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

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Aims: This study focuses on factors affecting students' engagement, and their 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.

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Results: The study indicates that the majority of students showed a positive attitude toward online education. The study findings show the student-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 engage in online education. The study also shows that the majority of students 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 the world were suddenly disrupted in 2020 due to the temporary closure of the universities [1]. 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 [2, 3]. 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, is also 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" [4]. As defined by [5] and [6] 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 [10], particularly in higher education even before the COVID-19 pandemic. However, with the closure of higher education institutions worldwide, establishing online learning platforms became 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 is mainly conducted through the traditional educational system before the COVID-19 pandemic has been adversely affected. The government ordered the closure of all educational institutions in the country in mid-March 2020 as a measure of control of the spread of 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 [11]. 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 teachinglearning 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 of online education in Sri Lanka [11,12,13,14,15] and many of these studies focused on online education in the university system in general without focusing on different disciplines. Apart from that [16] studied that online learning, particularly the use of recorded lectures, offers several benefits for management undergraduates in Sri Lanka. In addition, [17] 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 Management discipline delivered by state universities in Sri Lanka during the pandemic. As it is a different field that applies Agricultural Economics and Agribusiness Management theory to the farming community practically which does not require laboratory like most other agricultural-related works subjects, applied science, or other 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 issues in online education during the pandemic especially focusing on Economics and Agribusiness Agricultural 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 country in the future.

The remaining part of the paper is organized as follows. The next section highlights the findings of previous studies relevant to online education. The third section, discusses the methodology adopted in this study while the fourth section discusses the findings 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 understand the student engagement, their perceptions, and the effectiveness of changes from traditional systems to online modes even before the COVID 19 pandemic. Among many, [18, 19, 20, 21, 22] have 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, motivation. learner efficacy. learner selfregulated learning, learning environment and methods of assessment. [23] Indicated that the most prominent framework of interaction in online

education includes three major aspects: teacherstudent interaction, student-student interaction, and student-content interaction.

2.1 Student 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 [24]. In addition, [25] 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 [26] Moreira et al. (2020): emotional (how they feel), cognitive (how they think), and behavioral (how they act). [27] and [28] 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 [29] and teacher presence [30]. According to [31], 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 [32]. [33] pointed out that the more frequently students' access and engage with the learning materials, the better their academic performance. In addition. [34] 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, instructors should 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 learning when adapting their engagement strategies [35].

2.2 Teacher-Student Interaction

Teacher-student connections create a foundation for learning. According to [36], the studentteacher 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 [37] and it contribute to an increase in learning engagement. [38] and [39] reported that students do better with instructor interaction and communication. In addition, instructors need to be actively involved in the learning of their students [40, 41]. But instructors should be minimally active in discussions [42, 40, 43, 28] and use email appropriately [43, 41, 28]. However, too much instructor participation in discussion boards, etc. can decrease student participation [43]. In addition, [44] found that the teacher-student interaction is the most important among Moore's three types of interaction. [45, 46, 47, 48, 49, 50] also indicated that students' success in online learning is affected by their interactions with their teachers. [49], indicated that teacher-student interaction has a significant impact on students' satisfaction and achievement in online learning.

2.3 Student-Student Interaction

There is evidence that students are more satisfied with their learning when they perceive the presence of their classmates [51] even in the distance learning mode. [52] noted that collaborative learning activities can help to build a sense of community in online classes. However, as indicated by [53] 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. [54] learned that studentstudent interaction help the students to reconcile what they learn with what they previously believed and it also enhances students' motivation and cognitively engages learning tasks by ideas sharing and collaborative thinking between students [55].

Regardless of the number of global literature to understand the recent changes in online education after COVID 19, it is not much studied in Sri Lanka. [11] 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, [12] 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, [14] 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 [13] examined the factors influencing online education during the COVID-19 pandemic using Management students in selected Sri Lankan universities and the study highlights that and related attitude. internet, 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

3.1 Data 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 prequestionnaire developed tested 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 of Agricultural Economics and Agribusiness Management curriculum in online education during the pandemic. Data were collected from January 2022 to February 2022 by emailing the questionnaires to the undergraduate who studving students are Agricultural Agribusiness Economics and Management discipline related subject in the state universities. All in all, 215 undergraduates from six state

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."	

Table 1. Questions used in Factor Analysis

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 undergraduates in Sri Lankan of state universities are female students¹, 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, 2disagree, 3-neutral, 4-agree and 5-strongly agree. The last section of the questionnaire was designed to identify problems in online education and identify comments and suggestions.

3.2 Factor 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 form dependent variable to 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)

X₄=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.

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.

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)

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%) are between the ages of 24-26 years, 44% are between the ages of 21-23 years and only а few undergraduates are ages 27 years or above. In addition, the majority of the participants of the survev are first-vear and fourth-vear undergraduates and they represent 75% of the sample.

4.2 Usage of Online Education

Fig. 1 shows the different online platforms used bv 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 [12] 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 [11, 56]. 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.

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



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



Fig. 3. Average number of hours per day spent by undergraduates for online learning sessions Source: Online Survey, 2022

According to the views of undergraduates shown in Fig. 2, Kahoot (77%), poll everywhere Google Classroom (67%) (70%), and 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, garden and Socrative Answer 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 [57]. 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 indicates, the majority of undergraduates (42%) spent 5-6 hours per day on online learning of agricultural economics discipline while 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.

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Fig. 4. Issues faced by the students during online learning Source: Online Survey, 2022

4.3 Obstacles in Online Learning

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 difficultv in submittina online 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 considered when conducting 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/tablets for 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 are greatly 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 study isolated without social interactions could cause a lot of anxiety. [58] 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. [59] 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 a one-hour session is 31-45 minutes for the majority of students (42%) and only 27% can effectively engage in a session of 46-60 minutes. Hence it is important to plan some other activities in between or give some break after every 45 minutes if there is a continuous 2 or 3-hour teaching session. So prior planning of a lesson is essential in online sessions.

4.4 Students' Engagement and Understanding of Online Lectures

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

Accordingly, the 51% of students agreed that the move to distance learning was a learning exercise for them (mean score value 3.5) but 50% of them have not 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 participated online discussions regularly.

In an online course, the risk of students feeling isolated is of great concern [60, 61, 62]. Hence, it is important that online learning includes student-to-student and student-to-teacher interaction and the next two sections focus on it.

Table 3. Students'	views on	engagement	and un	derstandir	ng 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

Table 4. Students' responses on students-teacher interaction

Statement	Mean score level of	Median	SD
	agreement in 5 point scale		
"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

4.5 Building and Maintaining the Studentteacher Interaction

As shown in Table 4, this study also confirmed that teacher-student interaction creates 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 firstday experience are more motivated and help to achieve higher grades at the end of the semester which is also agreed with [63]. [64] confirmed there were positive correlations between teacherstudent 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.

Results of the survey further agreed with findings of [65], 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%).

4.6 Building and Maintaining Studentstudent Interaction

The interaction between students is also important in adult learning. Especially during the COVID-19 pandemic, students did not receive the 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 Economics and Aaribusiness Agricultural Management related classes 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 help to build a sense of community while only 7% disagreed with that.

4.7 Multiple 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 students also 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, studentstudent interaction is positively affected but it is not significantly influenced student engagement in online education in Agricultural Economics and Agribusiness Management discipline in Sri Lankan universities. In addition, those who performed well in academic activities are mostly engaged with online education.

Source	SS	df		MS	No of obs $= 215$				
Model	195.208	13	15.016		15.016		15.016 F(13, 201) =6.82		6.82
Residual	442.816	201		2.203	Prob >F	=0.0000			
Total	638.024	214		2.981	R-Squared	=0.3060			
					Adj R-squared=0.2611				
					Root MSE	=1.4843			
Studentengage	Coef.	Std. error	Т	P>Itl	[95% Conf.	interval]			
Q3									
second year	.82594	.421545	1.96	0.051	-0.00528	1.65716			
third year	.35669	.30447	1.17	0.243	24368	.95707			
fourth year	.75220	.23782	3.16	0.002	.28326	1.22114			
gender dummy	59802	.25488	-2.35	0.020	-1.10060	-0.09544			
Q11									
Poor	-2.68779	1.51094	-1.78	0.077	-5.66711	.29153			
good	-2.28849	1.50592	-1.52	0.130	-5.25793	.68094			
excellent	-2.09985	1.54313	-1.36	0.175	-5.14265	.94295			
Student_teach	.36441	.08534	4.27	0.000	.19613	.53270			
Stu_stu	.14047	.10522	1.33	0.183	06702	.34796			
Q49									
disagree	24889	.59524	-0.42	0.676	-1.42263	.92483			
neutral	.64309	.48498	1.33	-0.186	31322	1.59940			
agree	.92578	.48476	1.91	-0.058	.03009	1.88166			
Strongly agree	1.41029	.55876	2.52	-0.012	.30850	2.51208			
_cons	-1.03992	1.77881	-0.58	0.559	-4.54745	2.46760			

Table 5. Regression results

Source: Online Survey results, 2022

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

4.8 Effect of Classroom Size and Breakout 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. [65] also noted that if the class size is large in many instances there 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 in the agricultural economics are 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 [66]. 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.

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.

4.9 Examinations and Academic Performance of Undergraduates' during Online Examinations

Since the temporary closing of universities in mid-March 2020 in the country, almost all state started universities have teaching for undergraduates in 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 faced online examinations three times after discontinuing the physical lectures.

As indicated in Fig. 6, the majority of undergraduates were given assignments, followed by online guizzes and presentations while 78% had open-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 agribusiness management economics and discipline. In addition, Zoom (50%), emails and Google forms (22%) were also used by the teachers to conduct the online examinations.



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

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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 and Agribusiness Management related curricula mentioned that conducting examinations contributed to stress online 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 on more questions than paper based examinations.

In addition, from the total sample, 49% of that students agreed 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 examinations allow students to focus and concentrate more while the burden they faced with online lesser 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 [12] 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-teacherfriendly 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 Agricultural Economics and Agribusiness Management discipline in Sri Lankan state universities during the pandemic. The findings of the study reveal that Zoom technology becomes a prominent and convenient method in delivering undergraduates' and Agribusiness Agricultural Economics Management discipline over other methods

during the pandemic. This is also agreed with the findings of [12] who studied the impacts of online education on the overall university system. However, the study highlighted the importance of using 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 Economics and Agribusiness Agricultural 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 Lanka with 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.

CONSENT

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

COMPETING INTERESTS

Author has declared that no competing interests exist.

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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.
- 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.

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