Covid 19: Implementation of Digital Interactive Teaching and Learning (Ditl) in the 'Statistics for Social Science' Course

Norlaila Abdullah Chika[1,2,*], Nur Aili Hanim Hanafiah[2], Nor Suzylah Sohaimi[2], Farahiyah Fadzil[2]

[1] Institute of Local Government Studies, College of Law, Government and International Studies, Universiti Utara Malaysia, 06010 Sintok Kedah, Malaysia
[2] School of Government, College of Law, Government and International Studies, Universiti Utara Malaysia, 06010 Sintok Kedah, Malaysia

ARTICLE INFO	ABSTRACT
   	The spread of COVID-19 has drastically changed the community's norms or lifestyles, including public or private servants working from home (WFH). WFH also occurs among staff at the school and university. All students and educators were encouraged to continue their teaching and learning sessions online. The lecturers had to continue teaching and learning (T&L) at the university level via e-learning or electronic learning, including calculation courses such as statistics. At UUM, the 'Statistics for Social Science' course is one of the courses offered for social science students, and it is a compulsory subject. Most students have studied statistics courses in high school, and some are not interested in the calculation course, particularly when it becomes a compulsory course at the university level. University management introduced various methods to ensure the lecturers and students can fulfil their roles in teaching and learning. Therefore, universities introduced DITL through online workshops and training for lecturers and students. This study aims to examine the effectiveness of DITL on students of the 'Statistics for Social Sciences' course during COVID-19. The methods used are descriptive statistics, Pearson correlations, and regression analysis. The results were found moderately effective based on a mean score of 3.53. The Pearson correlation results show a positive and significant relationship between Course Delivery (lecturers' delivery, course assessment, and course content) and DITL. The descriptive analysis result of DITL confirms the results. Based on the result of simple regression analysis, it shows that Internet Speed affects the DITL and H null failure to accept. In conclusion, DITL can be continued during the COVID-19 pandemic as it aligns with the advancement of information and communication technology (ICT). Therefore, ICT in teaching and learning has been implemented as well as possible, even during COVID-19.

1. Introduction

According to UNESCO, at the end of 2019, COVID-19 began to spread rapidly around the world [3]. The World Health Organization (WHO) declared COVID-19 a pandemic on March 11, 2020. At the time of this research, Malaysia was in the second wave of the COVID-19 outbreak. This is due to the widespread COVID-19 pandemic throughout the country, resulting in very high deaths in most of the

world's population. The government advised Malaysians to continue to maintain new norms and stay hygienic so that the spread of the COVID-19 pandemic can be controlled.

The spread of the COVID-19 pandemic shows a drastic change in some communities' norms or life patterns, including public or private servants who must work from home (WFH). In addition, school and university students also must attend online classes introduced by their respective teachers. Some countries started online learning throughout the year. Technology integration requires special attention in higher education with the rapid evolution of Information and Communication Technology (ICT). Moreover, the COVID-19 pandemic and social distancing challenged all stakeholders to work online to meet current needs and situations. It is well known that the practice of an online learning environment will involve not only technical problems but also pedagogical and instructional challenges.

ICT has the power to change education policy around the world. However, changing education from a traditional approach in response to COVID-19 requires the best decision-making and coordination. There is a clear impact on the use of technology in most people's lives. Thus, COVID-19 has provided an opportunity to implement online learning in the education system as a worldwide necessity [3]. The rapid development of education today demands that educators take more practical steps to ensure student excellence in education [10]. Considering the evolving development of technology, education should be one of the interactive fields in delivering information more effectively.

Interactive means students can control the lesson material according to their wishes [18]. They can start the software, explore, and end the learning session. It does not include classroom interactions or interactive theories. Interactive education places teachers as mentors, monitors, and facilitators to students [14]. In interactive teaching and learning, the focus is on how lesson-related information is presented more interestingly. The explanation of the content of the lesson using elements such as text, graphics, animation, audio, and video produces a more exciting teaching presentation. The use of rich media can stimulate students' minds [14]. Thus, learning related to pictures, drawings and sketches can help in improving student achievement in lessons.

Bila *et al.*, [5] define interactive learning as learning in the form of organising cognitive activities. Ways of learning are conducted through activities with students, where all students involved will interact with each other, exchange information, solve problems together, model situations, and evaluate people's actions and behaviour. They engage in an authentic, collaborative atmosphere to solve problems.

DITL was implemented in the education system during COVID-19. Using digital interactive elements can attract and maintain students' interest in learning. Graphic elements such as drawings, pictures, or charts are more constructive in conveying information than nonvisual elements alone [2]. The graphic elements can help students improve their visualisation of information [14]. According to Rahmat [17], animation can also develop a lesson that requires students to describe and pay attention. DITL are also applicable for calculation subjects such as mathematics, Accounting, and Statistics, especially to social science students. 'Statistics for Social Science' is a compulsory course for students of non-statistical programs at Universiti Utara Malaysia (UUM), such as Bachelor of Public Management, Bachelor of Development Management, Bachelor of Counselling, Bachelor of Communication, Bachelor of International Affairs, etc. This course is essential for applying statistical skills in research methods.

Most students have studied statistics courses at school, and some are not interested in the calculation course even though they experience anxiety about statistics, particularly when it becomes a compulsory course at the university level. If they have an opportunity, they will try to avoid taking statistics courses at university. Many students experience statistical anxiety due to a lack of

arithmetic or numerical skills. A survey by Gibbs [9] shows a 'numeracy crisis' among social science students due to many students' lack of preparation to undertake quantitative skills and the shortage of qualified teachers. As a result, the students experienced anxiety about the statistics skill. Based on a study by Siew [21], students who experience statistical anxiety will harm academic performance and require the application of new methods to understand the nature of statistical anxiety. The most effective intervention for students with high anxiety levels is to change their perception that solid mathematical ability is not a prerequisite for statistical excellence [21].

Statistics courses will be more difficult now and in the future for the lecturers and students because traditionally, teaching and learning are conducted face to face but are now changing to the online classroom. University management introduced various online learning methods in March 2020 to ensure that lecturers and students can continue teaching and learning. Thus, during COVID-19, almost all university students studied online and stayed home due to Movement Control Order (MCO). Because the role of statistics lecturers is more challenging during COVID-19 in the online classroom, universities introduced DITL through online workshops and training. Hence, DITL has been implemented by lecturers in statistics teaching, such as Padlet, PowToon, Drawing Pad, Edpuzzle, etc, so that teaching and learning are more effective in stimulating students' interest in the online classroom.

Given the pandemic context and challenges facing lecturers and students alike in online classrooms, the current study aims to examine the effectiveness of DITL on the students of the 'Statistics for Social Science' course at Universiti Utara Malaysia. Our report of the study is organised as follows: Section 1 explains the introduction of this study. Section 2 reviews several empirical studies. Section 3 explains the methodology. Section 4 presents the results and discussions. Some concluding remarks and suggestions are made in the closing section as a conclusion in Section 5.

2. Literature Review

The main task of higher education is to train competent and fully qualified students with a high level of civic awareness and flexible thinking ability, which allows them to renew their knowledge independently and develop professional views and pedagogical skills [5]. Among the main methodological principles of interactive learning emphasised by Bila *et al.*, [5] are the development of a glossary of professional vocabulary: comprehensive practical analysis, ongoing visual relationships with all students, student performance in each lesson as a moderator, initiating and directing discussions on learning problems. This includes the active use of technical methods, including grants and educational materials in the form of tables, slides, educational films, videos, video clips, and video equipment through the help of study materials. Teacher intervention in discussions in the event of unforeseen difficulties takes place, as well as clarifying new curriculum provisions, intensive use of individual tasks, environmental organisations that should contribute to student liberation, as well as the role of teachers by considering the creative and intellectual abilities of individuals.

There are three signs of interactive learning, according to Bila *et al.*, [5], among which are interpersonal, or interaction between "teachers - students" and "students - students"; working in small groups collaboratively, and active roles in games and training organisations. Thus, based on the signs of interactive learning, forms and methods of interactive learning can be divided into discussions (interactive talks, dialogues, group discussions, situation analysis from training, debates); games (business, role play, organisational activities); and the formation of classroom training (communication, independence, professional), as shown in Figure 1.
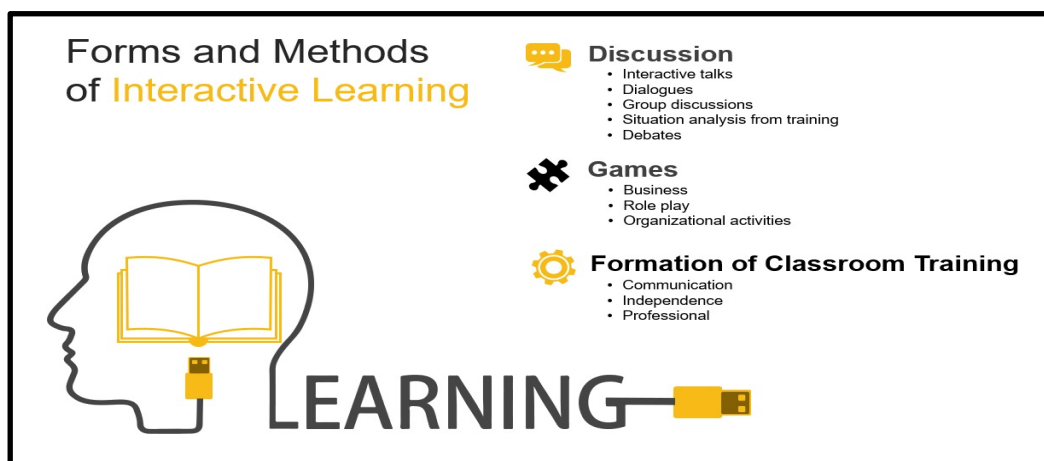
Fig. 1. Forms and Methods of Interactive Learning

The term interactive learning is often associated with information technology, distance education, and internet resources, as well as electronic textbooks and reference books obtained online. The use of interactive learning methods has changed the role of an instructor as the primary source of information students get. This is because the role of teachers is now seen as simply organising processes and dealing with organisations, completing required tasks first and formulating questions or topics to be discussed in groups, giving advice, controlling time, and organising learning frameworks [5].

The study by Bila *et al*., [5] examined the extent of the use of interactive technology among university students and lecturers and found that almost all respondents had heard about the concept of interactive technology. However, many needed to understand which method covered this concept. Moreover, many lecturers believe it is used everywhere, but it is not. The results show that interactive technology, such as brainstorming and group discussion, is less effective than interactive learning, but practical training methods can increase the effectiveness of student learning. On average, teaching efficiency increased by 25.8% due to lecturers' use of interactive technology elements. Therefore, the essential learning parameters are the application of disciplines taught in real life, learning lecture materials, the ability to work in groups, and the ability to maintain a position. If the effectiveness of training is evaluated on the most important parameters, the effectiveness of interactive technology increases to 42.7% [5].

Moreover, the study of Marian *et al*., [14], which aims to evaluate the effectiveness of interactive CDs on students' visualisation skills, proves that students are more interested in topics with pictures and sketches and learn something better when looking at diagrams. In addition, Raman's [18] study examined the effects of Animated and Interactive Maps in teaching and learning topographic map skills by dividing students into experimental and control groups. The experimental group received animated and interactive map-assisted processing, while the control group received printed (static) map processing. The results showed that the students from the experimental group exhibited higher ability and mastery of topographic map skills compared to the control group students. Thus, the study proves that the Animated and Interactive Map Approach can arouse interest, reduce the burden of cognition, and stimulate curiosity among students.

In the study of Asad *et al*., [3], the effectiveness of information delivery and communication technology integration in teaching and learning has been evaluated through e-learning in Pakistan. The results show a high level of interest among students towards integrating ICT and e-learning in the science and social sciences field. Furthermore, the findings state that students can learn more effectively through ICT and e-learning materials while facilitating teachers' teaching tasks in this era

of modern technology. Conventional teaching methods such as "chalk and talk", often used by teachers or instructors, can weaken students' interest and make them bored quickly [14].

Today, the development of technology has dramatically influenced human life, including in the field of education. Using slides in PowerPoint programs can show the accurate illustration of something by including dynamic models, animation, and colour diversity in a lesson [23]. Thus, this method is seen as one of the initiatives to prevent students from feeling bored quickly with lessons compared to using the conventional teaching method. Writing notes through conventional teaching methods that often take a long time will cause students to be passive. According to Jones [12], using PowerPoint will make students more focused on the teacher teaching.

Information and communication technology (ICT) is related to computer-based communication involving classroom teaching methods and e-learning. Moreover, ICT can fulfil its purpose by expanding quality improvement, accessibility, and cost efficiency for information delivery and benefiting students to face the challenges of globalisation today (John, 2015). Through ICT, students can access online course materials easily anytime and anywhere. Currently, ICT learning is no longer based on printed materials because many resources can be accessed through the internet, where knowledge can be developed with various presentation topics, video, audio, graphics, and so on. Furthermore, ICT has changed from a teacher-centred environment to a student-centred environment [20].

The use of ICT provides excellent facilities for teachers and students to obtain complete knowledge in the field of education [3]. Similarly, it is stated that ICT has a positive impact on the education system, and it is observed that ICT can make the field of learning and the environment potentially more interactive, especially in countries that integrate ICT specifically. The quality of student achievement is highly dependent on teachers' teaching strategy in the classroom [10]. According to Tukiran et al. (2010), students find engagement in the classroom challenging if learning only involves teacher-centric teaching alone. The failure of teachers to make changes through methods and techniques in teaching technology is a challenge that needs to be addressed immediately. The study by Asad *et al.*, [3] states that the seventh standard has been recommended to educators to prepare them with the master of educational technology to enhance and strengthen the teaching and learning process [6].

Fuchs [8] proved that the application of Padlet has more potential to generate new ideas, which shows that such applications are efficient for collaborative learning in generating new ideas. Students can be given the task of creating their Padlets in specific topics as individual or group assignments. In short, Padlet is a very easy-to-use technology that can be applied to attract students in various ways, whether inside or outside the classroom [7].

Padlet is a Web 2.0 application that can collaborate and communicate for learning purposes. Jusoh *et al.*, [13] studied the effectiveness of video and Padlet use methods in the T&L process. They found that using video clips dramatically helps students understand the topics taught. More than 70% of students also agreed that using Padlets is more fun and effective than conventional teaching. The average mean score for students' perceptions of the implementation video and Padlet in the classroom is at a large scale of 3.93. Berk [4] and Romanov and Nevgi [19] supported the study's results, where they found that video clips successfully attracted and produced a more exciting and enjoyable learning environment.

Padlet in the T&L is an alternative to improving student achievement and performance [22]. Padlet, formerly known as Wallwisher, is one of the types of interactive board applications in Web 2.0. This interactive board, also known as a virtual wall, serves as a space that allows students and teachers to share information such as text, pictures, videos, and audio in one interface. All group

members will be able to see all the information written on the wall and exchange ideas in their group [22].

In addition, due to the COVID-19 pandemic, the Association of College and University Educators (ACUE) created a Special Online Teaching Tool Kit for educators to complete successful online teaching. ACUE provides short videos and written assignments for faculty to complement productive online teaching [1]. However, if students are looking for a quick, simple, and economical method to make learning more engaging, increase interest, and find multi-mode paths to understand, ThingLink is the most appropriate choice because it can provide an easy-to-navigate surface and links that are easy to share for engaging content [1].

Furthermore, Flipgrid is a platform to create engaging discussions, especially video discussions, suitable for all ages, including kindergarten students, PhD students, and the general public. Participants can use filters, stickers, text, or pictures in Flipgrid. Flipgrid allows participants to see and listen to each other in ways unavailable on more traditional discussion platforms. Flipgrid includes reflections or video journals, lecture reports, project presentations, demonstrations, peer reviews, or Socratic discussions. All ages using Flipgrid will find it intuitive and attractive [1].

3. Methodology

The purpose of the study survey through a quantitative approach is to examine the effectiveness of non-statistical program students in interactive teaching and learning during COVID-19. This is a descriptive design study. 100 students from non-statistical programs were selected as respondents using a purposive sampling method in 2020. Information was collected using a questionnaire filled out by the respondent via Google Forms. The data obtained was analysed by using SPSS for Windows. Questionnaires were divided into five sections. The first section covered demographics, gender, course, semester, among other variables. The second section in the survey relates to interactive teaching and learning during COVID-19. The third through fifth sections measured the effectiveness of the Lecturer, Course Content, and Course Assessment, respectively. Respondents were given a choice of answers (Likert Scale) which is 1 = strongly ineffective, 2 = ineffective, 3 = moderate effective, 4 = effective, and 5 = strongly effective. Descriptive statistics were used to determine frequency, percentage, and mean. Inference statistics included the Pearson Correlation test to determine the relationship between the DITL, the Lecturer's delivery, Course content, and Course assessment. The R^2 was calculated manually to interpret effect size in terms of the percentage of variation in the dependent variable explained by variation in the independent variables. The reliability value obtained for every part is Excellent, as shown in Table 1.

Table 1
Data Reliability Test for Dependent and Independent Variables

Part	Item	No. Question	Alpha Cronbach
A	Demographic	5	
Independent Variables			
B	Lecturer	12	0.937
C	Course Content	12	0.968
D	Course Assessment	12	0.943
Dependent Variables			
E	Digital Interactive Teaching & Learning	15	0.946

Source: from the survey

Table 1 shows that all the variables in the questionnaire have a high-reliability value. The independent variable is that the Lecturer Delivery recorded a value of 0.937, the Course Content recorded a value of 0.968, and the Course Assessment showed a value of 0.943. The reliability test (Cronbach's Alpha) results on the whole questionnaire of this study showed the digital effectiveness of Interactive Teaching and Learning, which is a dependent variable obtaining a value of 0.946.

We used a simple linear regression to test the power of the predictor of one independent variable and the relationship with a variable dependent in a straight line. The research question is to study the affected of Student Mark Scores on DITL with the hypothesis:

- Hypothesis Null
  Internet Speed does not affect Digital Interactive Teaching and Learning.
- Hypothesis Alternative
 Internet Speed affects Digital Interactive Teaching and Learning

Simple regression analysis results demonstrated a significant relationship between Internet Speed and DITL.

4. Results and Findings

The study results are divided into the respondents' demographics, results of descriptive analysis, Pearson correlation and simple regression analysis.

4.1 Respondent Demographics

Figure 2 shows the respondent's background information. Respondents of this study consisted of 100 social science students who took the 'Statistics for Social Science' course at Universiti Utara Malaysia. About 60% of respondents were male, and 40% were female. About 73% of respondents were from Bachelor of Public Management and living in an urban area of about 80% of respondents. About 65% of respondents spend on the internet every month below RM100. Most of them have a moderate speed of internet, about 37% of respondents.
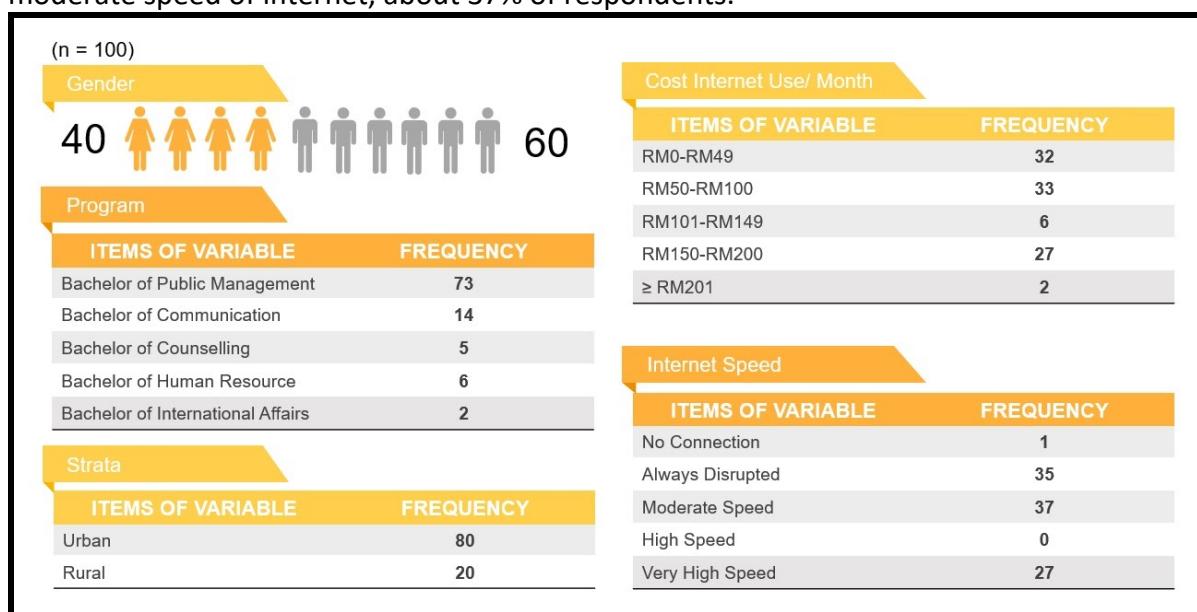
Source: From the questionnaire

Fig. 2. Respondent Background Information

4.2 Results of Mean Score

Table 2 shows the mean values of the dependent and independent variables. The highest mean score is Lecturer Delivery, about 4.04, while the lowest mean value is DITL, about 3.53. This means that the response to Interactive Teaching and Learning during Covid19 is moderately effective compared to the Course Delivery variables, that Lecturer Delivery is effective, and Course Assessment and Course Content are most effective at about 3.80 and 3.75, respectively.

Table 2
Mean Score of Course Delivery and Interactive Teaching and Learning

No	Variable	Mean	Level
1	DITL (dependent variable)	3.5300	Moderate
2	Lecturer Delivery (independent variable)	4.0425	High
3	Course Assessment (independent variable)	3.8092	High
4	Course Content (independent variable)	3.7500	High

Reference: Pallant [15]

Measured on a five-point unidirectional scale, the descriptive analysis results in Table 3 showed that 22 per cent of the respondents had a negative perception of DITL, with only one per cent (n = 1) saying that the DITL was strongly ineffective. Another 21 per cent (n = 21) said the DITL was ineffective. However, most respondents had a positive perception of the DITL, with 49 per cent (n = 49) saying the DITL was moderately effective, 28 per cent (n = 28) saying DITL was effective, and one per cent of respondents said DITL is strongly effective.

Table 3
Descriptive Analysis Result of DITL

Scale	Frequency	Per cent
Strongly Effective	1	1
Effective	28	28
Moderate effective	49	49
Ineffective	21	21
Strongly Ineffective	1	1

Therefore, the DITL during COVID-19 is effective for a social science student, particularly for calculation subjects, because it aligns with Generation Z, with some Generation Y students, who are digital natives and prefer using technology in teaching and learning. Although classes are conducted online, most students are highly committed. The role of ICT is crucial during COVID-19, including DITL, because students can assess the online class everywhere [3,6,11].

4.3 Pearson Correlation Analysis

This study used the Pearson correlation method to test the strength of the relationship between the independent and dependent variables. According to Piaw [16], correlation consists of three types of relationships - positive linear correlation, negative linear correlation, or no correlation. Determining the strength of the relationship between the two variables can be seen based on the value of the Pearson Correlation (r) range is between -1.00 to +1.00; this value indicates the existence of a perfect relationship between the two variables, while Correlation r = 0 shows no relationship directly between the two variables.

There is a positive and significant relationship between Interactive Teaching and Learning and Course Delivery. Therefore, this study applies Pearson's correlation analysis to analyse the relationship between Interactive Teaching and Learning and Course Delivery in Table 4. This shows that the higher the Interactive Teaching and Learning, the higher of lecturers, Content of Course, and Assessment.

Table 4
Pearson Correlation

		Interactive Teaching and Learning	Lecturer Delivery	Course Content	Course Assessment
Interactive Teaching and Learning	Pearson Correlation	1	.712**	.908**	.785**
	Sig. (2-tailed)		.000	.000	.000
	N	100	100	100	100

The result of the Pearson correlation in Table 4 shows a significant relationship between DITL and Lecturer Delivery, i.e. r = .713 (Low Positive Correlation) in Table 4. The value obtained is r = .713 (p = .000). Therefore, the value of r^2 = 0.50(50%). This means that the relationship between the two variables relating to DITL, and Lecturer is 50%, which is moderate. Variance R^2 = 0.50 (50%) indicates that 50% of DITL is due to Lecturer. Thus, another 50% change in dependent variables may be caused by other factors. This shows a significant relationship between the DITL and Lecturer among the students of the 'Statistics for Social Science' course.

Similarly, the Pearson correlation results in Table 4 show a significant relationship between the DITL and Content of Course, i.e. r = .908 (High Positive Correlation). The value obtained is r = 0.908 (p = 0.000). Therefore, the value of R^2 = 0.82 (82%). This means that the relationship between the two variables relates to Contribution to family income and the Content of Course, is 82%, which is a weak relationship. Variance ^{2} = 0.82 (82%) indicates that 82% of DITL is due to the Content of the Course. Thus, another 18% change in dependent variables may be caused by other factors due to the significant relationship between the use of DITL and the Content of the Course among the students of 'The statistics for Social Science' course.

Similarly, the Pearson correlation results in Table 4 show a significant relationship between the DITL and the Assessment of the course is r = .785 (High Positive Correlation). The value obtained is r = 0.785 (p = 0.000). Therefore, the value of R^2 = 0.62 (62%). This means the relationship between the two dependent variables DITL is due to Assessment is 62%, which is moderate. Variance r^2 = .62 (62%) indicates that 62% of DITL is due to Assessment of course. Thus, another 38% change in dependent variables may be caused by other factors. Due to the significant relationship between the use of DITL and Assessment of course among the students of the non-statistical program, there is a significant relationship between the DITL and the Assessment among the students of 'Statistics for Social Science' course.

4.4 Simple Linear Regression Interpretation and Analysis

Table 5 shows R^2 = 0.136, a 13.6% contribution of the Internet Speed (independent variable) to DITL (dependent variable)

Table 5
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.368[a]	.136	.127	.73188

a. Predictors: (Constant), Internet Speed
b. Dependent Variable: DITL

The results of the ANOVA analysis in Table 6 show that there is an effect on the DITL (DITL). It shows that Internet Speed affects the DITL. The statistical formula is ($F_{(1,98)}$ = 15.381, $p < 0.05$). The significance p-value is 0.000 and less than significant level=0.05. Therefore, the null hypothesis fails.

Table 6
ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.239	1	8.239	15.381	.000[b]
	Residual	52.494	98	.536		
	Total	60.732	99			

a. Dependent Variable: DITL
b. Predictors: (Constant), Internet Speed

Table 7 shows the regression equations of Internet Speed's effect on DITL

$$Y (DITL) = 2.772 + 0.239 (Internet Speed)$$

The statistical formula is (t = 3.922, $p < 0.05$). Significance value is 0.000 and the less than significant level=0.05. It shows that Internet Speed affects the DITL. Therefore, the null hypothesis fails.

Table 7
Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.772	.207		13.414	.000
	Internet Speed	.239	.061	.368	3.922	.000

a. Dependent Variable: DITL

The result of simple regression analysis in Table 7 shows that Internet Speed affects the DITL. Thus, DITL is effective during COVID-19-based student feedback, as shown in Table 3.

5. Conclusions and Contributions

The study found that the overall factors influencing the effectiveness of DITL are critical. This indicates that the students valued DITL during COVID-19 based on the results shown in Section 4.

Besides the unstable COVID-19 situation, which might even take a long time to recover as the new normal, has caused many human activities to be affected, including teaching and learning (T&L) at the university. Therefore, various efforts have been made by stakeholders to make sure T&L continues even online.

Technology can change the teaching and learning methods in the operation of the education system as a whole. Today, technology usage in teaching and learning is due to the rapid growth in information technology (IT), and it needs to be emphasised to advance education. Information and communication technology (ICT) in teaching and learning (T&L) should be applied in theoretical subjects because it can act as a complement, additional resource, or aid to lecturers. At the same time, they can produce practical and fun learning sessions [13].

The COVID-19 pandemic that has hit most countries in the world has changed the method of teaching and learning (T&L) in higher education institutions using application solutions like Padlet, Flipgrid, Mentimeter, ed-puzzle, etc. For example, Padlet is an excellent resource for library teaching [1]. Customisation of Padlet allows users to create visually appealing content that can be used in various ways. Easy-to-use, accessible, and compatible formats can provide many options and flexibility for teaching. Besides, Padlet can foster creativity and student interaction and is beneficial for creating interesting educational content to promote active learning and student engagement [1].

DITL is one of the methods Technology Enhanced Learning (TEL) used to illustrate the usage of ICT in teaching and learning, especially for calculational subjects such as Mathematics and Statistics. During COVID-19, TEL was strongly encouraged for remote and online learning through computers, laptops, smartphones, and other interactive devices. Therefore, the contribution of this study is that DITL in online classrooms is effective, and it found that almost 90 per cent of non-statistical students pass this subject. DITL helps students enhance their learning and allows them to create knowledge and optimal meaning. In addition, students can develop practical self-directed learning skills using the DITL approach. For example, they can discover what they need to learn and explore how to solve the problem on one issue related to the topic. However, DITL also depends on the creativity and innovation of lecturers to attract students so that teaching and learning can be continued.

Acknowledgement

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