



# How successful the online assessment techniques in distance learning have been, in contributing to academic achievements of management undergraduates?

Hiruni Thathsarani<sup>1</sup> · Dinushika Kaushalya Ariyananda<sup>1</sup> · Chalani Jayakody<sup>1</sup> · Kerthiga Manoharan<sup>1</sup> · A.A.S.N Munasinghe<sup>1</sup> · Nilmini Rathnayake<sup>1</sup>

Received: 27 October 2022 / Accepted: 6 March 2023

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2023

## Abstract

The implementation of online teaching and assessments was prompted by the current COVID-19 pandemic. Therefore, all universities had to adopt the distance-learning method as the only choice to continue education delivery. This study's main objective is to understand the effectiveness of assessment techniques followed through distance learning in Sri Lankan management undergraduates during COVID-19. Furthermore, utilizing a qualitative approach and thematic analysis for data analysis, semi-structured interviews with 13 management faculty lecturers selected through the purposive sample technique were used for data collection. The survey was conducted via an online questionnaire that was distributed to Sri Lankan undergraduates, and a total of 387 samples from management undergraduates were drawn for the quantitative data analysis using a simple random sampling technique. The study's main findings revealed that five online assessments are currently being utilized to evaluate management undergraduates' academic performance under distance learning, including online examinations, online presentations, online quizzes, case studies, and report submissions. In addition, this study statistically and with some qualitative empirical evidences in the existing literature proved that online examinations, online quizzes, and report submissions have a significant impact on undergraduates' academic performance. Further, this study also recommended that universities should implement procedures for online assessment techniques in order to assess the quality assurance of assessment techniques.

**Keywords** Distance learning · Assessment techniques · Management undergraduates · Academic performance

---

✉ Hiruni Thathsarani  
hirunithathsarani405@gmail.com

Extended author information available on the last page of the article

## 1 Introduction

The COVID-19 pandemic impacted all sectors globally, including education, and it has significantly changed students' learning environments. Governments had to close schools and universities worldwide to curb the virus spread and make education delivery available through online mode. Universities were forced to replace the former face-to-face classroom teaching with online methods where student assessment tools were carried out via online platforms. The sudden switch from physical classrooms to online mode, thus with no physical teacher-student support, students find online tools challenging in terms of their performance assessment. As a result, their academic achievement may not be properly assessed. As an example, due to the COVID-19, the transition to online classes has resulted in a significant drop in academic performance (Kim et al., 2021). As such, a more practical assessment technique that is compatible with online learning is needed. The COVID-19 pandemic is the key challenge to expanding academic performance, and this pandemic raised conversations about taking online teaching to a new level. Instead of offering a few selected, often online courses, universities had to turn full virtual programmes (Al-Karaki et al., 2021). In recent years, distance education has expanded quickly at all levels around the world. Distance learning entails lecturers and undergraduates being physically separated during instruction, as well as the use of various technologies to improve student–student interactions. Distance learning has long been used to instruct nontraditional undergraduates and undergraduates who are unable to attend lectures (Sutiah et al., 2020).

Yılmaz İnce et al. (2020) has shown that it is important to provide training on online assessment and evaluation practices for both lecturers and students to improve quality in assessing success and performance in distance learning. In this new, highly virtual mode, the time has come to evaluate the efficiency and effectiveness of these efforts. It's critical to raise concerns/questions about the quality of online teaching and student satisfaction because any unresolved issues could have long-term implications. More importantly, the latter would have negative consequences on students' academic achievement.

The findings of this study help the management of universities develop efficient management undergraduate assessment techniques and improve academic performance in distance learning. First, the current study provides information regarding distant learning to academic officers at various levels, and they may help to conduct quality assessments in the future. In addition, researchers can be used by campus academic staff to assess the quality of online assessment techniques in distance education programs and determine what needs to be done to enhance the academic performance of undergraduates.

Second, the data assists university policymakers in determining how to evaluate distance education courses at each university by increasing the quality of assessments. This helps the lecturers to provide encouragement to think of ideas that will give proper guidance to the online assessments. Finally, the study findings will be useful as a reference for future researchers and this study contributes by giving some information on students' capacity to adjust to virtual platforms, especially in unexpected pandemic-type situations. By the end of this study, it obvious how successful the assessment techniques used in distance learning are in Sri Lankan management undergraduates.

## 2 Problem statement

Many other countries, including Sri Lanka, adopted innovative virtual learning and teaching platforms for Higher education during the COVID-19 pandemic. All universities have proceeded to continue their academic activity for all courses on an online platform. Students at the institution did not adjust to the new environment in the same manner when it was switched from traditional learning to online learning, and students confronted several obstacles when conducting online examinations in Sri Lanka and worldwide locations (Guangul et al., 2020; Rameez et al., 2020). Therefore, the critical issue is whether conducting online assessments for analyzing student performance is as effective as the traditional physical assessment mode that educational institutes have used for years. However, academic administrators and university committees have acknowledged that although some students have gotten high marks on online assessment processes, others do not (Beringuela, 2009). As indicated above, it might impact online students' academic performance. When evaluating published literature, many studies were related to distant learning, only a few studies were concerned with the empirical research gap in developing online assessment techniques for distance learning (Dikli, 2003; Kearns, 2012). During the COVID-19 pandemic in Sri Lanka, few studies evaluated online assessment techniques. This research assesses the effectiveness of switching from a physical assessment to distance learning from the perspectives of management undergraduates and university lecturers.

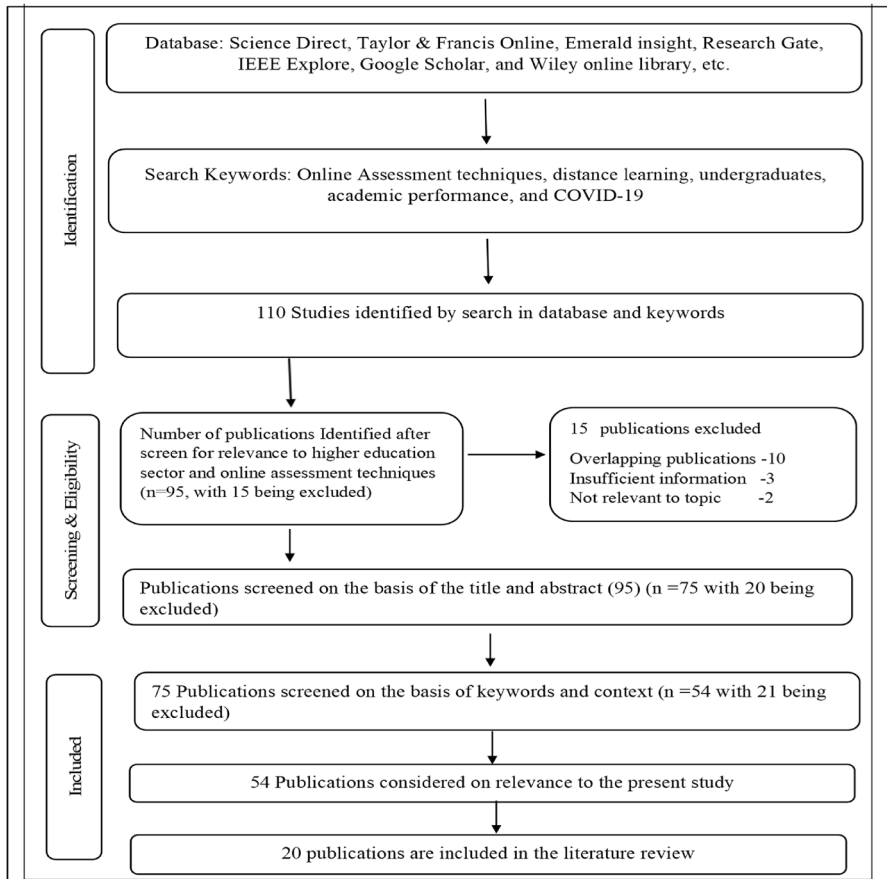
## 3 Literature review

The study focused its literature review on the initial 20 papers through a broad and in-depth analysis of the literature, and the many well-known journal databases, including Science Direct, Taylor & Francis Online, Emerald insight, Research Gate, IEEE Explore, Google Scholar, and Wiley online library, etc., were referred. The search terms used were (Online Assessment techniques, distance learning, undergraduates, academic performance, and COVID-19). The procedure of studies that were included and excluded during each stage of the literature review is summarized in Fig. 1's flow diagram.

This study covered a literature review in different areas relevant to the present study: distance learning, online assessment techniques, and the academic performance of undergraduates.

### 3.1 Distance learning

Distance education is a method of education rather than a philosophy of education in that students can learn at their own place and in their preferred location (at home, at work, or at an educational center) without having direct contact with the lecturer. As a result, technology plays a vital role in distance learning. Then as result, distance learning is a type of educational system in which the teacher and student



**Fig. 1** A flow diagram of the literature source. Source: Based on the authors' observations and (Noorbahani et al., 2022)

communicate through various media to exchange information, such as publications and educational media, using modern audio-visual technologies (Liguori & Winkler, 2020). There are two types of distance learning: synchronous and asynchronous. The lectures are delivered in real-time via asynchronous video conferencing, allowing for live interaction between the teacher and the students. Students learn from materials provided by the teacher and interact through forums, emails, discussion boards, or synchronous chat rooms in the asynchronous mode. Further, other researchers proved that the majority of students preferred asynchronous learning to synchronous learning, and the rest of the students either strongly disagreed, disagreed, or were neutral about the subject (Al-Mawee et al., 2021).

In addition, blended learning occurs when face-to-face and online learning are structurally combined (Bączek et al., 2021). The study used a semi-structured debriefing session and questionnaire, as well as relevant statistical techniques, to investigate students' opinions about the distance learning process. Their findings

revealed that first-year students were significantly less motivated during the learning process than older students and that they perceived distance learning as less valuable and interesting than others. This research reveals that the pandemic had a number of beneficial effects, including the ability for students to work on their own schedules in a relaxing environment, revisit lectures, if necessary, feel free to ask questions, make contact with lecturers, and save travel time, as this type of education is less expensive than other education systems (Lassoued et al., 2020; Stevanović et al., 2021).

### 3.2 Online assessment techniques

Online assessments are currently a major concern for all educational institutions across the world due to the closure of all campuses and the lack of face-to-face teaching, students are now taking their exams and evaluations primarily online (Bennett & Barker, 2012). Some advantages of online assessment include the capacity to offer students immediate, tailored feedback to help them improve their knowledge and performance, the capacity to access it from various geographical locations at times depending on the student's convenience, and the capacity to take assessment tests multiple times to evaluate and refine their knowledge (Sikurajapathi et al., 2020). According to Ali and Dmour (2021); Shraim (2018), students can complete take-home exams from home by using programs like Blackboard Learn and Lockdown Browser. Since these solutions include safeguards against students using third-party software to cheat during assessments, they enable more fair and valid exams.

The study conducted by Gaftandzhieva et al. (2022) investigated that student attendance is strongly related to academic performance. When compared to the other categories of academic achievement, most students with more than 60% attendance received Good (37.7%), Very Good (32.1%), and Excellent (18.9%) academic grades. Furthermore, they found that assignments and exercises were significantly impacted on undergraduates' ultimate grade using logistic regression model.

By using correlation analysis to the survey data, this was found that there were a number of problems that had a detrimental effect on online engineering education, including technical issues, privacy and security issues, and a lack of technological know-how (Asgari et al., 2021). The rapid switch from traditional to online exams during the COVID-19 outbreak was examined by Bashitialshaaer et al. (2021) in order to examine the challenges and barriers to successfully implementing online exams in the distance education process. The results show that undergraduates and university lecturers faced a variety of difficulties, including a lack of electricity, internet, time, skills, and financial resources to conduct online exams during the COVID-19 pandemic. This study found that there was significant agreement between undergraduates and university lecturers on these difficulties using a regression model. Guangul et al. (2020) have found that online presentations are a better way to reduce academic dishonesty when conducting other online assessments with the online presentation because it helps to identify whether the submitted online

assessment is of student's work. Further, Choi et al. (2021) findings of focus group discussions suggested that in order for online presentations to be successful, blended education should be taken into consideration to supplement learning and increase levels of satisfaction, success, and quality. Akimov and Malin (2020) showed that oral examinations can assist in overcoming some of the challenges associated with an online learning environment, but proper planning is required to ensure that it adheres to the fundamental principles of a successful assessment strategy: accuracy, quality, and honesty. In addition, Crecelius et al. (2021) found that oral examinations are a valuable form of assessment for assessing students' learning, improving their communication skills in physiology, and reducing exam grading time. Cohen and Sasson (2016) analyzed students' behavior and learning outcomes towards online quizzes to enhance the instructional design using Linear Regression. Students significantly improved their scores and reduced their performance time on the final attempts of the online quiz when compared to their first attempts.

### 3.3 Academic performance

El Said (2021) has empirically investigated to assess the impact of a sudden transition from direct to online distance learning consequence of COVID-19. In two parts of the study, academic performance was examined, specifically how online and direct learning affected students' grades. A series of online interviews were conducted to examine the qualitative experience of academics who used online distance learning. There was no statistically significant change in students' grades, according to the findings. Adeyeye et al. (2022) studied the effectiveness of online learning platforms such as Zoom and Moodle, as well as their impact on the academic accomplishment of Covenant University Ota, Nigeria, students enrolled in practical-related courses. The study found that students enrolled in practical courses outperformed their peers academically because they used Zoom and Moodle, and also revealed that student academic performance was quite excellent when Covenant University used its online learning platforms. According to Hadwin et al. (2022), the study investigated the role of self-regulation practices and self-regulate and learn participation in the effect of COVID-19-related psychological suffering and academic challenges on academic results on Grade Point Average (GPA) and academic performance in a sample size of 496 undergraduate students at a Western Canadian University. Levels of metacognitive and motivational problems completely arbitrated the impact of COVID-19 suffering on GPA, but the impact of metacognitive challenges on GPA was managed by self-regulate and learn familiarization strategies and moderated by semester-long self-regulate and learn involvement. Hussain et al. (2018) evaluated those beneficial sessions in an e-learning system for each student. The findings demonstrated that there are strong relationships between the input student characteristics (engagement, difficulty, workload, and loyalty) and the session grades. Furthermore, they discovered that when instructors do not get adequate feedback on a course session or week, students may fail the course, drop out, or obtain a lower grade on the final test.

### Online Assessment Techniques

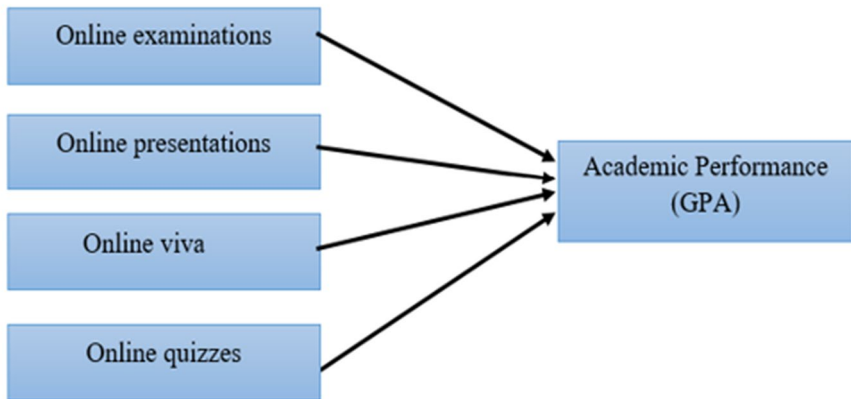


Fig. 2 Concept indicator model. Source: Authors' creation based on literature review

### 3.4 Concept indicator model

Figure 2 represents the study area of this research and, based on a literature review, we have identified online examinations, online presentations, online viva, and online quizzes as online assessment techniques. These online assessment techniques will be tested by academic performance, which is GPA. These assessment techniques are most commonly used as online assessments in distance learning, and this study focuses on the online assessment techniques that were used during the COVID-19 period in Sri Lanka. However, there is no evidence to support this. Once we have achieved our qualitative objective, some new assessment techniques can be added to this, or some assessment techniques may need to be removed from this. As a result, a concept indicator model has been built.

## 4 Data methodology and analysis

The first objective of this study is to explore the assessment techniques used in management undergraduates' distance learning in a Sri Lankan higher education context. According to this objective, this study's population of interest is university management lecturers in Sri Lanka. The unit of analysis is management faculty lecturers who have over five years of experience from both public and private universities, and it is carried out using a qualitative approach. Semi-structured interviews were used as a qualitative data gathering strategy adapted to the respondents' responses. Semi-structured interviews were conducted with thirteen experienced university lecturers in Sri Lanka in relation to this approach. Purposive sampling is used to select a sample from the interviews. Thematic analysis was used as a method to analyze qualitative data. This method was selected as suitable as it aims to find categories in data and identify patterns (themes) that emerge. We followed Braun and Clarke

(2006), six-phase approach to analyze interview data, which included familiarization, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and generating the report.

The second objective of this study is to examine the impact of different assessment techniques of management undergraduates' academic performance on distance learning as a quantitative approach for management undergraduates. Management undergraduates in Sri Lanka are regarded as the unit of analysis. The questionnaire (Online Questionnaire) was distributed using Google Form between May and July 2022. Based on the findings of the semi-structured interviews, the questionnaire was divided into three sections: demographic factors, online assessment techniques, and academic performance. We used open-ended questions with a Likert scale to gather data in the questionnaire, which we distributed to university colleagues via social media platforms such as WhatsApp, Facebook, Instagram, and LinkedIn, among others. It was also distributed on the Facebook pages of Sri Lankan universities. A five-point Likert scale was used, with responses ranging from strongly agree to strongly disagree. Because the sample is selected from a subset of the undergraduate population, a simple random sampling technique was used as a sampling technique. In Sri Lanka, 382 management undergraduates were given the questionnaire. To test our hypothesis, we used multiple linear regression models. The multiple linear regression model is specified as follows:

$$AP_i = \beta_0 + \beta_1 OE_i + \beta_2 OP_i + \beta_3 OQ_i + \beta_4 RS_i + \beta_5 CS_i + \beta_6 DM_i + \varepsilon_i$$

where for  $i = n$  observations:

Where  $AP_i$  indicates academic performance while  $OE_i$ ,  $OP_i$ ,  $OQ_i$ ,  $RS_i$ , and  $CS_i$  indicate online examinations, online presentations, online quizzes, report submissions, and case studies. Demographic factors such as gender, academic year, university location province, and university type are denoted by  $DM_i$ , while  $\varepsilon_i$  denotes the individual random error term. Alternative multiple regression models with varied specifications were estimated to test the robustness of the baseline results. As a result, model 1 included the main variables, model 2 included the main variables along with the study's demographic factors, model 3 included the same variables but only responses from Sri Lankan public university undergraduates, and in model 4 same was done for the private university undergraduates of Sri Lanka. Statistical Package for the Social Sciences (SPSS) software is used to analyze quantitative data using multiple linear regression.

## 5 Results

### 5.1 Objective 01: To explore the assessment techniques used in management undergraduates' distance learning in A Sri Lankan higher education context

Main three themes were identified based on semi structured interviews that are (1) distance learning during COVID-19, (2) effectiveness of online assessment techniques, (3) academic performance of management undergraduates.



### 5.1.1 Theme 1: Distance learning during COVID-19

Distance learning is an educational system in which the teacher and the student communicate via various media and exchange learning material and lessons over the internet. It allows students to learn at their place or at the location of their choice without having direct contact with the lecturer.

“Learning scenario where a teacher and student is no longer interacting face-to-face, where both of them are in different locations.” (SSL1)

It seems to be that distance learning is any learning that occurs while students are not physically present at the point of education delivery and students can obtain knowledge, learning material etc., by using their mobile devices or other instruments. Further, distance learning enhances access to education for students who were unable to attend traditional classes due to mobility restrictions imposed during the pandemic.

The lectures are delivered in real-time via video conferencing, allowing for live interaction between the teacher and the students. Students learn from materials provided by the teacher and interact through forums, emails, discussion boards, or symmetric chat rooms in the online mode. These enabled for knowledge sharing, collaboration and communicate with teachers and fellow students, and minimizing isolation triggered by the online education.

“We have this lockdown browser with the monitoring option also, we can even see the student, therefore it is very unlikely for the student to copy using the mobile phone also.” (SL1)

“Now, we are using Learning Management System (LMS) to conduct many types of assessments because there are many options available. We also got to know that only after the pandemic.” (CL2)

“It can be LMS-based, it can be Kahoot or something like that, so we use many online tools to do assessments.” (KSL2)

“The new techniques are Eduscope and Zoom platform, so they have developed several online platforms.” (SSL2)

Universities have made many improvements to facilitate distance learning, conduct online assessments and adapt to the new education system during the COVID-19 pandemic by minimising problems encountered with the new learning style.

### 5.1.2 Theme 2: Effectiveness of online assessment techniques

In the traditional learning method, assessments are usually conducted traditionally, with a physical audience. The COVID-19 pandemic saw a sudden and forced transformation in education delivery from traditional education concepts to online education. Many higher education institutions have created virtual learning environments where students can learn whenever and wherever they want, and have largely shifted away from paper-and-pencil exams and toward take-home exams. Because of these, online assessment techniques played a major role during the COVID-19 pandemic. Studies investigated

common online assessment techniques such as online examination, online presentation, online viva and quizzes during COVID-19 that are currently used globally.

“In online assessments, basically we have online Multiple-Choice Question (MCQ) tests, we can have online even essay type questions.” (SL1)

“At one time, we are conducting classroom tests, the other one is the submission of reports, sometimes we may get the submission of report plus presentation.” (CL1)

“We do open book type of examinations where the students are supposed to write the answers, scan it and upload.” (KSL2)

Due to the closure of the universities, universities have conducted various assessment techniques through online mode during COVID-19. University lecturers used the above assessment techniques to access their undergraduates’ progress while MCQ is mostly used in online assessment techniques in online education during the pandemic.

In general, MCQ was perceived to be an effective assessment way for conducting exams online and this method has many drawbacks.

“I think students like to do the online MCQ tests the most” (SL1)

“Yes, it is MCQ because they can copy easily” (CL2)

“Mostly preferred MCQ-based questionnaires, online quizzes, from students’ point of view. I think they prefer online quizzes more.” (SSL1)

“Students prefer very simple things may be multiple choice questions, online things.” (JSL2)

According to the above, MCQ was the most preferred assessment of the undergraduates in online education. Here, the MCQ test was conducted through an online system without the observation of university lecturers because of that, undergraduates could easily copy from other friends, internet materials, and their lecture notes, probably attending the exam at their preferred location.

The effectiveness of online assessments can be achieved by conducting assessments with a valid, reliable, and secure system with minor errors and also with teachers’ support, financial support and infrastructure support of technology.

“Based on the marks, based on things like how they have answered, the time taken for them to answer because usually when we conduct a test on online exam so we can see the time taken by a student to answer a question.” (SL1)

“I see it is very effective now, using the exams through an online proctoring system.” (KSL1)

“LMS we can check the plagiarism as and when the students submit an assignment.” (KSL2)

With the results of online assessment, cannot exactly decide the effectiveness of online assessment because undergraduates have discovered methods of passing exams by discussing and sharing answers with their friends and can present their work by looking at internet materials. Even though undergraduates get high marks, it does not imply assessment is effective. The majority of universities are using plagiarism checkers and proctoring systems to assess the effectiveness of online assessments.

### 5.1.3 Theme 3: Academic performance of management undergraduates

From a university perspective, this study analyses the online assessments, which are carried out to measure the undergraduates' performance. Lecturers used to share learning materials, exercises and references through emails, Google groups, and Google Drive, and they also used WhatsApp for communication, Zoom for teaching, and Google Classroom for assessments. However, students did not appear to be at ease or confident in communication, and were concerned about the clarity of the right email messages.

“Some students send e-mails saying that certain characters on the keyboard are not working so they have replaced it with other characters.” (SL1)

This signaled to us that the students have faced many issues which impact their academic performance. Additionally, doing online quizzes on computers and personal computers has a positive effect on examination scores, but using mobile phones to do online quizzes has a negative effect on examination scores. Most respondents believe that there are different issues relating to accessing technology and not that all students have not equal access to resources.

“When it comes to the online assessments, the access to resources has a big impact on their academic performance.” (KSL2)

Lecturers expressed problems with undergraduates' online learning while studying at home like infrastructure failure, and internet connection issues.

“Because of these infrastructure failures or electricity or other internet things, some very capable students will receive C or whatever, or fail.” (JSL2)

“Certain students having issues with their laptops.” (SL1)

Yet, it was not only the failure of the internet connection and infrastructure that presented a challenge to students' online learning. Students not possessing various skills essential for online learning was also another key concern in this issue. The below responses indicate that creative thinking, application of knowledge etc., are more important, but these have not been necessitated in traditional classrooms. Hence, some students who have performed well in traditional classrooms find it difficult to adapt to new skills, thus resulting in poor performance.

## 5.2 Conceptual framework (Fig. 3)

### 5.3 Objective 02: To examine the impact of different assessment techniques of management undergraduates' academic performance on distance learning in Sri Lanka

#### 5.3.1 Descriptive statistics

Table 4 displayed under the appendix shows the descriptive statistics of the main study variables. Management undergraduates have categorized into various group in terms

of their gender, current academic year, age, province of university location, university sector, and degree specialization. The management undergraduates' perceptions of assessment techniques in distance learning during the COVID-19 pandemic analyzes in 387 responses. Majority of undergraduates belongs to private universities (53.5%) while majority represents business management as the degree specialization (27.6%). In addition, Majority are female respondents (60.7%) and 44.7% of sample represents the fourth-year undergraduates. Table 1 summarizes the views of the participants on all independent and dependent variables examined in this study.

The mean of academic performance is 3.8906 and mode value 4.0 shows the agreement of the participants related to 10 questions. It explains the respondents' various impacts on academic performance. It ranges between 2.70 and 5.00. Standard deviation less than 0.44302 indicates a modest variance from the mean value because most participants' responses matched similar opinions. Online examinations have a mean value of 3.3741 and a mode value of 3.00, indicating that participants' agreement on each of the 10 questions and with a standard deviation as low as 0.57157. The mean value of the participants' responses to the online presentations is 3.4208, with a standard deviation of 0.52305 and mean value of the online quizzes is 3.5564, which is more than the standard deviation value of 0.52305, indicating that the data set does not exceed the mean value and that each participant has a similar perspective as the mean value.

The index values of report submissions range from 2.10 to 4.71 with mean value of 3.5318 and mode is 3.71. The case study ranges from 2.20 to 4.80 with a mean of 3.5165, while a standard deviation of 0.49215. Cronbach's Alpha is used to determine internal reliability of each hidden component and Cronbach's alpha should be

### Independent Variables

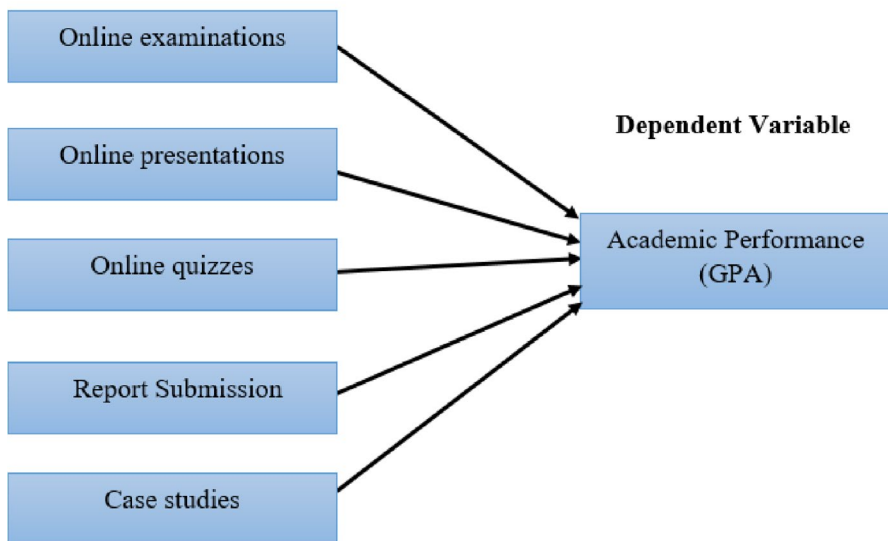


Fig. 3 Conceptual framework, Source: Author's creation based on interviews (2022)

**Table 1** Descriptive statistics

	Descriptive statistics										
	N	Mean		Median	Mode	Std. Deviation	Variance	Skewness		Kurtosis	
		Statistic	Std. Error					Statistic	Std. Error	Statistic	Std. Error
Academic Performance	387	3.8906	0.02252	4.0000	4.00	0.44302	0.196	-0.220	0.124	-0.095	0.247
Online Examinations	387	3.3741	0.02905	3.4300	3.00	0.57157	0.327	-0.024	0.124	-0.478	0.247
Online Presentations	387	3.4208	0.02659	3.4300	3.57	0.52305	0.274	-0.219	0.124	0.234	0.247
Online Quizzes	387	3.5564	0.02553	3.5700	3.71	0.50222	0.252	-0.606	0.124	1.244	0.247
Report submissions	387	3.5318	0.02337	3.5700	3.71	0.45972	0.211	-0.069	0.124	-0.450	0.247
Case study	387	3.5165	0.02502	3.5700	4.00	0.49215	0.242	0.074	0.124	-0.121	0.247

Source: Authors' compilation based on survey data. (2022)

equal to or better than 0.7 to be considered reliable. Cronbach's alpha value for this study is 0.909 which is greater than 0.7, demonstrating that the measure has a sufficient level of reliability and is internally consistent (See Table 2).

### 5.3.2 Reliability and validity results

Researchers able to conduct a successful analysis due to the reliable information. Table 2 shows accordingly, the Alpha values and validity values for each variable. The Alpha values of the five independent variables are higher than 0.7, determining that the measures are internally consistent with a high degree of reliability and also Kaiser–Meyer–Olkin (KMO) value for the five independent variables are higher than 0.7, which means measures are valid and partial correlation's strength between the variables are strong.

### 5.3.3 Baseline regression results and robustness checks

In the data analysis multiple linear regression was conducted in order to identify the variables that impact the academic performance as a whole when all variables are acting on the same. There were 4 main models developed including the major variables of the conceptual framework. Model 1 included the main variables, model 2 included the main variables along with the demographic factors of the study, model 3 included the same variables taking into account only the responses from public university students of Sri Lanka and finally in model 4 same was done for the private universities of Sri Lanka as depicted in the table below.

Table 3 demonstrates baseline regression findings as well as the outcomes of the other three alternative models. As shown in the model 1, online examination has positive impact on the academic performance ( $B=0.349$ ,  $P<0.01$ ). Hence, Online examinations have high significant impact on academic performance. Even after in model 2, demographic variables gender, academic year, province of study and type of university was also taken into account for the development of the regression model, the results in regards to the direction of their impact remain the same ( $B=0.363$ ,  $P<0.01$ ). In the model 3 we have done an estimation by altering the responses considering only from government university undergraduates of Sri Lanka since the education approaches of

**Table 2** Reliability and validity of variables

Variable	Reliability (Cronbach's Alpha)	Validity (KMO)	N of items
Online Examination	0.734	0.788	7
Online Presentation	0.720	0.769	7
Online Quizzes	0.731	0.823	7
Report Submission	0.775	0.844	7
Case Study	0.702	0.774	7
Academic Performance	0.909	0.857	7

Source – Authors' development based on SPSS analysis

government and private universities of Sri Lanka, it shows it has negative impact on academic performance ( $B = -0.528$ ,  $P < 0.01$ ). However, it is highly significant impact on academic performance. In the model 4 same type of model was developed by considering only the undergraduates of private universities in Sri Lanka. According to the above table, baseline findings remain unchanged ( $B = 0.255$ ,  $P < 0.01$ ) indicating positive impact on academic performance.

Online presentations are not statistically significance ( $B = 0.051$ ,  $P > 0.1$ ), which have not an impact on academic performance. However, after developing model 2 and 3 online presentations are not significance on academic performance. Furthermore, expanding the model 4 including undergraduates of private universities in Sri Lanka, it shows positive impact on academic performance ( $B = 0.180$ ,  $P < 0.05$ ), even after excluding government undergraduates, online presentations have positive impact on academic performance and impact is statistically significant.

Online Quizzes have moderate significant impact on the academic performance ( $B = 0.099$ ,  $P < 0.05$ ). When developing the demographic information as above, the results in regards to the direction of their impact remain the same ( $B = 0.099$ ,

**Table 3** Regression results on variables

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Gender		-0.013 (0.669)	-0.045 (0.345)	0.022 (0.588)
Academic Year		-0.019 (0.306)	-0.012 (0.640)	-0.041 (0.145)
Province		0.006 (0.341)	0.528*** (0.000)	-0.004 (0.777)
Type		-0.030 (0.404)	-	-
Online Examinations	0.349*** (0.000)	0.363*** (0.000)	-0.528*** (0.000)	0.255*** (0.001)
Online Presentations	0.051 (0.410)	0.048 (0.442)	-0.114 (0.271)	0.180** (0.021)
Online Quizzes	0.099** (0.044)	0.099** (0.045)	0.126* (0.094)	0.073 (0.299)
Report Submissions	0.163*** (0.005)	0.162*** (0.006)	0.204** (0.044)	0.101 (0.169)
Case Study	0.037 (0.462)	0.033 (0.521)	-0.075 (0.404)	0.105* (0.081)
Constant	1.481*** (0.000)	1.574*** (0.000)	1.701*** (0.000)	1.511*** (0.000)
Observations	387	387	180	207
R-squared	0.590	0.596	0.574	0.639

Source: Authors' compilation based on survey data, (2022)

\*Significant at 10% level

\*\*Significant at 5% level

\*\*\*Significant at 1% level

$P < 0.05$ ). In the model 3 by altering the responses considering only from government university undergraduates of Sri Lanka, online quizzes have positive impact on the academic performance and it is statically significance on the academic performance ( $B = 0.126$ ,  $P < 0.1$ ). In addition, developing the model 4 only including private university undergraduates, the results in terms of the direction of their impact remain the same, it has a positive impact on academic performance ( $B = 0.073$ ,  $P > 0.1$ ) though the impact is not statistically significant.

Report submissions have a highly significant impact on academic performance ( $B = 0.163$ ,  $P < 0.01$ ). When adjusting for observations of demographic information as mention above, the results in regards to the direction of their impact remain the same ( $B = 0.162$ ,  $P < 0.01$ ). Furthermore, estimating model 03 only including government university undergraduates, report submissions have a moderate significant impact on the academic performance ( $B = 0.204$ ,  $P < 0.05$ ). Moreover, the model 4 was developed by considering only the undergraduates of private universities in Sri Lanka, indicates report submissions have a positive impact on the academic performance but the impact is not statistically significance on the academic performance ( $B = 0.101$ ,  $P > 0.1$ ).

Case study has a positive impact on the academic performance ( $B = 0.037$ ,  $P > 0.1$ ) though the impact is not statistically significance on the academic performance. By developing the model 2 and 3, the results in terms of the direction of their impact remain the same, implying that impact is not statistically significance on the academic performance. However, after incorporating model 4, case study has significant impact on academic performance ( $B = 0.105$ ,  $P < 0.1$ ).

Multicollinearity was examined using the Variance Inflation Factor (VIF) and tolerance to ensure the independent variables were free from highly correlated with one another. When examining this table, we observed that VIF and tolerance were within the values respectively less than 10 and higher than 0.1.; maximum VIF level was 5.594 and the maximum tolerance level was 0.346, therefore, suggesting that VIF values and tolerance values are within the expected range that prevents the multicollinearity.

## 6 Discussion

Online education is possible for students through distance learning. The internet is used to deliver lectures and educational materials Instead of in a classroom, students work from home. Some researchers have found that virtual classes are superior to traditional classes. On the contrary, participants' feedback indicated a mixed response highlighting some benefits and issues (Gamage & Zaber, 2021). The majority of participants of our study commented that they would prefer to teach at a university and agreed that, a traditional learning environment is better than a distance learning environment. They also stressed that traditional learning is more effective and interesting than distance learning because the latter has many downsides in the Sri Lankan context. For example, difficulties in system adaptability, engaging students actively in the learning process, teaching complex matters like accounting subjects' calculations, technical challenges, a lack of technological equipment, etc.



Therefore, it seems to be traditional learning is most effective method for learning. According to, Lassoued et al. (2020) this type of education is less expensive than other education systems. An earlier study revealed that instead of relying on a single specific source, as is the case in traditional education, a variety of methods are used to convey information to learners. These include flexibility in acceptance and learning, as the learner can receive his education at any time and from any location, and benefit from cost savings. Therefore, this study proved that distance learning tends to be more affordable for students and saves time. Therefore, it seems to be, distance learning is a cost-saving method.

In line with previous studies, our findings also found that evaluating students' levels of attention was tough because due to the lack of direct "face-to-face" eye contact similar to the finding confirmed by (Casacchia et al., 2021). Student–teacher interaction has a substantial impact on students' learning levels and satisfaction with distance learning (Sher, 2009). In particular, students could not interact with their teachers. Moreover, teachers are not much satisfied with the students' interaction and involvement. This means that social isolation/human aspect, and the lack of physical presence have created a distance between students and teachers. Only a few lecturers and students had the capability and skills to communicate and collaborate and adapted to reap the benefits of online learning.

Assessments are usually conducted traditionally, with a physical audience. As mentioned before, the COVID-19 pandemic has transformed traditional education concepts into online education due to the prolonged lockdowns that rapidly changed universities' common education approaches and assessments from traditional methods (Tam, 2022). Diverse kinds of assessments are being used in distance learning to assess the overall grades of undergraduates. During distance learning, researchers evaluated currently used online assessment techniques in global such as online examination, online presentation, online viva, quizzes, fieldwork, online discussions, and peer evaluations (Kearns, 2012). The majority of respondents revealed that online MCQ tests, online examinations, online presentations, case studies, and report submissions were used in Sri Lanka as online evaluations during the pandemic. This demonstrates that case study and report submissions are newly discovered assessment techniques when compared to previous researchers' findings. As such, assessing their effectiveness in a Sri Lankan setting is worthwhile, as still, within the present hybrid education delivery, mostly the online mode is used, even as a fallback mechanism.

Effective assessment techniques mean techniques that help to prevent undergraduates from cheating and plagiarism which can be used as a reliable test that generates accurate results and scores (Rambe, 2021). The effectiveness of assessment techniques was determined by the grade of online examinations and assisted teachers in providing fair and transparent results (Abdullah et al., 2021). Participants' responses proved that the effectiveness of online assessment cannot be detected accurately based on the examination results because undergraduates cheat in examinations by discussing and sharing answers with their peers. As a result, a high assessment grade does not necessarily imply that the evaluation is effective.

According to the model 1, online examinations have a highly significant ( $P < 0.01$ ) impact on the undergraduates' academic performance. In line with

previous findings of qualitative research of Khan and Khan (2019), demonstrated that online examinations impacted on undergraduates' grades. However, Rci et al. (2020) indicated opposed finding which investigated brief report on their experiences applying an almost identical strategy to exam delivery during the pandemic, but found no impact on test performance in any year group. Online quizzes have moderate significant ( $P < 0.05$ ) impact on the undergraduates' academic performance. These findings were consistent with earlier research done by Barbarick (1998), it was indicated that quizzes may lead to improved student performance on tests or their final grades and also qualitative study conducted by Kilickaya (2017) found that the scores obtained by the participants on the quizzes may have an impact on their final grade and overall achievement in the semester. Furthermore, it proved that online quizzes have a positive impact on the academic achievement.

Similarly, report submission showed highly significant ( $P < 0.01$ ) impact on the academic performance. This result is in alignment with that of the research conducted by Jones and Blankenship (2021), which indicated that year one and two students who submit assignments are negatively correlated with academic performance while online presentations and case studies have not significant ( $P > 0.05$ ) impact on academic performance. In line with previous studies, according to M. Braun (2017), no significant differences were found between teams that presented in class and online when tested for academic performance. Although not statistically significant, the online presentations typically have a higher rating. This was done to determine whether incorporating online presentations had any overall influence on scores. The t-test revealed that the means for all presentations (74.11.1 in 2015 with  $n = 36$  and 73.01.1 in 2016 with  $n = 39$ ). These results fulfilled study objective 2 which is to identify the impact of different assessment techniques of management undergraduates' academic performance on distance learning in Sri Lanka. Furthermore, to improve the further trust in the regression results, model 2 developed using the demographic information, gender, academic year, province university type. Similar to the model 1, model 2 also verify that there is a positive impact on the academic performance and for more accurate results, model 3 and 4 developed by only using university sector variable to check robustness of results. As per the model 3, online examinations, online presentations and case studies showed negative impact on academic performance. However, in model 4, online presentations generated a positive significant impact on the academic performance and online quizzes generated non-significant impact on the academic performance. These results in line with the previous studies conducted by Urtel et al. (2006), concluded that online quizzes had no statistically significant impact on academic performance as measured by test scores.

Marti-Ballester and Meo (2020) indicated that undergraduates seem to appreciate quizzes with limited feedback because these allow them to verify their knowledge of a subject. Undergraduates' examination scores were positively influenced by their positive perception of online quizzes and not merely based on their online quizzes scores. S. H. P. W. Gamage et al. (2019) identified multimodal quizzes were useful in teaching and examining a theoretical engineering course, and these provided efficient alternatives to traditional assessments. The current study's findings also

revealed that MCQ is the most preferred online assessment technique for management undergraduates during distance learning and it is statistically proved.

Furthermore, more researchers focused on evaluating undergraduates' academic performance. Distance learning means an educational system through which the teacher and the student communicate using modern audio-visual technologies to share information such as publications and educational media (Liguori & Winkler, 2020). Some of the assessment strategies used in distance education are individual works created by students and sent via regular mail or email, assessments based on contributions to group discussions, tests, term papers, and oral or written tests given in the presence of the instructor via online platforms (Dikli, 2003). According to the respondents, email issues are impacting students' performance. For example, some characteristics of the email do not function; sometimes typing errors occur. But this study identifies that further concern should be needed regarding proper communication methods in communicating.

As shown in the findings, university lecturers and undergraduates faced many challenges during the COVID-19 pandemic, including lack of electricity, internet, time, skills, and financial capability to conduct online exams. These results revealed that there were various challengers faced by undergraduates and lecturers (Bashitialshaaer et al., 2021). In this study, assessing students' levels of attention was impossible due to a lack of real "face-to-face" eye contact. During the COVID-19, the results showed that distance learning is a great alternative to face-to-face instruction and that different teaching methods promote student participation and engagement in unique ways (Al-Karaki et al., 2021). Even though the findings of this study revealed that typing skills, creative skills, thinking skills, and listening skills impacted undergraduates' academic performance and also found technical issues as impediments, all students did not have equal access to resources. Furthermore, this study indicated that earlier-year students performed better than current-year students when concerning creative and thinking skills. When compared to the previous study, the findings of this study further proved that students' skills are still needed to improve in distance learning. Therefore, respondents have shown that the effectiveness of students' performance is very low. Yet, our study highlights that it is not the only issue but higher commitment is also one of the skills which are crucial to improving their academic performance. In addition, these findings affirmed that students' performance can be improved by increasing student engagement, effective time management, and good understandability.

Ali & Dmour (2021) stressed that students can participate in online exams at home using software such as Blackboard Learn and Lockdown Browser. All these solutions allow more reasonable and valid examinations because these have inbuilt features to prevent students from cheating during online assessments by using third-party software. This study identified unethical activities like students cheating which can hinder their academic performance. Respondents indicated that students answer questions by using Google. From these facts mentioned above, it is clear that various issues and challenges impact students' performance in several ways.

## 7 Conclusion

This study examining the effectiveness of online assessment techniques which impact the undergraduates' academic performance. The first objective findings of this research showed that five online assessments, including online exams, presentations, quizzes, case studies, and report submissions, are being used in Sri Lanka to evaluate undergraduate students' academic performance. When compared to the findings of previous studies, case study and report submissions are newly discovered assessment techniques in the first objective. According to the current study's findings, MCQ is the most preferred online assessment technique for management undergraduates during distance learning. The findings indicated that during the COVID-19 pandemic, university professors and students face numerous difficulties, including a lack of energy, internet facilities, time, skills, communication, and financial resources to hold online exams.

Based on the current study findings, when compared with online teaching with offline teaching, there is an issue with the effectiveness of online teaching because face-to-face conversations fulfill social needs, become more interactive, and make the learning process more effective. Furthermore, traditional teaching is more interactive and works faster than virtual classes because virtual demonstrations may not provide a real-time experience to the students. As a result, the traditional method is more effective than the online method.

The study's second objective demonstrated that online exams, online quizzes, and report submissions significantly impacted management undergraduate students' academic performance during the COVID-19 pandemic. Furthermore, during the COVID-19 epidemic, online presentations and case studies did not have any significant impact on the academic achievement of management undergraduates. The majority of respondents believe that, in the future, online assessment should be improved at their universities. The study statistically revealed that online examinations, online quizzes, and report submissions indicate that they have a significant relationship with the dependent variable, academic performance, as well as, it has also been statistically proven that online presentations and case studies have no impact on undergraduate academic performance.

The policy implication of this study further suggested introducing strategies and develop the new technology for the quality of effectiveness of online assessment techniques in distance learning. In addition, the study proved that improving student involvement, more efficient time management, and growing existing skills while learning new ones, can help students achieve higher academic achievements. The findings of this study are limited to management undergraduates in the Sri Lankan context. As well as the researchers could not physically observe participants' expressions and body language therefore, rely on their opinions for data, which was a crucial drawback in this study.

Finally, future researchers can also focus their study on different university departments of assessment techniques with information technology, medical, arts, and engineering among inter-faculties. Moreover, the researchers will be able to expand their research for global perspective by conducting a comparative study between the South Asian countries to assess the impact of the effectiveness of assessment techniques used in distance learning on undergraduates' academic performance.

## Appendix

**Table 4** Demographic profile of the respondents (N387)

Demographic profile of respondents		N (%)
Gender	Female	235 (60.7)
	Male	152 (39.3)
Current academic year	1st year	11 (2.8)
	2nd year	46 (11.9)
	3rd year	157 (40.6)
	4th year	173 (44.7)
Age group	18—20	2 (0.5)
	21—23	174 (45.0)
	24—26	211 (54.5)
Province of university location	Western Province	240 (62.0)
	Southern Province	23 (5.9)
	Central province	20 (5.2)
	North Central Province	14 (3.6)
	Sabaragamuwa Province	23 (5.9)
	Uva Province	18 (4.7)
	North Western Province	21 (5.4)
	Northern Province	15 (3.9)
	Eastern Province	13 (3.4)
University sector	Private	207 (53.5)
	Public	180 (46.5)
Degree specialization	Business Management	107 (27.6)
	Accounting and Finance	77 (19.9)
	Business Analytics	21 (5.4)
	Marketing Management	59 (15.2)
	Management Information Systems	29 (7.5)
	Business Economics	5 (1.3)
	Logistic and Supply Chain Management	29 (7.5)
		9 (2.3)
	Quality Management	36 (9.3)
	Human Resource Management	15 (3.9)
Tourism & Hospitality Management		

Source: Authors' compilation based on questionnaire, (2022)

**Abbreviations** *GPA*: Grade Point Average; *KMO*: Kaiser-Meyer-Olkin; *LMS*: Learning Management System; *MCQ*: Multiple Choice Question; *SPSS*: Statistical Package for the Social Sciences; *VIF*: Variance Inflation Factor

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s10639-023-11715-7>.

**Acknowledgements** The authors would like to thank the anonymous referees for their helpful opinions and suggestions, which resulted in the paper being improved.

**Authors' contribution** Hiruni Thathsarani: Writing, editing, methodology, data curation and data analysis  
Dinushika Kaushalya Ariyananda: Writing, editing, methodology, data curation and data analysis  
Chalani Jayakody: Writing, editing, methodology, data curation and data analysis  
Kerthiga Manoharan: Writing, editing, methodology, data curation and data analysis  
Sumudu Munasinghe: Supervision, writing-review & editing  
Nilmini Rathnayake: Supervision, writing-review and editing  
All authors read and approved the final manuscript.

**Data availability** The authors confirmed that the data supporting the findings of study are available within the article or its supplementary materials.

## Declarations

**Competing interest** The authors declare that they have no competing interest.

## References

- Abdullah, S. A., Fadil, T. A., & Ahmed, N. (2021). *Online Examination System (Electronic Learning)*. 309–323. [https://doi.org/10.1007/978-981-15-7527-3\\_30](https://doi.org/10.1007/978-981-15-7527-3_30)
- Adeyeye, B., Ojih, S. E., Bello, D., Adesina, E., Yartey, D., Ben-Enukora, C., & Adeyeye, Q. (2022). Online learning platforms and covenant university students' academic performance in practical related courses during COVID-19 pandemic. *Sustainability (Switzerland)*, *14*(2), 1–16. <https://doi.org/10.3390/su14020878>
- Akimov, A., & Malin, M. (2020). When old becomes new: A case study of oral examination as an online assessment tool. *Assessment and Evaluation in Higher Education*, *45*(8), 1205–1221. <https://doi.org/10.1080/02602938.2020.1730301>
- Ali, L., & al Dmour, N. A. H. H. (2021). The shift to online assessment due to covid-19: An empirical study of university students, behaviour and performance, in the region of UAE. *International Journal of Information and Education Technology*, *11*(5), 220–228. <https://doi.org/10.18178/ijiet.2021.11.5.1515>
- Al-Karaki, J. N., Ababneh, N., Hamid, Y., & Gawanmeh, A. (2021). Evaluating the effectiveness of distance learning in higher education during covid-19 global crisis: Uae educators' perspectives. *Contemporary Educational Technology*, *13*(3), 1–16. <https://doi.org/10.30935/cedtech/10945>
- Al-Mawee, W., Kwayu, K. M., & Gharaibeh, T. (2021). Student's perspective on distance learning during COVID-19 pandemic: A case study of Western Michigan University, United States. *International Journal of Educational Research Open*, *2*, 1–14. <https://doi.org/10.1016/j.ijedro.2021.100080>
- Asgari, S., Trajkovic, J., Rahmani, M., Zhang, W., Lo, R. C., & Sciortino, A. (2021). An observational study of engineering online education during the COVID-19 pandemic. *PLoS One*, *16*(4), 1–17. <https://doi.org/10.1371/journal.pone.0250041>
- Bączek, M., Zagańczyk-Bączek, M., Szpringer, M., Jaroszyński, A., & Woźakowska-Kapłon, B. (2021). Students' perception of online learning during the COVID-19 pandemic: A survey study of Polish medical students. *Medicine*, *100*(7), 1–6. <https://doi.org/10.1097/MD.00000000000024821>

- Barbarick, K. A. (1998). Exam frequency comparison in introductory soil science. *Journal of Natural Resources and Life Sciences Education*, 27(1), 55–58. <https://doi.org/10.2134/jnrlse.1998.0055>
- Bashithalshaar, R., Alhendawi, M., & Avery, H. (2021). Obstacles to applying electronic exams amidst the COVID-19 pandemic: An exploratory study in the Palestinian universities in Gaza. *Information (Switzerland)*, 12(6), 1–28. <https://doi.org/10.3390/info12060256>
- Bennett, S., & Barker, T. (2012). The use of electronic voting and peer assessment to encourage the development of higher order thinking skills in learners. *International Journal of E-Assessment*, 2(1), 1–10.
- Beringuela, F. (2009). Factors affecting academic performance of undergraduate students at Uganda Christian University, Academia. <https://www.academia.edu/22535654/>
- Braun, V., & Clarke, V. (2006). *Using thematic analysis in psychology*.
- Braun, M. (2017). Comparative evaluation of online and in-class student team presentations. In *Journal of University Teaching & Learning Practice*, 14(3). <http://ro.uow.edu.au/jutlp>, <http://ro.uow.edu.au/jutlp/vol14/iss3/3>. Accessed 28 Sept 2022
- Casacchia, M., Cifone, M. G., Giusti, L., Fabiani, L., Gatto, R., Lancia, L., Cinque, B., Petrucci, C., Gianoni, M., Ippoliti, R., Frattaroli, A. R., Macchiarelli, G., & Roncone, R. (2021). Distance education during COVID 19: An Italian survey on the university teachers' perspectives and their emotional conditions. *BMC Medical Education*, 21(1), 1–17. <https://doi.org/10.1186/s12909-021-02780-y>
- Choi, J. J., Robb, C. A., Miffl, M., & Zainuddin, Z. (2021). University students' perception to online class delivery methods during the COVID-19 pandemic: A focus on hospitality education in Korea and Malaysia. *Journal of Hospitality, Leisure, Sport and Tourism Education*, 29, 1–12. <https://doi.org/10.1016/j.jhlste.2021.100336>
- Cohen, D., & Sasson, I. (2016). Online quizzes in a virtual learning environment as a tool for formative assessment. *Journal of Technology and Science Education*, 6(3), 188–208. <https://doi.org/10.3926/jotse.217>
- Creceilius, A. R., DeRuisseau, L. R., & Brandauer, J. (2021). Cumulative oral examinations in undergraduate human physiology: Process, student perceptions, and outcomes. *Advances in Physiology Education*, 45(3), 518–525. <https://doi.org/10.1152/advan.00028.2021>
- Dikli, S. (2003). Assessment at a distance: Traditional vs. Alternative Assessments. *The Turkish Online Journal of Educational Technology-TOJET*, 2(3), 13–19.
- El Said, G. R. (2021). How did the COVID-19 pandemic affect higher education learning experience? An empirical investigation of learners' academic performance at a University in a Developing Country. *Advances in Human-Computer Interaction*, 1–10. <https://doi.org/10.1155/2021/6649524>
- Gaftandzhieva, S., Talukder, A., Gohain, N., Hussain, S., Theodorou, P., Salal, Y. K., & Doneva, R. (2022). Exploring online activities to predict the final grade of student. *Mathematics*, 10(20). <https://doi.org/10.3390/math10203758>
- Gamage, S. H. P. W., Ayres, J. R., Behrend, M. B., & Smith, E. J. (2019). Optimising Moodle quizzes for online assessments. *International Journal of STEM Education*, 6(1), 1–14. <https://doi.org/10.1186/s40594-019-0181-4>
- Gamage, S. N., & Zaber, M. (2021). *Teaching and learning in distance mode during COVID-19 in Sri Lanka and Bangladesh*.
- Guangul, F. M., Suhail, A. H., Khalit, M. I., & Khidhir, B. A. (2020). Challenges of remote assessment in higher education in the context of COVID-19: A case study of Middle East College. *Educational Assessment, Evaluation and Accountability*, 32(4), 519–535. <https://doi.org/10.1007/s11092-020-09340-w>
- Hadwin, A. F., Sukhawathanakul, P., Rostampour, R., & Bahena-Olivares, L. M. (2022). Do self-regulated learning practices and intervention mitigate the impact of academic challenges and COVID-19 distress on academic performance during online learning? *Frontiers in Psychology*, 13, 1–14. <https://doi.org/10.3389/fpsyg.2022.813529>
- Hussain, M., Zhu, W., Ni, J., Khan, Z. U., & Hussain, S. (2018). ICBDA 2018 : 2018 IEEE Conference on Big Data and Analytics : 21st-22nd November 2018, Holiday Villa Resort & Spa Langkawi, Langkawi, Kedah, Malaysia. *Identifying Beneficial Sessions in an E-Learning System Using Machine Learning Techniques*, 1–6.
- Jones, I. S., & Blankenship, D. (2021). Year two: Effect of procrastination on academic performance of undergraduate online students. *Research in Higher Education Journal*, 39, 1–12. [https://scholarworks.utrgv.edu/tl\\_fac](https://scholarworks.utrgv.edu/tl_fac). Accessed 24 May 2022
- Kearns, L. R. (2012). Student Assessment in Online Learning: Challenges and Effective Practices. In *MERLOT Journal of Online Learning and Teaching* (Vol. 8, Issue 3).


- Khan, S., & Khan, R. A. (2019). Online assessments: Exploring perspectives of university students. *Education and Information Technologies*, 24(1), 661–677. <https://doi.org/10.1007/s10639-018-9797-0>
- Kilickaya, F. (2017). The effects of pre-lecture online quizzes on language students' perceived preparation and academic performance. *PASAA*, 53, 60–84.
- Kim, D. H., Lee, H., Jeong, Lin, Y., & Kang, Y. J. (2021). Changes in academic performance in the online, integrated system-based curriculum implemented due to the COVID-19 pandemic in a medical school in Korea. *Journal of Educational Evaluation for Health Professions*, 18(24), 1–9. <https://doi.org/10.3352/jeehp.2021.18.24>
- Lassoued, Z., Alhendawi, M., & Bashitialshaer, R. (2020). An exploratory study of the obstacles for achieving quality in distance learning during the covid-19 pandemic. *Education Sciences*, 10(9), 1–13. <https://doi.org/10.3390/educsci10090232>
- Liguori, E., & Winkler, C. (2020). From offline to online: Challenges and opportunities for entrepreneurship education following the COVID-19 pandemic. *Entrepreneurship Education and Pedagogy*, 3(4), 346–351. <https://doi.org/10.1177/2515127420916738>
- Martí-Ballester, C. P., & Meo, F. (2020). Effects of the perceptions of online quizzes and electronic devices on student performance. *Australasian Journal of Educational Technology*, 36(1), 111–125. <https://www.researchgate.net/publication/333967647>
- Noorbehbahani, F., Mohammadi, A., & Aminazadeh, M. (2022). A systematic review of research on cheating in online exams from 2010 to 2021. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-022-10927-7>
- Rambe, S. L. (2021). Creative techniques for online learning assessment. *Englisia: Journal of Language, Education, and Humanities*, 8(2), 138. <https://doi.org/10.22373/ej.v8i2.8111>
- Rameez, A., Fowsar, M. A. M., & 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*, 10(6), 341–349. <https://doi.org/10.36941/jesr-2020-0132>
- Rci, O., Amir, D., Sam, H., & Reid, M. D. (2020). High-stakes, remote-access, open-book examinations. <https://orcid.org/0000-0002-9599-9069>
- Sher, A. (2009). Assessing the relationship of student-instructor and student-student interaction to student learning and satisfaction in Web-based Online Learning Environment. *Journal of Interactive Online Learning Wwww.Ncolr. Org/Jiol*, 8(2). <https://www.ncolr.org/jiol>. Accessed 10 Jun 2022
- Shraim, K. (2018). Online examination practices in higher education institutions: Learners' perspectives. *Turkish Online Journal of Distance Education*, 20(4), 185–196.
- Sikurajapathi, I., Henderson, K., & Gwynllyw, R. (2020). Using e-assessment to address mathematical misconceptions in engineering students. *International Journal of Information and Education Technology*, 10(5), 356–361. <https://doi.org/10.18178/ijiet.2020.10.5.1389>
- Stevanović, A., Božić, R., & Radović, S. (2021). Higher education students' experiences and opinion about distance learning during the Covid-19 pandemic. *Journal of Computer Assisted Learning*, 37(6), 1682–1693. <https://doi.org/10.1111/jcal.12613>
- Sutiah, S., Slamet, S., Shafqat, A., & Supriyono, S. (2020). Implementation of distance learning during the covid-19 pandemic in faculty of education and teacher training. *Cypriot Journal of Educational Sciences*, 15(5), 1204–1214. <https://doi.org/10.18844/CJES.V15I5.5151>
- Tam, A. C. F. (2022). Students' perceptions of and learning practices in online timed take-home examinations during Covid-19. *Assessment and Evaluation in Higher Education*, 47(3), 477–492. <https://doi.org/10.1080/02602938.2021.1928599>
- Urtel, M. G., Bahamonde, R. E., Mikesky, A. E., & Vessely, J. S. (2006). On-line quizzing and its effect on student engagement and academic performance. In *Journal of Scholarship of Teaching and Learning* (Vol. 6, Issue 2).
- Yılmaz İnce, E., Kabul, A., & Diler, İ. (2020). Distance education in higher education in the COVID-19 pandemic process: A case of Isparta Applied Sciences University. *International Journal of Technology in Education and Science (IJTES)*, 4(4), 343–351. <https://www.ijtes.net>. Accessed 18 Apr 2022

**Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.



## Authors and Affiliations

Hiruni Thathsarani<sup>1</sup>  · Dinushika Kaushalya Ariyananda<sup>1</sup> · Chalani Jayakody<sup>1</sup> · Kerthiga Manoharan<sup>1</sup> · A.A.S.N Munasinghe<sup>1</sup> · Nilmini Rathnayake<sup>1</sup>

Dinushika Kaushalya Ariyananda  
dinukaushalya077@gmail.com

Chalani Jayakody  
kaushalya22c@gmail.com

Kerthiga Manoharan  
kannambalkeerthi123@gmail.com

A.A.S.N Munasinghe  
sumudu.m@sliit.lk

Nilmini Rathnayake  
nilmini.r@sliit.lk

<sup>1</sup> Department of Business Management, SLIIT Business School, Sri Lanka Institute of Information Technology (SLIIT), Malabe, Sri Lanka