Online education during Covid-19 lockdown -Student experience in the non-state higher education in Sri Lanka

Chapter · December 2021

4 authors, including:

Malitha Wijesundara
Sri Lanka Institute of Information Technology
24 PUBLICATIONS   **58** CITATIONS

SEE PROFILE

Colin Peiris
Sri Lanka Institute of Information Technology
8 PUBLICATIONS   **5** CITATIONS

SEE PROFILE

Thaiyamuthu Thanaraj
Sri Lanka Institute of Information Technology
2 PUBLICATIONS   **8** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Geophone Based Home Surveillance System View project

Distributed Web Caching View project

Online education during Covid-19 lockdown - Student experience in the non-state higher education in Sri Lanka

Wijesundara M.N.[1,*], Peiris T.S.G.[1], Thanaraj T.[1], Peiris C.N.[1]

1 Faculty of Humanities and Sciences, Sri Lanka Institute of Information Technology (SLIIT), Malabe, Sri Lanka

ABSTRACT

The objective of this paper is to analyze the effectiveness of online education in both teaching and learning, based on data captured from the Moodle LMS, Eduscope Lecture Video Management System and two students' feedback surveys at the Sri Lanka Institute of Technology (SLIIT) from January to December 2020. Regression analysis and chi-square test were used as data analyses tools. The data were analyzed using simple linear regression and Analysis of LMS data showed that with each user logging into LMS 3 to 4 times a day with a minimum of 10 user actions per login. The study also found that the percentage of 'satisfactory' ratings by students for all aspects considered under four criteria, namely lecture delivery, technology, support services and overall satisfaction exceeded 80% irrespective of the faculty and time of the year. However the students' responses for individual criteria within four aspects were significantly associated ($p < 0.05$) by the nature of the faculty. More than 75% of students claimed that the online delivery is working well and enabling them to continue with their studies. No significant difference was found with respect to overall satisfaction by the students between the two periods. The inferences of this study can be used effectively to provide better online education environment in higher education organizations in Sri Lanka. and The infrastructure upgrades, including overall bandwidth, new services including Zoom, Webex and MS Teams, staff training on online delivery enabled a quick transition to online delivery. The incorporation of Respondus lockdown browser and Respondus Monitor online proctoring system further enhanced the integrity of online assessments and examinations.

Key words: Covid-19, LMS, Eduscope, Institutional response, Online education, Zoom

1. INTRODUCTION

The closure of both state and non-state universities due to COVID-19 pandemic continues to have a severe impact on higher education in Sri Lanka. The government provided the Zoom Pro video conferencing facility to all state university staff and students via the Lanka Education and Research Network (LEARN) free of charge. In addition, the Telecommunication Regulatory Commission of Sri Lanka offered several subsidized data packages through the Internet Service Providers (ISPs) to reduce the financial burden on the teaching staff and students for participation in video conference-based teaching and learning. The packages covered both Zoom and Microsoft Office 365, which includes Microsoft Teams.

Such facilities and online technologies, however, pose new challenges of both technical and non-technical nature. Although both state and non-state higher education sectors have taken additional steps to further support

online teaching learning process, the real impact on online education (both learning and teaching) has not been deeply investigated. This is primarily due to the lack of a continuous data series over time and the lack of facilities to monitor students. In this paper, we present the measures taken to support online teaching and learning and the student feedback during two semesters in 2020 at the Sri Lanka Institute of Information Technology (SLIIT), Malabe, Sri Lanka.

1.1. Background

Although the literature has emerged from around the world on online education during the Covid-19 pandemic emerging, owing to the recent nature of the experience reliable long term data sets are not available to clearly understand the dynamics of the process. Some countries report insignificant change in academic achievement before and after transition from face-to-face to online education in higher education (Said, 2020; Dhawan, 2020). However, it must be noted that this is possible when the transition takes place for the entire student body without a significant drop-out rate during the transition. The experience of Bulgaria (Ilieva et al., 2020), further studies the challenges faced by the students and teachers in detail.

A report by Hayashi et al. (2020) for the Asian Development Bank provides the most comprehensive coverage of measures taken by Sri Lanka in the transition, covering both state and non-state sectors, based on descriptive statistics. They used data collected through three online surveys during 17–29 June 2020, covering both state (46) and nonstate (10) higher education institutions. The study claimed that Sri Lanka made a remarkably quick transition to online tertiary education after all educational institutions were forced to close in March 2020 because of the COVID-19 pandemic and the level of access to online education is comparable to developed countries like Japan. Nevertheless, the report also highlights the challenges faced by teachers and students during the transition. Poor internet connectivity in remote areas,

cost of internet access (to sites other than the university LMS) and the cost access devices were the challenges of non-academic nature. The highlighted academic challenges were poor student attendance in some disciplines, inability to perform laboratory activities, limited assessment and examination options, and poor of adjustment of pedagogical methods to online and blended mode by lecturers. No other detailed studies were reported on online education in Sri Lanka.

1.2. Introduction to SLIIT

SLIIT is the largest and highest ranking non-state higher education institution in Sri Lanka. SLIIT had more than 10,500 students in 2020, with 5 faculties namely: Computing, Engineering, Business, Humanities & Sciences (HS) and Graduate Studies & Research. Teaching and Learning at SLIIT is supported by a Moodle Learning Management System (LMS) named CourseWeb since 2006, and a Lecture Capture / Lecture Video Management System (LVMS) by Eduscope, since 2019.

1.3. Environment in SLIIT

Multiple technologies and methodologies were put in place at SLIIT, before and during the pandemic as shown in Table 1. During the pre-pandemic period, the primary delivery method was face-to-face. However, each module had a course page on the LMS which contained supplementary material including presentation slides and reference material. During mid-term assessments, Moodle-based examinations were extensively used for Multiple Choice Questions and short answer questions. The Eduscope lecture capture facility was available at 3 lecture halls, which recorded face-to-face lectures during the day and uploaded to the Eduscope portal. The viewership remained below 200 views per day in this period.

1.4. First Wave and lockdown (Semester-1, 2020)

Sri Lanka went into the first Covid lock down during the 2nd week of March 2020 during the 5th week of the first semester. SLIIT announced fully online delivery starting from

Table 1. Teaching Learning and Assessment methodologies used at SLIIT

	Before Covid-19	Jan – June 2020	July – Dec 2020	Feb – June 2021
Face-to-face Teaching	Yes (Primary delivery method)	No	Laboratory only for selected programmes	No
LMS (Moodle)	Yes Compulsory to maintain an updated course page	Yes Compulsory to maintain an updated course page	Yes Compulsory to maintain an updated course page	Yes Compulsory to maintain an updated course page
Online Exams (Moodle)	Mid-term examinations	All	All	All
Viva Examination via Zoom / Teams	Limited	Yes	Yes	Optional due to real-time invigilation
Eduscope (Lecture Video Management System)	Limited	Yes Compulsory to upload Recorded Offline Lectures (Primary delivery method)	Yes Compulsory to upload Recorded Live Lectures	Yes Compulsory to upload Recorded Live Lectures
Zoom Meeting	No	Limited (Supplementary delivery method)	Yes (Primary delivery method)	Yes (Primary delivery method)
MS Teams	No	Limited (Supplementary delivery method)	Yes (Supplementary delivery method)	Yes (Supplementary delivery method)
Cisco Webex	No	Limited	No	No
Respondus Lockdown Browser	No	Limited	Yes	Yes
Respondus Monitor	No	No	No	Yes

the 18th of March. The recommended mode of delivery was recorded videos uploaded to the Eduscope Lecture Video Management System (LVMS) platform and linked to the relevant course page on the LMS. The system had 7398 views by 1845 unique students (individuals) on the first day as shown in Figure 1. SLIIT Management was able to secure free access to LMS and LVMS for students and staff from three service providers, thus reducing the financial burden on students.

1.5. Limited university operations and the Second Wave (Semester-2, 2020)

During the 2nd Semester of 2020, live delivery according to a timetable was enforced using Zoom and MS Teams. The live sessions were recorded on the Cloud and the recordings were uploaded to LMS and made accessible via the LMS. After the mid-semester examinations,

the campus was accessible to students from the month of September until suspension of on-campus activities from 6th October owing to the 2nd wave of Covid-19 until end of the Semester. The drop in the number of views noticed in Figure 2, during September 2020 is for this reason. The Respondus lockdown browser was introduced for the first time to ensure reliability of online assessments during this semester and made mandatory for most examinations.

1.6. Limited university operations and the Third Wave (Semester-1, 2021)

As shown in Figure 3, this ongoing semester allowed on-campus activities for selected academic activities such as laboratory work and examinations. The lectures were delivered via Zoom and Teams and uploaded to the LVMS. For the upcoming end semester
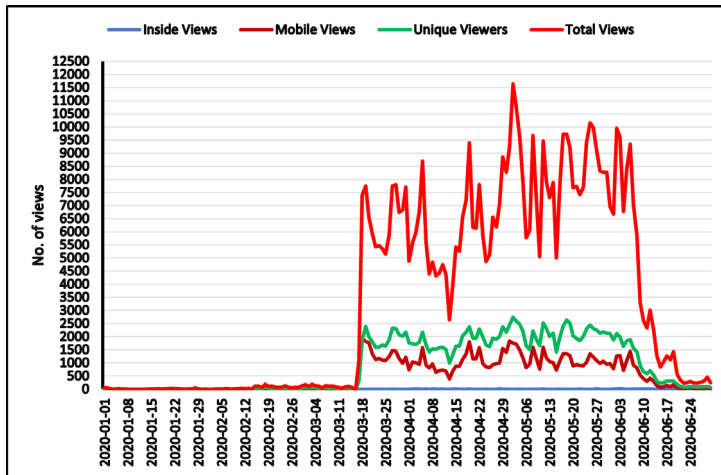
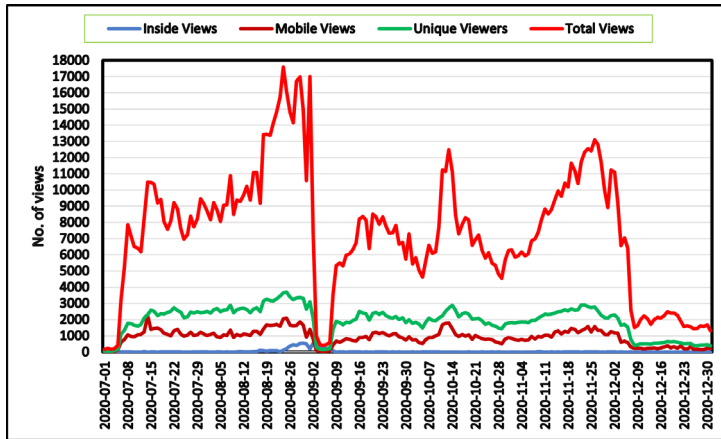Figure 1.   Eduscope LVMS access pattern during Semester-1 (Jan – June, 2020)

Figure 2.   Eduscope LVMS access pattern during Semester-2 (July – Dec. 2020)
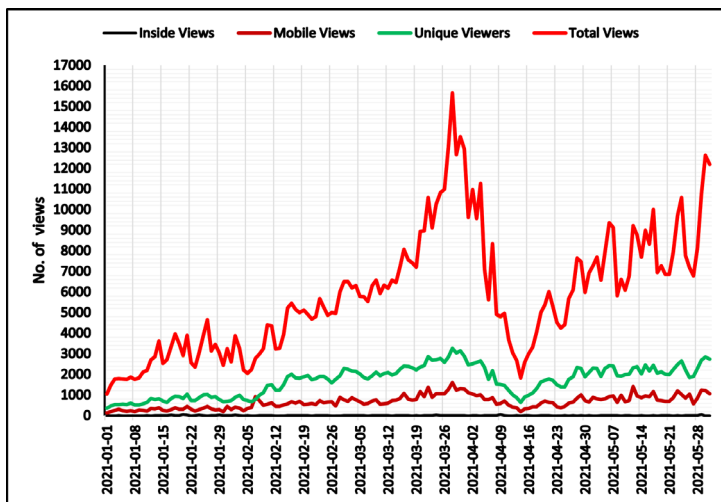

Figure 3.   Eduscope LVMS access pattern during Semester-1, 2021

examinations, Respondus Monitor proctoring system will be introduced to further improve the integrity of assessments.

2. MATERIALS AND METHODS

2.1. Materials

2.1.1. Moodle LMS

Moodle user activity was recorded on a daily basis from March to June 2020 to monitor user login (User_login), unique user login (Unique_UL) and user action (User_action) daily.

2.1.2. Eduscope Lecture Video Management System

The daily view statistics were obtained from the Eduscope LVMS which provided the daily views and daily unique views.

2.1.3. Students Feedback Survey Semester-1, 2020 (Jan-June 2020) & Semester-2, 2020 (July-Dec 2020)

The questionnaire for feedback survey for Semester-1 comprised four main factors and there are six, three, three and one aspects (variables) for Factors 1, 2, 3 and 4, respectively. Each aspect has 5-point Likert scale (1 = Strongly agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly disagree) The total number of students who responded was 2564 from the four faculties of SLIIT, namely Engineering, Computing, Business and Humanities & Sciences (HS) and the School of Architecture.

2.1.4. Students Feedback Survey Semester 2-2020 (July-Dec 2020)

The questionnaire for the students' feedback semester 2 also consists for four main factors, but with additional aspects for the factors. There were ten, seven, four and one aspects for factors 1 to 4, respectively. Each aspect also has 5-point Likert scale as explained above. The total number of students responded was 1093 from the four faculties.

2.2. Data analysis

Correlation analysis and simple linear regression were carried out to find the relationship between User_login, Unique_UL and User_action. Students' feedback data in both surveys were analyzed by ignoring the neutral responses as it does not has impact for the objective of studies. Also, both agree and strongly agree were pooled as "agree" and both disagree and strongly disagree were pooled as "disagree" for better interpretation since both agree and strongly agree and disagree and strongly disagree are very subjective. The percentage of responses for agree and disagree were taken initially, irrespective of five faculties mentioned above. The 2-way frequency analyses were carried out using chi-square test statistic to test whether there is a significant association between faculties and each aspect considered individually within all factors.

3. RESULTS AND DISCUSSION

3.1. Analysis of LMS activity data (March – June 2020)

The Moodle LMS has been extensively used since 2006 at SLIIT and it is compulsory for the lecturers to maintain a course page on the LMS to supplement the face-to-face delivery. It was found that there is a significantly high multi-collinearity among User_login, Unique_UL and User_action and all correlation coefficients are more than 0.9 with p value of 0.001. In order to determine the usage of LMS soon after the first lock down, a simple linear regression model was developed as shown in Figure 4. It was found that the fitted model is significant ($p < 0.05$), and it has captured about 95% of the variability of user logins. Similarly, a linear regression model was developed between user actions and user logins as shown in Figure 5. It is also significant ($p < 0.05$) and can explain about 90% variability of user action. Based on the two models and the 95% confidence interval for the parameters, it can be concluded that the students were actively using the LMS with each user logging in 3.7 to 4.0 times a day with a range of 10-12 user actions per login.
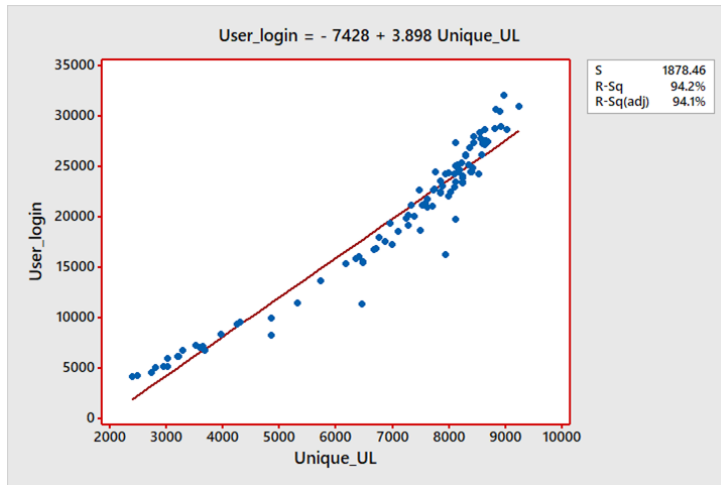
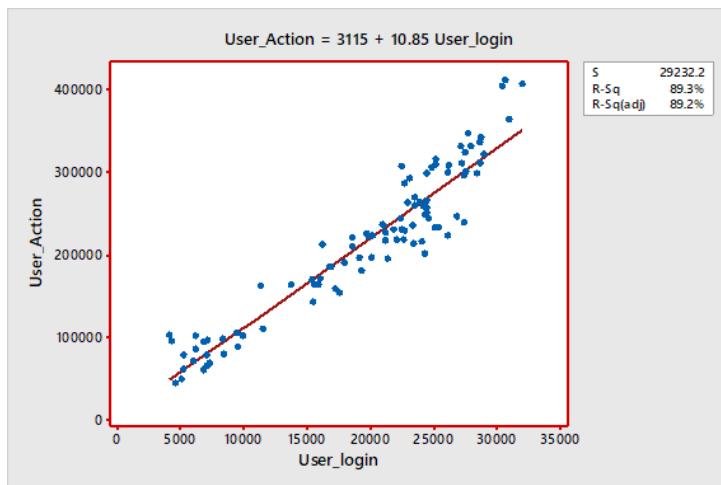Figure 4.   Relationship between Unique user logins and total logins

Figure 5.   Relationship between number of user actions and user logins

3.2. Cleaning of survey data

The number responding considered for the data analyses in both surveys, by ignoring the neutral responses as shown in Tables 2 and 3 respectively for the two surveys. The total numbers of the student's response for the two surveys were 2564 and 1093 respectively.

Results in Table 2 indicate that the number of responses for non-neutral point of Likert scale varies from 1946 (minimum) for the question, "Queries to Faculties/Departments are addressed in a timely manner" to 2152 (maximum) for the question, "the Online delivery is working well and enabling me

to continue with studies". As a result, the corresponding percentages varies from 75.9 to 83.9. Similarly in the second survey (Table 3) also, non-neutral point of Likert scale varies from 79.1% ("essential students services were available to support online learning") to 91.2% ("easy to access the site").

3.3. Student's response to the questions

Results of percentage responses for each variable within a factor for the two surveys are shown in Table 4 and Table 5, respectively. Results in Table 4 show that percentages of 'agree' for all questions exceed 80%, with a marginal exception for overall assessment, at

Student experience in the non-state higher education during Covid-19 lockdown

Table 2.   Number of subjects used for the analysis for each aspect in Survey 1

Factor/Variable	A	B	C
Lecture Delivery			
Live/ recorded videos were clear and audible.	2142	422	83.5
Speed of delivery is optimal.	2136	428	83.3
Presented in a manner that kept students engaged and focused	2075	489	80.9
Supplementary material provided is useful and well prepared.	2119	445	82.6
An effective online forum is available to post questions and discuss course content.	2030	534	79.2
Online assessments are well organized and effective.	2145	419	83.7
Technology			
Video streaming is high quality.	2101	463	81.9
Easy to access the site.	2232	332	87.1
Easy to navigate the site.	2202	362	85.9
Online help services are effective.	1999	565	78.0
Support Services			
Sufficient online library services are available to support online learning.	1952	612	76.1
Required student services are available via online.	1972	592	76.9
Queries to Faculties/Departments are addressed in a timely manner.	1946	618	75.9
Overall Assessment			
Online delivery is working well and enabling me to continue with studies.	2152	412	83.9

(A – No. used for the analysis, B – No. of neutral cases & C – % subjects used with respect to the initial total)

Table 3.   Number of responses subjects considered for the analysis for each aspect in the Survey 2

Variable	A	B	C
Lecture Delivery			
Both live and recorded videos were provided, and they were clear and audible.	971	122	88.8
Only recorded videos were provided, and they were clear and audible.	946	147	86.6
Online laboratory sessions were well delivered.	889	204	81.3
The module instructor responded to queries Promptly.	969	124	88.7
The speed of delivery was optimal.	973	120	89.0
Lectures were presented in a manner that kept students engaged and focused.	969	124	88.7
The supplementary material provided was useful and well prepared.	956	137	87.5
An effective online forum was available to post questions and discuss course content.	918	175	84.0
Online assessments were well organized and effective.	941	152	86.1
Online review sessions were provided to support learning	908	185	83.1
Technology			
Video streaming was of high quality.	995	98	88.5
Easy to access the site.	930	163	91.2
Easy to navigate the site.	939	154	91.0
Online technical help services were adequate.	956	137	85.1
My overall experience with Eduscope was positive.	868	225	85.9
Zoom was the technology used for online teaching.	891	202	87.5
MS-Teams was the technology used for online teaching.	860	233	79.4
Support Services			
Good online library services were available to support online learning.	891	202	81.5
Webinars presented by the Library facilitated access to online resources.	860	233	78.7
Essential student services were available online.	865	228	79.1
Queries to Faculties/Departments are addressed in a timely manner.	872	221	79.8
Overall Assessment			
Online delivery was working well during this semester and enabled me to continue with my studies	935	158	85.5

(A – No. used for the analysis, B – No. of neutral cases & C – % subjects used with respect to the initial total)

79%. It is clear that the high level of 'satisfactory' ratings were obtained for the various aspects of online delivery system introduced by the SLIIT irrespective of faculty and despite problems faced by students such as power cuts, signal problem, income status etc. which are outside the purview of the SLIIT. It should be noted that the 'agree' percentage is more than 85% for "easy to assess the site" and "easy to navigate the site" referring to the Eduscope video portal which was designed to give the impression of a private YouTube channel.

In the second survey (Table 5), the 'agree' percentage for "Online delivery was working well during this semester and enabled me to continue with my studies" (85.5) is higher than the corresponding percentage in the first survey, but no statistically significant difference was obtained ($p > 0.05$) between those two percentages Is this a long winded way of saying that "the difference between the two ratings is insignificant". The percentage of students' 'agree' for all features, under technology factor, namely "Video streaming was of high quality", "Easy to access the site" and "Easy to navigate site" are around 85%. These percentages clearly indicate that the students were satisfied with the technologies and facilities made available for online learning.

The dedicated section on Eduscope was not available in the first survey, but 85% of the students were satisfied with the experience they gained from Eduscope for their online learning. It helped students to follow the recorded lectures when and where they wanted them.

3.4. Association between faculties and the response of the students

As described above, the association between faculties and each variable within a factor was analyzed using chi-square test and the summary results are shown for each factor separately for both periods (Table 6 and Table 7). Since there were no responses from the School of Architecture during July-December, their results cannot be used for comparison of the two periods. The parenthesis represents the percentages of 'agree' for the aspects. Those are the percentages of 'satisfactory' (agree) obtained with respective faculty total for a given aspect.

3.5. Aspects on 'Lecture Delivery' factor

As chi-square statistics are significant for all six variables, it can be concluded with 95% confidence that there is significant association ($p < 0.05$) between student's response and type of faculty for all six aspects under each variable.

Table 4. Percentages of response of the students (irrespective of faculty) for Survey 1: (Jan. - June), 2020

Factor	Variable	Agree (%)	Disagree (%)
Lecture Delivery	Live/ recorded videos were clear and audible.	81.8	18.2
	Speed of delivery is optimal.	83.7	16.3
	Presented in a manner that kept students engaged and focused.	80.9	19.1
	Supplementary material provided is useful and well prepared.	82.4	17.6
	An effective online forum is available to post questions and discuss course content.	81.9	18.1
	Online assessments are well organized and effective.	82.9	17.1
Technology	Video streaming is high quality.	83.2	16.8
	Easy to access the site.	85.1	14.9
	Easy to navigate the site.	85.5	14.5
	Online help services are effective.	83.2	18.8
Support Services	Sufficient online library services are available to support online learning.	81.4	18.6
	Required student services are available via online.	83.9	16.1
	Queries to Faculties/Departments are addressed in a timely manner.	82.5	17.5
Overall Assessment	Online delivery is working well and enabling me to continue with studies.	79.0	11.0

Table 5.   Percentages of response of the students (irrespective of faculty) for the Survey 2: (July to December) 2020.

Factor	Variable	Agree (%)	Disagree (%)
Lecture Delivery	Both live and recorded videos were provided, and they were clear and audible.	86.8	13.2
	Only recorded videos were provided, and they were clear and audible.	76.2	23.8
	Online laboratory sessions were well delivered.	80.9	19.1
	The module instructor responded to queries promptly.	88.5	11.5
	The speed of delivery was optimal.	88.6	11.4
	Lectures were presented in a manner that kept students engaged and focused.	87.8	12.2
	The supplementary material provided was useful and well prepared.	88.4	11.6
	An effective online forum was available to post questions and discuss course content.	86.7	13.3
	Online assessments were well organized and effective.	88.3	11.7
	Online review sessions were provided to support learning.	86.8	13.2
Technology	Video streaming was of high quality.	88.3	11.7
	Easy to access the site.	89.3	10.7
	Easy to navigate the site.	87.9	12.1
	Online technical help services were adequate.	88.9	11.1
	My overall experience with Eduscope was positive.	84.8	15.2
	Zoom was the technology used for online teaching.	83.7	16.3
	MS-Teams was the technology used for online teaching.	64.6	33.4
Support services	Good online library services were available to support online learning.	87.8	12.2
	Webinars presented by the library facilitated access to online resources.	84.7	15.3
	Essential student services were available online.	86.7	13.3
	Queries to Faculties/Departments were addressed promptly.	86.9	13.1
Overall	Online delivery was working well during this semester and enabled me to continue with my studies.	83.8	16.2

Table 6.   Summary results of chi-square analyses for the aspects of lecture delivery during (Jan-June), 2020

Variables related to the factor 'lecture delivery'	Faculty				Chi-square
	Business	Computing	Engineering	HS	
Live/ recorded videos were clear and audible.	405 (91.4)	856 (77.6)	342 (82.2)	140 (83.3)	$x_3^2 = 45.5$, p = 0.001
Speed of delivery is optimal.	424 (92.6)	857 (79.1)	360 (85.3)	135 (84.4)	$x_3^2 = 48.3$ p = 0.001
Presented in a manner that kept students engaged and focused.	406 (92.5)	798 (76.0)	334 (80.3)	130 (82.3)	$x_3^2 = 62.7$ p = 0.001
Supplementary material provided is useful and well prepared.	425 (93.2)	822 (77.1)	348 (83.7)	140 (83.8)	$x_3^2 = 65.6$, p = 0.001
An effective online forum is available to post questions and discuss course content.	403 (92.9)	795 (77.9)	315 (78.9)	136 (84.6)	$x_3^2 = 56.7$ p = 0.001
Online assessments are well organized and effective.	421 (93.8)	851 (82.9)	349 (82.7)	143 (78.1)	$x_3^2 = 63.6$, p = 0.001

The percentages of 'satisfactory' for all six aspects within the factor of lecture delivery are more than 75% in all faculties with exceptional in the Faculty of Business (90%) confirming that the facilities offered for online teaching by all faculties are satisfactory. Furthermore, the percentages of 'satisfactory' for all six aspects are highest for the Faculty of Business during Jan-June, 2020.

The corresponding percentages are lowest for the Faculty of Computing. The reasons for these aspects were not investigated in this study as we used already collected data. By testing two proportions using binomial distribution, it was found that all percentages of satisfactory in the Faculty of Business are significantly higher ($p < 0.05$) than the corresponding percentages in the Faculty of Computing. The results in Table 7 for the second period also confirm that there is strongly significant association ($p < 0.05$) between the student's response and the faculties for all ten aspects.

Percentages of 'satisfactory' were sustained during the second period as well, by all faculties for the six aspects assessed during Jan-June, 2020. Of the additional new four aspects included in the second survey, percentages of 'satisfactory' are lower for two aspects, namely "Only recorded videos were provided, and they were clear and audible" and "Online laboratory sessions were well delivered" in two faculties.

3.6. Aspects of "Support Services" factor

The results of summary of the chi-square analyses with respect the association between faculties and the student's response for the aspects within the support services factor in both surveys are shown in Table 8 and Table 9, respectively.

As Chi-square statistics are significant in Table 8 and Table 9, it is clear that there is significant association ($p < 0.05$) between the faculties and the students' response to various aspects of the support services factor. The percentage of 'satisfactory' is significantly higher for the Faculty of Business for all three aspects during the first survey. However, the percentage of 'satisfactory' for these aspects

Table 7. Summary results of chi-square analyses for aspects of lecture delivery during (July-December), 2020

Variables related to the factor 'lecture delivery'	Faculty				Chi-square
	Business	Computing	Engineering	HS	
Both live and recorded videos were provided, and they were clear and audible	609 (89.7)	184 (78.6)	24 (96.0)	26 (78.8)	$x_3^2 = 22.3$, $p = 0.001$
The speed of delivery was optimal.	619 (91.3)	194 (81.9)	23 (88.5)	26 (82.1)	$x_3^2 = 43.8$, $p = 0.001$
Lectures were presented in a manner that kept students engaged and focused.	623 (91.3)	177 (76.0)	22 (95.7)	29 (93.5)	$x_3^2 = 33.6$, $p = 0.001$
The supplementary material provided was useful and well prepared.	630 (91.6)	165 (77.8)	24 (100)	26 (81.2)	$x_3^2 = 33.4$, $p = 0.001$
An effective online forum was available to post questions and discuss course content.	603 (90.4)	148 (72.9)	19 (100)	26 (89.7)	$x_3^2 = 41.3$, $p = 0.001$
Online assessments were well organized and effective.	621 (91.3)	165 (78.2)	20 (100)	25 (83.3)	$x_3^2 = 30.2$, $p = 0.001$
Only recorded videos were provided, and they were clear and audible.	540 (81.9)	147 (62.8)	18 (78.3)	16 (53.3)	$x_3^2 = 43.8$, $p = 0.001$
Online laboratory sessions were well delivered.	542 (86.9)	147 (65.3)	18 (94.7)	12 (57.1)	$x_3^2 = 59.5$, $p = 0.000$
The module instructor responded to queries promptly.	618 (91.0)	189 (81.1)	24 (96.0)	27 (84.4)	$x_3^2 = 17.7$, $p = 0.001$
Online review sessions were provided to support learning	603 (90.4)	148 (72.9)	19 (100)	26 (89.7)	$x_3^2 = 63.7$, $p = 0.001$

Table 8.   Summary results of chi-square analyses for the aspects within support services during (Jan – June), 2020

Variables related to the factor 'lecture delivery'	Faculty				Chi-square
	Business	Computing	Engineering	HS	
Sufficient online library services are available to support online learning.	393 (94.5)	807 (81.0)	278 (71.8)	102 (76.8)	x_3^2 =73.8, $p = 0.001$
Required student services are available via online.	391 (93.3)	763 (77.7)	312 (79.5)	118 (83.7)	x_3^2 =44.8, $p = 0.001$
Queries to Faculties/Departments are addressed in a timely manner.	391 (93.5)	783 (78.7)	312 (79.5)	118 (83.7)	x_3^2 =48.3, $p = 0.001$

Table 9.   Summary results of chi-square analyses for the aspects within support services during (July – December), 2020

Variables related to the factor- lecture delivery	Faculty				Chi-square
	Business	Computing	Engineering	HS	
Good online library services were available to support online learning.	587 (89.9)	157 (79.3)	15 (98.5)	23 (92.0)	x_3^2 =18.5, $p = 0.001$
Essential student services were available online.	573 (90.1)	144 (75.8)	14 (77.8)	19 (90.5)	x_3^2 27.4, $p = 0.000$
Queries to Faculties/Departments were addressed promptly.	577 (89.2)	145 (78.8)	15 (75.0)	21 (100.0)	x_3^2 =19.2, $p = 0.001$
Webinars presented by the Library facilitated access to online resources.	556 (87.7)	132 (72.9)	20 (95.2)	20 (83.4)	x_3^2 = 5.5, $p = 0.001$

decreased slightly in the second survey. There is noticeable improvement for all three aspects in the Faculty of HS in the second survey. Percentages of 'satisfactory' for "webinars presented by the library facilitated access to online resource" is high and it varied from 72.9% in the Faculty of Computing to 95.2% in the Faculty of Engineering.

3.7. Aspects of "Technology" factor

The response of student for all aspects of technology factor is also significantly associated (p < 0.05) with the faculty (Table 10 and Table 11). Three additional aspects for technology factor were included for the second survey.

On comparison of results in Table 10 and Table 11 it was found that there was no significant difference (p > 0.05) in the percentages of 'satisfactory' between two periods with respect to four aspects: "Video streaming is high quality", "Easy to access the site", "Easy to navigate the site" and "Online help services are effective" in all Faculties. Of the new aspects added to the second survey, the percentage of 'satisfactory' for the "overall experience with Eduscope was positive but significantly varied among faculties from

Table 10.   Summary results of chi-square analyses for the aspects of technology during (Jan – June) 2020

Variables related to the factor- lecture delivery	Faculty				Chi-square
	Business	Computing	Engineering	HS	
Video streaming is high quality.	415 (93.4)	856 (79.6)	335 (82.2)	142 (84.3)	x_3^2 =45.7, $p = 0.001$
Easy to access the site.	429 (93.7)	949 (85.1)	361 (83.3)	146 (87.4)	x_3^2 =36.3, $p = 0.001$
Easy to navigate the site.	425 (92.5)	948 (84.0)	347 (83.7)	142 (86.1)	x_3^2 =34.6 $p = 0.000$
Online help services are effective.	407 (94.2)	795 (78.9)	307 (79.9)	136 (88.3)	x_3^2 =55.2, $p = 0.001$

Table 11. Summary results of chi-square analyses for the aspects technology factor during (July – December), 2020

Variables related to the factor- lecture delivery	Faculty				Chi-square
	Business	**Computing**	**Engineering**	**HS**	
Video streaming was of high quality.	623 (91.6)	189 (79.6)	16 (88.9)	26 (89.9)	$x_3^2 = 26.1$, $p = 0.001$
Easy to access the site.	637 (91.8)	207 (83.1)	21 (87.5)	25 (89.3	$x_3^2 = 15.3$, $p = 0.001$
Easy to navigate the site.	624 (89.5)	205 (83.3)	22 (88.0)	24 (88.9)	$x_3^2 = 6.7$, $p = 0.087$
Online technical help services were adequate.	613 (91.5)	174 (81.3)	18 (85.7)	22 (88.0)	$x_3^2 = 65.6$, $p = 0.001$
My overall experience with Eduscope was positive.	609 (90.0)	151 (70.6)	12 (63.2)	24 (82.8)	$x_3^2 = 54.5$, $p = 0.001$
Zoom was the technology used for online teaching.	615 (89.0)	137 (65.8)	22 (95.7)	26 (78.8)	$x_3^2 = 67.6$, $p = 0.001$
MS-Teams was the technology used for online teaching.	432 (69.2)	110 (55.8)	6 (31.6)	13 (53.6)	$x_3^2 = 25.5$, $p = 0.001$

90% (Faculty of Business) to 63.2% (Faculty of Engineering). Furthermore, percentages of 'satisfactory' by the students for the use of Zoom are higher than the use of MS-Teams, irrespective of faculty.

3.8. 'Overall' Factor

Results in Table 12 indicate that there is significant association between the faculties and students' response for the overall performance in both surveys. The percentage of overall 'satisfactory' in the Faculty of Business is 93.4% during Jan-June' 2020 and it is significantly higher (p < 0.05) than the corresponding percentages in other three faculties. Though the percentages of overall 'satisfactory' in Faculties of Engineering and Humanities and Sciences increased, the increase is not statistically significant in view of the very small sample size for the second survey. There is no significance difference (*p* > 0.05) between the

two percentages of overall 'satisfactory' in the Faculty of Computing.

4. CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS

Based on the results of data analyses obtained from Eduscope LVMS maintained by SLIIT, the LMS and students' feedback acquired during January to June, 2020 and during July to December, 2020 the following conclusions and recommendations can be made.

4.1. Conclusions

- As 80% of students are satisfied that online delivery was working well during the two semesters and enabled them to continue with their studies irrespective of the nature of the faculty, the infrastructure developed by SLIIT for the online teaching and learning is considered as effective and efficient.

Table 12. Summary results of chi-square analyses for the overall factor in two periods

Variables related to the factor- lecture delivery	Faculty				Chi-square
	Business	**Computing**	**Engineering**	**HS**	
Online delivery is working well and enabling me to continue with studies – (Jan-Jun) 2020	422 (93.4)	792 (72.5)	324 (77.3)	140 (84.8)	$x_3^2 = 87.5$, $p = 0.001$
Online delivery was working well during this semester and enabled me to continue with my studies-(July-Dec), 2020	570 (88.5)	170 (70.1)	22 (95.7)	20 (80.1)	$x_3^2 = 66.6$ p = 0.001

- In 2020, irrespective of gender, income, and semester about 80% of the students expressed satisfaction in all the aspects tested under lecture delivery, technology, and support services.
- The percentages of students reporting 'satisfactory' are not significantly different for almost all aspects of the periods (Jan-Jun) 2020 and (July – Dec) 2020.
- As chi-square statistics indicate the response of the students for almost all aspects is significantly associated with the nature of faculty, but the percentage of 'satisfactory' varied between 70 and 90.
- The students indication of 'satisfactory' for the use of Zoom technology is significantly higher than for Microsoft Teams

4.2. Recommendations

- High quality video streaming, easy access to the site, easy means to navigate the site and an effective online help service are important to providing efficient technology to improve online learning by the students in higher education organizations.
- Sufficient online library services and providing prompt solutions for queries receiving to Faculties and Department are necessary for efficient online learning.
- The availability of the Eduscope Learning Video Management System was beneficial during the transition from face-to-face to online mode. It provided access to recorded live lectures so that students who had connectivity issues could access the lectures at a convenient time. In addition, the peaks in the usage graphs refer to examination periods indicating that students use the videos extensively for the purpose of revision. Therefore,

it is recommended to maintain a video repository of lectures to support the learners.
- Zoom and Microsoft Teams have become the primary mode of interaction and it may be useful to provide staff development programmes on how to use these two platforms effectively.
- It is necessary to explore online tools for attendance tracking, gamification, surveys, collaborative whiteboards and brainstorming to supplement video conferencing. This could boost learner engagement and motivation to attend lectures online.
- It is better to get the views by filtering the 20% students who claimed that online delivery is not satisfied to provide better service for the students.

REFERENCES

Ghada Refaat El Said (2021). How Did the COVID-19 Pandemic Affect Higher Education Learning Experience? An Empirical Investigation of Learners' Academic Performance at a University in a Developing Country, Hindawi Advances in Human-Computer Interaction Volume 2021

Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. Journal of Educational Technology System. 49(1), 5-22

Ilieva, G., Yankova, T., Klisarova-Belcheva, S. and Ivanova, S. (2021). Effects of COVID-19 Pandemic on University Students' Learning. Information 2021, 12, 163. https://doi.org/10.3390/info12040163

Hayashi, Ryotaro, Garcia, Marito, Maddawin, Angelica, Hewagamage, K.P. (2020). Online Learning in Sri Lanka's Higher Education Institutions during the Covid-19 Pandemic, ADB Briefs, September 2020.