



ColomboArts

Journal of Social Sciences and Humanities

Volume 7 | Issue I

2022



Open-book vs. closed-book examinations in higher education during COVID-19: The case of the Faculty of Arts, University of Colombo

T. A. M. Pushpakumara

Recommended Citation

Pushpakumara, T. A. M. (2022). Open-book vs. closed-book examinations in higher education during COVID-19: The case of the Faculty of Arts, University of Colombo, *ColomboArts Journal of Social Sciences and Humanities*, 7(I), 22-37.

Available at: <https://colomboarts.cmb.ac.lk/?p=626>

Open-book vs. closed-book examinations in higher education during COVID-19: The case of the Faculty of Arts, University of Colombo

Pushpakumara, T. A. M.

mahinda@econ.cmb.ac.lk

Abstract

The COVID-19 pandemic has made a significant impact on the education sector in Sri Lanka. During the pandemic, Sri Lankan universities resorted to online platforms to continue teaching. Undergraduates had online lectures and sat online open-book examinations. The Faculty of Arts (FoA), University of Colombo conducted the final examination of semester I as an onsite closed-book examination and the final examination of semester II as an online open-book examination for the first-year undergraduates in the academic year 2020/2021. The objective of this study is to identify the impact of the mode of examination on the performance of the first-year undergraduates at the FoA. The study is based on both primary and secondary data. Secondary data were collected from three departments of the FoA selected randomly. Primary data were collected from the selected undergraduates through a telephone survey. Paired sample T test is applied as the main analytical tool of this study. The findings show that the average mark of the onsite examination is significantly higher than the average mark of the online examination. According to the undergraduates' opinions, the main reason for the low performance at the online examination was the teaching-learning environment they had during the COVID-19 pandemic.

Keywords: *Online teaching, Online examination, Open-book examination, Onsite examination, Performance.*

Introduction

Throughout history, the world has faced a number of pandemics. However, COVID-19 could be considered the most widespread pandemic in the recent past (Amarathunga et al., 2000). In Sri Lanka, the first confirmed COVID-19 case, a Chinese tourist, was reported on the 27th of January, 2020. After one month, the first Sri Lankan COVID-19 patient was identified. To control the spread of the virus, the Sri Lankan government announced an island-wide curfew on the 20th of March, 2020.

After announcing the island-wide curfew, all public and private institutions were closed and people were confined to their homes. Consequently, without much preparedness, universities and schools adopted online platforms to continue teaching. The University Grants Commission of Sri Lanka issued a special bylaw granting permission for universities to recommence academic work via online platforms.

The Faculty of Arts (FoA), University of Colombo, with a student population of close to 3000, commenced the academic year 2019/2020 in February, 2020. There were 851 first year undergraduates who started academics that year. After one month of onsite work, the faculty was closed in March, 2020, and recommenced lectures for all undergraduates in April, 2020 via online platforms. By that time, the freshers had had only one month to orient themselves to the university.

The FoA has two online platforms. The undergraduates register for courses and exams via the Student Information System (SIS). The SIS is an online system which was introduced in 2012. Further, the faculty has a Learning Management System (LMS) useful for teaching and evaluation. Though the LMS was introduced in 2015, only few academics fully utilized all functions of the LMS before the pandemic. During the pandemic, however, the faculty fully utilized the functions of the LMS and the SIS. The faculty granted permission to lecturers to decide the mode of delivery of the lectures. Most lecturers conducted online lectures through the Zoom platform and their recordings were uploaded to the LMS. The undergraduates who were unable to attend online lectures due to connection issues used these recordings for asynchronous learning. Some lecturers uploaded lecture materials and recordings to the LMS without conducting online lectures.

During the pandemic, the faculty had to restructure the examination procedures. Prior to the pandemic, 60 percent of marks were allocated for the final examination while 40 percent

was allocated to continuous assignments and mid semester examinations. During the pandemic, the faculty granted permission to lecturers to decide the percentage of marks allocated for continuous assignments and mid semester examinations. For some courses, the undergraduates had the opportunity to earn 60 percent of the grade via the mid semester examination and the continuous assignment/s.

Hence, the midterm tests and assignments of the semester I in the academic year 2019/2020 were conducted online. The faculty managed to conduct a part of the semester I final examination as an onsite closed-book examination at the end of first wave of the pandemic. In the semester II, all teaching and evaluation were conducted online. The semester II final examination was conducted as an online open-book examination. The examination papers were uploaded to the LMS, and undergraduates wrote answers and uploaded a scanned copy of their answer scripts to the LMS. Twenty-four hours were given to undergraduates to complete the exam.

Conducting online open-book examinations was a new experience for the Sri Lankan education sector and there was not much research done on this topic in Sri Lanka. Hence, the objective of this paper is to compare the undergraduates' performance at an onsite closed-book examination to their performance at an online open-book examination. There were three specific objectives. The first was to identify whether there was a significant difference between the average marks obtained by undergraduates for online open-book and onsite closed-book examinations. The second was to identify whether the mode of examination has an impact on the distribution of marks. The third was to identify students' perceptions towards onsite and online examinations.

Mseleku (2020) has conducted a comprehensive literature review about e-learning, teaching, challenges, and opportunities in the era of the COVID-19 pandemic based on studies published in 2020. According to Mseleku (2020), most studies are limited to identifying educational institutions' response to COVID-19 and challenges associated with online teaching and learning. Few researchers have conducted studies to identify the opportunities emerging from the pandemic and their academic outcomes. This literature review revealed that there were limited research studies on students' academic performance

during the COVID-19 period. This study attempts to fill a gap in the literature by focusing on undergraduates' performance during the COVID-19 pandemic.

Literature review

Biggs's 3P model (Biggs, 1979) has been used as the theoretical background of this study. According to the 3P model, learning is a process that depends on three factors: learning environment and students (presage), students' approach to learning (process) and learning outcomes (product) (Biggs, 1979). Personal characteristics such as prior knowledge, academic ability, personality, and learning environment (teaching methods, workload, course structure) are considered as presage factors. Students use two different approaches to learn (process). Some students use the 'deep' approach to learning and others use the 'surface' approach. In the deep approach, students learn through application and comparing ideas. The learning outcomes derived from the learning process are called product factors.

As Biggs's 3P model explains the relationship between teaching, learning and outcomes, it has been used in this study to analyze changes in the teaching-learning environment during the COVID-19 pandemic. Prior to the pandemic, closed-book onsite examinations were the norm for exams. During the COVID-19 pandemic, online open-book examinations were used for evaluation. Though relatively unpopular in the Sri Lankan higher education sector, the concept of open-book examination has a long history. Students prefer open-book examinations as they do not have to memorize facts and it encourages a deeper engagement with course materials (Stalnaker & Stalanker, 1934). According to Tussing (1951), the rationale of open-book examination is "reasoning" rather than recalling the facts. The open-book examination improves understanding of course material (Eilertsen & Valdermo, 2000). Feller (1994) has pointed out that the open-book examination is more realistic as it is similar to problem-solving situations in the real world.

When introducing online open-book examinations at the University of Delhi in 2020, lecturers and student unions opposed it (Ashri & Sahoo, 2021). They pointed out that the online open-book examination setup is discriminatory to marginalize students who did not have electronic devices and proper internet connectivity. Another reason for this opposition was the unavailability of required study materials. Similar arguments were raised at the

faculty board meeting of the FoA, University of Colombo when the proposal for open-book examinations was presented.

Methodology

This study is mainly based on the secondary data collected from three departments (Economics, Sinhala, and Geography) of the FoA. They were selected randomly. Each department offered one course module for semester I and one course module for semester II for the first-year undergraduates in the academic year 2019/2020. The semester I final examination was conducted as an onsite closed-book examination while the semester II final examination was conducted as an online open-book examination. The marks obtained by each first-year undergraduate for the onsite examination and the online examination were collected from the selected departments, and the undergraduates' performance at the onsite examination and online examination were compared.

A telephone survey was conducted with twenty randomly selected undergraduates in the first year who sat the onsite examination in semester I and the online examination in semester II. The objective of the survey was to identify the nature of the teaching and learning environment the undergraduates faced during the COVID-19 pandemic.

As the same group of first year undergraduates sat the onsite examination in semester I and the online examination in semester II, it gave an opportunity to compare their performance at the two examinations using the paired sample T test. Since the two modules selected belong to the first year, they are introductory modules and do not have a vast difference in content. Hence, the paired sample T test can be identified as the most appropriate analytical technique for this study. Further, Otifi, Hassan, and Andarawi (2022) and Natarajan, Dhanasekaran, Giftson, and George (2022) have used the paired sample T test in similar studies.

At the initial stage, the following hypotheses were tested using the paired sample T test.

$$\text{Null hypothesis} \quad (H_0) : \mu_o - \mu_c = 0$$

$$\text{Alternative hypothesis} (H_1) : \mu_o - \mu_c \neq 0$$

where μ_o is the mean marks obtained in an open-book examination and μ_c denotes the mean marks obtained in a closed-book examination.

According to the recent literature (Ashri & Sahoo, 2021), online open-book examinations create a better learning environment and improves students' performance. Hence at the second stage, the following hypotheses was used to test whether the findings of this study are compatible with the literature.

$$\text{Null hypothesis} \quad (H_0) : \mu_o - \mu_c \leq 0$$

$$\text{Alternative hypothesis} \quad (H_1) : \mu_o - \mu_c > 0$$

Results and Discussion

At end of the first COVID-19 wave, the faculty conducted semester I examinations as an onsite closed-book examination. Before the final examination of semester, I, the faculty was opened for undergraduates for one month. During this one-month period, onsite revision was conducted and the library also opened for undergraduates.

The semester II lectures were conducted via Zoom and the final examination was conducted as an online open-book examination. Unlike in semester I, the undergraduates had no opportunity to attend onsite revision or to use the library at the faculty prior to online examinations. In such a background, marks obtained by first year undergraduates for the selected main subjects at the semester I onsite examination and semester II online examination were analyzed and results are presented accordingly.

The Department of Geography offers two courses (Principles of Geography and Cartography) for first year undergraduates. The Principles of Geography course is offered in semester I and the Cartography course is offered in semester II. The final examination of the Principals of Geography course was conducted as an onsite closed-book examination in semester I. The semester II final examination of Cartography was conducted as an online open-book examination. The table below shows the descriptive statistics related to the onsite and online examinations of the two courses in Geography.

Table 1: Descriptive statistics of Geography marks

	Online open-book exam	Onsite closed-book exam
Mean	66	69
Median	65	70
Mode	65	70
Standard Deviation	5.96	4.9
Kurtosis	0.49	1.6
Skewness	-0.20	-0.6
Range	30.51	30.0
Minimum	49.94	50.0
Maximum	80.46	80.0
Count	106.00	106.0

The maximum and minimum marks obtained in both examinations are 80 and 50 respectively. The median mark of the online open-book examination is 65, whereas the median mark in the onsite closed-book examination is 70. This shows that fifty percent of undergraduates who sat the onsite closed-book examination have obtained an A minus (A) grade. At the online examination, a B grade was obtained by fifty percent of undergraduates.

Marks distribution of the onsite examination is representing by the solid black line. The dotted black line shows the marks distribution of the online examination. Both distributions are approximately normally distributed as there is no big difference between their mean, median, and mode. The marks distribution of the onsite closed-book examination has been shifted to the right as the mean of the onsite examination is higher than the mean of the online open-book examination. The marks distributions are presented in figure 1.

The mean mark of the onsite closed-book examination is 69 and the mean of the online open-book examination is 66. According to the results of the two-tail paired t-test presented in table 2, the difference between the two means is significant. The p value of one tail test is near zero, rejecting the null hypothesis and accepting that the mean of onsite marks is higher than that of the online examination. This indicates that undergraduates have performed better at the onsite examination. According to the value of the correlation coefficient (0.47), there is a positive relationship between marks obtained at online and

onsite examinations which shows that undergraduates who have performed well at the onsite examination have also performed well at the online examination.

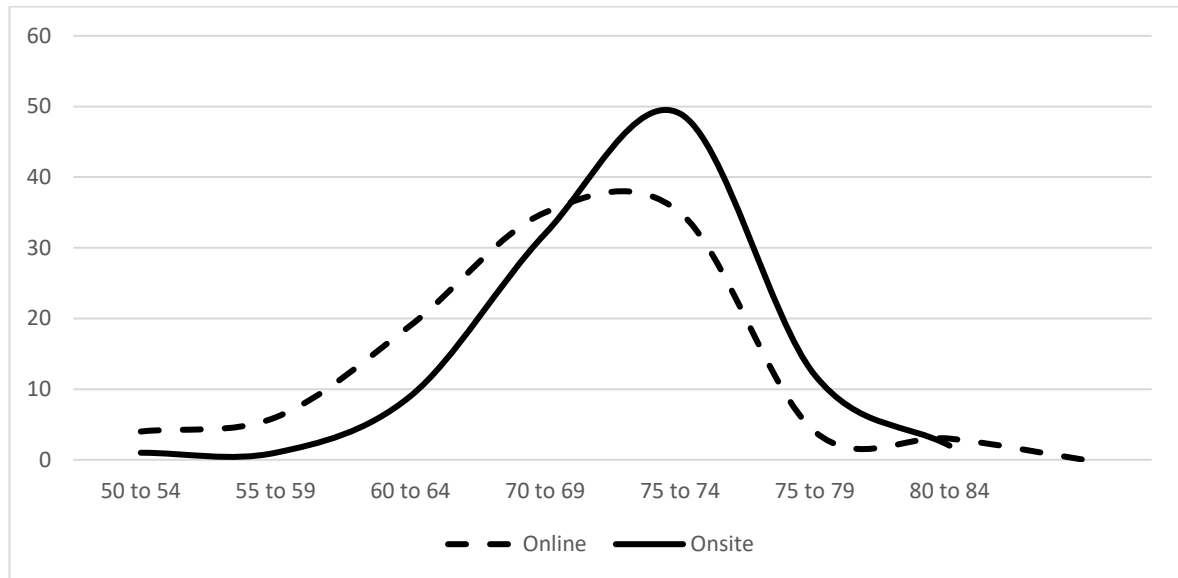


Figure 1: Distribution of marks in Geography: Onsite vs Online

Table 2: Paired two samples for means of onsite and online examinations

	Online open-book	Onsite closed-book
Mean	66.34	69.20
Variance	35.55	23.68
Observations	106.00	106.00
Pearson Correlation	0.28	
Hypothesized Mean Difference	0.00	
Df	105.00	
t Stat	-4.49	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	0.00	
t Critical two-tail	1.98	

The Department of Sinhala offers two courses (Introduction to Language and Introduction to Literature) for first year undergraduates. Introduction to Language is offered in semester I and Introduction to Literature is offered in semester II. The final examination of Introduction to Language was conducted as an onsite closed-book examination in semester I. At the semester II, the final examination of Introduction to Literature was conducted as an online open-book examination. Table 3 given below shows the descriptive statistics of onsite and online examinations of the Sinhala subjects.

The median mark for the online open-book examination was 62 whereas the median mark of the onsite closed-book examination was 68. This shows that fifty percent of undergraduates who sat the onsite closed-book examination have obtained a B plus (B+) grade. At the online examination, a B minus (B-) was obtained by fifty percent of undergraduates.

Table 3: Descriptive statistics of marks: Sinhala

	Online open-book	Onsite closed-book
Mean	62.32	67.70
Median	62.00	70.00
Mode	65.00	70.00
Standard Deviation	7.60	8.55
Kurtosis	0.80	2.34
Skewness	-0.44	-1.07
Range	49.00	56.00
Minimum	31.00	26.00
Maximum	80.00	82.00
Count	210.00	210.00

The marks distribution of Sinhala is similar to the marks distribution of Geography. The average mark of the onsite closed-book examination was 68 and the average mark of the online open-book examination was 62. As the mean of the onsite closed-book examination is higher than the mean of the online open-book examination, the marks distribution of the onsite closed-book examination has been shifted to the right. The marks distributions are presented in figure 2.

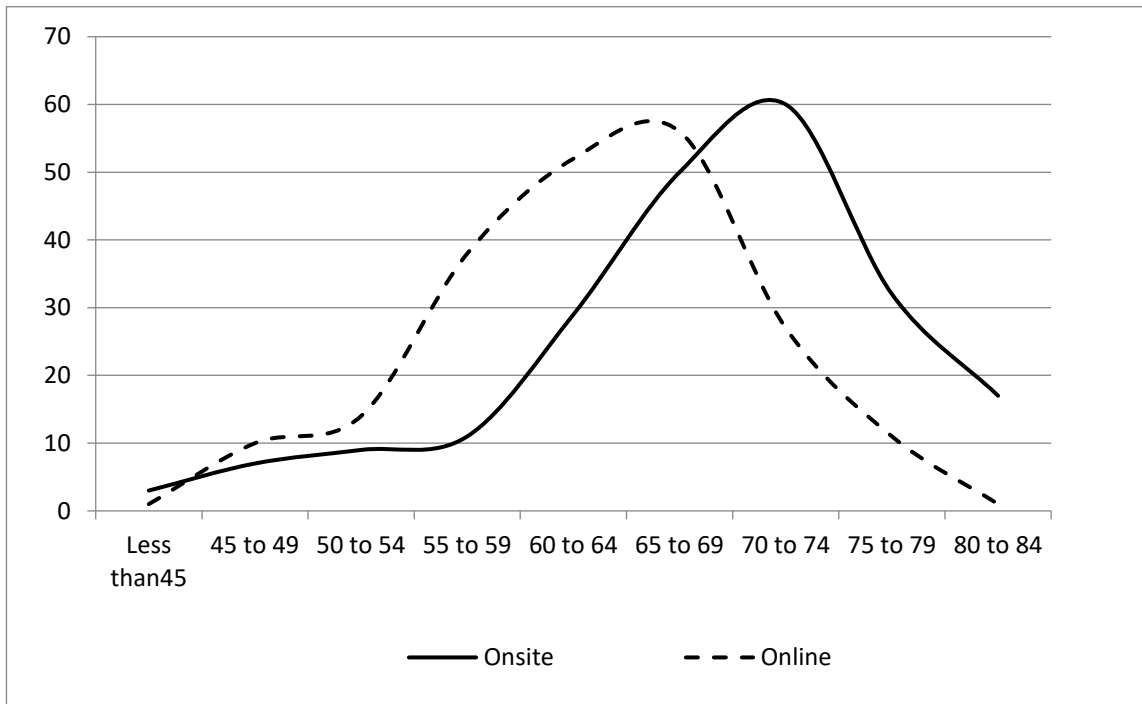


Figure 2: Distribution of marks in Sinhala: Onsite vs Online

Table 4: Paired two samples for means of the onsite and online examinations

	Online open-book	Onsite closed-book
Mean	62.34	67.73
Variance	57.81	73.40
Observations	210	210
Pearson Correlation	0.38	
Hypothesized Mean Difference	0.00	
Df	209	
t Stat	-8.61	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.65	
P(T<=t) two-tail	0.00	
t Critical two-tail	1.97	

According to the results of the two-tail paired t-test presented in table 4, the difference between the two means is significant. The p value of one tail test is near zero and the null hypothesis is rejected. It is seen that the mean of onsite marks is higher than that of the online examination.

The Pearson correlation coefficient between the marks of online and onsite examinations is 0.38. The positive correlation shows that undergraduates who have performed well at the onsite examination have also performed well at the online examination. However, as the value of the coefficient is less than 0.5, there is a weak relationship between the performance at the two examinations.

The Department of Economics offers two courses (Elementary Microeconomics and Elementary Macroeconomics) for first year undergraduates. Elementary Microeconomics is offered in semester I while Elementary Macroeconomics is offered in semester II. The final examination of Elementary Microeconomics was conducted as an onsite closed-book examination in semester I. In the semester II, the final examination of Elementary Macroeconomics was conducted as an online open-book examination. Table 5 shows the descriptive statistics of the onsite and online examinations of the Economics modules.

The median and mode of the onsite examination was 80 which shows that fifty percent of undergraduates who sat the onsite examination obtained a A plus (A+) grade. On the other hand, fifty percent of undergraduates who sat the online examination obtained a B plus (B+) grade as the median is 67. The mode of the online examination was 72 which shows that most undergraduates who sat the online examination obtained a A minus (A-) grade.

At the onsite examination, though the median and mode are equal, the mean is lower than the median. Hence the shape of the mark's distribution is left skewed which shows that more than fifty percent of undergraduates obtained marks higher than the mean. At the online examination, both the mean and the median were equal which indicates that the marks distribution is approximately normally distributed.

Table 5: Descriptive statistics of marks: Economics

	Online open-book	Onsite closed-book
Mean	66.99	77.56
Median	67	80
Mode	72	80
Standard Deviation	8.41	12.87
Kurtosis	-0.31	-0.01
Skewness	-0.42	-0.71
Range	37	63
Minimum	45	37
Maximum	82	100
Count	153	153

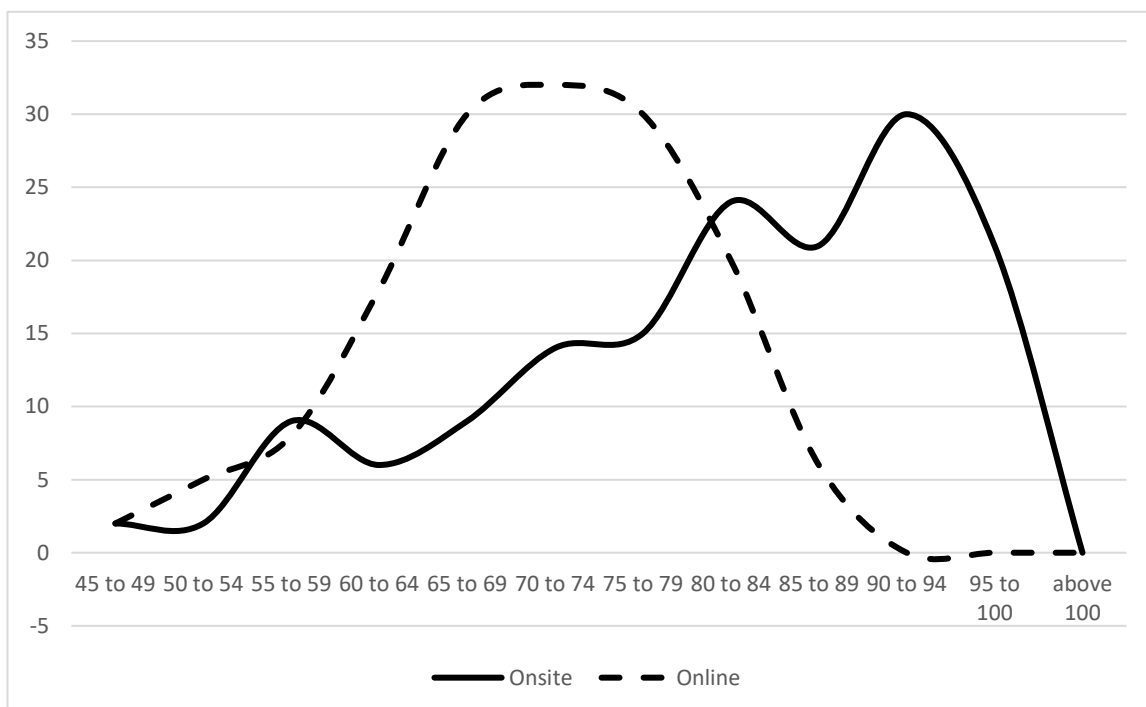
**Figure 3: Distribution of marks in Economics: Onsite vs Online**

Table 6: Paired two samples for means of onsite and online examinations

	Online open-book	Onsite closed-book
Mean	66.99	77.56
Variance	70.77	165.74
Observations	153	153
Pearson Correlation	0.27	
Hypothesized Mean Difference	0	
Df	152	
t Stat	-9.81	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.65	
P(T<=t) two-tail	0.00	
t Critical two-tail	1.98	

As in the other two subjects, according to the results of the paired t-test, there is a significant difference between the average marks of the online and onsite examinations. The Pearson correlation coefficient shows that there is a weak positive relationship between the performance of undergraduates at the online and onsite examinations.

Discussion

The findings of this study contradict the literature. According to Ashri and Sahoo (2021) and Brallier, Schwanz, Plam and Irwin (2015), when students were allowed access to their books and notes, they performed significantly better on exams than when they took exams without access to these resources. However, in the present study, students only scored about 5 percent higher on exams when they had access to books and notes. Researchers believe that the time limitation of the examination was the main reason for this marginal difference between the average marks of the online and onsite examinations.

The background of this study is different from the studies available in the literature. For the onsite closed-book examination, undergraduates had only two hours to answer the given question paper. Undergraduates had a convenient learning environment at the university when they sat the onsite examination at the University.

In the online setup, undergraduates had opportunities to use lecture materials and other sources to write the answer and had twenty-four hours to answer and upload their answer scripts to the LMS. The findings show that though undergraduates had access to materials and more time to upload answer scripts, they were unable to perform well, in comparison to onsite exams.

The findings of the telephone survey show that the main reason for the poor performance at the online examination was the teaching and learning environment undergraduates had during online teaching and testing. In the second semester, undergraduates were not able to refer recommended textbooks as the library was closed. Though they had access to the e-library, it was not useful as students did not find soft copies of the recommended textbooks. About 27 percent of undergraduates stated that one reason for the poor performance at the online examination was not having access to the recommended books.

Additionally, 29 percent of undergraduates stated that they were unable to learn advanced subject matter without support from the seniors. In the university setup, seniors arrange classes (called 'kuppi' in university jargon) for juniors to explain complicated subject matter. As the second semester was fully online, the juniors were unable to get the support of seniors, which was stated as a reason for the poor performance at the examination.

Prior to the semester I onsite examination, the faculty arranged onsite revision for students. During this period, undergraduates were able to complete their lecture notes. However, 20 percent of undergraduates stated that they were unable to complete lecture notes before the semester II examination, as these revision sessions were not conducted.

A significant percentage of undergraduates stated that they did not have a suitable environment to do exams from home. About 20 percent of undergraduates stated that they did not have a separate room to work from. Another important statement made was that undergraduates did not feel the weight of the exam when sitting the exam from home. The evidence revealed in this study shows that the main reason for the poor performance at the online examination was not the mode of examination. It is mainly the unsuitable teaching and learning environment students had during the COVID-19 pandemic.

Summary and Recommendations

The FoA, University of Colombo adopted online teaching to mitigate the negative impacts of the COVID-19 pandemic on students' education. However, some issues faced by students affected the success of that effort. Hence, the government of Sri Lanka should take measures to create favorable digital infrastructure for the education sector, in case online teaching has to be conducted in the future. A significant number of undergraduates, even those from the Western province, stated that they experienced connectivity issues. Hence, it is evident that the government and private firms should take measures to create equal access to internet for all students and lecturers.

The present university curriculums which have been designed for traditional classrooms, are not suitable for online delivery. Hence, universities should revamp their curriculums. The evaluation system needs to be restructured to conduct examinations on an online platform. At present, 60 percent of marks of a course are allocated for the final examination while 40 percent of marks are allocated for classroom tests and assignments. This should be revised giving more weightage to classroom tests and assignments. Also, other than written final examinations, the possibility of implementing viva examinations should be considered.

As some lecturers do not have knowledge about the digital environment, training programs should be conducted to give better training for lecturers. The COVID-19 has provided an opportunity for educational institutes to incorporate new technological changes to upgrade the higher education sector, which should be used to revise and better the programmes offered by them.

References

- Amarathunga, D., Frenado, N., Haigh, R., & Jayasinghe, N. (2000, November 11). *The COVID-19 outbreak in Sri Lanka: A synoptic analysis focusing on trends, impacts, risks and science-policy interaction processes*. doi:2020 Dec;8:100133. doi: 10.1016/j.pdisas.2020.100133.
- Ashri, D., & Sahoo, B. (2021). Open Book Examination and Higher Education During COVID 19 : Case of University of Delhi. *Journal of Educational Technology System* , 73-86.
- Biggs, J. (1979). Individual differences in study process and the quality of learning outcomes. *Higher Education*, 381-394.

- Brallier , S., Schwanz , K., Plam, L., & Irwin, L. (2015). Online Testing: Comparison of Online and Classroom Exams in an Upper Level Psychology. *American Journal of Educational Research*, 255-258.
- Eilertsen, T., & Valdermo, O. (2000). . Open-book assessment: A contribution to improved learning? *Studies in Educational* , 91-103.
- Feller, M. (1994). Open-book testing and education for the future. *Studies in Education Evaluation*, 235-238.
- Mseleku, Z. (2020). A Literature Review of E-Learning and E-Teaching in the Era of Covid-19 Pandemic. *International Journal of Innovative Science and Research Technology*, 588-597.
- Natarajan, D., Dhanasekaran, B., Giftson, S., & George , B. (2022). Study and Analysis of COVID-19 Impacts on the Performance of College Students and Courses. *Eduactional Journal*, 11-22. <https://doi.org/10.31058/j.edu.2022.51002>.
- Otifi, H., Hassan , H., & Andarawi, M. (2022). Evaluation of the effect of COVID-19 mandated shift to virtual teaching on medical students' performance at King Khalid University, Abha. *Taibah Univ Med Sci.*, 331-336.
- Stalnaker, J., & Stalanker, R. (1934). Open-book examinations. *The Journal of Higher Education*, 117-120.
- Tussing, L. (1951). *A consideration of the open book examination. Educational and Psychological Measurement*. <https://journals.sagepub.com/doi/10.1177/001316445101100406>