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Measuring Students' Performance In Face To Face And Online Learning - An Empirical Evidence From Oman In The Pre And During The Covid-19 Pandemic Period

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Abstract

The education sector has witnessed a paradigm shift in how the curriculum was delivered during the Covid-19 pandemic. Most of the higher educational institutions have been prompted to propel their regular course delivery mode from offline mode into a less familiar online mode to both the teachers and students This transition has resulted in a differing student's learning performance, which was not investigated much by the academic community. This paper discusses how students' learning performance differs in higher education in technological business education in face-to-face and online learning classroom settings. The study considers data of 101 graduate students from an Oman Technical University, selected systematically from the university database for consecutive two semesters in a face to face learning context in the pre-pandemic semester and online mode semester during the pandemic. Descriptive and inferential tools are used for analysis. Paired t-test shows statistical significance between the mean student's performance in Face to face and Online mode of learning. Gender analysis depicts that male students have performed better in online learning than in face-to-face learning environments. Female students found F2F mode is more convenient and suitable to give best performance, contrary to males' performance, where they prefer to be online.

Key Words: Higher education, F2F Learning, Online Learning, student performance, academic probation.

Introduction

Universities responded swiftly to the Covid19 pandemic by shifting regular classes conducted from face-to-face to online classroom platforms to curb the pandemic outbreak in 2020. Educational institutions had prompted to shift to online learning by using different learning management systems (LMS) to continue the teaching and learning process to avoid disruptions in the learning process. The higher education sector has been pushed into experimenting with e-learning unprecedentedly (UNESCO, 2020) as the learning process was shifted entirely online, all the tools and resources needed to be ready to support the learning process. This transformation was challenging for both students and lecturers who were forced to adopt a new educational environment, otherwise accustomed to face-to-face (F2F) learning. However, academic management, faculties and students were not prepared for such a sudden transition. A significant number of faculties have never taught courses entirely online before the pandemic. Similarly, students were not equipped with adequate digital gadgets and internet connectivity to adapt to the new changes (Means & Neisler, 2020). The acceptance level for digital learning by teachers and students is not extraordinarily high but sometimes satisfactory in many countries (Sharma, 2020). Academic institutions have to continuously monitor student's performance based on the data available in the large databases of universities to formulate evidence-based academic policies (Kuyoro, et.al, 2013). Therefore studies are required to understand how to enhance student's retention rates, allocation of teaching and support resources, or create intervention strategies to mitigate factors that adversely affect student's performance. Ability, gender and academic probation of students are performance standards for their academic performance (Lindo, Sanders, and Oreopoulos, 2010). Students on academic probation have poor academic preparation, lack of study skills, and difficulty transitioning and adjusting to university life (Coleman and Freedman, 1996; Pascarella and Terenzini, 2001; Tovar and Simon, 2006).Data kept in University database on students' performance is a vital source of knowledge that lets educational managers, government, parents, and other stakeholders understand how effectively they carry out the national responsibilities vested in them due to the importance of education in the national development process Managing student performance is a critical function of academic management. Universities did not have evidence-based prior researches to drive the changes with clear

direction and guidance, mainly to steer the work in the post-pandemic context. In today's complex dynamic academic environment, improving and maintaining the quality of education remains a daunting task for universities. Student performance is an indicator to gauge the efforts of a university in measuring the quality of education it imparted to its student population. As online course offerings and course assessments continue to grow in higher education, knowledge needs to be created to identify effective delivery modes for teaching and learning activities to manage student performance proactively. This empirical research focuses on how students' learning performances differ in face-to-face (F2F) classrooms and online classrooms (OL) based on selected academic indicators drawn from the university database. This paper focuses on identifying significant differences in the students' performance in F2F and OL.

Context and background of the study

The study took place at the University of Technology and Applied science, Ibri, Al Dhahirah, Sultanate of Oman. The University was a technical college until August 2020 and converted into a University vide Royal Decree 76/2020 on August 12, as part of the educational reformation that took place in the country. The University offers three qualifications, namely, Diploma, Advanced Diploma and Bachelor in technological education. There are two intakes in an academic year. The typical study period is five years in the graduate programme, including one year studying in the foundation programme, a preparatory bridging course from school to University. To get a bachelor in technology course, a student should undergo five years course of study. The business department of the Ibri campus of the University offers two specialisations, namely, accounting and human resources. The regular academic year consists of three semesters, September to December, January to April, and a shortened summer semester, May- July. During the pandemic, the University shifted its teaching and learning to online from March 16, 2020, after the midterm examination of semester 2 in AY 2019-2020. The University primarily uses Moodle as its online learning management system (LMS) and MS Teams to deliver online sessions.

Learning is an essential subset of education, and if teaching knowledge can enhance people positive behaviour, then learning becomes an education (Marsapa and Narin, 2009). Online

learning has become a necessity and in high demand in the field of education. According to the Oxford dictionary, online learning is "a system of learning that uses electronic media, typically over the internet". The integration of various technical tools is mandatory in today's changing world. There are several advantages for online learning, including ease of access to courses, reducing travel expenses and saving time (James, 2002).

Moreover, online learning and teaching gave both instructors and learners the chance to test their technical skills (Murphy, 2020). Online learning can also develop essential graduate attributes such as independence, problem-solving, and critical analysis (Hart et al., 2019). Richmond and Cummings (2005) argued that the online course is structured and designed could best influence students' learning (Richmond and Cummings, 2005). However, online learning might be quite expensive and inconvenient for students, specifically those living in remote areas lacking internet service. Furthermore, students' assessment is limited and difficult to measure in an online environment (James, 2002).

Additionally, the feeling of social presence among students is compromised in the online educational environment. Attempting to create a social presence can reduce the feeling of isolation and encourage students' engagement and participation, improving the online learning environment (Garrison et al., 2001; Aargon, 2003). If the online environment lacks social presence, the amount of information shared among other students will diminish (Mykota and Duncan, 2007). Studies show that social presence is an essential element in students' satisfaction with the learning process. This can be enhanced by the lecturer sharing information about the subject, both students and lecturers interests and challenges (Rovai et al., 2007).

F2F instructions is defined as an approach that uses the conventional educational approach in which all the learning process is arranged and managed by the instructor (Liu, 2010). The discussion between students in the classroom has more advantages than their GPA regarding F2F learning. It allows students to understand nonverbal signals, emotions and get instant feedback (Meyer, 2007). F2F learning provides a better chance for learning through interaction and sharing stories and real-life examples with other students. In addition, less distraction may occur in the classroom compared with the home environment. Furthermore, F2F discussion is

sometimes not easy, and conversations might take different directions, giving less time to clarify a doubt or comment about a topic (Meyer, 2003).

Oman is just like any other country that was impacted by the crisis due to COVID 19, particularly in education. The usage of information and communication technologies (ICTs) in education was vital to sustaining the teaching and the learning progression. The implementation of information and communication technologies needs to be planned to ensure that this implementation will withstand longer (Al Muswi, 2010). Despite the necessity of this crucial alignment of technologies with educational practices, humble movements were taken to integrate ICT in Oman's schools and University's curriculum. However, after COVID19 hits, the need for this integration was recognise and accelerated. A blended learning philosophy is adopted in all the educational environments of Oman. As the cases of infections increased in the Sultanate, a supreme committee was formed to manage all related decisions, including those linked with education. The supreme committee decided to shift all classes online and advised schools and universities to use e-learning platforms to continue the education process from home (Osman, 2020).

Conversely, several challenges were identified that hinder the effective usage of the internet and online tools in Oman's education field. The technological infrastructure which is the base for this whole process of learning is still weak, and the technical support is not up to date (Saini & Al Mamri, 2019). Another challenge of implementing E-learning in the Sultanate of Oman is the services provided by the internet services providers where they banned some particular services and online features before COVID 19 catastrophe. Due to this, many of these features -which are valuable to learners- were undiscovered and not ideally used. Moreover, some students may struggle with shifting from F2F to a complete online learning platform due to the nature of the courses, primarily on vocational training courses where the application and practical learning is vital (The Economist Intelligence Unit, 2020).

Reviews of extant literature exemplify that sparse research was done directly comparing students' performance in the traditional F2F learning delivery mode with students in the online learning delivery model, particularly in the higher education scenario of Oman. This research discusses the differences in the student performances due to the shifting of learning from F2F

to OL and how the results could be used to enhance knowledge on managing students' learning experiences in the way forward.

Methods And Procedures

This study attempts to understand how student performance differs among F2F and OL platforms considering selected academic performance variables systematically collected from specific student cohorts. The paper tries to understand how students were performed in the F2F mode of learning in two semesters selected from the pre-pandemic period and how the same students performed in the OL during the pandemic. Is there any significant difference in students' performance between F2F and OL due to the mode of learning? The study also aims to analyse the difference in performance patterns of students based on gender demographic attributes. With these questions in the background of the paper, the study has the following primary objectives:

- To analyse student's performance in F2F and OL based on gender and average SGPA using descriptive analysis.
- To analyse and compare students' performance in F2F and OL using inferential analysis.

For measuring students' performance, secondary data was collected from the database of the University. The systematic random sampling method has been adopted so that each student should complete two semesters in both F2F and OL modes. Semesters 1 &2 of AY 2018-2019 had been selected for F2F data, and Sem1 & 2 of AY 2020-2021 were selected as the period OL learning environment. In semesters 1 and 2 (2018-2019), 1137 active students studied under the business department. In 2020-2021, 881 active students represented all the learning levels from diploma to bachelor level. However, the sample for this study was 101 who underwent learning in both modes in consecutive years. The data was collected as per the University code of ethics and data usage policy. Data was used only for aggregate analysis respecting the individual privacy of each student. The main variables used for analysis are;

Semester Grade Point Average (SGPA)

Grade Point Average (GPA), is a number that indicates how well a student scored in a course on average on a 1.0 to 4.0 scale. GPA is the most common measure of a student's performance in a course and is a crucial indicator to evaluate the student performance in their graduate program. There are three types of GPA's calculated in this regard: SGPA, Cumulative GPA and the overall GPA. We used SGPA, because of our independent sample selection groups based on two consecutive online and offline learning semesters. These GPAs measures individual students' performance in the formative and summative assessments, including Quizzes, Assignments, gradable class activities and written tests. In addition to that, the performance of the student in a particular semester is considered to decide the probation status. We considered both SGPA for comparing students' performance in F2F and OL.

Probation status

As per the university rules, a student is considered to be under probation status if his/her semester GPA is less than 2 out of 4. Probation status is an indicator of students under academic risk, which will trigger counselling services to improve their performance. The probation rate is calculated using the following formula:

$$\text{Probation rate} = \frac{\text{Number of probation students}}{\text{total number of students}}$$

Descriptive statistical tools to describe the demographic and other descriptive characteristics of students' performance—paired sample t-test used for testing hypothesis.

Analysis and discussions

For analysis, two streams of analysis were performed- descriptive and inferential analysis. The results are discussed below. Table 1 shows the descriptive analysis based on gender description.

Table 1- Descriptive Statistics- Gender and Average SGPA

Gender	Count	Average SGPA	
		OL	F2F
Males	32(32%)	2.63	2.57
Females	69(68%)	2.95	3.19
	N=101	2.85	2.99

The above demographic descriptive statistics show that females (68%) are more compared to their male counterparts (32%) in the sample population. When it comes to the gender-based overall learning performance as SGPA, an indicator, in both the learning environment, female students' performance (2.95) is better than male students (2.63).

However, if we consider the gender-based performance in OL and F2F separately, the male students tend to be better performers in OL mode than in F2F mode. The assessment method essentially comprises higher-order thinking questions, which require higher levels of logical and reasoning skills. In this, male students exhibited better performance than females.

These findings go in tune with Piraksa, Srisawasdi and Kou (2014) in their study where they found that males are way better than females when it comes to possessing scientific reasoning faculty ((Piraksa, Srisawasdi and Kou, 2014). Furthermore, a study done by Blum(1999) reveals that males dominate in the online educational discussion forum (Blum, 1999). There is also an argument whether the internet is suitable for the learning styles of female students. Anderson (1997) suggests that female learners have a marked preference for face to face communication (Anderson, 1997). Conversely, in a study by McSporran, M., & Young, S. (2001), online courses were preferred by women and older students who seem to be more motivated, better at communicating online and scheduling their learning. In contrast, male students and younger participants need classroom sessions' discipline (McSporran and Young, 2001).

Table 2- Descriptive Statistics- Gender-wise Probation Rate

Gender	Count	Number Of Probation and Rate			
		OL	Rate	F2F	Rate
Males	32	11	34%	8	25%
Females	69	12	17%	2	3%
	101	23	23%	10	10%

The probation rate was found to be more among male students than against their female counterparts. The probation rate is significantly increased among males and females during OL 34% and 17%, respectively. Female students' probation rate is considerably increased from 3%

to 17% from F2F to OL. Similarly, the male probation rate has also increased from 25% to 34%. These statistics is further substantiated with the results exhibited in table 1.

The inferential analysis was performed based on two Hypotheses:

H_{o1}: There is no significant difference in student's performance based on GPA in F2F and OCL

H_{o2}: There is a difference in the probation status of students among F2F and OCL

Hypothesis 1

Ho1: There is no significant difference in student's performance based on SGPA in F2F and OCL

The Paired Samples t-Test is used to determine whether there is statistical evidence that the mean difference between student's performances based on GPA in F2F and OCL.

Table 3: Paired Samples Statistics for SGPA

Learning Mode		Mean	N	Std. Deviation	Std. Error Mean	Correlation	Sig.
Pair 1	SEM_GPA_OL	2.8506	101	.79542	.665	.000	.000
	SEM_GPA_F2F	2.9930	101	.75041	.07467		

The mean F2F is 2.9930, and the mean OL score is 2.8506, indicating that students' performance was slightly higher in F2F mode than in OL mode. GPA in F2F and OL mode are moderately and positively correlated ($r = 0.665$, $p < 0.026$).There was a significant difference between F2F and OL scores ($t_{100}=2.2578$, $p < 0.026$) as the $p<0.05$, we rejected the null hypothesis and concluded that there is a statistically significant difference between the mean student's performance in F2F and OL mode of learning. Thus, the analysis proves that the SGPA was affected positively by the change in the learning environment.

Hypothesis 2

Ho2: There is a difference in the probation rate of students among F2F and OCL

A paired sample test was conducted to find the link between the changes in probation status in online and face-to-face learning and revealed no significant relationship, as shown in Table 4.

Table 4: Paired Samples Statistics for Probation status

Probation Status	Mean	N	Std. Deviation	Std. Error Mean	Correlation	Sig.
Prob F2F	.20	101	.633	.063	.188	.059
Prob OL	.45	101	1.015	.101		

The difference in the mean between F2F is 0.20 and 0.45, respectively, indicating OL mode causes a slightly higher number of probation students. There is a significant difference between probation status in F2F and OL mode of learning (t_{101} =0.188, p >0.4668), as the absolute value of t is less than the critical value, we accept the hypothesis p-value is higher than 0.05. Therefore, the shifting of the learning mode from F2F to OL has significantly increased the probation status of the students.

Conclusion

Proving the facilities and the technical infrastructure is essential to succeed in any mode of learning. Bringing the best means of learning, flexibility and adaptability is needed to create the best experience for educators and learners. The study explains how a particular learning environment impacts the way students study and learn and thus their performance. The findings present a clear connection between the mode of learning and the student GPA. The students GPA was affected by the platform students take their classes. The study also shows significant relation between the probation rate and the mode of learning. The study substantiates that the mode of learning does impact students' performance and their academic probation status. Female students found F2F mode is more convenient and acceptable for them to deliver the best performance, contrary to males' performance, where they prefer to be OL. However, some of our general observation shows that some students overcame probation when the learning mode changed. The paper shed light on academic planners on choosing the best learning platform to deliver the curriculum in the University in future. Male students have performed well in OL, as students will have continuous access to lectures through recorded videos, course materials in LMS, and class discussions available in Teams chat. OL would have helped students, particularly those who need to reread a lecture or take more time to reflect on topics

to reinforce their learnings. Therefore, the OL mode is more convenient and effective to slow learners and those who need special attention. Considering the study results, an appropriate mode of learning will be a blended learning approach that combines the best part of F2F and OL mode.

Limitation and scope for further research

This article provides valuable insights into students' performance in F2F and OL learning modes. However, the study was conducted only in the University's business department based on fewer samples than the University's entire student population, which might cause selection bias. The limited sample size was essentially due to the constraints in collecting the data from the university database. A similar study could be conducted with a better sample to discover more about this topic. The research was quantitative, which may not provide a complete picture of the qualitative impact of COVID 19 on students' performance. A mixed method can be used to improve the research findings to replicate the study in similar settings in different geographical contexts. Future qualitative research can explore the reasons (why & how) behind the empirical findings of the current study.

This research provides an opportunity to discuss the implications of F2F and OL for both genders, mainly how lecturers can transfer necessary skills to all students irrespective of their gender. Our study offers empirical evidence to develop a well-designed online teaching and learning pedagogy to overcome gender-based differences in students' performance in the geographical context. Further studies could be undertaken to figure out what factors or barriers causes' low female performance in OL mode and how everyone can benefit from this new learning mode or blended learning environments

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