

A COMPARATIVE STUDY REGARDING FACE-TO-FACE AND ONLINE LEARNING APPROACH DURING THE COVID-19 PANDEMIC AMONG PRE-UNIVERSITY STUDENTS IN MALAYSIA

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Abstract

The coronavirus disease (COVID-19) has caused many fallouts in human daily activities including teaching, learning and examination activities. Students of the Science and Medicine Foundation programme, Universiti Sultan Zainal Abidin (UniSZA), Malaysia, were also affected by the situation where the usual face-to-face (F2F) learning sessions were turned into online sessions. This study aims to examine the impact of online learning on students' academic performance among UniSZA foundation students. It is a retrospective study that involved 251 students who completed the foundation studies between 2020 (intake year 2019/2020) and 2021 (intake year 2020/2021). The mid-semester one assessment grades of Biology, Physics, Chemistry, Mathematics, and Information Technology courses were used as the primary comparative factor in assessing performance differences between online and F2F learning. Continuous variables were compared with the independent t-test. A p-value obtained from SPSS that was less than 0.05 ($p < 0.05$) was considered statistically significant. The results showed significant differences in grade performance mean scores for Biology, Physics, and IT subjects compared to Mathematics and Chemistry. The grade performance mean score for Biology was higher in online learning compared to F2F learning. The opposite was noted for Physics and Information Technology subjects where F2F learning showed higher mean scores than online learning. Although there were issues and study limitations, the results show both online learners and F2F learners perform at the same level. This indicates teaching modality may not matter as much as other factors.

Keywords: Academic Performance, Covid-19, Face-to-Face, Pre-University, Online Learning

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Introduction

The COVID-19 pandemic has caused many governments to enforce lockdowns as a serious measure to combat this outbreak. Many sectors and industries have to be closed temporarily including the education sectors. This pandemic has disrupted the teaching and learning process in many types and levels of study, causing a whole new system and method to be used for teaching and new types of assessment to be introduced in schools and most higher education institutions as a result of the pandemic. The unprecedented changes made in the education system where all teaching and learning activities shifted

to online classes have not only impacted the educators but also the students as they inevitably have to adapt and improvise to the new style of the learning process. Though it seems that online classes do make the teaching and learning process easier, without proper preparation and planning it will only make things more difficult than the traditional way. According to Dhull and Sakshi (2017), online learning needs a large number of resources along with attentive arrangement. The new method is remarkably uncertain given its importance, but there are pros and cons either way.

Online learning may be in the form of synchronous or asynchronous and it may facilitate learning anytime, and anywhere plus it is a fast and easy learning environment. However, online learning must be supported with good resources and internet infrastructure. For example, if access to the internet is limited and slow, a special device to enhance the data transmission over the internet is needed. The lack of direct interaction between the teacher and the learner may result in difficulty in having active participation from the learner and involvement in group discussion. On the other hand, online learning could possibly increase student's ability and skill in searching for information through the internet which automatically covers blended learning simply. The approach also involves paperless and cost reduction with at the same time easy to excess wide information within a very short time (Lall and Singh, 2020). However, the teacher and student faced a quite challenging situation during an online class. They needed to maintain contact with each other to ensure any information was delivered completely with correct understanding (König et al., 2020).

Meanwhile, classroom learning has a face-to-face conversation using text, speaking, body language, and expressions and is more convincing (Bayazit and Askar, 2012). Teachers and students can interact directly and therefore the teachers can easily monitor, access, and evaluate the students. The teacher has to distribute all the hands-on, assignments and exercises to the students all by herself or himself. Traditional instructor-led classroom learning is a proven learning with full opportunities for interaction between the instructor and students as well as between students and students. The students can participate in the learning experience fully as well as have effective group discussions. However, the requirement for the instructor and students to be in a classroom on the day and time that have been designated in the class schedule has made it difficult for certain instructors and students (Daniel et al., 2017). In addition, the lack of equipment in the classroom may not support effective teaching and learning processes.

In Malaysia, when the pandemic struck, the government announced a movement control order (MCO), and it left the education system with no choice in pursuing the learning process of the student. Most of the learning institutions in Malaysia including the Centre for the Foundation of Science and Medicine (PUSPA), Universiti Sultan Zainal Abidin (UniSZA) have switched to online learning fully for the new batch students and it was the first experience for both the students and the lecturers to complete the semester via online class. From the feedback, the lecturers found that the students faced difficulties in understanding certain topics especially when using asynchronous online mode. During the synchronous online class, on the lecturer's side, the delivery was challenging because it was difficult to get responses from the students since most of them did not turn on their cameras to save their data usage. All these challenges may affect the performance of the students. The aim of this study is to examine the effect of online learning on students' academic performance among foundation students in UniSZA during the COVID-19 pandemic. Two groups of students are used in making the comparison. One group is the students from batch 2019/2020 who had their academic session via F2F learning mode and the other is those from batch 2020/2021 who had full online learning.

Methods

This was a retrospective study conducted at the Center for the Foundation of Science and Medicine (PUSPA), Universiti Sultan Zainal Abidin (UniSZA) Malaysia. The subjects involved 253 foundation students who completed the foundation studies between 2020 (intake year 2019/2020) and 2021 (intake year 2020/2021). Out of 251 students, 115 students from the intake year 2019/2020 had participated in F2F learning between June and November 2019, before the COVID-19 pandemic outbreak in Malaysia, whereas 136 students in the intake year 2020/2021 had engaged in fully online learning between August

until October 2020 exclusively during the outbreak. Online students spend as much time studying as their F2F counterparts. In this study, mid-semester I assessment grades of the students served as the primary comparative factor in assessing the students' performance. The mid-semester I grades were derived from Biology, Physics, Chemistry, Mathematics, and Information Technology (IT) subjects. The final grades of each subject were converted from numerical scores to traditional GPA letters. Data entry and analysis were done by using Statistical Package for Social Sciences (SPSS) version 23.0 (IBM, USA). Continuous variables were compared with the independent t-test. Independent t-test was used to compare mean scores for each subject between 2019/2020 and 2020/2021 batches of students and to compare mean scores for each subject between males and females in both F2F and online learning modes. A p-value obtained from SPSS that was less than 0.05 ($p < 0.05$) was considered statistically significant.

Result and Discussion

Table 1 shows Biology subjects more significant in online learning than F2F, where students can benefit from the flexibility in the online learning environment. The online learning environment may have the potential to produce more in-depth revisions and to improve the quality of learning, as well as having the visual attraction of encouraging wider student participation compared to F2F. Previous researchers have suggested that in contrast to the F2F classes, the extra time available for online activities might allow students to think about course material more critically and reflectively, leading to a deeper understanding of the course content (Ramsden, 1992; Robinson and Hullinger, 2008). The results in students' performance comparing both F2F learning and online learning for each subject are shown in Table 1 to Table 5.

Table 1. Students' performances for subject Biology in both groups (n= 253).

Variables	F2F learning(n=115)		Online learning (n=138)		p-value
	mean (SD)	n (%)	mean (SD)	n (%)	
Grade performance	67.1 (11.0)		76.1 (12.1)		<0.001
A to A-		28 (24.3)		88 (63.8)	
B+ to B-		60 (52.2)		35 (25.4)	
C+ to C-		22 (19.1)		13 (9.4)	
D+ to D		4 (3.5)		1 (0.7)	
F		1 (0.9)		1 (0.7)	

The grade performances and mean scores of each subject during the mid-semester examination were reported in Table 1 to Table 5. For Biology subjects, the study shows that students who were engaged in online learning classes scored significantly better than students in F2F learning (76.1 vs 67.1; $p < 0.001$). The result indicates that more than half of the students in the online learning group (63.8%) scored between A to A- compared to F2F learning where most of the students (52.2%) scored between B+ to B-. In contrast, students who were engaged in F2F classes scored significantly better than students in online learning for Physics (70 vs. 62.3; $p < 0.001$) and Information Technology (79.6 vs. 74.3; $p < 0.001$) subjects. The result indicates that 40.9% of the students in the F2F group scored between A to A- compared to the online learning group where only 18.1% of the students scored between A to A-. Meanwhile, for IT subjects, 73.9% of the students in the F2F group scored between A to A- compared to the online learning group where only 53.6% of the students scored between A to A-. However, there were no significant differences in scores between the two groups for Chemistry ($p = 0.770$) and Mathematics ($p = 0.420$) subjects.

No significant difference in student performance between online and F2F learning for Mathematics and Chemistry subjects as shown in Table 2 and Table 3. Although there were issues and study limitations, the results show both online learners and F2F learners perform at the same level. This indicates teaching modality may not matter as much as other factors.

Table 2. Students' performances for subject Chemistry in both groups (n= 253).

Variables	F2F learning(n=115)		Online learning (n=138)		p-value
	mean (SD)	n (%)	mean (SD)	n (%)	
Grade performance	72.1 (11.8)		71.7 (12.1)		0.770
A to A-		53 (46.1)		57 (41.3)	
B+ to B-		46 (40.0)		60 (43.5)	
C+ to C-		13 (11.3)		16 (11.6)	
D+ to D		2 (1.7)		3 (2.2)	
F		1 (0.9)		2 (1.4)	

Table 3. Students' performances for subject Mathematics in both groups (n= 253).

Variables	F2F learning(n=115)		Online learning (n=138)		p-value
	mean (SD)	n (%)	mean (SD)	n (%)	
Grade performance	66.7 (13.5)		68.0 (12.1)	138 (100.0)	0.420
A to A-		33 (28.7)		39 (28.3)	
B+ to B-		49 (42.6)		68 (49.3)	
C+ to C-		23 (20.0)		21 (15.2)	
D+ to D		6 (5.2)		8 (5.8)	
F		4 (3.5)		2 (1.4)	

According to Table 4 and Table 5, the student's mean scores for Physics and Information Technology were recorded higher in F2F compared to online learning. The result shows Physics and Information Technology had significant differences where p-value is less than 0.05 regarding the mode of learning. The nature of Physics subject includes calculation skills which involve too many formulas referring to the information that needs to be acquired for students to learn and solve Physics problems. Meanwhile IT class is more hands-on, especially during lab practical class. Students can listen to their lesson, can hear the teacher as they follow along, and those that do well with visuals and duplicating steps during hands-on practice rather than a learning style alone.

Table 4. Students' performances for subject Physics in both groups (n= 253).

Variables	F2F learning(n=115)		Online learning (n=138)		p-value
	mean (SD)	n (%)	mean (SD)	n (%)	
Grade performance	70.0 (13.1)		62.3 (12.6)		<0.001
A to A-		47 (40.9)		25 (18.1)	
B+ to B-		48 (41.7)		62 (44.9)	
C+ to C-		11 (9.6)		35 (25.4)	
D+ to D		6 (5.2)		11 (8.0)	
F		3 (2.6)		5 (3.6)	

There are a few factors that support our findings for these two subjects for Physics and Information Technology. First and most importantly, F2F learning classroom instruction is extremely dynamic. Traditional classroom teaching provides real-time face-to-face instruction and sparks innovative questions. It also allows for immediate teacher response and more flexible content delivery. Online instruction dampens the learning process because students must limit their questions to blurbs, and then grant the teacher and classmates time to respond (Salcedo, 2010). Second, some students are opposed to change and view online instruction negatively. These students are more comfortable with sitting in a classroom taking notes than sitting at a computer absorbing data. Other students may value face-to-face

interaction, pre and post-class discussions, communal learning, and student-teacher bonding (Rovai and Jordan, 2004).

Table 5. Students' performances for subject Information Technology in both groups (n= 253).

Variables	F2F learning(n=115)		Online learning (n=138)		p-value
	mean (SD)	n (%)	mean (SD)	n (%)	
Grade performance	79.6 (10.2)		74.3 (9.7)		<0.001
A to A-	85 (73.9)		74 (53.6)		
B+ to B-	26 (22.6)		54 (39.1)		
C+ to C-	4 (3.5)		9 (6.5)		

They may see the Internet as an impediment to learning. Third, face-to-face instruction doesn't rely upon networked systems. In online learning, the student is dependent upon access to an unimpeded Internet connection. If technical problems occur, online students may not be able to communicate, submit assignments, or access study material. This problem, in turn, may frustrate the student, hinder performance, and discourage learning. These factors contribute to the effectiveness of F2F learning as opposed to online learning and it is parallel with the findings of many researchers who reported that many students faced difficulties in regulating their learning through online (Perry et al., 2004; Winne, 2005).

Table 6 shows the gender differences recorded in student performance in both learning modes. There are significant differences between mean scores in online and F2F learning for both females and males in Biology, Physics, and Information Technology subjects. Both males' and females' mean scores for Biology in online learning [Male (73.7 (13.1)), Female (77.9(11.0))] are higher compared to F2F learning [Male (67.7 (10.7)), Female (66.7(11.2))]. On the other hand, for Physics and Information Technology subjects mean scores for both genders in F2F learning are higher [Physics: Male (71.1(11.7)), Female (69.2(14.1))] [IT: Male (79.4(9.8)), Female (79.8 (10.6))] than in online learning [Physics: Male (63.9(14.4)), Female (61.1(10.9))] [IT: Male (73.0(10.8)), Female (75.3(8.7))]. For between genders, the result shows no statistically significant differences between males and females in terms of performance in Mathematics and Chemistry. Overall, the result for each gender reflects the whole subject. The results show that there is a significant effect of the COVID-19 lockdown on students' performance. The COVID-19 confinement changed students' learning strategies to a more continuous habit and study.

Table 6 shows that for Biology, the mean scores (SD) for both males and females are higher in online learning (Male:73.7, Female:77.9) compared to F2F learning (Male:67.7, Female:66.7). while for Physics and Information Technology the mean scores for both genders in F2F learning [Physics: Male (71.1), Female (69.2)] [IT: Male (79.4), Female (79.8)] are higher than in online learning [Physics: Male (63.9), Female (61.1)] [IT: Male (73.0), Female (75.3)]. However, the results show no significant difference in Chemistry and Mathematics for both genders.

Table 6. Comparison of mean score for each subject between and within genders in both learning modes

Variables	Males (n=108)			Females(n=145)		
	mean (SD)		p-value	mean (SD)		p-value
Biology (score)	67.7 (10.7)	73.7 (13.1)	0.012	66.7 (11.2)	77.9 (11.0)	<0.001
Physics (score)	71.1 (11.7)	63.9 (14.4)	0.006	69.2 (14.1)	61.1 (10.9)	<0.001
Chemistry (score)	72.0 (10.1)	70.7 (13.5)	0.592	72.2 (12.9)	72.4 (11.1)	0.924
Mathematics (score)	67.9 (13.5)	66.0 (13.7)	0.476	65.8 (13.6)	69.5 (10.6)	0.068

Information Technology (score)	79.4 (9.8)	73.0 (10.8)	0.002	79.8 (10.6)	75.3 (8.7)	0.006
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The results show that there is no difference in terms of preference in the medium of learning between genders. For Biology, both male and female students scored higher using online mediums. Studies in the existing literature considering gender and perception variables reported that each gender had significant positive perceptions towards online learning since both gender groups indicate that the method facilitates the assessment process (Terzis and Economides, 2011). From a broader perspective, it can be determined that no significant difference in the perceptions of students based on the gender variable being found in the context of the current study provides a result similar to other studies that focused on the acceptance, perceptions, and attitudes towards computers and information technologies (Chu, 2010; Dong and Zang, 2011). Atkinson and Blankenship (2009) also suggested that there is significant readiness for online learning in both male and female students. In contrast, both male and female students seem to prefer F2F learning for subjects that have calculation or hands-on in nature such as Physics and Information Technology. Even though this result indicates that both genders still prefer F2F learning compared to online learning for these two subjects, it does not give an indicator of the difference in preference between males and females. These findings are more or less parallel to what had been suggested by Amparo et al., (2018) who found a persistent and consistent under-performance by online students of all genders vs. F2F classroom-based students of all genders.

Conclusion

In conclusion, it can be observed that Biology, Physics, and Information Technology subjects showed significant differences towards academic performance where p-value is less than 0.05 regarding the mode of learning. Physics and Information Technology recorded higher student scores during the F2F examination rather than the online examination. Biology was recorded higher in online examinations rather than F2F examinations. This reflects the medium of delivery during the lecture. From the mean score of each subject, female students were recorded as having higher grades as compared to male students during the online learning. During online examinations, there were significant differences between Biology and Information Technology subjects towards gender. It showed female students show higher grades in Biology and Information Technology subjects only as compared to calculation subjects. This revealed that female students are more likely to adapt to online learning compared to F2F learning. Males are easier to adapt to face-to-face learning rather than online learning. While there were minor variations in student performance based on gender in both traditional classroom settings and online learning environments, it is crucial to emphasize that individual factors such as discipline, motivation, and preparedness play a significant role in determining their ultimate success.

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Author Contribution

A Abdul Malek, SNS Muhammad Amin – Analysis of questionnaire data; SM Aziz, SWW Syed Saadun Tarek Wafa – Conceptualization; NAH Zulkifly, A Othman – Review & editing; S Jamal Mat Rosid, N Mohammad Yusoff; NN Mohamed – Data collecting; SNA Zamri – Methodology; NA Mohamed, F Ab. Wahab – Resources.

Conflict of Interest

None of the authors of this paper has a financial or personal relationship with other people or organizations that could inappropriately influence or bias the content of the paper. It is to specifically state that “No Competing interests are at stake and there is No Conflict of Interest” with other people or organizations that could inappropriately influence or bias the content of the paper.

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