were moderate and positively correlated ($r=.686$, $p<0.001$). There was a significant average difference between F2F and F2FONLINE students' scores ($t(39) = -5.02407$, $P<0.001$). On average, F2FONLINE scores were 8.33 higher than F2F scores (95% CI [-11.63, -5.02]

F2F and ONLINE students' scores performances were moderate and positively correlated ($r=.500$, $p<0.001$). There was a significant average difference between F2F and ONLINE students' scores ($t(30) = -4.48536$, $P<0.001$). On average, ONLINE scores were 8.30 higher than F2F scores (95% CI [-12.06, -4.460]

F2FONLINE and ONLINE students' scores were moderate and positively correlated ($r=.501$, $p<0.001$). There was no significant average difference between F2FONLINE and ONLINE students' scores ($t(66) = 5.72562$, $P>0.001$).

3.2. Analysis of Course Wise Performance for Different Modes of Teaching

This section makes analysis on the course wise analysis of students' performance for three different modes of teaching. The Second research question investigated is to determine whether the mean test score differs over all for F2F, F2FONLINE and ONLINE for different courses.

Research hypothesis considered is that the mean test score for F2F, F2FONLINE and ONLINE for different course are equal.

3.2.1. Analysis of Variance

In order to test the hypothesis, the mean score student wise performance by course wise in three mode of teaching, single factor ANOVA was performed.

Table 6. ANOVA.

Source of Variation	SS	df	MS	F	P-value
Between Groups	950.8162	2	475.4081	8.696238	0.00049
Within Groups	3225.427	59	54.66825		
Total	4176.243	61			

The Table 6 above illustrates that the decision is to reject the null hypothesis. There is a statistically significant difference between the group means. The significance value is below 0.05, ($F(2, 59) = 8.696, p < 0.001$) and it was seen that the at least one mean test score is different from other. To determine that, it is required to follow up with multiple comparisons.

3.2.2. Paired Samples t-Test

A paired-samples t-test was conducted to compare the mean test score for F2F, F2FONLINE and ONLINE for different course in three different mode of Teaching.

Table 7. Paired Samples Statistics.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	F2F	61.7986	8	5.62033	1.98709
	F2FONLINE	71.6131	8	5.88922	2.08215
Pair 2	F2F	63.1404	15	6.02889	1.55665
	ONLINE	68.6157	15	7.18949	1.85632
Pair 3	F2FONLINE	73.0774	12	7.86960	2.27176
	ONLINE	69.4024	12	8.05626	2.32564

3.2.3. Paired Samples Correlations

Table 8 illustrates the course wise analysis of paired sample using correlations for three modes of teaching. (Table 8)

Table 8. Paired Samples Correlations.

		N	Correlation	Sig.
Pair 1	F2F - F2FONLINE	8	.315	.447
Pair 2	F2F - ONLINE	15	.404	.136
Pair 3	F2FONLINE -ONLINE	12	.623	.030

3.2.4. Paired Samples Confidence Interval

The below given table describes the mean, standard deviation, error mean and confidence interval for paired samples of three modes of teaching. (Table 9)

Table 9. Paired Samples Test.

		Paired Differences			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower
Pair 1	F2F - F2FONLINE	-9.81450	6.73949	2.38277	-15.44885
Pair 2	F2F - ONLINE	-5.47530	7.28338	1.88056	-9.50870
Pair 3	F2FONLINE -ONLINE	3.67506	6.91635	1.99658	-.71938

3.2.5. Paired Samples Two-tailed Test

Course wise analysis of paired samples of three modes of teaching using two tailed test is given in Table 10.

Table 10. Paired Samples Test.

		Paired Differences	t	df	Sig. (2-tailed)
		95% Confidence Interval of the Difference			
		Upper			
Pair 1	F2F - F2FONLINE	-4.18014	-4.119	7	.004
Pair 2	F2F - ONLINE	-1.44190	-2.912	14	.011
Pair 3	F2FONLINE -ONLINE	8.06950	1.841	11	.093

3.2.6. Analysis of All Tests

F2F and F2FONLINE students' test scores performances for different courses were weak and positively correlated ($r=.315$, $p>0.001$). There was a significant average difference between F2F and F2FONLINE students' scores ($t(7) = -4.119$, $P<0.001$). On average, F2FONLINE scores were 9.81 higher than F2F scores (95% CI [-15.44, -4.18])

F2F and ONLINE students' test scores performances for different courses were weak and positively correlated ($r=.404$, $p>0.001$). There was a significant average difference between F2F and ONLINE students' scores ($t(14) = -2.912$, $P<0.001$). On average, ONLINE scores were 5.47 higher than F2F scores (95% CI [-9.50, -1.44])

F2FONLINE and ONLINE test scores performances for different courses were moderate and positively correlated ($r=.623$, $p<0.001$). There was no significant average difference between F2FONLINE and ONLINE students' scores ($t(11) = 1.841$, $P>0.001$).

3.3. Common Students' Performance in Different Modes of Teaching

This section analysis about the common students' performance in all mode of teaching. For this purpose, the sample of 29 same students are included in the all the mode of Teaching with their scoring of marks. The students' performance in all the three modes of teaching is found to be different, which are described as follows.

3.3.1. Analysis of F2F Mode of Teaching

In the first mode of teaching namely F2F, the students have scored between 57.37 and 65.83, which is described in Figure 1.

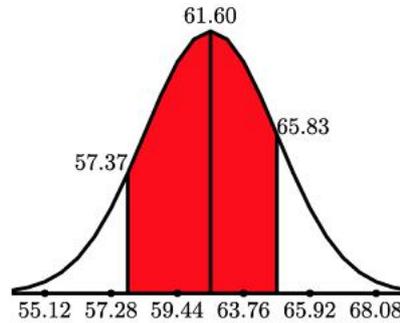


Figure 1. F2F students scored in Between 57.37 and 65.83.

3.3.2. Analysis of F2FONLINE Mode of Teaching

The same set of students, when undergone F2FONLINE mode of teaching, their scores were found to be between 65.26 and 73.72 which is shown in Figure 2.

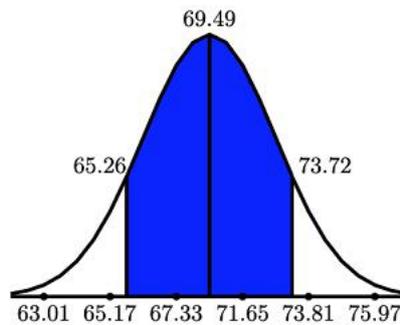


Figure 2. F2FONLINE students scored in Between 65.26 and 73.72.

3.3.3. Analysis of ONLINE Mode of Teaching

With respect to online teaching, the same 29 students appeared for examination from ONLINE teaching mode. The students scored in between 66.48 and 73.14. Comparing to other two modes, the minimum marks of the students 66.48. (Figure 3)

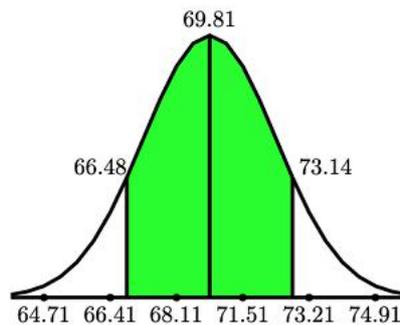


Figure 3. ONLINE students scored in Between 66.48 and 73.14.

3.3.4. Comparative Analysis of Three Modes of Teaching

Out of 125 students, only 29 students participated in all the three modes. From the 95% confidence interval, the students scored in between 53.54 and 75.40 (This calculation included all the mode of student such as F2F, F2FONLINE and ONLINE). (Figure 4)

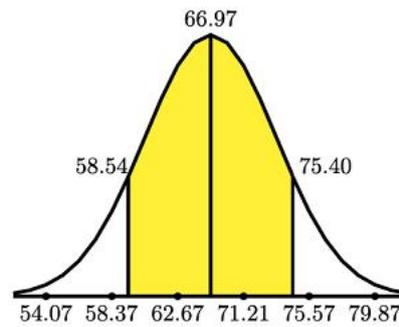


Figure 4. Comparative analysis of three modes of teaching.

3.3.5. One Sample Test for Three Modes of Teaching

Comparing to F2F, the ONLINE mode teaching students scored more marks particularly online mode students scored more marks. (Table 11, Figure 5)

Table 11. One-Sample Test.

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
F2F	29.574	29	.000	61.59842	57.3385	65.8583
F2FONLINE	33.272	29	.000	69.48851	65.2170	73.7600
ONLINE	42.465	29	.000	69.81494	66.4525	73.1774
Target mean	40.277	29	.000	66.96729	58.5425	75.4017

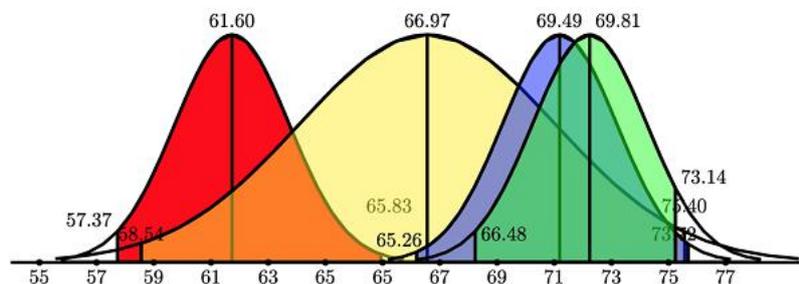


Figure 5. Comparative one-sample test result on three modes of teaching.

4. Conclusions

Analyses based on three modes of teaching namely, F2F, F2FONLINE and ONLINE, were discussed. The analysis is performed based on three categories of study. The first category of the work is to analyze the three modes of teaching for all students. The second category of the research work is the course wise analysis for three modes of teaching. In both these categories of analysis, it is found that both F2FONLINE and online mode of teaching have produced almost similar results. The third category of analysis is about the common students' performance, which has shown result that in online mode of teaching, students' performance is found to be high. The result reveals that the students' performance is remarkable with respect to online mode of teaching. In future, to find the significant reasons behind the students' high performance in the online mode of teaching, the factors like home environment, time management, online resources, concentration on virtual classes, recorded classes and e-learning videos etc., may be investigated.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Acknowledgments

The authors would like to thank the Deanship of the University of Technology and Applied Sciences – Salalah (CAS) Campus for permitting us to conduct our research to find out the impact of the pandemic in the students' progress. We would like to thank all the staff members of the IT department of the same campus who have handled the courses and shared the statistics with us for successfully completing this research.

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