Student Engagement in the Online Learning Environment during the COVID-19 Pandemic in Sri Lanka

ABSTRACT

Aims: This study focuses on factors affectingstudents' engagement, andtheir issues and perceptions of online education in Agricultural Economics and Agribusiness Management related curricula in Sri Lankan state universities during the COVID-19 pandemic.

Place and duration of the study: Data were collected from university undergraduates who studied Agricultural Economics and Agribusiness Management subjects in six state universities in Sri Lanka from January 2022 to February 2022.

Methodology: The primary data were collected from 215 university undergraduates in relevant discipline through a pre-tested questionnaire developed by the researcher via Google form. All the respondents were volunteered to complete the questionnaire and submitted their responses online and those responses were collected anonymously.The Factor analysis was employed in the study to generate a single value for the dependent variable and the multiple linear regression was used to understand the factors affecting Student engagement in online learning.

Results: The study indicates that the majority of students showed a positive attitude toward online education. The study findings show thestudent-teacher interaction is a positive and significant factor in online education in Agricultural Economics and Agribusiness Management disciplines but student-to-student interaction is not a significant factor for student engagement in online education. Moreover, when the students are female and students are in their final year, they are most likely to engagein online education. The study also shows that the majority ofstudents prefer online education even though some highlighted the negative issues.However, providing continuous and stable access to the internet connection and providing other infrastructure facilities to students and teachers are some of the main challenges in promoting online education in Sri Lanka. In addition, proper attention should be paid to assure the quality of online education to develop students holistically.

Conclusion: Study concludes that building and maintaining student-teacher interaction is one of the key determinants in student engagement in online education.Also student engagement can be enhanced through a student-centered learning activities which focus on their active contribution.

Keywords-Student engagement, Online classroom environment, E-learning and COVID- 19 pandemic

1. INTRODUCTION

In the wake of the unprecedented COVID-19 pandemic, more than 220 million tertiary-level students around theworld were suddenly disrupted in 2020 due to the temporaryclosure of the universities (UNESCO 2021). This has had a major impact on the education sector and has severely hindered its activities. Further, the restrictions on international as well as domestic travel affected the physical mobility of both university students and staff members which caused to transform the global education in favor of distance learning and commenced in universities and schools through the online education system (Alipio

2020; Trung et al. 2020). According to the Encyclopedia Britannica, distance learning, also called distance education, e-learning, and online learning, is defined as the “form of education in which the main elements include physical separation of teachers and students during instruction and the use of various technologies to facilitate student-teacher and student-student communication”. E-learning, isalso defined as “an instructional process that gives online learners access to a wide range of resources—teachers, other learners, and content such as readings and exercises—independently of place and time” (Xu 2011). As defined by Hodges et al., 2020 and Means & Neisler., 2020 online learning is delivery and reception of teaching through online platforms[7,8,9].

Distance learning traditionally has focused on nontraditional students, such as full-time workers, military personnel, and nonresidents or individuals in remote regions who are unable to attend classroom lectures. However, it has been widely used in the education sector (Islam 2016), particularly in higher education even before the COVID-19 pandemic. However, with the closure of higher education institutions worldwide, establishing online learning platformsbecame more popular and crucial to provide the required knowledge and skills to their students. Regardless of the global education sector, higher education in Sri Lanka which ismainly conducted through the traditional educational system beforethe COVID-19 pandemic has been adversely affected. The government ordered the closureof all educational institutions in the country inmid-March 2020as a measure of controlof the spreadof the disease.

During the pandemic period, Lanka Education and Research Network (LEARN) was connected to university web servers and used for online education to mitigate the effects of disrupted learning (Hayashi et al. 2020). Moreover, several workshops have been conducted while technical knowledge, skills, and instructions were given to university staff on conducting online lessons effectively. However, this sudden change in the teaching-learning process in the higher education sector in the country without providing adequate facilities has created many concerns, especially among students. There are several studies conducted to find the impact ofonline education in Sri Lanka (Hayashi et al. 2020; Haththotuwa et al. 2021; Sriyalatha and Kumarasinghe 2021;Weerathunga et al.2021; Wijayanayake et al, 2023) and many of these studies focused on online education in the university system in general without focusing on different disciplines. Apart from that Chathuranga et al (2023) studied that online learning, particularly the use of recorded lectures, offers several benefits for management undergraduates in Sri Lanka.Rathnakara (2023) studied challenges and benefits of online learning, as well as satisfaction levels and acceptance of online learning.

However, there is a lack of studies to understand the factors affecting students’ engagement, their perceptions, and issues in online learning especially focusing on Agricultural Economics and Agribusiness Managementdiscipline delivered by state universities in Sri Lanka during the pandemic. As it is a different field that appliesAgricultural Economics and Agribusiness Management theoryto the farming community practically whichdoes not require laboratory works like most other agricultural-related subjects, applied science,orother subjects like medicine, and engineering, students’ responses might be different from other curricula. Therefore, this study shed light on addressing factors affecting students’ engagement, their perceptions, and issuesin online education during the pandemic especially focusing on Agricultural Economics and Agribusiness Management discipline in Sri Lankan state universities. The findings of this study can help both educators and educational institutes to suggest what kind of modifications are needed to improve online education in the higher education sector in the countryin the future.

The remaining part of the paper is organized as follows. The next section highlights thefindings of previous studies relevant to online education. The third section, discusses the methodology adopted in this study while thefourth section discusses thefindings of the research. Finally, the last section concludes and discusses the implications of the study findings.

2. LITERATURE REVIEW

There are several studies have been conducted in other countries to understandthe student engagement, their perceptions, andthe effectiveness of changes from traditional systems to online modes even before the COVID 19 pandemic. Among many,Piccoli 2001; Eom et al. 2006; Sun et al. 2008; An et al. 2009; Bair et al.2011have investigated the determinants of student satisfaction with online learning. Accordingly,

some of the key determinants of student satisfaction include the role of the instructor, teacher-student interaction, nature of the course structure, course content,role of technology, learner motivation, learner efficacy, self-regulated learning, learning environment and methods of assessment. Moore (1989) indicated that the most prominent framework of interaction in online education includes three major aspects: teacher-student interaction, student-student interaction, and student–content interaction.

2.1Student Engagement and Active Participation

Students' active engagement is one of the key factors to understand the effectiveness of online education. Student engagement has been defined as participation and energy that students devote to learn (Borup et al., 2020). In addition, Briggs (2015) described student engagement as the level of interest demonstrated by students, how they interact with others in the course, and their motivation to learn about the topics.The student engagement could be divided into three categories according to Moreira et al. (2020): emotional (how they feel), cognitive (how they think), and behavioral (how they act).Graham et al. (2001) and Levy (2008) found collaborative activities along with other interactions were valued by students and seem to be a necessary component of effective online instruction. The students' engagement with online learning activities may be influenced by factors such as communication, responsiveness, and course design (O'Shea et al., 2015) and teacher presence (Muir et al., 2019).According to Abuhassna et al., (2022), learners' prior experience and knowledge related to e-learning environments have a notable impact on their engagement levels.Also, students' learning habits can significantly influence their level of engagement in online teaching and learning (Werang Brw et al., 2022.). Atherton et al. (2017) pointed out that the more frequently students' access and engage with the learning materials, the better their academic performance.In addition, Dubey et al (2023) examined that student's perception, hedonic motivation or perceived pleasure, usefulness of the course, empowerment and attitude are influenced on student engagement.It is also noted that,instructorsshould use suitable and well-designed learning courses to cater to students' needs in an online-learning setting and should consider students' goals and motivation in online learningwhen adapting their engagement strategies (Abou-Khalil, 2021).

2.2Teacher-student Interaction

Teacher-student connections create a foundation for learning.According to Vagos and Carvalhais (2022), the student-teacher relationship has been consistently associated to positive and generalized outcomes, though its quality seems to be questioned in online teaching.The online interactions between teachers and students are a significant predictor of learning social presence and student satisfaction (Kuo et al. 2014) and it contribute to an increase in learning engagement. Maki and Maki (2005) and Zhao et al. (2005) reported that students do better with instructor interaction and communication. In addition, instructors need to be actively involved in the learning of their students (Young 2006; Gayton and McEwen 2007). But instructors should be minimally active in discussions (Shea et al. 2006; Young 2006; Dennen et al. 2007; Levy 2008) and use email appropriately (Dennen et al. 2007; Gayton and McEwen 2007; Levy 2008). However, too much instructor participation in discussion boards, etc. can decrease student participation Dennen et al. (2007). In addition, Martin et al. (2018) found that the teacher-student interaction is the most important among Moore's three types of interaction. Fu et al. (2009), Moskvicheva et al.(2015),Lim at al (2021), Yang et al (2021), Guo (2022) and Sun (2022)also indicated that students' success in online learning is affected by their interactions with their teachers. Guo et al., (2022), indicated that teacher–student interaction has a significant impact on students' satisfaction and achievement in online learning.

2.3Student-student Interaction

There is evidence that students are more satisfied with their learning when they perceive the presence of their classmates (Russo and Benson 2005) even in the distance learning mode. Chatterjee and Correia (2020) noted that collaborative learning activities can help to build a sense of community in online classes. However, as indicated by Cameron et al. (2009) it must be well designed to view online group

projects as a learning experience that builds a classroom community rather than just a requirement for earning a grade.Cole et al (2021) learned that student–student interaction help the students to reconcile what they learn with what they previously believed and italso enhances students' motivation and cognitively engages learning tasks by ideas sharing and collaborative thinking between students (Lam et al., 2019)

Regardless ofthe number of global literatureto understand the recent changes in online education after COVID 19, it is not much studied in Sri Lanka. Hayashi et al. (2020) indicates that Sri Lanka made a remarkable transition in online tertiary education after closing its higher education institutions in response to the COVID-19 pandemic. This study further reveals that nearly 90% of student respondents have been able to access online education which is comparable to developed countries like Japan. In addition, Haththotuwa et al. (2021) studied the possibilities and students' perspectives on moving to an online system based on more than 900 undergraduates who studied in both government and private universities. Researchers discovered that university students most commonly used smartphones and laptops for online education and are connected to the internet through smartphones via hotspots. In addition, Weerathunga et al. (2021) highlighted, even though the COVID-19 pandemic had increased the usage of e-learning among all, students in various fields of study may not use e-learning to an equal extent for their major studies, and hence, the actual usage is varied between the groups of students. Further Sriyalatha and Kumarasinghe (2021) examined the factors influencing online education during the COVID-19 pandemic using Management students in selected Sri Lankan universities and the study highlights that attitude, internet, and related facilities, curriculum, and self-motivation have a significant positive impact on online education, while workload and time have no significant effect on online education. Therefore against this backdrop, the following hypotheses are proposed:

H1: Student-teacher interaction has a positive effect on students' engagement in online learning environments

H2: Student-student interaction has a positive effect on students' engagement in online learning environment

3. METHODOLOGY

3.1Data Collection

University undergraduate students who are studying Agricultural Economics and Agribusiness Management related subjects in the state universities of Sri Lanka were considered for the study.

The primary data were collected through a pre-tested questionnaire developed by the researcher via Google form to examine how student-teacher interaction and student-student interaction affect student engagement in online education during the COVID-19 pandemic. In addition,the questionnaire was developed to understand the usage of online learning and their perceptions ofAgricultural Economics and Agribusiness Management curriculum in online education during the pandemic.Data were collected fromJanuary2022to February2022 by emailing the questionnaires to the undergraduate students who are studying Agricultural Economics and Agribusiness Management discipline related subject in the state universities. All in all, 215undergraduates from six state universities volunteered to complete the questionnaire and submitted their responses online and those responses were collected. Undergraduates' names and other personnel details were not collected and responses were collected anonymously. However, as the majority of undergraduates in Sri Lankan state universities are female students[1], the majority of the respondents in the survey consisted of female students.

In this questionnaire, the students were asked to rate several statements according to the following scales: 1- strongly disagree, 2- disagree, 3-neutral, 4-agree and 5-strongly agree. The last section of the

[1]From the total number of undergraduates enrolled in 2021, 64.6% are female students (University Grant Commission statistics, 2021). Compared to the demographics of Sri Lanka from the total population, 51.6% are female in 2019 (Department of Census and Statistics)

questionnaire was designed to identifyproblems in online education and identify comments and suggestions.

3.2Factor Analysis and Regression

Multiple linear regression was used to understand the factors affecting Student engagement in online learning. Principle Component Analysis (PCA) (factor analysis) was used to formdependent variable and independent variables of student-teacher interaction and student-student interaction.

Multiple Linear Regression equation,

$$Y=\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

Y= Student engagement in online learning (Dependent Variable)

β_i=Coefficient

X_1=Current academic year of education

X_2= Gender (dummy)

X_3=Quality of internet connection in the location (dummy)

X_4=Student-teacher interaction

X_5=Student-student interaction

X_6=Academic results of the student(dummy)

ε = Error

Factor analysis was employed in the study to generate a single value for the dependent variable and the following table shows the questions used to generate independent variables.

Table 1.Questions used in Factor Analysis

Factor	Variable
Student engagement in online learning (Dependent variable)	"The move to distance learning was truly an experiential learning exercise for me."
	"I participate in online class, but I am not learning because I engage in other activities"
	"I enjoy online course sessions."
	"Even though I participate in almost all lectures, I still do not understand lessons."
Student-teacher interaction-X_4	"Instructor-student connections create a foundation for learning"
	"Our teachers provide the link of the session and other information relevant to lectures timely"
	" Encouraging feedback from the teachers create greater student engagement. "
	"Our teachers empowered us to provide feedback on distance learning instruction we had experienced and enjoyed in other classes."
Student-student interaction-X_5	"I interact with other learners during online learning sessions."

	"Collaborative group learning activities helped to build a sense of community in online classes."
	"Online group projects give us a learning experience that also builds a classroom community."

Factor loadings were calculated for each variable and the values were used to run the multiple linear regression model. STATA 15 software was employed to estimate the multiple regression model, in which the current academic year of education, gender, quality of internet connection, student-teacher interaction, student-student interaction, and students' view on academic results were considered in the model.

4. RESULTS AND DISCUSSION

4.1 Demographic Features of the Respondents

As shown in Table 2, the majority of the respondents are female students (78%) which is common to the gender distribution in the majority of Sri Lankan universities. From the sample, the highest number of students (51%) arebetween the ages of 24-26 years, 44% are between the ages of 21-23 years and only a few undergraduates are ages 27 years or above. In addition, the majority of the participants of the survey are first-year and fourth-year undergraduates and they represent 75% of the sample.

Table 2. Students' Demographic Characteristics(n=215)

Variable	Particulars	Age (%)
Gender	Male	21.9
	Female	78.1
Age*	21-23 years	44.2
	24-26 years	50.7
	27-30 years	4.2
Year of study	First Year	38.6
	Second year	7.5
	Third Year	16.7
	Fourth Year	37.2

Note: Sum of the percentage of ages is not equal to 100% as some students have not mentioned their ages.

Source: Online Survey, 2022

4.2Usage of Online Education

Fig.1 shows the different online platforms used by undergraduates to learn Agricultural Economics and Agribusiness Management curricula during the COVID-19 period. According to that majority of them (98) followed the lectures using zoom technology. This is also agreed with the findings of Haththotuwa and Rupasinghe (2021) who mentioned that almost all Universities in Sri Lanka prefer Zoom over other virtual conference platforms such as Google Meet and Microsoft Teams for online classes. Therefore, in recent

times Zoom has become a popular teaching platform for delivering online classes in Sri Lankan Universities. This might be because this facility is provided by all internet service providers in the country to all universities through the Lanka Education and Research Network (LEARN) for free of charge (Hayashi et al., 2020; Chandradasa and Galhena, 2021). In addition, 66% of students used Learning Management System (LMS) or Virtual Learning Environment (VLE) at the university web system for sharing lecture notes and other lecture materials. Only a few students mentioned that their teachers used Google meet or Microsoft Teams to conduct the lectures.

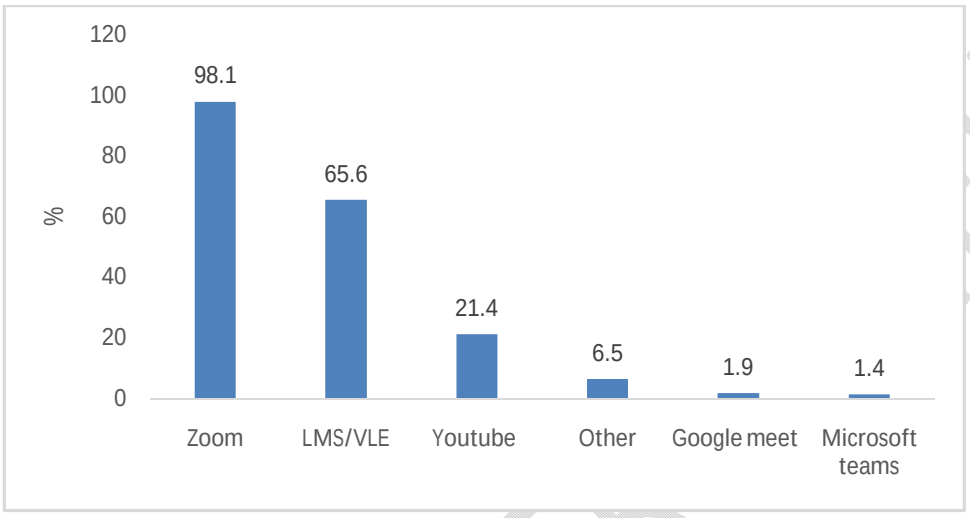

Fig 1. Modes of online learning methods used by undergraduates

Source: Online Survey, 2022

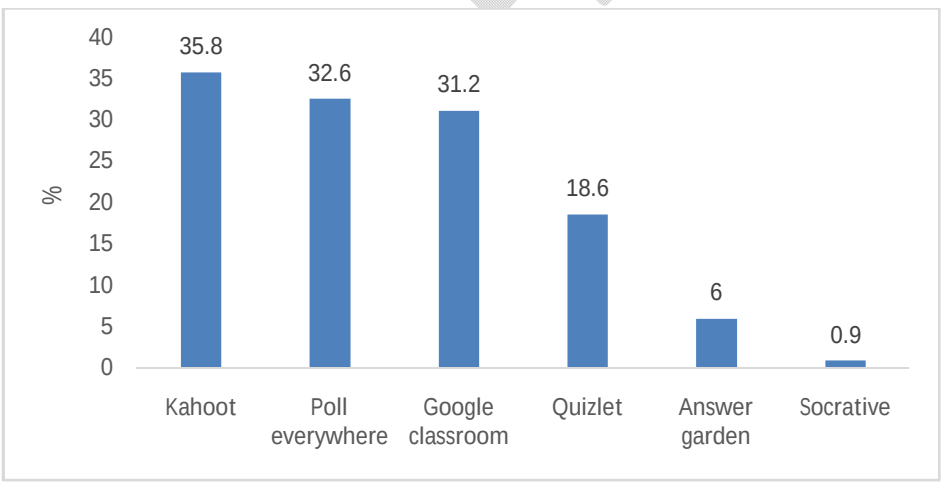

Fig. 2. Different tools used by university lecturers to support teaching undergraduates

Source: Online Survey, 2022

According to the views of undergraduates shown in Fig 2, Kahoot (77%), poll everywhere (70%), and Google Classroom (67%) are the most popular active learning tools (see appendix 1 for explanations of different tools) used by teachers as supporting technology tools to deliver the curriculum. However,

Answer garden and Socrative tools were not much used for online teaching in this discipline. Some researchers also mentioned that active learning is touted as a way to engage students in the online environment (Chickering and Ehrmann 1996). Therefore, it is needed to consider new and smart techniques and tools which are attractive and can be used for active learning in the future.

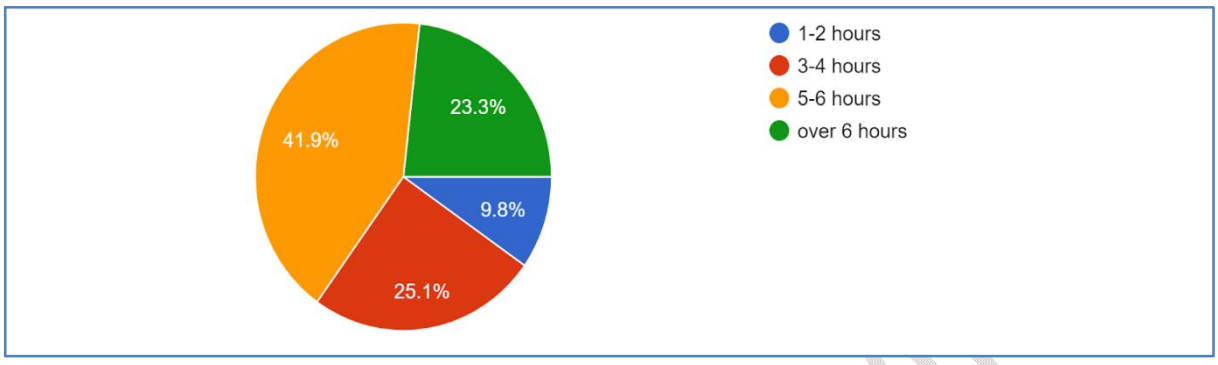

Fig. 3. Average number of hours per day spent by undergraduates for online learning sessions

Source: Online Survey, 2022

Fig. 3 indicates, the majority of undergraduates (42%) spent 5-6 hours per day ononline learning of agricultural economics disciplinewhile only around 10% of undergraduates mentioned that they spent 1-2 hours per day on online learning during the COVID-19 pandemic. However, 23% of undergraduates have spent more than 6 hours per day on online learning. The usual lecture time per week for a typical student is around 30-35 hours and this depends on the number of subjects they follow in each academic year. Mobile broadband internet with data package is the most used (74%) internet access method; whereas 28% of the undergraduates indicated that they used a landline internet connection to join the online lectures.

4.3Obstacles in Online Learning

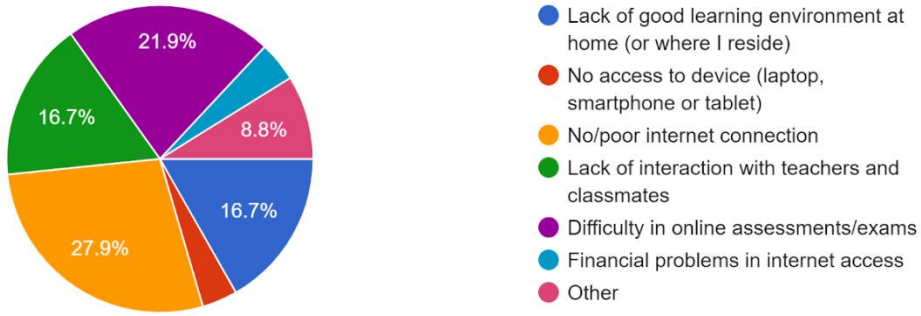

Fig.4.Issues faced by thestudents during online learning

Source: Online Survey, 2022

As shown in Fig.4, 28% of the students were affected due to no or poor internet connection whereas 22% of the total sample indicated difficulty in submittingonline assessments/examinations. In addition, 17% of the undergraduates have no good learning environment at home to study and the other 17% mentioned that lack of interaction with teachers and classmates is one of the main obstacles during online learning. Therefore, such issues needed to be consideredwhenconducting online teaching and examinations. As an example, if the students do not have a sound learning environment at home, they encounter many

difficulties such as switching on their videos during examinations. Moreover, 4% of students have financial problems and another 4% of undergraduates have no access to devices such as smartphones or computers/laptops/tabletsfor stable internet connection. This is one of the major concerns that should be considered in developing countries like Sri Lanka where there is no proper internet connection. In addition, social interactions with the teachers and peer groups aregreatly important for young students to discuss their matters, solve problems, and express their views because distance education due to the COVID-19 pandemic caused the students to studyisolatedwithout social interactions could cause a lot of anxiety. Zielinski (2000) also agreed that the feeling of isolation that learners develop in an online learning environment can be detrimental in the sense that it can make learners feel that they do not belong to a scholarly community. Yang et al. (2022) also mentioned that half of the students reported they found the real-time online classes tedious and stressful. The findings of this research indicated that the effective time duration of the students in aone-hour session is 31-45 minutes for the majority of students (42%) and only 27% can effectively engage in a session of46-60 minutes. Hence it is important to plan some other activities in between or give some break after every 45 minutes if there is acontinuous 2 or 3-hour teaching session.So prior planning of a lesson is essential in online sessions.

4.4Students' Engagement and Understanding of Online Lectures

The following statements highlightstudents'responses relevant to engagement and understanding of online lectures.

Table3. Students' views on engagement and understanding of online lectures

Statement	Mean score level of agreement in 5 point scale	Median	SD
"The move to distance learning was truly an experiential learning exercise for me"	3.5	4.0	0.87
"I participated in online class, but I am not learning because I engage in other activities"	2.6	2.0	0.98
"I enjoy online course sessions."	3.4	3.0	0.95
"I interact with other learners during online learning sessions."	3.2	3.0	0.90
"I often respond to questions of my teacher."	3.5	4.0	0.83
"I participate in online discussions regularly."	3.9	4.0	0.77
"I read lecture recordings several time to understand the lecture"	3.5	4.0	0.89
I watched YouTube videos many times to understand the lecture".	3.5	4.0	0.99
"Even though I participated almost all lectures, I still do not understand lessons."	2.9	3.0	0.97

Source: Online Survey, 2022

Accordingly, the 51% of students agreed that the move to distance learning was a learningexercise for them (mean score value 3.5) but 50% of them havenot interacted with other learners during the online learning sessions. Therefore, it should pay attention to the quality and other issues of the online teaching and need to think how to enhance the students' interactions with their peers. The half of the respondents of the survey agreed that they often respond to the questions of their teachers and 64% students agreed that they participatedonline discussions regularly.

In an online course, the risk of students feeling isolated is of great concern(Russo and Campbell 2004; Song and Singleton 2004; Ortiz-Rodriguez et al. 2005; Lewis and Abdul-Hamid 2006). Hence, it is important that online learning includesstudent-to-student andstudent-to-teacher interaction and the next two sections focus on it.

4.5 Building and Maintaining the Student-teacher Interaction

As shown in Table 4, this study also confirmed that teacher-student interactioncreates a foundation for learning. However, 44% of students were not satisfied that they were able to maintain good interaction with their teachers during the online lessons. They are also of the opinion that students who have a positive first-day experience are more motivated and helpto achieve higher grades at the end of the semester which is also agreed with Wilson and Wilson (2007). Akram and Li (2024) confirmed there were positive correlations between teacher-student relationships and students' online learning engagement. In addition, encouraging feedback from their teachers creates greater student engagement for the lectures.These findings are greatly important in decision-making in future platforms when face-to-face instructions and feedback are disturbed in some cases.

Table 4.Students' responses on students-teacher interaction

Statement	Mean score level of agreement in 5 point scale	Median	SD
"Teacher-student connections create a foundation for learning"	3.8	4.0	0.75
"I was able to maintain a good connection with my teachers during the previous and current semesters through online lessons "	3.4	3.0	0.89
"My teachers appreciate me during the lessons"	3.6	4.0	0.80
"Our teachers provide the link of the session and other information relevant to lectures timely"	4.1	4.0	0.85
Encouraging feedback from the teachers create greater student engagement. "	3.9	4.0	0.65
"Our teachers empowered us to provide feedback on distance learning instruction we had experienced and enjoyed in other classes."	3.6	4.0	0.70
"Students who have a positive first day experience are more motivated and achieve higher grades at the end of the semester."	3.6	4.0	0.82

Source: Online Survey, 2022

Results of the survey further agreed with findings of Hanson and Wachenheim (2020), which highlighted the importance of communication to students from their instructors, with expressing that communication helped them feel a connection to the instructor and the class. The most common methods used by the students to build and maintain interaction with their teachers are sending e-mails and asking questions online during the session. However, they used telephone calls (18%)and WhatsApp messages minimally (20%).

4.6Building and Maintaining Student-student Interaction

Theinteraction between students is also important in adult learning. Especially during the COVID-19 pandemic, students did not receivethe opportunities to meet their colleagues physically as all the universities in the country have been temporary closed and lectures have been continued online. In that sense,the majority of students (73%) in the Agricultural Economics and Agribusiness Management relatedclasses in Sri Lankan universities agreed with the idea of collaborative group learning activities which help to build a sense of community. In addition, 68% of the total sample agreed that online projects provide learning activities that helpto build a sense of community while only 7% disagreedwith that.

4.7Multiple Linear Regression Results

According to the results, the model is significant (P=0.0000) and the R-squared is 30%. Fourth-year students are mostly engaged with online education and results are significant at one%level. This might be

because now they are in the final year of their academic studies and they want to perform better to achieve higher results or higher GPA. In addition, the gender of the studentsalso significantly affects students' engagement and male students have a negative coefficient which meant when the student if male, their engagement in online education is negative. On the other hand female students' engagement in online education is more prominent. Moreover, the results show that, student-teacher interaction is the mostly influential positive factor in student engagement in online education during the pandemic. When student-teacher interaction increases by 1%, student engagement in online education increases by 36%. However, student-student interaction is positively affected but it is not significantly influenced student engagement in online education in Agricultural Economics and Agribusiness Mmanagement discipline in Sri Lankan universities. In addition, those who performed well in academic activities are mostly engaged with online education.

Table 5.Regression results

Source	SS	df	MS	Number of obs	=	215
				F(13, 201)	=	6.82
Model	195.208157	13	15.0160121	Prob > F	=	0.0000
Residual	442.816205	201	2.20306569	R-squared	=	0.3060
				Adj R-squared	=	0.2611
Total	638.024362	214	2.98142225	Root MSE	=	1.4843

studentengage	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Q3						
second year	.8259403	.4215472	1.96	0.051	-.0052819	1.657162
third year	.356698	.3044755	1.17	0.243	-.243678	.957074
fourth year	.7522039	.2378195	3.16	0.002	.2832628	1.221145
genderdummy	-.5980241	.2548791	-2.35	0.020	-1.100604	-.0954442
Q11						
poor	-2.687793	1.51094	-1.78	0.077	-5.667119	.2915325
good	-2.288497	1.505922	-1.52	0.130	-5.25793	.6809359
excellent	-2.099849	1.543131	-1.36	0.175	-5.142651	.9429528
student_teach	.3644159	.0853445	4.27	0.000	.1961306	.5327012
stu_stu	.1404708	.105228	1.33	0.183	-.0670216	.3479632
Q49						
disagree	-.2488992	.5952494	-0.42	0.676	-1.422634	.9248352
neutral	.6430924	.4849857	1.33	0.186	-.3132201	1.599405
agree	.9257812	.4847646	1.91	0.058	-.0300953	1.881658
strongly agree	1.410293	.5587644	2.52	0.012	.3085014	2.512086
_cons	-1.039921	1.778812	-0.58	0.559	-4.547446	2.467605

Source: Online Survey results, 2022

Note: Q3-current academic year, Q11-quality of internet connection, Gender dummy-female-0 and male 1, student_teach-student teacher interaction, stu_stu-student student interaction, Q49-Academic performance during online education is good compared to paper based examination

4.8Effect of Classroom Size and Break-out rooms on E-learning

The survey results show, 32% of the students are of the opinion that the size of the class affects the quality of online learning and teaching whereas 30%disagreed on that. Hanson and Wachenheim (2020) also noted that if the class size is large in many instancesthere may be problems of free-riding and poor communication which reduce the quality of the projects.Therefore, online classroom management tools such as break-out rooms and other student activities will be more important. Out of the total sample, 84% of the students who are in the agricultural economics and agribusiness management discipline have worked in the breakout rooms while they learn online and 59% of the students identified it as an effective method to engage with group activities in online sessions.

Despite the breakout rooms, student peer reviewing is another tool in the online teaching and learning process to increase students' engagement especially when the classroom size is large. As pointed out in Fig.5, students' peer reviewing helps to build a classroom culture. Also, students can develop themselves

by giving suggestions and it helps to generate social interactions to some extent. Moreover, if consistently used, giving and receiving peer feedback can develop a classroom's culture (Boud 2000).This method can be a highly effective tool because students can use the reviewing features (e.g., track changes and comment boxes) in Microsoft Word, and students are required to talk to each other through the suggestions.

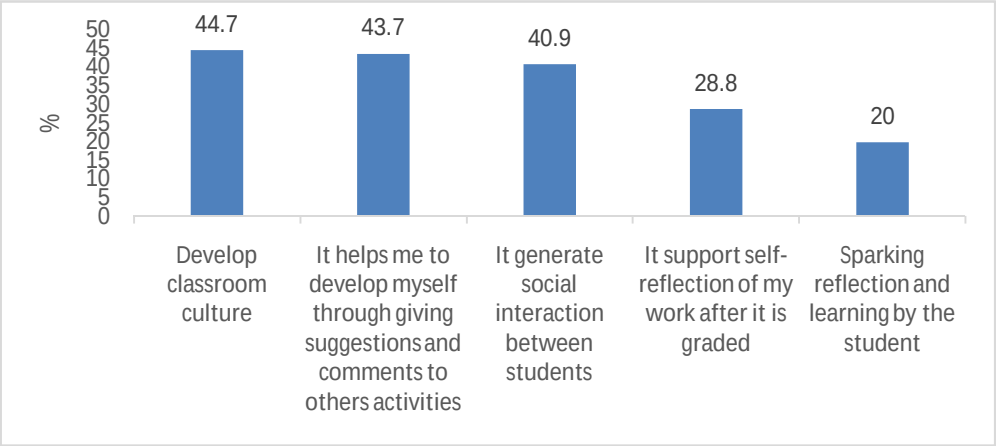

Fig.5.Undergraduates' responses on the importance of giving and receiving students' feedback

In addition, if the class is large, the lecturer can get support from supportive staff members/demonstrators during the discussion sessions and large groups could be divided into several breakout rooms & one demonstrator could be appointed to one room.

4.9Examinations and Academic Performance of Undergraduates' during Online Examinations

Since the temporary closing of universities in mid-March 2020 in the country, almost all state universities have started teaching for undergraduatesin online platforms and some universities continued semester examinations also online. Responses received from undergraduates revealed that the majority of them (91%) faced online examinations at least one time since May 2020. Further, 37% of the students indicated that they have facedonline examinations three times after discontinuing the physical lectures.

As indicatedin Fig.6, the majority of undergraduates were given assignments, followed by online quizzes and presentations while 78%hadopen-book examinations. Only 70%of students' faced viva while 47%of students were given case study reports as their assessment methods. VLE/LMS has been used as the most common method to upload assessments to the students in agricultural economics and agribusiness management discipline. In addition, Zoom (50%), emails and Google forms (22%) were also used by the teachers to conduct the online examinations.

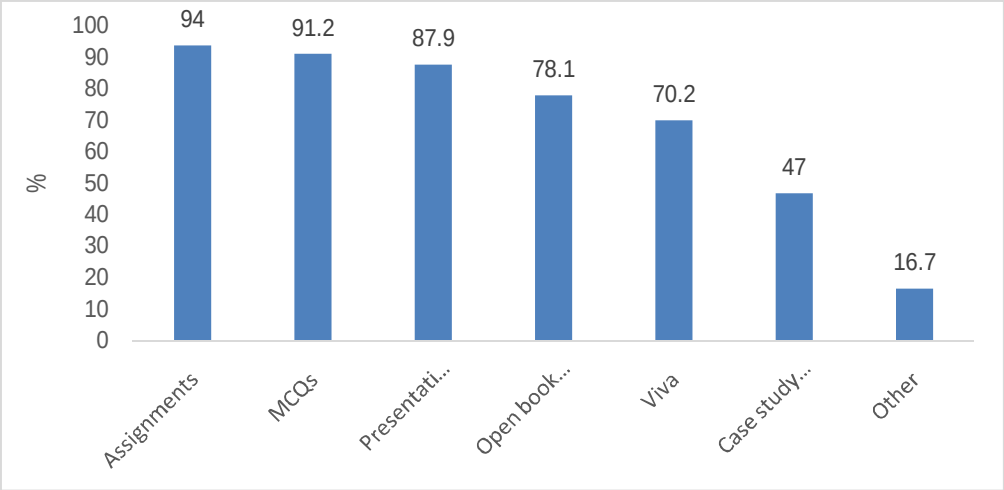

Fig. 6.Different types of assessment methods faced by Agricultural economics and Agribusiness management students during online education

However, there are both pros and cons of online assessments. This study shows that poor internet connection (72%) and problems with uploading answer scripts in time (71%) are the main issues faced by the students of Agricultural Economics and agribusiness management discipline.

The majority of students in Agricultural Economics andAgribusiness Management related curricula mentioned that conducting online examinationscontributed tostress reduction and anxiety (52%) compared to paper based physical examinations. In addition, around 42%undergraduates mentioned that they feel more comfortable while appearing in online examination than physical examinations whereas 36% mentioned that online examinations are more efficient in terms of time management. In addition, 32% noted that online examinations allowed them to focus and concentrate more on questions than paper based examinations.

In addition, from the total sample, 49% of students agreed that their academic performances were better during online examinations than paper-based examinations they faced previously, whereas only 13% of students disagreed. This might be because as mentioned earlier online examinationsallow students to focus and concentrate more while thelesser burden they faced with online examinations.

4.10 Undergraduates' Willingness to Continue Online Education

It is noticed that,the majority of the students (47%) are eager to continue online studies in the future as well. Only 27% disagreed with that. This study finding is also agreed with Haththotuwa and Rupasinghe (2021) who discovered that a high percentage of students are interested in online learning in the future after the commencement of the universities. However, it is important to develop a more student-teacher-friendly teaching-learning environment and solve issues in online education to increase its effectiveness. Moreover, it is essential to consider the compromise in the quality of the teaching-learning process when delivering the lectures 100% online as otherwise it would affect the quality of the education and quality of graduates in the future.

5. CONCLUSION AND THE WAY FORWARD

Online education has become inevitable during this COVID-19 pandemic. This study focuses on factors affecting students' engagement and their perceptions of online education in AgriculturalEconomics and Agribusiness Management disciplinein Sri Lankan state universities during the pandemic.The findings of

the study reveal that Zoom technology becomes aprominent and convenient method in delivering undergraduates' Agricultural Economics and Agribusiness Management discipline over other methods during the pandemic. This is also agreed with the findings of Haththotuwa and Rupasinghe (2021) who studied the impacts of online education on the overall university system. However,the study highlighted the importance ofusing more active learning tools such as case studies, group discussions via breakout rooms, and the usage of new and smart techniques which are attractive to young students during online teaching.Therefore, student engagement can be enhanced through a student-centered learning activities which focus on their active contribution (effort, energy, and time). Study results show that building and maintaining student-teacher interaction is one of the key determinants in student engagement in online education. It will be more effective if the teachers can build good interaction and provide positive feedback to the students to improve their performances. Also teachers must provide assistance and guidance in order to ensure the continuity of the learning process. The research findings show that, student-student interaction is positively affected on student engagement but it is not a significant factor here. Even though, university students encountered several problems with the sudden conversion towards online education, 47% of students in the Agricultural Economics and Agribusiness Management discipline prefer to use online learning even after the pandemic. However, more support and guidance are needed to help the students and academic staff in the transition to the online teaching and learning process. It is almost impossible for them to change their teaching methods overnight and retain the same level of instructional quality. Therefore, sufficient training must be provided to lecturers before university-wide online learning is implemented. In addition, stable internet access is the main challenge they are faced with. In some parts of the country, the lack of internet coverage has become a major obstacle for university students to carry out their education. Hence, providing technical infrastructure and proper internet connectivity without intermittent interruption is essential for online education. However, it might be the biggest challenge for Sri Lankawith the current economic crisis.Moreover, universities have to be concerned about students who are unable to follow online lessons due to not having devices, internet access, and a lack of learning space at home. Therefore, care must be given to ensure that online learning does not deny students of quality education. If there is any dilution in the quality of education will cause weaknesses in the level of knowledge of students. and the findings will be useful to the academic staff, university administrations and policymakers to promote online teaching effectively way even after the pandemic.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Author have declared that no competing interests exist.

Consent

As per international standards or university standards, respondents' written consent has been collected and preserved by the author(s).

REFERENCES

Abou-Khalil, V.; Helou, S.; Khalifé, E.; Chen, M.A.; Majumdar, R.; Ogata, H. (2021). Emergency Online Learning in Low-Resource Settings: Effective Student Engagement Strategies. Educ. Sci., 11, 24

Abuhassna, H., Busalim, A. H., Mamman, B., Yahaya, N., Aman Zahiri Megat Zakaria, M., AlMaatouk, Q., & Awae, F. (2022). From Student's Experience: Does E-learning Course Structure Influenced by learner's Prior Experience, Background Knowledge, Autonomy, and Dialogue.

Akram, H., & Li, S. (2024). Understanding the Role of Teacher-Student Relationships in Students' Online Learning Engagement: Mediating Role of Academic Motivation. Perceptual and Motor Skills, 0(0).

Alipio, M. 2020. Education during Covid-19 Era: Are Learners in a Less Economically Developed Country Ready for E-Learning? *SSRN Electronic Journal*.

Allen, I.E. and Seaman, J. 2006. Making the Grade: Online Education in the United States 2006. Needham, MA: Sloan-C. Retrieved October 13, 2007 from Sloan Consortium Publications website: http://www.sloan-c.org/publications/survey/survey06.asp

An, H.; Shin, S.; Lim, K. 2009. The effects of different instructor facilitation approach on students' interactions during asynchronous online discussions. *Comput. Educ*., 53, 749–760.

Anderson, J. 1979. Teacher Immediacy as a Predictor of Teaching Effectiveness. *Annals of the International Communication Association*. 3(1):543–559.

Atherton, M.; Shah, M.; Vazquez, J.; Griffiths, Z.; Jackson, B.; Burgess, C. (2017).Using Learning Analytics to Assess Student Engagement and Academic Outcomes in Open Access Enabling Programmes. Open Learn. J. Open Distance e-Learn. 32, 119–136.

Aultman, L.P. 2006. An Unexpected Benefit of Formative Student Evaluations. *College Teaching*, 54(3):251–285.

Bair, D.E, Bair, M. Paradoxes of online teaching. 2011. *Int. J. Scholarsh. Teach. Learn*., 5.

Bomia, L., Beluzo, L., Demeester, D., Elander, K., Johnson, M., & Sheldon, B. 1997. The impact of teaching strategies on intrinsic motivation. Retrieved from ERIC database (ED418825).

Borup, J., Graham, C. R., West, R. E., Archambault, L., & Spring, K. J. (2020). Academic communities of engagement: An expansive lens for examining support structures in blended and online learning. Educational Technology Research and Development, 68(2), 807–832.

Boud, D. 2000. Sustainable Assessment: Rethinking Assessment for the Learning Society. *Studies in Continuing Education*, 22(2):151–167.

Briggs, A. 2015, Feb. Ten ways to overcome barriers to student engagement online. Online Learning Consortium, Retrieved from http://onlinelearningconsortium.org/news_item/tenways-overcome-barriers-student-engagement-online/

Cameron, B.A., K. Morgan, K.C. Williams, and K.L. Kostelecky. 2009. Group Projects: Student Perceptions of the Relationship Between Social Tasks and a Sense of Community in Online Group Work. *The American Journal of Distance Education*, 23(1):20–33.

Chandradasa, A. and Galhena, B. 2021. "University students' intention of continuous use of Zoom for eLearning", International Research Conference 2020 - KDU, General Sir John Kotelawala Defence University, Ratmalana.

Chathuranga, N., Dissanayake, P. & Gunawardane, N. (2024). Unveiling the perceived benefits of online learning among management undergraduates: a study in a Sri Lankan government-owned university. Educ Inf Technol 29, 881–893. https://doi.org/10.1007/s10639-023-12355-7

Chatterjee, R., and A. Correia. 2020. Online Students' Attitudes Toward Collaborative Learning and Sense of Community. *American Journal of Distance Education*, 34(1):53–68.

Chickering, A.W. and Ehrmann, S.C. 1996, October. Implementing the seven principles: Technology as a Lever. *AAHE Bulletin*, 3-6. Retrieved October 7, 2007 from Teaching, Learning and Technology Group Website: http://www.tltgroup.org/programs/seven.html.

Dennen, V.P., Darabi, A.A. and Smith, L.J. 2007. Instructor-learner interaction in online courses: The relative perceived importance of particular instructor actions on performance and satisfaction. *Distance Education*, 28(1), 65-79.

Dubey, P., Pradhan, R.L. and Sahu, K.K. (2023), "Underlying factors of student engagement to E-learning", Journal of Research in Innovative Teaching & Learning, Vol. 16 No. 1, pp. 17-36. https://doi.org/10.1108/JRIT-09-2022-0058

Eom, S.B., Wen, H.J.; Ashill, N. The determinants of students' perceived learning outcomes and satisfaction in university online education: An empirical investigation. Decis. *Sci. J. Innov. Educ*. 2006, 4, 215–235.

Fu, F. L., Wu, Y. L., and Ho, H. C. 2009. An investigation of competitive pedagogic design for knowledge creation in web-based learning. *Computers & Education*, 53(3), 550–562.

Gayton, J. and McEwen, B.C. 2007. Effective online instructional and assessment strategies. The *American Journal of Distance Education*, 21(3), 117-132.

Graham, C., Cagiltay, K., Lim, B., Craner, J., and Duffy, T.M. 2001.Seven principles of effective teaching: A practical lens for evaluating online courses. Assessment, March/April.

Guo, C., Shea, P., & Chen, X. D. (2022). Investigation on graduate students' social presence and social knowledge construction in two online discussion settings. Education and Information Technologies, 27(2), 2751–2769. doi:10.1007/s10639-021-10716-8.

Hanson, E. and Wachenheim, C. 2020. Adapting to the Nontraditional Classroom: Lessons Learned from Agribusiness and Applied Economics Classes. *Applied Economics Teaching Resources*, AAEA, 2(5), 26-31.

Haththotuwa, P.M.P.S. and Rupasinghe, R.A.H.M. 2021. Adapting to Online Learning in Higher Education System during the Covid-19 Pandemic: A Case Study of Universities in Sri Lanka. *Sri Lanka Journal of Social Sciences and Humanities*. 1(2). 147-160.

Hayashi, R., Garcia, M., and Maddawin, A. 2020. Online Learning in Sri Lanka's Higher Education Institutions during the COVID-19 Pandemic, DOI: http://dx.doi.org/10.22617/BRF200260-2.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The diference between emergency remote teaching and online learning. Educause Review, 27, 1–12.

Lam, J. T., Gutierrez, M. A., Goad, J. A., Odessky, L., & Bock, J. (2019). Use of virtual games for interactive learning in a pharmacy curriculum. Currents in Pharmacy Teaching & Learning, 11(1), 51–57.

Levy, Y. 2008. An empirical development of critical value factors (CVF) of online learning activities: An application of activity theory and cognitive value theory. *Computers & Education*, 51, 1664-1675.

Lewis, C.C. and Abdul-Hamid, H. 2006. Implementing Effective Online Teaching Practices: Voices of Exemplary Faculty. *Innovative Higher Education*, 31, 2, 83-98.

Lim, J. R. N., Rosenthal, S., Sim, Y. J. M., Lim, Z. Y., & Oh, K. R. (2021). Making online learning more satisfying: The effects of online-learning self-efficacy, social presence and content structure. Technology, Pedagogy and Education, 30(4), 543–556.

Maki, R.H. and Maki, W.S. 2007. Online Courses. In F.T. Durso (Ed.), Handbook of applied cognition (2nd ed., pp. 527-552). New York: Wiley & Sons, Ltd.

Martin, F., & Bollinger, D. U. 2018. Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. Online Learning, 22(1), 205–222.

Means, B., & Neisler, J. (2020). Suddenly online: A national survey of undergraduates during the COVID19 pandemic. Digital Promise. https://digitalpromise.dspacedirect.org/bitstream/handle/20.500.12265/98/DPSuddenlyOnlineReportJuly2020.pdf?sequence=3

Moskvicheva, N., Bordovskaia, N., & Darinskaya, L. 2015. Role of students and supervisors' interaction in research projects. *Procedia - Social and Behavioral Sciences*, 171(1), 576–583.

Muir, T., Milthorpe, N., Stone, C., Dyment, J., Freeman, E., & Hopwood, B. (2019). Chronicling engagement: Students' experience of online learning over time. Distance Education, 40(2), 262–277. https://doi.org/10.1080/01587919.2019.160036

O'Shea, S., Stone, C., & Delahunty, J. (2015). "I 'feel' like I am at university even though I am online." Exploring how students narrate their engagement with higher education institutions in an online learning environment. Distance Education, 36(1), 41–58. https://doi.org/10.1080/01587919.2015.1019970.

Ortiz-Rodríguez, M., Telg, R. W., Irani, T., Roberts, T. G. and Rhoades, E. 2005. College students' perceptions of quality in distance education: The importance of communication. *Quarterly Review of Distance Education*, 6, 97-105.

Piccoli, G.; Ahmad, R.; Ives, B. 2001. Web-based virtual learning environments: A research framework and a preliminary assessment of effectiveness in basic it skills training. MIS Q. *Manag. Inf. Syst.*, 25, 401–426.

Rameez, A., Fowsar, M. and Lumna, N. 2020. "Impact of COVID-19 on higher education sectors in Sri Lanka: a study based on South Eastern University of Sri Lanka", *Journal of Educational and Social Research*, Vol. 10 No. 6, pp. 341-349.

Rathnakara, K. A. K. S. (2023). Online Learning Experience During Covid-19 Pandemic: Empirical Evidence from Management Undergraduates of Private Universities in Sri Lanka. Kelaniya Journal of Human Resource Management, Vol. 18, Issue 1, pp. 51-59.

Richardson, J. C., Besser, E., Koehler, A., Lim, J., & Strait, M. 2016. Instructors' perceptions of instructor presence in online learning environments. *The International Review of Research in Open and Distributed Learning*, 17(4), 82–97. doi:10.19173/irrodl.v17i4.2330.

Russo, T., and S. Benson. 2005. Learning with Invisible Others: Perceptions of Online Presence and Their Relationship to Cognitive and Affective Learning. *Journal of Educational Technology & Society*. 8(1):54–62.

Shea, P., Li, C.S., and Pickett, A. 2006. A study of teaching presence and student sense of learning community in fully online and web-enhanced college courses. *The Internet and Higher Education*, 9, 175-190.

Song, L. and Singleton, E. S. 2004. Improving online learning: Student perceptions of useful and challenging characteristics. *Internet & Higher Education*, 7, 59-70.

Sun, H. L., Sun, T., Sha, F. Y., Gu, X. Y., Hou, X. R., Zhu, F. Y., & Fang, P. T. (2022). The influence of teacher–student interaction on the effects of online learning: Based on a serial mediating model. Frontiers in psychology, 13, 779217.

Sun, P.-C.; Tsai, R.J.; Finger, G.; Chen, Y.-Y.; Yeh, D. 2008. What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Comput. Educ.,* 50, 1183–1202.

Trung, T., Hoang, A. D., Nguyen, T. T., Dinh, V. H., Nguyen, Y. C., & Pham, H. H. 2020. Dataset of Vietnamese student's learning habits during COVID-19. *Data in Brief*, 30, 105682. https://doi.org/10.1016/j.dib.2020.105682.

UNESCO. 2020, Maret 4. 290 million students out of school due to COVID-19: UNESCO releases first global numbers and mobilizes response. Dipetik April 13, 2020, dari UNESCO: https://en.unesco.org/news/290-million-students-out-school-dueCovid-19-unesco-releases-first-global-numbers-and-mobilizes.

UNESCO. 2021. COVID-19: Reopening and reimagining universities, Survey on higher education through the UNESCO National Commissions.

Vagos, P., & Carvalhais, L. (2022). Online versus classroom teaching: Impact on teacher and student relationship quality and quality of life. Frontiers in psychology, 13, 828774.

Werang, B. R., & Radja Leba, S. (2022). Factors Affecting Student Engagement in Online Teaching and Learning: A Qualitative Case Study. The Qualitative Report, 27(2), 555-577. https://doi.org/10.46743/2160-3715/2022.5165

Wijayanayake, J., Erandika, L., & Prasadika, J. (2023). Analysing the impact of student engagement on learning outcomes in e-learning platforms: a systematic review of literature.Proceeding of the 1st Desk Research Conference – DRC 2023, Commerce & Management Studies, Medicine & Health Sciences, Science & Technology.

Wilson, J.H., and S.B. Wilson. 2007. The First Day of Class Affects Student Motivation: An Experimental Study. *Teaching of Psychology* 34(4):226–230.

Yang, D.; Tang, Y.M.; Hayashi, R.; Ra, S.; Lim, C.P. 2022. Supporting Inclusive Online Higher Education in Developing Countries: Lessons Learnt from Sri Lanka's University Closure. Educ. Sci., 12, 494.

Yang, W., Stein, D., & Shen, S. S. (2021). Students' and teachers' perceived teaching presence in online courses. Distance Education, 42(3), 373–391.

Young, S. 2006. Student views of effective online teaching in higher education. *The American Journal of Distance Education*, 20(2), 65-77.

Zhao, Y., Lei, J., Yan, B., Lai, C., and Tan, H.S. 2005. What makes the difference? A practical analysis of research on the effectiveness of distance education. *Teachers College Record*, 107(8), 1836-1884.

Zielinski, D. 2000. Can you keep learners online? *Training*, 37, 64–66

Appendix 1: Different technology tools used to support online teaching

1. Poll everywhere**-** is a dynamic online polling platform that allows students to vote on custom teacher-generated polls through text messaging (SMS), smartphone, or computer by visiting this website.
2. Answer Garden - is a free web-based tool that can be used to instantly collect short (up to 40 characters) text-based feedback from students. Instructors post a question or topic and invite

students to enter responses. If multiple students enter the same response, a world cloud is formed.

3. Kahoot-is a tool that delivers and presents questions to students. It is set up as a game that students can play either individually or in groups. Instructors provide students with multiple-choice questions, which are projected on a classroom screen.
4. Google classroom-Google Classroom is a suite of online tools that allows teachers to set assignments, have work submitted by students, to mark, and to return graded papers. It was created as a way to get eliminate paper in classes and to make digital learning possible.
5. Socrative-is a formative assessment tool that helps teachers and learners to assess understanding and progress in real-time in class through the use of quizzes, questions and reflection questions.
6. Quizlet-is a game-based learning tool and a mobile app that boosts students learning through a number of study tools that include flashcards and game-based quizzes.

7 Zhu Y, Zhang JH, Au W, Yates G. University students' online learning attitudes and continuous intention to undertake online courses: A self-regulated learning perspective. Educational technology research and development. 2020 Jun;68:1485-519.

8 Zimmerman WA, Kulikowich JM. Online learning self-efficacy in students with and without online learning experience. American Journal of Distance Education. 2016 Jul 2;30(3):180-91.

9 Kumar RR, Fernandez D. Impact of Challenges and Advantages of Online Learning on the Academic Performance of Students in Higher Education Institution in Sultanate of Oman. Asian J. Educ. Soc. Stud. [Internet]. 2022 Jan. 21 [cited 2024 Jun. 25];26(1):36-50. Available from: https://journalajess.com/index.php/AJESS/article/view/481