Does Covid-19 Degrade the Quality of Lecturing?
A Research Evaluation on Multimedia Usage in Civil Engineering Lectures

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Abstract: Due to Covid-19 lecturers must adopt an e-learning method, but some Civil Engineering subjects hypothesized can't achieve outcome learning goals if delivered by e-learning method. This study is a contribution to mixed method research, integration of classroom action research method, evaluation questions, data analysis with statistical software and paradigm stances, and aims to explore the effectiveness of video usage in delivering courses. A questionnaire was distributed to 56 students, the data analyzed by Levene's Test and t-Test. The results obtained from Group 1 which received courses face-to-face had the quality of learning output with a standard deviation of -1,847 smaller than Group 2 which received courses through multimedia. The percentage of student approval as a respondent to the video is 95.5%.
Keywords: covid-19; e-learning; multimedia; rich-media; teaching

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INTRODUCTION

In Indonesia universities, mainly in Engineering Faculties, most lecturers deliver their subject to students just like a high-school teacher teaching; start from explaining the fundamental philosophy in detail, write every formula coherently and even teach the counting process step by step in the whiteboard, make sure the students achieve the learning outcome targets. It is criticized as an old-fashioned teaching method and not a proper teaching method for the adult learner, but they are hard to change the habit, haunted by anxiety that student can't reach a good understanding. Then, Covid-19 quarantined everyone, as other public activities, schools, and campuses are closed. Every lecturer enforced to do e-learning with various media, old-fashioned lecturers who usually teach the counting process of a given case study on the whiteboard patiently and freely, now deliver their subject with some limitations.

E-learning support some advantages including interactivity, and facilitation of communication between teachers and learners but some lecturers, mainly those who teach difficult subjects in Civil Engineering are still worried about its effectiveness in supporting good understanding. To facilitate comprehensive and clear teaching, e-learning must be supported with video in real time or recorded, so that both lecturer and students still get a face-to-face impression. The advantage of real-time or live video is that the lecturer can directly ask whether students get the point that he/she delivers or yet, it can overcome the lack of face-to-face interaction which is stated as another chief disadvantage of e-learning (Burbles, 2004). While the advantage of recorded video is that the lecturer can prepare a good video that can be edited for perfection before being uploaded online.

Most Indonesian universities adopt e-learning for years, in Indonesia e-learning has a different understanding from distance education. Distance education refers to the at-home study, attending all the classes from home with an e-learning method, so here e-learning is a medium to support the whole study. Where e-learning in at-college-study usually only supports not more than 30% of subjects, and the rest are done face-to-face in a class or laboratory.

In 2005 the Engineering Subject Centre of the UK Higher Education Academy held a writing competition entitled "How to be a Good Engineering Lecturer?". Davies et.al, (2006) informed that there were 29 essays entered, then 11 best essays were selected for review at that event. The aim of the event was to find out "what attributes do students expect of a good engineering lecturer?" The attributes mentioned by students are then classified into 3 groups; 1) strong consensus, including characteristics referred by all selected essays, 2) good consensus, including characteristics that are referred to by more than half of selected essays, 3) some consensus, characteristics that are referred by several essays. One of the strong consensus characteristics is high enthusiasm, which includes good consensus in using visual materials and demonstrations effectively, giving good handouts, and making classes fun, than those included in some consensus are able to make difficult concepts difficult (Davies, 2006). Referring to the essay competition, lecturers are expected to be able to provide visual material and able to make difficult concepts easy for students to understand, therefore a lecture delivery tool that can effectively be able to help students understand the material, even though the material is not delivered face to face, is needed.

In line with the conclusion of the Engineering Subject Centre of the UK Higher Education Academy essay competition, Amin and Shahab (2006) conducted research on the dominant factors that influenced the success of the teaching and learning process in the Engineering Mechanics subject in the Civil Engineering Study Program. The ability of Physics and Mathematics is the most influencing factor in addition to low motivation and low ability of students' learning methods. In addition, there is a competency gap between high school graduates and lecture material which causes a low percentage of graduation in Mechanical Engineering subjects.

Gillie et al (2017) conducted a study using three types of rich media; podcasts, key-concept videos, and solution video tutorials for undergraduate engineering students. As written by Saunders and Hutt (2014) in Gillie et al (2017) that rich-media material is defined as all kinds of videos that have been prepared, audio, and images (both still and animated). Regarding previous research studies, it is revealed that the use of rich media is part of the landscape of teaching in university institutions so its utilization must be maximized. Bos et al. (2015) mention that student attendance increases if rich-media material is given. Al Jandan, et al (2015) wrote that students state that the use of video is very helpful for their understanding. Bravo (2011) uses video streaming, involves 12 lecturers and 487 students at the School of Industrial and Aeronautical Engineering of Terrassa (ETSEIAT) Faculty of Engineering, and reveals the impact of videos on increasing student motivation and interest in the subject of their studies. Park (2014) in his research revealed that video-based e-learning produced better learning outcomes than face-to-face lectures that he had tried out in agricultural engineering study programs. Vronska (2017) conducted research on the use of adding additional videos in teaching, the result of which students found this very helpful because teaching became clearer, easier to remember, and more interesting.

During Covid-19 quarantine, lecturers do their best to deliver the course from home. Automatically they are divided into 3 groups:

a. Handout group, those who attach handouts, open a discussion forum by texting, and give assignments. All 3 main activities are done inside the e-learning website called POST (temporary e-learning media for some courses which is actually not e-learning but then must be done by e-learning during Covid-19 quarantine)

b. Live group, those who prefer to teach using Zoom or Bluejeans at their course schedule, give handout and the assignment via POST

c. The recorded group, those who prefer to record themselves in a video and upload it to a Youtube channel, are also supported with handouts and assignments via POST

Delivering lecture by e-learning, some subjects' outcome goals are trusted will be achieved, but some are not, depends on the difficulties level of the subjects. This study aims to explore the effectiveness of using the video of the Civil Engineering Study Program with a focus on the Transportation course.

RESEARCH METHOD
1. Respondent

This research is a unique contribution to the mixed methods research approach, an integration of classroom action research method, evaluation questions, and data analysis with software application and paradigm stances as well. This study was conducted with students taking Transportation Engineering courses as the respondents. 56 respondents were involved, they are students of the Civil Engineering Study Program in Mercu Buana Universitas in West Jakarta, Indonesia, of which 31 respondents were students who experienced face-to-face learning methods (before the pandemic) and 25 respondents experienced online learning or multimedia (during the pandemic). 39 respondents were males and 17 females.

From the record of the scores achieved by students, descriptive statistical analysis was carried out to see the level of achievement of each course. Questionnaires were also given to students to assess the benefits of the videos and the level of student approval of the video usage to deliver material on e-learning. The respondents were all students whose class was selected in this study.

2. Data Analysis Method

The data analysis process begins by examining the data obtained from the tabulated questionnaire results and the student test scores. The analysis data process of student test scores in this study used The Independent-Sample t-Test. The Independent-Sample t-Test is used when the mean value of a sample is compared with the mean of another sample, where the two samples are related but not paired, meaning that the data sources come from different subjects.

The Independent t-Test includes Levene's Test to check the equality of variance, and the t-test to check the equality of the mean value. The t-Test to check the mean is the essence of the Independent t-Test which provides answers to the problem question, which is, whether there are differences in the quality of the results of delivering material through face-to-face methods with the online (multimedia) methods.

Levene's Test for an Equality of Variance Test to find out whether the two groups have an equal population variance. The null hypothesis (H_0) and the alternative hypothesis (H_a) for Levene's Test are used as follows:

H_0: $\sigma^2 face\text{-}to\text{-}face = \sigma^2 Multimedia$
H_1: $\sigma^2 face\text{-}to\text{-}face \neq \sigma^2 Multimedia$

If p ≤ 0.05, then H0 is rejected (Levene's test is significant), and it is assumed that the population variance is unequal. If p ≥ 0.05 then H0 is accepted (Levene's test is not significant), and it is assumed that the population variance is equivalent. Furthermore, the conclusion that H_0 is accepted or rejected will be the basis for using the t value in the output table.

Furthermore, it is necessary to know how much influence (effect size) of the two methods of delivery of the lecturing material, to determine the value of the effect, formula 1 was used:

$$d = t\sqrt{\frac{N1+N2}{N1.N2}} \dots\dots\dots\dots\dots(1)$$

Referring to Cohen (1988) in Yockey (2011), the d values of 0.2, 0.5,

and 0.8 refer to small, medium and large influences.

RESULTS AND DISCUSSION

This study resulting the answers or findings about the possibility of outcomes learning goals will be unreached and about student disagreement or discomfort regarding multimedia usage in delivering the course. The test score used for this research is the test score regarding the Operational Analysis of Urban Roads using MKJI 1997 (Manual Kapasitas Jalan Indonesia 1997/ Indonesian Road Capacity Manual which was published in 1997), both students from face-to-face classes (hereinafter referred to as group 1) and students using multimedia (hereinafter referred to as group 2) must both take the exam with the same questions, duration, forms and both have to write the answers by handwriting (not typed).

The lowest score for group 1 is 55 and the highest value is 100, with an average value of 72.39. Meanwhile, in group 2, the lowest score is 35 and the highest score is 100, the average score for group 2 is 75.96. Shown in the graph in figure 1 is the distribution of test scores achieved by students between the two groups.
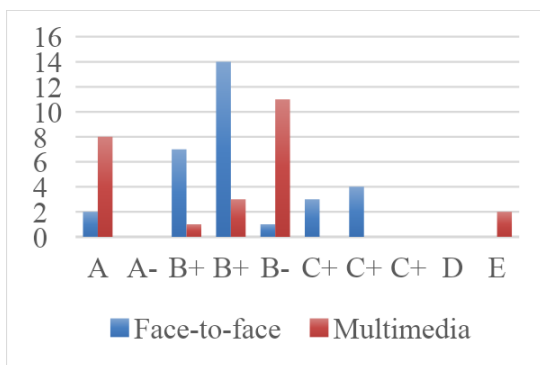

Figure 1. Test Score Distribution of Face-to-Face and Multimedia Teaching

The Influence of Material Delivery Methods on Output Quality

Group Statistics output in table 1 shows descriptive statistics including sample size, mean value, standard deviation, and standard error of each group. It shows that the Face-to-Face group has a lower mean value (mean = 31) than the Multi-Media group (mean = 25).

Table 1. Output Group Statistics

			Group Statistics		
	Metode	N	Mean	Std. Deviation	Std. Error Mean
Nilai	Face-to-Face	31	72.3871	10.41370	1.87036
	Multi Media	25	4298.8400	3075.64681	615.12936

The Independent Samples t-Test output listed in table 2 shows an F value of 238,962 with a p-value (Sig) of 0.000. Because the p-value of 0.000 is less than 0.05, it is assumed that the variance is not equal, so the t value used is the t value of Equal variances not assumed (the bottom of the t-value line).

Then by looking at the t-test for Equality of Means, in the p-value (Sig. (2-tailed) part, it is obtained that the number 0.000 is less than 0.05, so that H_0 which states the means of the two groups are equal, is rejected.

To determine the effect size, the calculation is carried out using formula 1:

$$d = t\sqrt{\frac{N1+N2}{N1.N2}}$$

$$d = -6.871\sqrt{\frac{31+25}{31.25}} = -1.847$$

The d value of -1,847 according to Cohen (1988) is considered a very small effect.

Video Feasibility from Student Perceptions

Conducting an opinion poll about the feasibility of delivering lecturing video was conducted by Al-Jandan et al in 2015 on students at Dammam University, Saudi Arabia which concluded that according to students the use of video in teaching was very useful. It was also done by Vronska (2017) from the University of Latvia in Riga, the Republic of Latvia. This research used the same questions that were asked in the Al-Jandan et al and Vronska's questionnaires.

Table 3 shows how students' opinions in responding to the video given to deliver material on Transportation Engineering lectures, especially for the Operational Analysis material for Urban Roads with MKJI 1997.

Table 2. Output Independent Samples t-Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Nilai	Equal variances assumed	238.962	.000	-7.668	54	.000	-4226.45290	551.17750	-5331.49725	-3121.40856
	Equal variances not assumed			-6.871	24.000	.000	-4226.45290	615.13221	-5496.02214	-2956.88367

Table 3. Percentage of respondents showing the significance of the addition of videos

Question	University of Dammam students (Al-Jandan, et al 2015)		University of Latvia students (Vronska, 2017)		This Research Respondents	
	Agree	Disagree	Agree	Disagree	Agree	sagree
Is the addition of a video useful in the lecture?	95.2	4.8	93.5	6.5	100	0
Are lectures having videos more comprehensible than the ones without them?	92.0	8.0	96.8	3.2	88	12
Are videos clarifying the facts?	95.2	4.8	90.4	9.6	92	8
Are videos helpful to remember the lecture better?	88.7	11.3	90.4	9.6	88	12
Are videos helpful to maintain the interest in the lecture?	85.6	14.4	96.8	3.2	96	4
Are video mediums significant educational tools?	91.0	9.0	83.9	16.1	100	0
Can knowledge gained from the video be applied/ reproduced easily?	92.6	7.4	80.4	9.6	100	0
Are knowledge gained from the video will be retained for a longer period of time compared to lectures without videos?	68.5	31.5	80.7	19.3	100	0

Source: Vronska (2017) and Author's calculation

Based on table 3, student respondents of this research who are Civil Engineering students like the teaching videos given on difficult material, this is likely because they can watch the video repeatedly until they really understand the material and the video can be seen whenever they need it. When compared with students from Latvian University and University of Dammam students, it shows that they also have the same opinion on videos given by lecturers, even though the percentage of student approval from this research respondents is greater than others. The average approval rate for University of Dammam students was 88.6%, University of Latvia students was 89.11% and respondents were 95.5%. The percentage of approval by this research respondents is greater than the percentage of student approval from the other two universities, possibly because this research conducted was carried out during the Covid-19 pandemic so the need for teaching videos is even greater and more important for students.

CONCLUSION

There is a difference between the average test scores for group 1 (a class in which the lecturing material is delivered face-to-face) and group 2 (a class in which the lecturing material is delivered using multimedia/video). Group 1 who received material face-to-face had the quality of the learning output with a standard deviation of -1,847 smaller than the group who received material through multimedia, in this case, the recorded learning video delivered online.

The results of the student perception poll regarding the video given to convey material were considered by respondents to be very important and useful, make it easier for them to apply or imitate the knowledge obtained from the video, can maintain interest in the course, be able to clarify facts and material can be understood better than from the lecturer who did not provide the video.

It is recommended that videos be made with more sophisticated equipment, for example in a recording studio owned by the broadcasting department of the university

and the editing process is done by professionals to produce high-quality videos in appearance terms.

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