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VICINITY CONDITION OF ONLINE EXAMINATION: DOES IT AFFECT THE ACADEMIC PERFORMANCES OF PRE-UNIVERSITY STUDENTS?

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Abstract

Physical attendance of students in a hall for examinations is no longer being practiced during the global pandemic of Coronavirus disease 2019 (Covid-19). Most universities, including Universiti Sultan Zainal Abidin (UniSZA) have adapted to online exams. This paper presents an analysis of online final examination performances of 251 students from the Science and Medicine Foundation Centre, UniSZA who completed foundation for 2019/2020 and 2020/2021 intake sessions. The objective of this research is to compare the final scores of Semester 2 for the students from both sessions, if there is a significant difference between academic performance by taking online examination at home for 2019/2020 intake session and at the university for 2020/2021 intake session based on the subjects of Mathematics II, Physics II, Chemistry II, Biology II and Information Technology II. The z-test was performed to compare mean scores for each subject for both intake sessions using Microsoft Excel worksheet. According to the mean value, students achieved higher score in Biology II, Chemistry II and Information Technology II by taking examination at hostel. Meanwhile, Physics II and Mathematics II subjects shows that the score are higher while taking

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examination at home. The *p*-value for each subject is computed, and the result is less than 0.025. The null hypothesis is then rejected.

Keywords: Academic performances, Covid-19 pandemic, Online examinations, SPSS

Abstrak

Kehadiran secara fizikal bagi pelajar di dewan untuk peperiksaan tidak lagi diamalkan semasa pandemik *Coronavirus* 2019 (Covid-19). Kebanyakan universiti termasuk Universiti Sultan Zainal Abidin (UniSZA) menjalankan peperiksaan secara dalam talian. Kertas kerja ini membentangkan analisis prestasi peperiksaan akhir dalam talian untuk sampel 251 pelajar Pusat Asasi Sains dan Perubatan, UniSZA yang menamatkan asasi sesi 2019/2020 dan 2020/2021. Objektif kajian ini adalah untuk membandingkan markah akhir Semester 2 bagi pelajar kedua-dua sesi, sekiranya terdapat perbezaan yang signifikan antara prestasi akademik dengan mengambil peperiksaan dalam talian di rumah bagi sesi pengambilan 2019/2020 dan di universiti bagi sesi pengambilan 2020/2021 berdasarkan mata pelajaran Matematik II, Fizik II, Kimia II, Biologi II dan Teknologi Maklumat II. Ujian z dilakukan untuk membandingkan skor min bagi setiap subjek bagi kedua-dua sesi pengambilan menggunakan perisian Microsoft Excel. Mengikut nilai purata, pelajar mencapai markah yang lebih tinggi dalam Biologi II, Kimia II dan Teknologi Maklumat II dengan mengambil peperiksaan di asrama. Manakala Fizik II dan Matematik II pula menunjukkan markah lebih tinggi semasa mengambil peperiksaan di rumah. Nilai *p* bagi setiap subjek dikira, dan hasilnya kurang daripada 0.025. Hipotesis nol kemudiannya ditolak.

Kata kunci **:** Pandemik Covid-19, Peperiksaan dalam talian, Prestasi Akademik, SPSS

1.0 INTRODUCTION

The importance of assessment in the educational system cannot be overstated. It assesses pupils' progress toward achieving the desired learning objectives (Adri *et al*. 2021). A good evaluation reflects both the student's ability to answer the question and the teacher's performance in teaching learning themes. Formative assessments, summative assessments, and various sorts of assessments are available. A formative evaluation is carried out at the conclusion of a learning programme. It is frequently used as an end-of-semester exam to assess a student's cognitive abilities. The current pandemic of Covid-19 has ushered changes in the educational sector. All academic activities are modified into online learning modules to adapt to the new norm (Sutadji *et al*. 2021). The assessment must be done online in conjunction with the introduction of online learning.

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The online examination is one of the key innovations that should be incorporated along with the alteration of the educational system during the pandemic. In terms of assessment quality, the online examination should be comparable to the conventional methods. The grave concern of the online examination which is the tendency to cheat can be avoided by systematic proctoring (Harmon & Lambrinos 2008). Even though it is difficult to implement a perfect online examination method, educators have used different ways to meet the validity, reliability, fairness, and flexibility of a standard examination (Booth *et al*. 2003).

Administering an online examination is easier compared to the conventional approach. Online examination administered via computers saves time and paper. It eliminates the need to print exam papers and maintain record papers of applicants. Also, it cuts down the time spent monitoring the entire examination process. However, in remote regions where access to energy, reliable Internet connection, and other basic system criteria are difficult to achieve, one of the key disadvantages of an online examination system emerges. Such barriers may impede online examination. Overall, the proximity of tests has a significant impact on the students' performances.

Thus, the purpose of this article is to investigate the relationship between the proximity conditions of an online assessment and scoring grade. The final test scores for five subjects in the Foundation of Science and Medicine programme were analysed concerning the two online examination proximity. It is a comparison study of the students in session 2019/2020 who took the online examination at home against the students in session 2020/2021 who took the online examination at the university.

2.0 METHOD

2.1 Sampling Data

This study involves students from two sessions of one-year Science and Medicine programme at Science and Medicine Foundation Centre, Universiti Sultan Zainal Abidin (UniSZA) Malaysia. A total number of 251 students were involved in this study of which 115 students were from the 2019/2020 session and the rest of 136 students were from the 2020/2021 session. The students' performances were evaluated based on their final examination scores in Semester 2 for Biology II, Physics II, Chemistry II, Mathematics II and Information Technology II subjects. The online examination for both sessions was conducted through the Knowledge and e-Learning Integrated Platform (KeLiP), an e-learning platform managed by the university. Students of both sessions experienced different vicinity conditions. Students

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from the 2019/2020 session took the online final examinations at home while students from the 2020/2021 session sat for the examination at the university's hostel. In both sessions, the online examination was strictly invigilated despite the condition.

2.2 Statistical Analysis

In examining the effect of different vicinity conditions on the students' performances, the statistical analysis of the final examination scores for subject Biology II, Physics II, Chemistry II, Mathematics II and Information Technology II of both sessions were carried out using a z-test. A z-test is a statistical test used to determine whether two population means were different when the variances are known, and the sample size is large. The two samples z-test was performed to compare the mean scores of each subject in both sessions. Typically, the significant level was set at 5% and the result of the test is compared with the standardised statistical *p*-value of 0.05. However, since two samples of z-test were used, the *p*-value of 0.05 is divided into two. Thus, these results are compared with the *p*-value of 0.025.

The test was conducted using a Microsoft Excel worksheet where the input variable used is the score data of five subjects for both sessions. Two hypotheses test was constructed. The null hypothesis suggested that the score data of the five subjects for both sessions are equal, i.e. H_0: $\mu_1 = \mu_2$, meanwhile the alternative hypothesis suggested that there is a statistical difference between the score of the subjects for both sessions, i.e. H_a: $\mu_1 \neq \mu_2$. If the test score is less than 0.025, the null hypothesis needs to be rejected and the alternative hypothesis needs to be accepted. Meanwhile, if the test score is above 0.025, the null hypothesis needs to be accepted.

3.0 RESULTS AND DISCUSSION

3.1 Descriptive of Data

Figures 1 and 2 show the range score for five different subjects in session 2019/2020 and 2020/2021, respectively. Meanwhile, the data collected from the sample which includes the mean, standard deviation, and sample sizes from both sessions are listed in Table 1.

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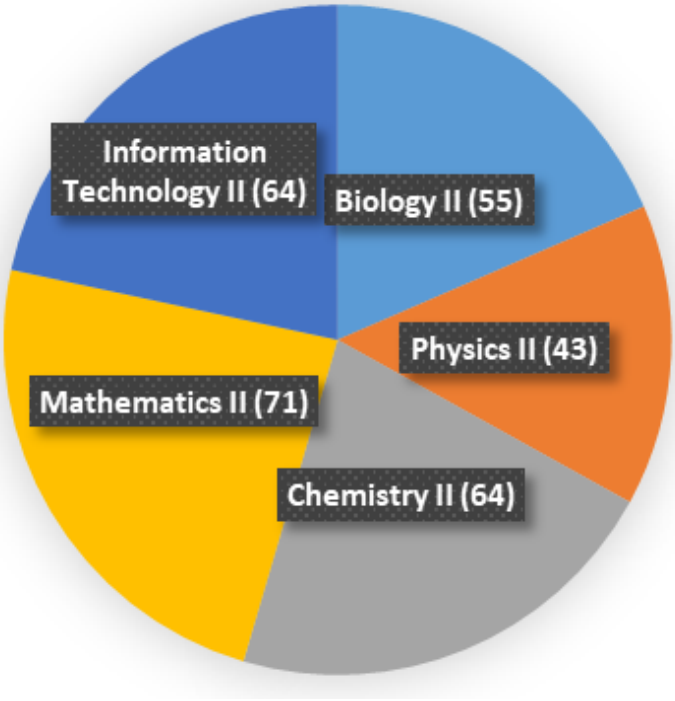

Figure 1: Range score for five different subjects of session 2019/2020

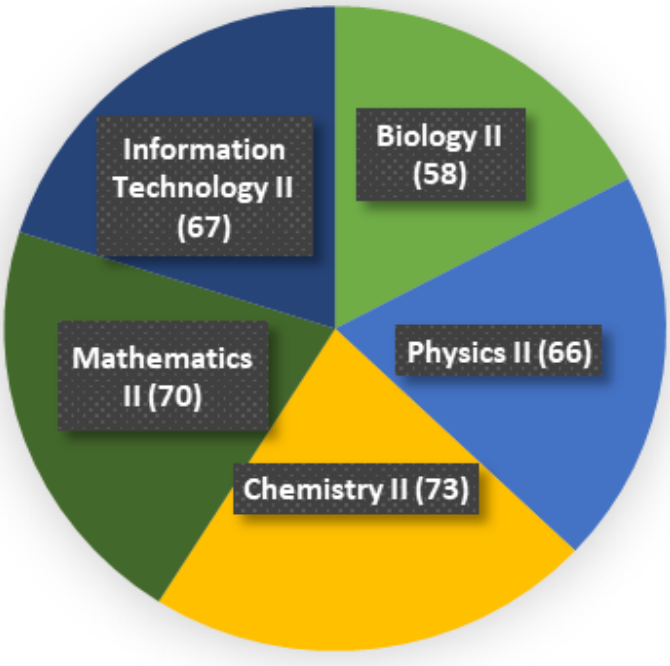

Figure 2: Range score for five different subjects of session 2020/2021

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Table 1: The mean, standard deviation and sample sizes for session 2019/2020 and session 2020/2021

Subject	Session	*N*	Mean	SD
Biology II	2019/2020	115	70.704	11.272
	2020/2021	136	76.934	10.956
Physics II	2019/2020	115	89.609	7.806
	2020/2021	136	76.438	11.094
Chemistry II	2019/2020	115	64.313	13.977
	2020/2021	136	70.573	13.514
Mathematics II	2019/2020	115	77.724	15.572
	2020/2021	136	70.312	14.892
Information Technology II	2019/2020	115	62.852	17.509
	2020/2021	136	71.206	11.526

Following that, the two samples z-test for all conducted subjects are presented in Table 2 until Table 6.

Table 2: Two samples z-test for Biology II

	Variable 1	*Variable 2*
Mean	70.70434783	76.93382353
Known Variance	127.0717	120.0326
Observations	115	136
Hypothesized Mean Difference	0	
z	-4.418663614	
P(Z<=z) one-tail	4.96565E-06	
z Critical one-tail	1.644853627	
P(Z<=z) two-tail	9.93131E-06	
z Critical two-tail	1.959963985	

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Table 3: Two samples z-test for Physics II

	Variable 1	*Variable 2*
Mean	89.60869565	76.438529
Known Variance	60.9323	123.0775
Observations	115	136
Hypothesized Mean Difference	0	
z	10.99490244	
P(Z<=z) one-tail	0	
z Critical one-tail	1.644853627	
P(Z<=z) two-tail	0	
z Critical two-tail	1.959963985	

Table 4: Two samples z-test for Chemistry II

	Variable 1	*Variable 2*
Mean	64.31304348	70.57261029
Known Variance	195.3573	182.621
Observations	115	136
Hypothesized Mean Difference	0	
z	-3.589186641	
P(Z<=z) one-tail	0.000165856	
z Critical one-tail	1.644853627	
P(Z<=z) two-tail	0.000331711	
z Critical two-tail	1.959963985	

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Table 5: Two samples z-test for Mathematics II

	Variable 1	*Variable 2*
Mean	77.72463768	70.3125
Known Variance	242.499	221.7627
Observations	115	136
Hypothesized Mean Difference	0	
z	3.833086419	
P(Z<=z) one-tail	6.32727E-05	
z Critical one-tail	1.644853627	
P(Z<=z) two-tail	0.000126545	
z Critical two-tail	1.959963985	

Table 6: Two samples z-test for Information Technology II

	Variable 1	*Variable 2*
Mean	62.85182609	71.20588235
Known Variance	306.584	132.8462
Observations	115	136
Hypothesized Mean Difference	0	
z	-4.377057265	
P(Z<=z) one-tail	6.01462E-06	
z Critical one-tail	1.644853627	
P(Z<=z) two-tail	1.20292E-05	
z Critical two-tail	1.959963985	

In Table 7, the *p*-values computed from the test were summarized and compared with the *p*-values of a significance level of 0.025.

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Table 7: Comparison of *p*-values between the two samples z-test with the original *p*-values of 0.025

Subject	p-value from the test	p-value of 0.025	Decision criteria
Biology II	0.000010	0.025	Reject H_0
Physic II	0.000000	0.025	Reject H_0
Chemistry II	0.000332	0.025	Reject H_0
Mathematics II	0.000127	0.025	Reject H_0
Information Technology II	0000012	0.025	Reject H_0

Since the *p*-values of all five subjects are less than 0.025, the decision was made to reject the null hypothesis. This means that there exists a significant difference between the score for session 2019/2020 and session 2020/2021.

3.2 Discussion

The online examination vicinity for these two studied sessions is different where session 2019/2020 took the examination at the home, while session 2020/2021 took the examination at the hostel. According to Table 1, the means for subjects Biology II, Chemistry II, and Information Technology II for session 2020/2021 were higher than the means for session 2019/2020. This suggests that the academic performance in these subjects is higher than for the other two subjects, implying that taking the online final examination in the hostel resulted in a higher score.

In Table 2, for the subject Biology II, the *p*-value from the two-tail z-test give 0.000010 which is less than 0.025. Similar results were obtained for the subject Physics II, Chemistry II, Mathematics II and Information Technology II with p-value from the two tails z-test were 0.000000, 0.000332, 0.000127 and 0.000012 respectively. This signify that the score between two sessions does give significance different since difference of online examination vicinity condition were employed. Therefore, these indicated that the null hypothesis for each subject must be rejected.

The vicinity condition of the online final examination at hostel was better than the vicinity condition of online final examination at the home as can be observed by the higher mean score

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for Biology II, Chemistry II, and Information Technology II subjects. This could be owing to easily accessible conditions enabling them to cheat by talking to friends and utilising additional sources available nearby (Karaman 2011). During the exam, invigilators monitored students using webcams and screen videos that forced full-screen mode and disabled content sharing (Li *et al*. 2021). However, if a large number of students utilised the same internet connection in the same location, the internet connection becomes unreliable, the face and surroundings were obscured, and the invigilators were unable to monitor adequately.

Furthermore, exams are commonly a trigger of stress, which can be worsened in new and unusual surroundings (IIgaz & Adanir 2020). Students will have favourable connections and feel as if they are taking a real exam when they sit for the exam with their pals at the hostel under the proctored state. Another study found that students are better equipped to use the university-provided technology to finish tests because they do not trust systems that employ personal computers or laptop operating systems or are concerned about data loss during exams (Pagram *et al*. 2018). As a result, it makes some students felt calmer and allowed them to complete the exam more pleasantly, whereas students taking online exams at home were facing technological concerns such as Wi-Fi connections (Jaap *et al*. 2021). Aside from that, students may experience anxiety as a result of probable technical system failures. Although none of the students had technological difficulties, the idea or likelihood of Internet connection issues, power outages, or unresponsive computers were cited as an additional source of anxiety for students. Without a doubt, the lockdown has an unpredictable impact on individual students' learning, review, and mental health as they adjust to the new normal, which may have contributed to the increased anxiety reported by some students who were taking examinations at home. These factors also have an impact on students' academic achievements.

In contrast, the mean values obtained for the other two subjects of Physics II and Mathematics II for the session 2020/2021 were lower than those acquired for the session 2019/2020. As a result, the academic achievement of the session 2019/2020 was superior to the session 2020/2021. It concludes that taking the final online physics and mathematics exams at home resulted in higher grades than attending examination at residential university. This is given that the students were not monitored by invigilators when they sat for their final exams from the comfort of their homes.

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It means that taking tests at home without online proctoring provides them the access to books, formulas, lecture notes, and websites for cheating. The current extensive usage of the Internet, mobile and wireless devices make it simpler for students to access materials illegally, while academic institutions struggle to manage and detect such events (Hosny & Fatima 2014; Renard 2000). Some comparable outcomes in Covid-19 academic performance have been studied which discovered that students do better on non-proctored examinations than on proctored exams. This could be due to the potential of students in this scenario to enter the contract cheating sector. Chegg is the most popular website among the other services offered. Furthermore, it has a homework assistance section where individuals may post issues and request detailed solutions, particularly for mathematical questions. Regular Chegg users or a team certified by Chegg as an expert can supply the solution (Lancaster & Cotarlan, 2021).

Therefore, from the five core subjects studied in the foundation, the calculation subject such as Mathematics II and Physics II offered a higher mean score when the online exam conducted at home. Meanwhile, for the understanding and theory subject which are Biology II, Chemistry II and Information Technology II revealed that online exam at hostel gave a higher mean score.

4.0 CONCLUSION AND RECOMMENDATION

The data analysis from Microsoft Excel revealed that *p*-value of all subjects are to be less than 0.025, which rejects null hypothesis and signifies a difference in the score of two sessions to the vicinity of online examination. The mean score for each subject plays an important indicator regarding the vicinity condition for online examination. The mean score for understanding and theory related subject such as Biology II, Chemistry II, and Information Technology II showed that taking final online examination at the hostel gave a better academic performance compared to the calculation related subject such as Mathematics II and Physics II. The student's vicinity condition does give effect to their examination performances. Therefore, academic institutions can play a role by getting students to partake in ethics agreement which will restrict them from cheating during exams. Other than that, teaching the ethics principle and explaining unethical behaviour in each course is also important to raise students' awareness of cheating and plagiarism. This is because it is likely that students think that the repercussions are less serious, as it is not done directly during the exam sometimes, or it is more difficult to identify the source of the plagiarism as it is mostly unknown. Thus, it is suggested that some methods need to be implemented to improve the quality of online examinations, such as varying question types while retaining the same level of thinking order.

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Also, prohibit backtracking can also be used to guarantee students' focus to be solely on the particular question at that time in order to present the best answer.

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