
THE IMPACT OF PANDEMIC ON ACADEMIC ACHIEVEMENTS OF STUDENTS AT UNIVERSITY OF TECHNOLOGY AND APPLIED SCIENCE- OMAN

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1. Introduction

Every aspect of human life was affected by the COVID-19 epidemic, which engulfed the world in early 2020 and presented previously unimaginable difficulties and interruptions. Education was one of the industries that was most severely impacted, with students of all ages having to deal with sudden changes in their learning settings and methodologies. This essay analyzes the pandemic's complex effects on students' academic performance, drawing from a variety of studies and reports conducted both during and after the outbreak.

Schools and institutions shut their physical doors and switched to online and remote learning forms as governments fought to stop the virus's spread. Students faced a new set of difficulties as a result of the abrupt change in instructional modalities, including the requirement for technological access, dependable internet connections, and the capacity for remote learning environments. Additionally, the closure of extracurricular activities, libraries, and study areas brought on by the epidemic severely disturbed the academic schedules that students had been accustomed to.

The pandemic's obstacles were not all the same; they greatly differed depending on things like age, socioeconomic status, location, and existing educational gaps. According to research, students from economically disadvantaged households experienced more difficulties and had less access to the digital resources required for online learning. The emotional toll of the epidemic, which was marked by elevated stress, worry, and isolation, also made it more difficult for many pupils to learn.

The influence of the pandemic on academic accomplishments will be examined from a variety of angles in this study. The differences in educational outcomes, the efficacy of distance learning, the effects on students' mental health, and potential long-term effects on their academic trajectories will all be covered. While the epidemic surely brought about a number of difficulties,

it also encouraged innovation and adaptation in the educational system, leading to inventive solutions being developed by institutions and instructors to lessen the disruptions. We must look at the data and experiences gathered during this exceptional moment in history if we are to fully comprehend the pandemic's impact on pupils' academic results. By doing this, we can gain understanding of the lessons discovered and the techniques that can be used to create a more durable and fair educational system in the post-pandemic age.

The COVID-19 pandemic had a complex effect on the academic success of students at the University of Technology and Applied Science in Oman. The sudden shift to online learning exposed access differences, and the emotional stress brought on by the pandemic impacted students' academic paths even more. To support students and teachers in adjusting to the new educational landscape, UTAS came up with creative ways as a response. Continuous investigation and assistance for UTAS students are necessary to comprehend and treat the pandemic's long-term consequences on academic success.

This global crisis affected all nations in the Gulf Cooperation Council (GCC), which consists of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE). This introduction investigates the many effects of the pandemic on students' academic performance in GCC nations, taking conclusions from a growing corpus of studies and reports that have recorded the difficulties and changes brought about by this unprecedented scenario.

Governments and academic institutions in the GCC region implemented a number of countermeasures to the COVID-19 pandemic, including the temporary closure of schools, colleges, and universities. These restrictions forced a sudden switch from traditional in-person learning to various forms of distant and online education, which presented difficulties for both students and teachers.

The pandemic's effects on students' academic performance in the GCC countries were not consistent and were influenced by a number of variables. They are such as the degree to which educational institutions were prepared for online learning, the extent to which students had access to technology and the internet, their age and educational background, and the length of the disruptions brought on by the pandemic. Additionally, the pandemic's impacts affected students' mental health and general well-being in addition to having an impact on their academic performance. As we go deeper into this topic, we'll examine the various facets of the pandemic's impact on students' academic performance in GCC nations in general and Oman in particular. The challenges posed by the abrupt change to online learning, the ensuing digital divide, the measures that educational institutions took to adapt, the implications for students' mental health, and the potential long-term impacts on their educational trajectories will all be covered in this inquiry.

2. Literature review

Institutions in Oman, including the University of Technology and Applied Science (UTAS), were affected by the COVID-19 epidemic, which disrupted higher education globally. The pandemic's consequences on students' academic performance at UTAS are investigated in this study, which takes into account variables like the switch to online learning, access disparities, the pandemic's effects on mental health, and creative responses from the institution.

The abrupt switch from face-to-face to online instruction significantly affected academic performances of UTAS students. Al-Mahrouqi and Al-Kalbani (2021) highlighted that technological concerns, digital literacy, and students' capacity to adjust to remote learning environments were challenges that were encountered throughout this transition. Many students encountered obstacles to efficient online learning, especially those without access to dependable internet or appropriate gadgets (Ministry of Higher Education, Oman, 2020).

Existing inequities among UTAS students were made worse by the pandemic. According to Al-Hinai and Al-Kalbani (2020), kids from lower socioeconomic backgrounds were disproportionately affected by the digital divide, which hampered their ability to advance academically. In Oman, where internet infrastructure is less established, these differences were especially noticeable in rural regions (Al-Rashidi & Al-Badi, 2022).

Academic success suffered as a result of the pandemic's emotional toll on UTAS students. Students are experiencing greater tension, worry, and loneliness, which has a negative impact on their capacity to focus and engage in their academics, according to Al-Salti and Al-Rawahi (2021). For the student to continue performing well in school, the pandemic-induced mental health issues needed to be addressed.

The pandemic's challenges were met by UTAS with creativity and agility. The institution uses a number of measures, some of which were reported by Al-Harthy and Al-Mahrouqi (2023), including faculty development in online teaching techniques, the creation of digital learning tools, and improved student support services. These initiatives intended to lessen the disruptions and guarantee continuous academic advancement.

Covid-19 and education in Ukraine: government reactions and teachers' perspectives, Lokshyna, O., Topuzov, O. 2021 study. The aim of the study was to examine how the Ukrainian educational system operated throughout the epidemic, and in order to do so, the synergetic theory was used to examine educational practices and policies. In order to operate the educational institutions, MES has implemented regulations, which were issued on April 1, 2020. Adding the "fixation" to the student's books and notes is another thing to do.

To improve Oman's virtual educational system, Slimi, Z. (2020), examines the advantages, difficulties, and potential solutions of online learning. Additionally, the study relies on first-hand knowledge for eight weeks of online instruction at the Maritime College of Oman, followed by an

online qualitative study. Additionally, there are a number of difficulties with the technical infrastructure for both academic institutions and students' readiness to use technology in learning and teaching.

Garcia, E., and Weiss, E. (2020) note a significant loss in learning over the summer, from one to two months for reading and (1-3) months for arithmetic. Consequently, there is a connection between the pupils' performance and absence. The results of the students would decline if attendance rose, demonstrating a negative link.

The Impact of COVID-19 on Education, according to a 2020 study by Syed, M. evidence on the effects of lockdown's early stages, summarized. The study analyzes The Learning and Work Institute's findings, which indicate that women, children, and those with lower levels of capability are all more at risk: Workers who are under 30 years old are more than twice as likely to work in a "closure area" as those who are 30 years or older. Given evidence from previous downturns, it is likely that young people would feel the effects more than others would. For example, 33% of long-term workers at that time were either furloughed or lost their primary jobs as a result of the first lengthy lockdowns.

Zancajo, A. (2020) study: The impact of the Covid-19 pandemic on education, a rapid review of the literature on Covid and Society -British Academy highlighted how the pandemic affects understudies' learning outcomes in the short term, and how this influence can exacerbate educational inequities or the achievement gap across groups of people. As a result, they discovered that kids whose mothers had poor levels of education and those who benefited from social benefits were the ones who were most affected by learning deficits as a result of the epidemic. Furthermore, research demonstrates that parents have had greater difficulties in assisting their children's recovery after an emergency, both in terms of material assets and self-capability.

Using data from a group of ESL students in Oman, Syahrin, S., and Abdalla, A. (2020) analyzed their online learning experiences. The analysis discovered a significant connection between the understudies' subject of study and learning preferences in this way. This result is consistent with research on community college students in the United States, which shows that there are significant differences in students' preferred learning styles across academic disciplines as per the adoption of the revolutionary COVID-The review.

According to a 2020 study by Di Pietro, Biagi, Costa, Karpiski, and Mazza regarding the expected effects of COVID-19 on education: Reflections based on recent international datasets and previous literature. Learning impairments are often expected to happen during the lockdown. However, considering that other factors are likely to also contribute to COVID-19's detrimental effect on student accomplishment, the true extent is probably greater. The size of the appraisals, for example, reveal a week-to-week learning loss of between 0.82 and 2.3 percent of a standard deviation.

S. Pokhrel and R. Chhetri (2021) report points out specific weaknesses include the absence of an internet-based presentation structure, teachers' resistance to online instruction, the data gap, an inadequate environment for at-home study, and the importance and academic excellence of advanced education. Diverse teaching strategies have been created for online and distant learning, though, and educators who are creatively in reverse want proper professional development and preparation to set themselves up for their students' success. Realistic assessments and ideal criticism are necessary for learning. Therefore, it is necessary to invest time and resources in finding the most suitable answers to their particular educational demands.

El Said, G. (2021) study examined the overall learning experience following the rapid switch from in-person instruction to online distance learning as a result of the COVID-19 lockout at one of Egypt's colleges. A variety of student academic displays from the spring 2020 semester and the semester before were examined, together with professors' comments and students' happiness. By giving a reasonable understanding of the impact of the pandemic's interference with face-to-face training, this examination will enhance the existing writing. The distance picking up during the COVID-19 lockdown prevented students with low GPAs from taking advantage of the assistance and tutoring programs provided by the local college, therefore the outcome was considered because of this.

Magomedov1, I., Khaliev, M., & Khubolov, S. (2020) show how these previously thought-of technologies were used in specific foundations well before the pandemic. Investigated in this work is how COVID-19 has an impact on schooling. New technology have been added to the learning part of the school to help with distance learning as a result of the epidemic. Thus, it was discovered that students who use remote learning run the risk of seeing a drop in their performance when compared to students who attend classes.

Mekonnen, S., and Muluye, W. (2020) investigated the effects of the pandemic on children and the educational system, as well as students' worries regarding the continuity of the educational system during COVID-19. The review of publications relating to the coronavirus is followed by a section on the challenges, opportunities, and educational system of online learning. However, access to educational materials is limited due to a lack of information technology and internet connection.

In 2020, Anwar, K., and Adnan, M. examined Online Learning amid the COVID-19 pandemic: Students' perceptions. It looks at educational institutions all around the world that have made the decision to make available to students online learning resources in all academic topics utilizing currently available technical resources. 73% of respondents reported having a reliable internet connection, 9.5 percent reported not having one, and 17.5 percent reported only having limited access to the internet through a cell phone or other handheld device. 67.5 percent of respondents who were asked if online and conventional learning are similar indicated that the two are quite different, while 18.3 percent stated there is little to no difference. Residents of the

community find distant learning challenging.

Most of the previous studies were conducted in countries where the resources and facilities are much better than the Oman and very limited studies were conducted related to health services, medical problems, public knowledge about COVID-19, teaching during the COVID-19 and students' satisfaction and achievement during the COVID-19 pandemic. Therefore, this study attempts to fill the gap by investigating the impact of the COVID-19 pandemic on students' academic achievements at university of technology and Applied science in Oman. It will contribute to the body of knowledge and represents novel research on this topic for Afghanistan. It may contribute to the development of policies and strategies for teaching and learning in emergency cases like the Coronavirus situation so that it will assist educational managers to improve the quality of education in post-war counties. It will also help lecturers to improve instruction and follow a proper plan for teaching in emergency situations. This research will address the following research questions.

Objectives of the Study:

1. To study the impact of pandemic times on paradigm shift in academic achievements.
2. Do the participants' demographic variables, i.e., gender, class and age have a significant impact on their responses?
3. Is there any relationship between students' level CGPA, actual marks, ACU-GPA, semester GPA, points and the impact of COVID-19 pandemic on students' academic achievements?
4. It verifies the importance of learning and studies the impact of COVID-19 pandemic on the education system especially for university students' applied science.
5. It helps educational leaders and policymakers by identifying university students' emotional needs and providing them with practical solutions to maintain a healthy educational experience among students.
6. It offers proposals, suggestions and recommendations for achieving an optimal online model of learning during the post-COVID-19 era.

3. Methodology

The study has employed a mixed method research design to collect both quantitative (numerical) and qualitative (descriptive) data. Creswell (2012) indicated that an equal emphasis should be given to both quantitative and qualitative approaches in the mixed method studies. Data were collected using an Ibri College of Technology. The researcher first collected quantitative data and then the qualitative data. He interpreted and reported the results of the study accordingly.

3.1. Quantitative research

3.1.1. Participants

The respondents of the quantitative part were 753 undergraduate students from university of technology and Applied science- Oman whose population was estimated to be around 45759 students for the academic year of 2019–2022. Based on the (Krejcie and Morgan, 1970) table for determining sample size from a given population, 900 students were selected as the sample of the study. From 900 selected respondents, only 753 of them filled out the survey questionnaire, which shows a high response rate (84%). A sample is a group of people who are taken from a given population for measurement. The sample of the study will be the representative of the population to assure that the researchers can generalize the finding of their studies to the whole population. Creswell (2012) stated that random sampling gives the chance for every member of the population to be selected as the participant of a study. The researcher estimated that some of the students might not fill out the questionnaire, so he selected a high number of students as the sample to reduce sampling error of the study. It is important to mention that the missing data do not have any effect on the interpretation and finding of the data because the participants' response rate is high. As Table 1 shows, 468 of the respondents were male and 285 were female. They were from different classes, i.e., 132 first-year diploma students, 508 second-year diploma students, 21 bachelor students and 92 advanced diploma students. In addition, 479 of them aged between 19-24 years, 245 of them aged between 25-29 years, and only 30 of them aged between 30 and above (see Table 1).

Table 1. Demographic information of the respondents

	Demographic Variables	Frequency	Percent
Class	Advanced Diploma	92	12.2
	Bachelor	21	2.8
	Diploma First Year	132	17.5
	Diploma Second Year	508	67.5
	Total	753	100.0
Gender	Female	285	37.8
	Male	468	62.2
	Total	753	100.0
Age	19-24	479	63.6
	25-29	245	32.5
	30-above	29	3.9
	Total	753	100.0

Grade	A	1	.1
	A-	3	.4
	B	19	2.5
	B-	23	3.1
	B+	15	2.0
	C	99	13.1
	C-	84	11.2
	C+	38	5.0
	D	91	12.1
	F	380	50.5
	Total	753	100.0
Results	Fail	509	67.6
	Pass	244	32.4
	Total	753	100.0
Status	COMPLETE	12	1.6
	INCOMPLETE	741	98.4
	Total	753	100.0

3.1.2. Data collection procedure

The researcher meet with the dean of the faculties and shared the aim of the research to take their agreement asking the students to cooperate with the researcher and participate in the study. After the permission was taken from university of technology and Applied science in Oman, the dataset was collected.

3.2. Data analysis

This study has employed a mixed method study, and the data were analyzed statistically and thematically. For the quantitative part, the researcher used Ms. Excel and SPSS to analyze the data. The data was then imported to SPSS and statistically analyzed using SPSS. Both descriptive and inferential statistical analyses were conducted. Descriptive analysis was carried out to find frequency and percentage. Independent Samples T-test, paired t test, Chi-Square test and One Way ANOVA tests were conducted to find out the differences in participants' responses by their demographic variables, i.e., gender, class, and age. Moreover, Regression analysis was carried out to examine the relationship between students' perception of teaching and learning and the impact of COVID-19 pandemic on academic achievements of students.

A Chi-Square test for independence compares two variables in a contingency table to see

whether they are related. Generally, it tests to see whether distributions of categorical variables differ from each other. A small Chi-Square test statistic means that the observed data fit the expected data, or there is a strong relationship. A large Chi-Square test statistic implies that the data does not have a relationship. The p-value is used to test if results are significant or not. The degree of freedom is the number of categories minus 1. The alpha level(α) is 0.05 (5%), but it could have other values such as 0.01 or 0.10. If Statistic greater than Critical Value: significant result, reject the null hypothesis (H_0), dependent. If Statistic less than Critical Value: not significant effect, fail to reject the null hypotheses (H_0), and independent.

For this work, the hypotheses are:

H_0 : The impact of pandemic on academic achievements of students' performance are independent.

H_1 : The impact of pandemic on academic achievements of students' performance are not independent.

The one-way ANOVA tests are conducted to determine the mean of some numeric variable differs across the levels of one categorical variable. It essentially answers the question: do any of the group means differ from one another. ANOVA involves more calculations than the t-test, but the process is similar: calculate the F-statistic value and then compare the test statistic to a critical value based on a probability distribution.

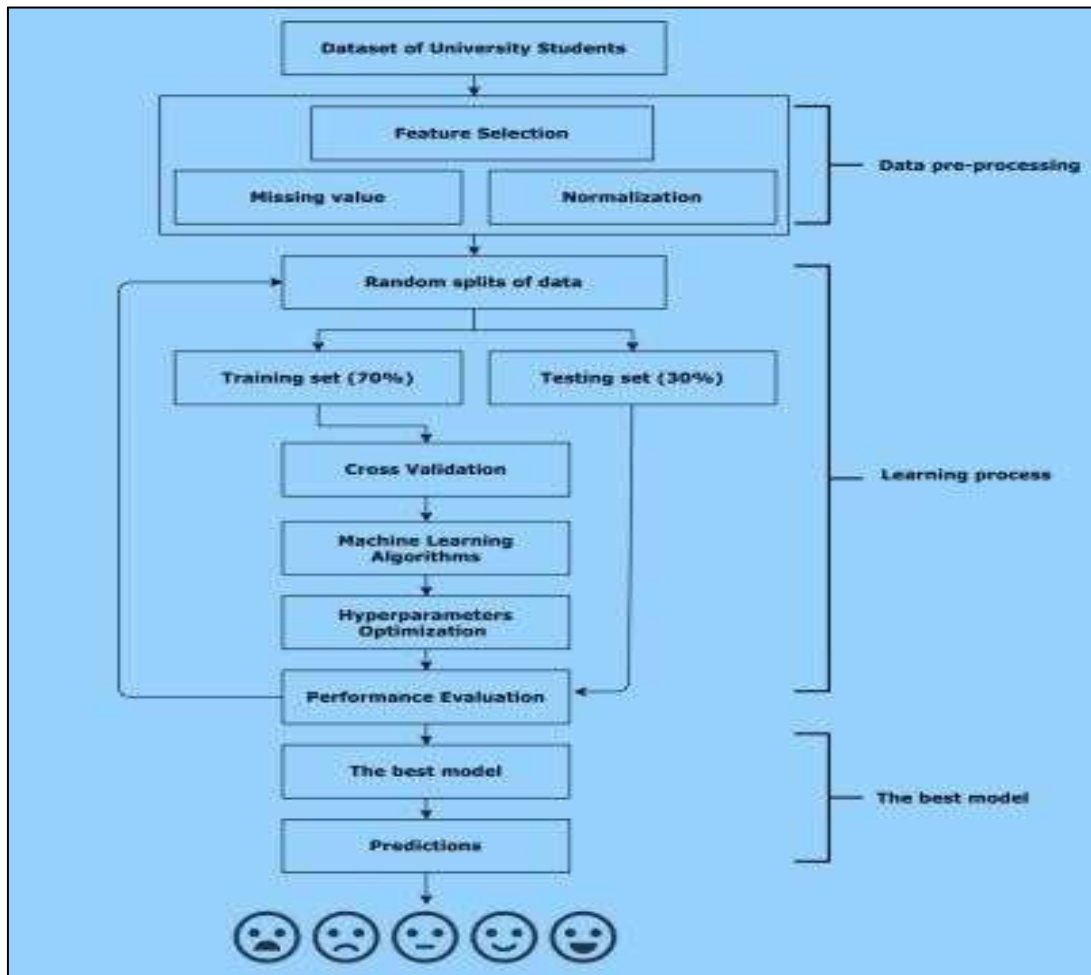


Figure. 1 Machine learning steps for data analysis.

Fig. 1 presents the steps of the proposed model for classifying the answers of students regarding COVID-19 effects. This architecture's basic idea is to use the collected dataset of university students for analysis by ensemble machine learning algorithms.

Fig. 1 shows the three main steps: data pre-processing, the learning process, and the best model. The available dataset is gathered from different Arabic universities, merged, and then pushed on to the proposed model. The commonly known data pre-processing techniques were applied to the dataset at the first block, such as missing data, normalization, and feature selection. In the learning process, the dataset was split randomly into two main subsets: Training set (70%) and Testing set (30%). Generally, the dataset size is not enough to train the models, where a part

of it is used for validation tasks. Thus, reducing the size of training data leads to losing essential patterns in the dataset, which increases the error produced by bias. Therefore, to validate the machine-learning model's stability, K-Fold Cross Validation was used to divide the data into k subsets Gad and Hosahalli, (2022). The hyper parameters optimization technique was also applied to improve the performance of the selected algorithms. Machine learning algorithms were developed using built-in python libraries such as Keras and scikit-learn Moolayil, (2018); Pedregosa et al. (2011). Finally, the predictions of the students' responses were made in the third stage.

3.3 The proposed models

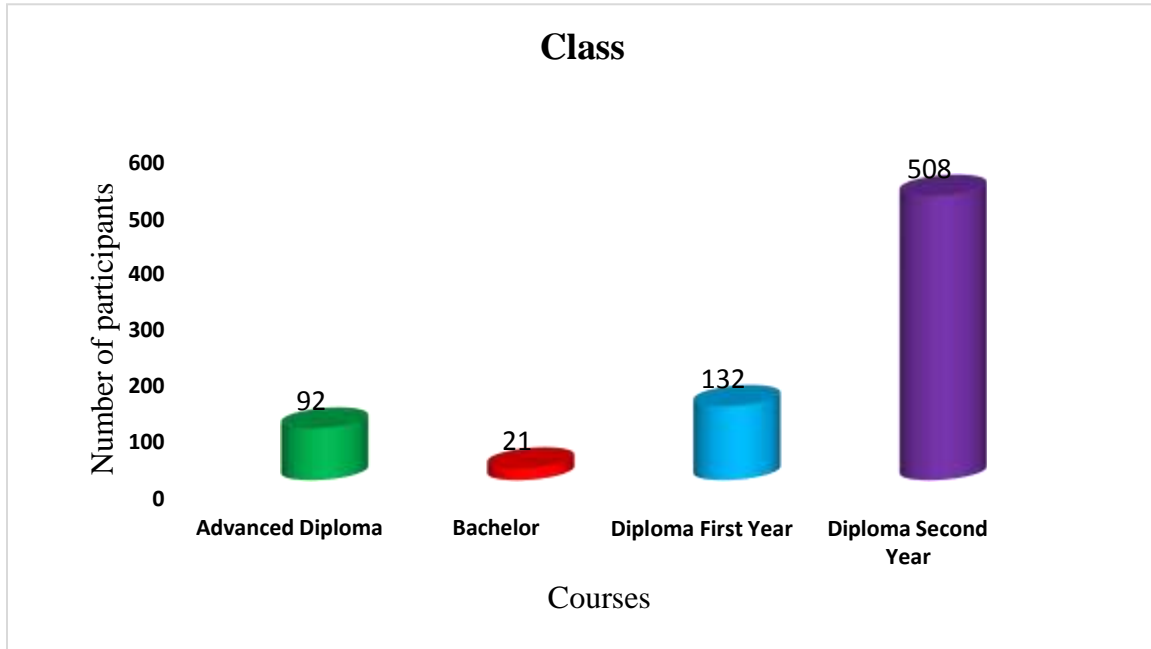
In this study, the ensemble machine learning algorithms were used to investigate the real effect of the use of impact of COVID-19 on the academic performance of the students Trappenberg, (2019) and David, (2019). The following machine learning models such as Logistic Regression model Hu et al. (2020) and ensemble learning-based models such as Random Forest, AdaBoost classifier Steinki,(2015), Extreme Gradient Boosting (XGBoost), Support Vector Machine (SVM) Lee, (2019), and Decision Tree Kumar and Priyanka, (2020) were used to predict academic performance.

These algorithms are selected because they are commonly used to solve many real-life problems. Moreover, these models were trained with the selected features such as semester GPA, courses hours, grade, points, status, results, level CGPA, probation, and academic performance.

4. Experimental results and analysis

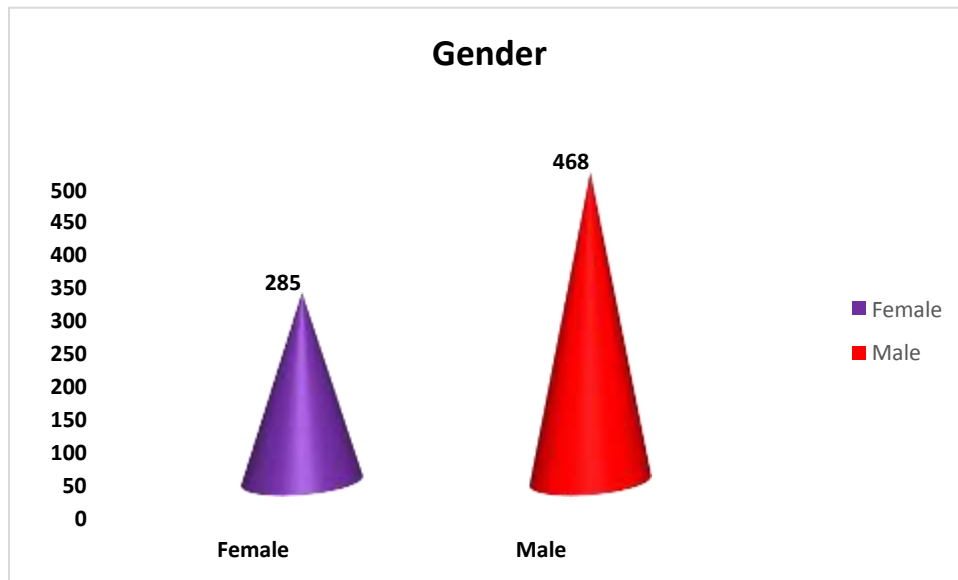
4.1. Descriptive Statistical Analysis

The data were gathered from 753 participants. Table 1 shows descriptive statistics of students' Class, Gender, age, grade, results, and status of students during the COVID-19 pandemic at university of technology and Applied science- Oman.



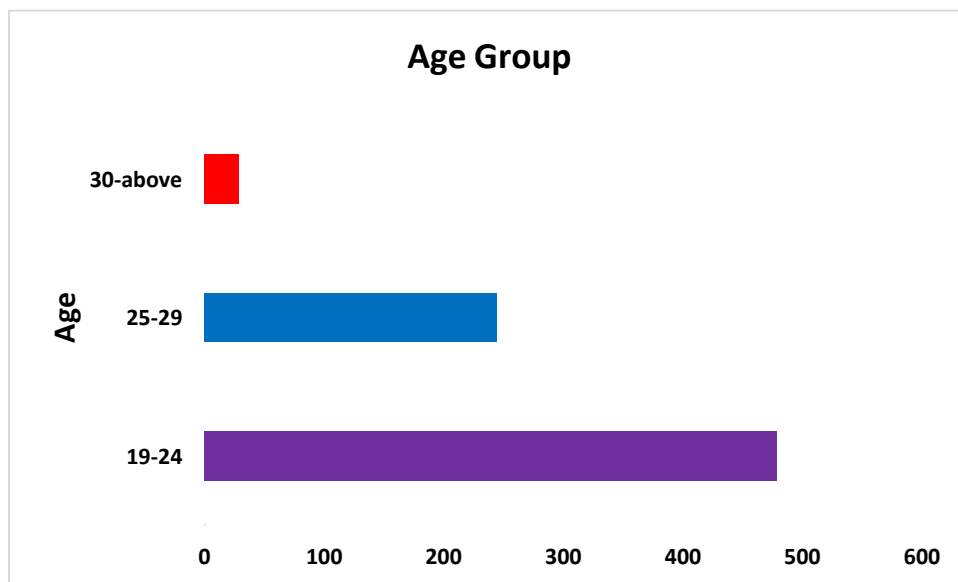
Inference

The above figure shows that 12.2% of the respondents are advanced diploma, 2.8% of the respondents are bachelor, 17.5% of the respondents are diploma first year, and 67.5% of the respondents are diploma second year.



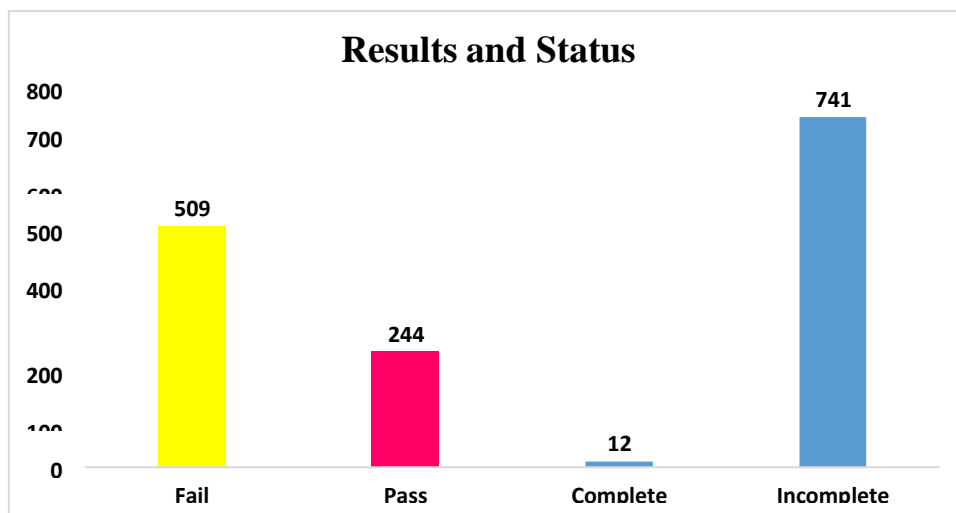
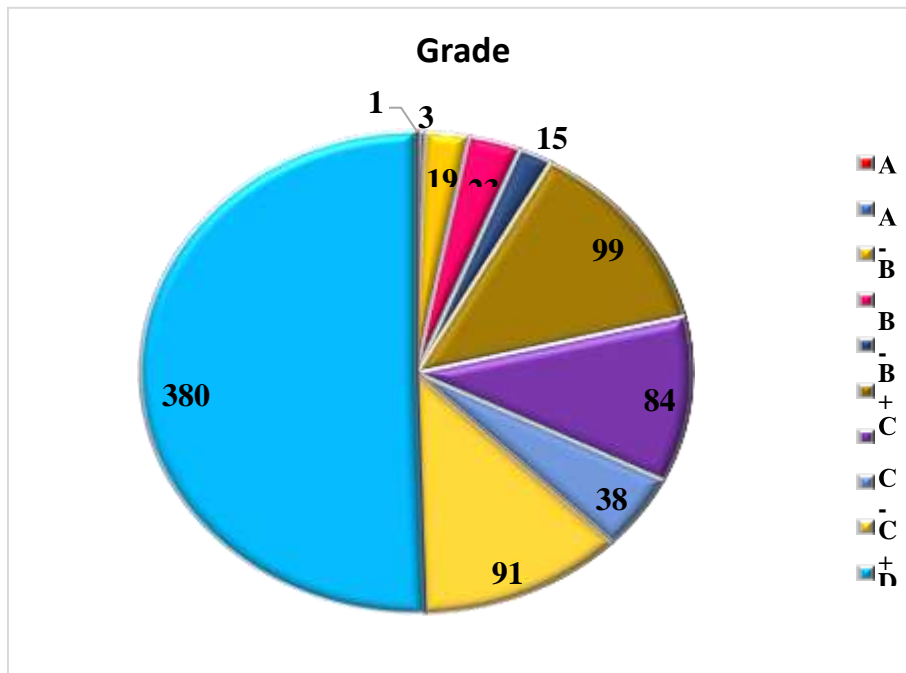
Inference

The above figure shows that 37.8% of the respondents are female and 62.2% of the respondents are male.



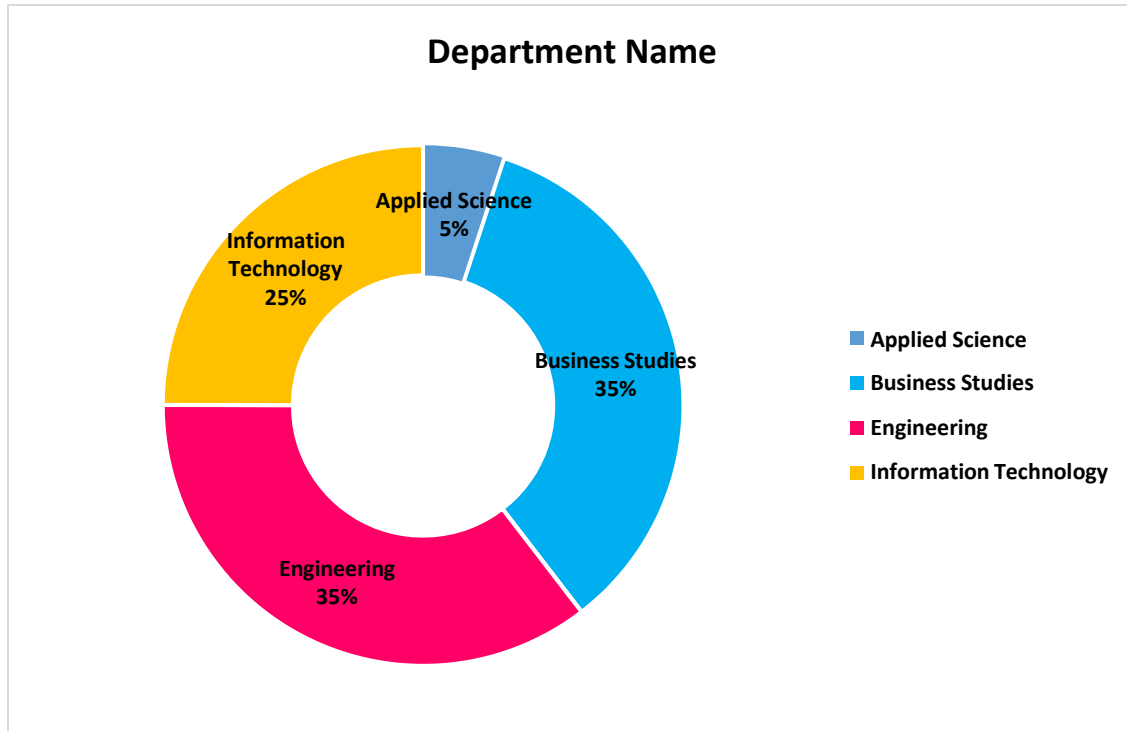
Inference

The above figure shows that 63.6% of the respondents are 19-24 age, 32.5% of the respondents are 25-29 age and 3.9% of the respondents are 30-above age.



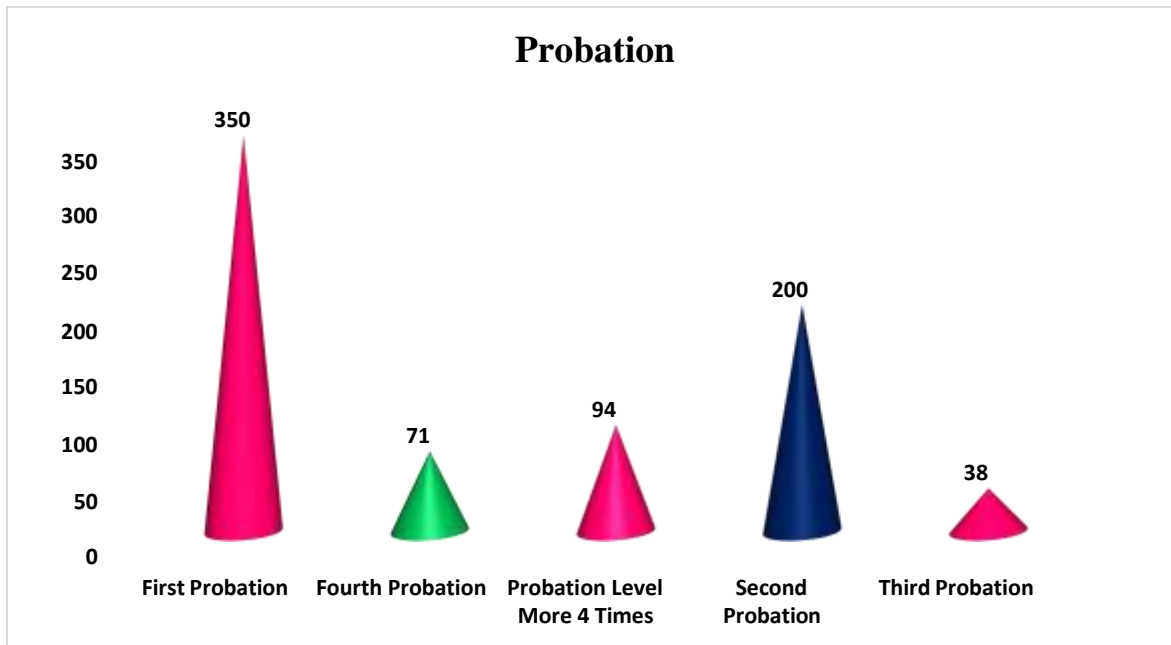
Inference

The above figure shows that 67.6% of the respondents are fail, 32.4% of the respondents are pass, 1.6% of the respondents are complete and 98.4% of the respondents are incomplete.



Inference

The above figure shows that 5% of the respondents are Applied Science, 35.5% of the respondents are Business Studies, 35.5% of the respondents are Engineering and 25% of the respondents are Information Technology.



Inference

The above figure shows that 46.5% of the respondents are first probation, 26.6% of the respondents are second probation, 5% of the respondents are third probation, 9.4% of the respondents are fourth probation, and 12.5% of the respondents are probation level more 4 times.

4.2 Participants' demographic profile

The researcher has conducted independent sample t-test and One-way ANOVA tests to determine the impact of respondents' demographic variables, i.e., gender, class, and age on their responses. The first portion of the table indicates Levene's test results. This test is done to understand if the variances of age in the two categories of each variable are homogeneous or not. As Table 2 shows, the mean was used to compare the differences in the responses of the participants for each variable. The results indicate that P-value for all variables is 0.000, which is less than 0.05 (Significance value). Therefore, it can be concluded that the students' gender does not have any significant impact on their response's outcome is rejected. However, the results of

One-Way ANOVA tests for class, Status, Probation, Result, Grade, Note demonstrate that P-value for status is 0.137, and each variable is 0.000, which is less than 0.05 (Significance value). Therefore, it is concluded that the respondents' probation, result, grade, note had a significant impact on their responses (see Table 3).

Table 2. Results of independent sample t-test

Variable s		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2- tailed)
Class	Equal variances assumed	68.352	.000	6.194	751	.000
	Equal variances not assumed			5.722	460.669	.000
Dept_Name	Equal variances assumed	149.650	.000	-9.690	751	.000
	Equal variances not assumed			-8.763	429.481	.000
Spec_Name	Equal variances assumed	63.377	.000	-11.967	751	.000
	Equal variances not assumed			-11.153	474.331	.000
Academic_Year	Equal variances assumed	6.209	.013	3.794	751	.000
	Equal variances not assumed			3.732	568.718	.000

Table 3. Analysis based on participants' demographic profile Variables.

Variables (courses)		Sum of Squares	df	Mean Square	F	Sig.
Status	Between Groups	.087	3	.029	1.847	.137
	Within Groups	11.722	749	.016		
	Total	11.809	752			
Probation	Between Groups	30.970	3	10.323	5.259	.001
	Within Groups	1470.371	749	1.963		
	Total	1501.341	752			
Result	Between Groups	2.890	3	.963	4.453	.004
	Within Groups	162.045	749	.216		
	Total	164.935	752			

Grade	Between Groups	68.194	3	22.731	5.629	.001
	Within Groups	3024.701	749	4.038		
	Total	3092.895	752			
Note	Between Groups	4.817	3	1.606	6.351	.000
	Within Groups	189.376	749	.253		
	Total	194.194	752			

4.3. Regression analysis for the impact of COVID-19 on students’ academic achievements.

The author conducted inferential statistical analysis (Regression) to examine the relationship between LEVEL_CGPA, ACTUAL_MARKS, ACU_GPA, SEM_GPA, POINTS and the impact of COVID-19 on students’ academic achievements (see Table 4). The results of the analysis showed that p-value is 0.001, which is less than the significance level (0.05). Thus, it can be concluded that there was a statistically significant relationship between LEVEL_CGPA, ACTUAL_MARKS, ACU_GPA, SEM_GPA, POINTS and the impact of COVID-19 on students’ academic achievements in university of technology and Applied science- Oman.

Table 4. Inferential statistical analysis (regression).

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	43.662	4	10.915	128.593	.000
Residual	63.493	748	.085		
Total	107.154	752			

4.4 The performance results for machine learning models

Generally, to overcome biased classification, respondents’ gathered data is randomly split into training and testing sets. Table 5 describes the classification report of the selected machine learning models. The Logistic Regression, Decision Tree, AdaBoost, XGB, and Deep learning models have achieved the best performance, which is 100%, 100%, 100%, 100% and 100% for accuracy, precision, recall, and F1-score, respectively. On the other hand, the lowest performance was achieved by the SVC method, accuracy, precision, recall, and F1-score at 94%, 88%, 100%, and 87%, respectively.

Table 5. The performance results for machine learning models.

	Accuracy	Precision	Recall	F1	ROC_AUC	R ²	MSE
Logistic Regression	1	1	1	1	1	1	0
Decision Tree	1	1	1	1	1	1	0
Random Forest	0.99361	1	1	1	0.89603	0.8967	0.453
SVC	0.94938	0.8856	1	1	0.87582	0.9967	0.6781

XGB	1	1	1	1	1	1	0
AdaBoost	1	1	1	1	1	1	0
Deep Learning	1	1	1	1	1	1	0

5. Discussion

COVID-19 pandemic has impacted all spheres of human life and students' learning in higher education is not an exception. The impact of COVID-19 pandemic on students' learning in a country with limited resources varies from those with better resources. This study aimed to find out the impact of the COVID-19 pandemic on students' academic achievements in higher education in Oman. It also attempted to explore whether students' demographic variables such as gender, class, and age had any significant influence on their responses. The finding of the study revealed that the majority of students have not experienced constant and effective learning and teaching during the COVID-19 pandemic because they were facing lack of enough facilities and resources. These limitations have hindered students' engagement in learning in higher education. The finding of this study is aligned with UNESCO (2020) report and earlier studies conducted by Onyema et al. (2020) who reported that students experienced an ineffective learning and they faced different challenges in teaching and learning activities during the COVID-19 pandemic because of lack of enough resources hindered their learning.

The results of data analysis disclosed that almost 90% of the respondents indicated that the virus outbreak and lockdown severely influenced their learning. The participants of this study ascertained that the COVID-19 pandemic has affected different aspects of students' learning such as, class projects, load of their assignments, quality of their learning, their motivation for learning, educational activities, goals, knowledge of subjects, learning performance, educational

opportunities, and the duration of their studies. Praghlapati (2020) argued that because of COVID-19 pandemic, many students have experienced anxiety which badly affected their learning outcome and academic achievement. This researcher recommended that the educational institutions should provide psychological and counseling services to support students' learning in higher education. Furthermore, the result of the study showed that the respondents' gender did not have any significant effect on their responses, although a small number of female students had status, result, grade compared to male students (Orfan, 2021). However, it revealed that the respondents' class and age had an impact on their responses.

In addition, the study found that there was statistically a significant relationship between teaching and learning and the impact of COVID-19 pandemic on students' learning in higher education of Oman. It is indicated that the association between students' level CGPA, actual marks, ACU_GPA, semester GPA, points on the impact of COVID-19 pandemic with regards to students' academic achievement is significant. Qazi et al. (2020) believed that when students do not have access to enough facilities in online learning activities, they achieve low grades and experience negative effects with regards to their achievement. Therefore, universities should try to provide enough resources for online teaching and learning.

6. Conclusion

COVID-19 is a global serious issue that needs the world's cooperation and coordination for reducing its effects. The virus pandemic has completely changed people's way of life in any corner of the world. In March 2020, the world health organization (W.H.O) declared that the virus pandemic is worldwide whose threat caused transformation and changes in education. Ever since, teaching and learning experienced different paradigm shifts and variations in the time of Coronavirus. These changes have created barriers for students' learning in higher education. Among the limitations, students experienced unstable Internet, lack of technological facilities, inadequate resources, high costly Internet, lack of awareness, lack of linguistic skills, lack of full-time power supply, preparation issues for online teaching were the major barriers to teaching and learning during the COVID-19 pandemic. These challenges had the foremost effects on teaching and learning in higher education and they are felt by students, instructors, educational institutions and other stakeholders. Oman as a post-conflict country has experienced the worst effects of COVID-19 pandemic on teaching and learning because other countries had better facilities and organized policies in managing online learning.

The study found that the majority of the respondents indicated that they have not experienced constant online teaching and learning during the COVID-19 pandemic in academic achievements of students at university of technology and Applied science, Oman. It also revealed that almost all of the respondents agreed that the COVID-19 pandemic has negatively affected their learning and they felt that they did not study for years. Moreover, the results of data analysis

showed that there was statistically no significant difference in the responses of the students by their status. However, they revealed that there were statistically significant differences in students' responses by their class, probation, result, and grade. In addition, the finding of the study exposed that there was a statistically significant relationship between level CGPA, actual marks, ACU GPA, semester GPA, points and the impact of COVID-19 pandemic on students' academic achievements in higher education of Oman.

Therefore, educational managers and higher education leaders should adapt and change policies in emergency cases and consider all aspects of teaching and learning in higher education. Particularly, each part of the world might have experienced different problems in teaching and learning. For example, during COVID-19 pandemic, students experienced dramatic changes which negatively affected their learning in university of technology and applied science. Consequently, the integration of emerging technologies in teaching is not only a case but educational leaders and higher education managers should consider changing environments, flexibility in methodologies and enhance students' involvement and creativity in higher education. This research suggests some implications. The platforms and policies for online learning in higher education in Oman need critical evaluation and review because the students faced several challenges during the COVID-19 pandemic. Researchers may compare the findings of the current study with other studies and suggest policies for improvement at both school and university level.

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