Quality of College Virtual Teaching and Learning during COVID-19 Pandemic

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Abstract

This study was conducted to assess the quality of the virtual teaching and learning activities at a college during pandemic COVID-19 as perceived by its students. Specifically, it aimed to describe the types of ICT supporting devices students used, types of the network they used, quality of internet connection they had, and their perceptions on the quality of virtual teaching and learning activities. It also studied the effect of different use of ICT devices and internet connection quality toward virtual learning quality. This was a quantitative study using descriptive and inferential statistical analyses. The data were gathered through an online questionnaire filled by 71 respondents. The results showed that virtual learning would be effective if they used both desktops/laptops and smartphones altogether when doing virtual learning activities. Another result was the better the quality of the internet connection they had; their virtual learning activities were more effective. Based on their perceptions, the virtual teaching and learning activities were well conducted.

Keywords—*learning quality, virtual learning, online learning*

1. INTRODUCTION

COVID-19 pandemic has caused many major changes in global education activities due to the lockdowns applied in many different countries. Teaching and learning activities now are being held fully online to change the traditional model of learning or blended learning where the traditional model is combined with virtual learning. This drastic change has forced all levels of educational institutions to employ the full virtual teaching and learning activities held and done from home.

Following the determination of policy about social and physical distancing in Indonesia, the Minister of National Education released an official instruction to ban all offline teaching and learning activities held in schools and universities. Through a Circular Letter of the Minister of Education Number 36962 / MPK.A / HK / 2020 dated 17 March 2020, the Minister of Education instructed that the face-to-face teaching and learning process at schools and universities be eliminated and replaced with a fully online or virtual teaching/learning model [1]. To respond to this, teachers and lecturers decided to use various kinds of online media to communicate with their students. Some conducted teaching/lectures using common teleconference media such as Zoom, Google Meet, or other similar media and some lecturers used the method of exchanging or sharing text/documents online. Studies showed that the mostly used and effective platforms for these purposes were Google Classroom [2] and WhatsApp, which was followed by lecturers and students' use of an e-learning system provided by their university [3].

Students then were encouraged to respond and take advantage of the information and communication technology (ICT) that their teachers/lecturers used so that the previously interrupted learning process could be continued until the government officially ends this limitation period. This condition then continued even until the release of the new normal policy.

At that time, the schools and universities started the new period of school/study (semester) in July and August 2020 by still consistently implementing the virtual model.

However, various barriers to the implementation of this model of teaching/learning emerged everywhere around Indonesia. Some of these are related to the availability and quality of virtual learning facilities owned and used by students. Other students have problems regarding the ability to provide adequate internet access for learning. For example, not all students own and use necessary devices like smartphones or computers to support this type of learning [4]. Likewise, not all students can regularly buy internet data packages that they can use to access virtual classes every day. Despite this condition, this model has been being put into practice until today.

Specifically, the implementation of full virtual teaching and learning activities in North Sulawesi was started when the first COVID-19 positive case was found on 16 March 2020 in Manado city. A few days later, the local government responded to the situation by banning all kinds of working activities including schools/universities' activities for fourteen days. After this local social restriction period, the government extended the status until the end of April which caused schools and universities to keep implementing the virtual teaching and learning model.

A university in Manado, North Sulawesi Indonesia, responded to the current situation by deciding to carry out all its teaching and learning activities virtually. This policy appeared to have various weaknesses when implemented in terms of the quality of the virtual teaching and learning activities. Previously, a few studies had found out that this practice was not effective. Several of its aspects such as internet access, virtual communication, and lesson understanding were not as effective as when offline learning is conducted [5, 6, 7, 8]. Based on observations and information obtained in/from social media conversations of lecturers and students, broadly speaking, these weaknesses can be grouped into several groups. These were differentiated in categories of weaknesses related to skills in using ICT, the ability to buy internet data packages, and the quality of the learning process.

First, some students were not still familiar with the use of technology for various learning activities. Even though the involvement of technology in learning activities has been carried out for more than a decade, some students are not used to doing activities that involve ICT. This also became one of the disadvantages of virtual learning found when students were anxious during its process due to poor IT skills they had [9]. The higher IT skills students have, the lower their level of worry about having difficulties on virtual learning [10] Second, some students had difficulty purchasing data packages regularly to participate in online learning activities due to their low level of economic ability. In a study, [6] it similarly identified the same problem of which they found that most of the students they studied did not have the supporting financial ability to access the internet during virtual learning. Third, there were complaints of students about the quality of using ICT when an online class process was in progress. For example, studies [11, 12] reported that university students experienced technical challenges like unstable internet connection that was slow or suddenly dropped and disappeared when conducting a video conference. Even worse, a few students did not have the supporting infrastructure like ICT devices and internet network [13]. According to the studies, these things impacted students' online learning effectiveness and became one of the negative aspects virtual learning has.

This research was conducted for descriptive and inferential objectives. Firstly, it aimed to describe the frequency of ICT supporting devices use for virtual classes among students, types of internet access used by students, sources of internet financial support, and the quality of internet access students had. One study [11] found that one of the virtual learning challenges students faced had to do with poor quality of virtual learning. For this reason, it mainly sought to describe the level of quality of virtual teaching and learning model used by lecturers as perceived their students. In addition, another study considered this as a very important variable because the results could give recommendations for virtual learning evaluation [14]. For the inferential objectives, it studied the differences of perception levels among students who used laptops/desktops, smartphones, or laptops/desktops and smartphones about the quality of virtual teaching done by lecturers. Finally, due to certain barriers that involved internet bandwidth and connectivity [15],

this study also sought to infer the correlation between the quality of internet access students had and their perceptions of virtual teaching and learning quality.

2. METHODS

This research was a quantitative and survey study that was conducted at a university in Manado, North Sulawesi from November to December 2020. The subject of this study was 300 students from the school of teacher's training and education who majored in several different majors (English language education, Christian religion education, elementary education, and economics education).

2.1 Sampling Method

Due to the COVID-19 restrictions, it used a convenience sampling method to gather data. There were 71 respondents of 14 males and 57 females who willingly participated in the survey despite all limitations caused by the pandemic. The respondents consisted of 59 English language majors, three Christian religion majors, six elementary education majors, and three economics education majors.

2.2 Data Collection

The data were gathered through administering online questionnaires. These were designed in the format of Google Forms and sent through students' WhatsApp groups. When respondents finished filling in, their responses were automatically saved in a virtual format of Google Sheets. These responses were then downloaded for offline analyses.

2.3 Instrument

The questionnaires consisted of three sections to gather quantitative data in numerical type. The first section gathered data about respondents' demography and availability of ICT supporting devices. The second section gathered data about their perceptions toward virtual teaching quality. Finally, the third section gathered data about their perceptions toward the virtual learning quality.

To prove the construct validity of the second and the third section of the questionnaire, asking about students' perceptions toward the virtual teaching quality and about virtual learning quality, it used the exploratory factor analysis. To conduct this, two principal component analyses (PCA) were primarily done. For the first part consisting of eight items, the testing results of Kaiser-Meyer-Olkin (KMO) was .83, and Bartlett's test of sphericity value was $p = .00$ showing that the sample was significantly adequate for PCA. The oblique rotation showed that the eight items were made up of only one component with all loading factors > .40 (see Table 1).

Table 1 Loading Factors of First Part: Teaching Quality Items

Item No.	Item	Loading Factor
1	Lecturers successfully used all kinds of media necessary for virtual teaching.	.46
2	I can well understand the lessons taught by lecturers virtually.	.74
3	Lecturers used visual aids following the lessons when teaching virtually.	.65
4	Lecturers well responded to the questions that I asked virtually.	.71
5	Lecturers used virtual learning resources that are following the lessons.	.80
6	Lecturers gave appropriate feedback on the assignments I did virtually.	.81
7	Lecturers gave appropriate feedback on the tests I did virtually.	.78
8	Lecturers could virtually assess my learning performance well.	.81

Similarly, the latter which consisted of 10 items also showed a significant value of sampling adequacy (KMO = .77 and Bartlett's test = .00). The second oblique rotation analysis conducted showed that it was made up of two components (see Table 2). Based on the loading factors information in Table 2, the items were grouped into components with items whose loading factors were > .40. The first component was made up of items 2, 7, 8, 9, and 10. On the other hand, the second component was made up of items 1, 3, 4, 5, and 6. Item 5 has similar loading

factors upon the two components, but logically it is more suitable to be placed into the 2nd component, learning media use because its statement corresponds to most item statements in the component.

Table 2 Loading Factors of Second Part: Learning Quality Items

Item No.	Items	Components	
		Learning Activities	Learning Media Use
1	I successfully used all kinds of media necessary for virtual learning.	.33	.44
2	I can understand the lessons taught by lecturers virtually.	.69	.39
3	I was helped by the virtual visual aids used by lecturers.	.53	.69
4	I can ask virtual questions to lecturers effectively.	.23	.77
5	I can effectively use the virtual resources recommended by lecturers.	.68	.68
6	I can effectively use the virtual learning resources I found on the internet.	.26	.73
7	I can effectively do assignments virtually assigned by lecturers.	.78	.40
8	I can virtually submit assignments assigned by lecturers.	.89	.37
9	I can answer virtual class quizzes easily.	.93	.35
10	I can answer virtual class tests easily.	.89	.30

On the other, to estimate the reliability of the two parts of the questionnaire, two different coefficient alpha reliability analyses were conducted. The two of them had relatively high reliability because the Cronbach's α for both was r_{xx} = .87. In other words, the items used in both parts were highly consistent to measure constructs.

2.4 Data Analysis

To analyze data, it used both descriptive and inferential statistics. To analyze the frequency of ICT supporting devices availability among students, types of internet access used by students, sources of internet financial support, it used percentages analyses. To analyze the quality level of internet access students had, it used mean score analysis. The level of quality was determined referring to the following five scales: 4.50 – 5.00 = very good; 3.50 – 4.49 = good; 2.50 – 3.49 = good enough; 1.50 – 2.49 = poor; and 1.00 – 1.49 = very poor. In the same way, it also used the mean score analyses to determine the levels of students' perceptions toward virtual teaching and learning quality. It also used the similar five scales to interpret the levels but were interpreted with different descriptions: 4.50 – 5.00 = very highly effective; 3.50 – 4.49 = highly effective; 2.50 – 3.49 = moderately effective; 1.50 – 2.49 = ineffective; and 1.00 – 1.49 = very ineffective. Special for the inferential analyses, the nonparametric statistics were used due to the nonnormally distributed data this study had. To analyze the correlation between the quality of internet connection and students' perceptions, it used Spearman's correlation coefficient analysis. Finally, to analyze the differences of perception levels among students who used laptops/desktops, smartphones, or laptops/desktops and smartphones about the quality of virtual teaching and learning model used by lecturers, this study used the Kruskal-Wallis test.

3. FINDINGS AND DISCUSSION

Some results were found after the descriptive and inferential statistical analyses were conducted. The findings are described in the findings section, and they are elaborated in the discussion section.

3.1 Findings

3. 1.1 Descriptive Findings

Firstly, the analysis was conducted to describe the frequency of ICT supporting devices availability among students that they used during virtual learning activities. The types of ICT

supporting devices targeted for analysis were smartphones, laptops, or desktops. The results showed that, out of 71 students, 14 students (19.72%) used only smartphones, two students (2.82%) only used laptops/desktops, and 55 students (77.46%) used both smartphones and laptops/desktops.

The second descriptive analysis was conducted upon the types of internet access used by students. These were divided into three types, namely (1) Wi-Fi, (2) data package quota, and (3) both Wi-Fi and data package quota. Out of 71 students, nine students used Wi-Fi to do virtual learning activities and another 44 students used only the data package quota. The rest, the other 18 students, were able to have access to both Wi-Fi and data package quota.

Thirdly, the analysis was done to describe the sources of financial support students employed to have access to the internet. The types of support were categorized into four, namely (1) self-supporting source, (2) university assistance, (3) government assistance, and (4) other sources. Out of 71 students, 40 students were self-supported to access the internet. Another two students claimed that they were assisted by the school (university) to access it. Another 12 students stated that they were assisted by the government. The rest, 17 students, claimed that they were supported by other sources.

Table 3 Types of Financial Support to Access the Internet

No.	Sources of Support	Percentage
1	Self-support	56.34 %
2	University Assistance	2.82 %
3	Government Assistance	16.90 %
4	Other Sources	23.94 %

Fourthly, the descriptive analysis was conducted to describe the level of internet connection quality students had during the virtual learning activities. The levels of quality were differentiated into the following categories: (a) very good, (b) good, (c) enough, (d) poor, and (e) very poor. From all respondents, two students (2.82%) claimed that their internet connection was very good. Another 15 students (21.13%) claimed that it was good, and another 50 students (70.42%) stated that it was good enough. Only four students (5.63%) claimed that their internet connection was poor. Luckily, none claimed to have a very poor internet connection (see Figure 1). Overall, the quality level of the internet connection used by all students fell in the category of good enough (M = 3.21 and SD = .58).

How did students perceive the quality of virtual teaching activities done by lecturers? Responses of students were tabulated in percentages and categorized as follows: strongly agree, agree, slightly agree, disagree, and strongly disagree (see Table 4). Overall, the mean score level of students' perceptions on virtual teaching quality was M = 3.85 and SD = .45.

Table 4 Students' Responses on Virtual Teaching Quality (in %)

Item No.	Item	Strongly Agree	Agree	Slightly Agree	Disagree	Strongly Disagree
1	Lecturers successfully used all kinds of media necessary for virtual teaching.	9.86	76.06	14.08	0	0
2	I can well understand the lessons taught by lecturers virtually.	5.63	46.48	43.66	4.23	0
3	Lecturers used visual aids following the lessons when teaching virtually.	12.68	67.61	16.90	2.82	0
4	Lecturers well responded to the questions that I asked virtually.	18.31	67.61	12.68	1.41	0
5	Lecturers used virtual learning resources that are following the lessons.	14.08	78.87	7.04	0	0

6	Lecturers gave appropriate feedback on the assignments I did virtually.	12.68	69.01	16.90	1.42	0
7	Lecturers gave appropriate feedback on the tests I did virtually.	9.86	70.42	14.08	5.63	0
8	Lecturers could virtually assess my learning performance well.	8.45	50.70	29.58	9.86	1.41

How did students perceive the quality of virtual learning activities done by themselves? Similarly, the responses of students were tabulated in percentages and categorized as follows: strongly agree, agree, slightly agree, disagree, and strongly disagree (see Table 5). Overall, the mean score level of students' perceptions on virtual learning quality was M = 3.69 and SD = .49.

Table 5 Students' Responses on Virtual Learning Quality (in %)

Item No.	Item	Strongly Agree	Agree	Slightly Agree	Disagree	Strongly Disagree
	Learning Activities:					
2	I can understand the lessons taught by lecturers virtually.	5.63	43.66	42.25	5.63	2.82
7	I can effectively do assignments virtually assigned by lecturers.	9.86	63.38	22.54	2.82	1.41
8	I can virtually submit assignments assigned by lecturers.	12.68	43.66	36.62	2.82	4.23
9	I can answer virtual class quizzes easily.	8.45	43.66	42.25	2.82	2.82
10	I can answer virtual class tests easily.	9.86	39.44	46.48	1.41	2.82
	Learning Media Use:					
1	I successfully used all kinds of media necessary for virtual learning.	11.27	54.93	28.17	5.63	0
3	I was helped by the virtual visual aids used by lecturers.	9.86	67.61	21.13	1.41	0
4	I can ask virtual questions to lecturers effectively.	8.45	57.75	30.99	2.82	0
5	I can effectively use the virtual resources recommended by lecturers.	11.27	64.79	22.54	1.41	0
6	I can effectively use the virtual learning resources I found on the internet.	8.45	73.24	18.31	0	0

3.1.2 Inferential Findings

Before analyzing the data using inferential statistics, a normality test was conducted on the variables. Three variables that were analyzed were (1) the quality of internet connection, students' perception toward virtual teaching quality, and (3) students' perception toward virtual learning quality. The normality test results of Kolmogorov-Smirnov showed that the three variables were not normally distributed due to the *p*-values of all variables < .05 (see Table 6). Consequently, the analyses conducted on the following problems were done using nonparametric statistics.

Table 6 Normality Test

No.	Variable	*D*	*Df*	*p*
1	Quality of Internet Connection	.402	71	.000
2	Students' perception toward virtual teaching quality	.175	71	.000
3	Students' perception toward virtual learning quality	.123	71	.009

Did students from different groups of ICT device types differently perceive the quality of virtual teaching/learning? To determine the differences, a Kruskal-Wallis analysis was conducted. The first results showed that the test statistic for students' perceptions of teaching quality, $H = 1.39$, $df = 2$, and $p = .50$. On the other variable, students' perceptions of learning quality, the test statistic showed $H = 6.35$, $df = 2$, and $p = .04$. To see which variables differed, the descriptive analysis results on the ranks of the three ICT device groups were shown (see Table 7). Table 7 shows how the mean rank scores vary among the groups.

Table 7 Differences in Perceptions of Quality in Terms of the ICT Devices Used

No.	Type (s) of ICT Devices	Perception of Virtual Teaching Quality		Perception of Virtual Learning Quality	
		N	*Mean Rank*	*N*	*Mean Rank*
1	Smartphones	14	30.43	14	25.29
2	Laptops/desktops	2	41.50	2	56.75
3	Smartphones & Laptops/desktops	55	37.22	55	37.97

Did the quality of internet connection students had during the virtual learning activities affect their perceptions of virtual teaching and learning quality? An analysis of Spearman's correlation was conducted, and it showed the following results: the *P*-value of virtual teaching quality was .13; the *P*-value of virtual learning quality was .00, and $r = .40$. Next, a Kruskal-Wallis analysis was also conducted to determine the effect. For students' perceptions on virtual teaching quality, $H = 7.04$, $df = 3$, and $p = .07$. On the other hand, the test statistic of students' perceptions on learning quality, showed $H = 13.49$, $df = 3$, and $p = .00$. To see how the variables differed, the descriptive analysis results on the ranks of the three ICT device groups were shown (see Table 8). Table 8 shows how the mean rank scores vary among the groups.

Table 8 Quality of Internet Connection

No.	Type of Response	Perception of Virtual Teaching Quality		Perception of Virtual Learning Quality	
		N	*Mean Rank*	*N*	*Mean Rank*
1	Very Good	2	70.00	2	69.50
2	Good	15	36.30	15	45.23
3	Good Enough	50	35.53	50	33.63
4	Poor	4	23.75	4	14.25
5	Very Poor	0	0	0	0

3.2 Discussion

Students disproportionally used the three types of supporting devices to do the virtual learning. Findings showed that most students preferred to use both smartphones and laptops/desktops altogether to do it. It seemed they liked to combine the use of both types of devices to gain more effective access to the process of virtual teaching and learning. The second position was occupied by students who preferred to use only smartphones. At this position, students might not have another option of supporting devices. What they could use were only smartphones. Probably, smartphones were the only devices they used for virtual teaching/learning activities. In the third position, some students used only laptops/desktops. Like those who only used smartphones, they probably did not have another choice, or they might not

have another type of device but laptops/desktops. In conclusion, the combination of smartphones and laptops/desktops use was the number one preference among students.

Out of three types of network students used for virtual learning, one type was more commonly used by students compared to the other two types. In fact, most students used the data package quota to access the internet. This fact showed that accessing the internet with an internet data package quota was the most convenient way among students compared to doing it with Wi-Fi. On the second position, it was occupied by students who used both Wi-Fi and data package quota. This showed that they did not have only a single type of access but two. Having more than one type of internet access may allow them to reduce the risks of losing internet connection during all virtual learning activities. If they lost connection on one type, for example, Wi-Fi, they could still use the other to solve the problem. At least, they had a backup when dealing with the situation. The final position was occupied by students who used only Wi-Fi for virtual learning. It clearly showed that the use of Wi-fi to access the internet was not as convenient as the use of data package quota among students. It was inferred that accessing the internet through smartphones was probably popular due to the flexibility of use they offer by which the students could follow the virtual learning activities anywhere their smartphones could be connected to an internet network.

To support students' virtual learning activities, the finding showed that most students financially self-supported themselves to provide internet access. Being self-supported here does not mean that they provided the fund, for example, to buy internet data packages. Probably, they used the money their parents gave as the source of funds to buy the internet data packages. Secondly, a few students claimed that to access the internet they were assisted by the university. These students could be those who made use of the internet access provided by the university around the campus which has been available even before the COVID-19 pandemic started in March 2020. Thirdly, some students claimed that they were funded by the government to access the internet. These students were probably those who received the special fund of the Indonesian government for students. Following the policy released by the government, all students from elementary school students to postgraduate students received some gigabyte access to the internet and multimedia to support all their virtual learning activities [16]. Finally, the other students (the second biggest percentage of students) got funded from other sources. These sources could not be explained in detail because there was no specific information about the detail of the sources.

When following virtual learning activities, the findings showed that the internet connection quality varied among students. Most students claimed that the quality of the connection they had was good enough. This was then followed by a quite big percentage of students who had a good quality of connection. After that, there was a small percentage of students with a poor connection. Similarly, there were only a few students who thought that they had a very good connection. Finally, none of them claimed that they had a very poor connection. It was quite good news because the success of the virtual teaching and learning process mainly depends on it.

In terms of virtual teaching and learning quality based on students' perspectives, it was found that they perceived both as highly effective. In their perspective, teachers were successful to conduct the virtual teaching activities they followed. In the same way, they thought that they were also successful to do the virtual learning activities conducted by their teachers. These results were contradictory to what was found in a study. It found that the virtual learning conducted for civil engineering students at a public university was perceived as not quite effective by them [17]. The students claimed that they were not able to build their level of lesson material understanding due to the lack of direct involvement in classroom exercises. The quality of the virtual teaching and learning process as perceived by the students could have probably been influenced by two factors. The first factor could be the training taken by all lecturers in June and July 2020 before the start of the new semester in August. In the training, lecturers were trained to use several kinds of media they could use for teachings like Google Classroom, Google Meet, and Microsoft Teams. The other factor that could contribute to it was probably because the students had been studying virtually for three months when this study was conducted. The three-month virtual learning

experiences might have given them a lot of time to practice and exercise their virtual learning skills.

Other findings were related to differences in students' perceptions toward the virtual teaching and learning activities in terms of the different ICT devices they used and the quality of internet connection they had. Findings showed that the different ICT devices students used did not make any difference in their perception of the virtual teaching quality because the *p*-value is higher than .05. However, these made a difference in their perspective of the virtual learning quality. Because this time the *p*-value is less than .05, this means that there are significant differences of perceptions among students on virtual learning quality. From their perspective, the types of ICT devices they used affected the quality of virtual learning activities they were doing. When compared, it seemed that the combined use of laptops/desktops and smartphones was more effective than the single use of smartphones only. Similar findings were seen in how the different quality levels of internet connection affected students' perception toward virtual teaching and learning quality. When compared, the different levels of internet connection did not significantly affect the quality of the virtual teaching activities due to the *p*-value that was higher than α (.05). On the other hand, there was a significant positive correlation between the internet connection quality and virtual learning quality, or the different levels of internet connection quality affected the quality of the virtual learning activities due to the p-value which was less than α (.05).

4. CONCLUSION

To conclude, a few inferences were made based on the results. First, in students' perception, the virtual teaching and learning activities during the working from home period were well conducted. Second, their virtual learning would be effective if they used both desktops/laptops and smartphones altogether when doing virtual learning activities. Third, the better the quality of the internet connection they had, the more effective their virtual learning activities were. Because of these reasons, this study recommends students make use of both laptops and smartphones when doing virtual learning activities to reach maximum quality. Finally, the other one is that those with poor internet connection are recommended to find better internet access during the virtual class process or when doing virtual learning activities to gain more quality.

5. FUTURE WORKS

Due to several delimitations that this research had; a few recommendations were given to any related future research to study variables that were not investigated in this study. Related future research could study how lecturers perceived the quality of and/or their satisfaction with virtual teaching and learning activities. Second, they could also study how college students perceive the quality and satisfaction of virtual teaching and learning compared to blended learning or full traditional learning or how virtual teaching and learning impact their social lives. Finally, they could also study how virtual teaching and learning activities impact students' academic achievement or outcome. The future results of such studies are expected to fill in the gaps of results found in this study.

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