

Analysis of Factors Affecting Industrial Engineering Students' Learning Interest in the Online Lecture System

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ABSTRACT

The COVID-19 pandemic has forced universities, lecturers, and students to suddenly migrate from face-to-face learning to online learning. In early 2020 these three components must adapt to the situation, but after 2 semesters of adaptation had taken place, the factors that influenced students in attending online lectures are the factor of lecturers and students' adaptability to the software used, the factor of phone signal in the area where the students live, and the factor of limited funds for data. These factors will affect the students' comfort factor and shape their interest in the online learning system. This research used a sample of Industrial Engineering students to produce the factors that influence learning interest in the online system. From the descriptive data analysis, it reveals that students perceive lecturer adaptation to online learning as quite good, the quality of the network as tolerable, although there are areas where the internet signal is considered weak. The students' experience of online lectures is a little less satisfactory. The highest scores of students' expectations for future teaching system are: 48% for a 50% online and 50% offline system, 75% for a pure offline system, and 25.6% for a 25% online system. The relationship between students' perceptions of the adaptability of lecturers, internet quality and their experiences of online lectures affect the student's comfort in online lectures in the form of a linear regression.

Keywords Online lecture, Students' interest

Paper type Research paper

INTRODUCTION

Online learning was introduced by DIKTI in 2019 via SPADA software at many universities in Indonesia. The use of the software was difficult for many lecturers as the intended users, even though they had been given incentives to use it, but since there were no other factors that might encourage or even enforce the use of the software, the implementation proceeded too slowly. However, the unexpected emergence of the COVID-19 Pandemic in early March 2020 necessitated close contact constraints in the teaching and learning processes on campuses as a precautionary measure against the spread of the virus. This measure was enforced by BNPB (National Board for Disaster Management), and supported by the Ministry of Education and Culture decree No. 36962/MPK.A/HK/2020 which determined that the learning system be carried out online and lecturers to work from their homes. This change in the procedures for the learning process was very sudden, but formal legal provisions and the threat of a deadly virus had forced university officials, lecturers, and students to adapt quickly. The adaptation process was thankfully made rather easier by a number of easy-to-use online learning applications such as WhatsApp groups, Zoom, Google Meet, Microsoft Team, and many more. Lecturers were forced to adapt to technology and adjust the way they deliver the learning materials. Likewise, students must adapt to the technology and the limitations of that technology in their places of residence. The stress level of students at the beginning of the adaptation process reached 38.5 percent in moderate stress. During the online learning process, 32.8% of students were reported to experience mild stress, and the rest experienced severe stress in adjusting to the online learning process, which caused various student decisions about their studies [1]. However, with the passage of time, adjustments made by lecturers and students in the odd semester of 2020-2021 began to run more smoothly despite various obstacles.

The success of online learning was obviously influenced by several factors such as lecturers' adaptation to new technology, students' problems, and means of interaction. For online lectures, the factors involved were network availability and costs, which are strongly related to the economic effect on the students' families in making allocations for telephone credit. Lecturers are quite adaptive to adjust to online learning, and in fact at the beginning many used the already existing WhatsApp groups compared to other applications [2]. At the initial stages of online learning, lecturers and students faced a lot of technical problems in using the face-to-face online software that 44.4% of students doubted that online learning could provide a solution to their learning problems. After one semester, it was reported that 37.1% of students actually felt helped by the online system in understanding the courses they took [3]. Network constraints in areas with weak signals remained an obstacle in online learning through frequent disconnections, which affected the effectiveness of delivering learning materials [4]. On the other hand, students whose family economy had been disrupted due to the Pandemic, in the form of layoffs, salary reductions, business closures, and decreased turnover, were often unable

to afford the internet credit required to participate in their online classes. It became worse for some students that they were forced to terminate or suspend their studies [5].

This research was conducted on students of the Industrial Engineering Study Program at W University in Malang, especially on those from the economic segment of lower-middle families who are most affected by the COVID pandemic. The purpose of this study is to determine students' perceptions of lecturer adaptation, of network constraints, experiences with online lectures, which will affect the students' comfort in online lectures. The results of the study may be beneficial in the planning of the subsequent semesters' lectures, whether they will still be hampered by the pandemic or be conducted in the new normal post- COVID 19 period. This research is meant to: first, find out how students' perception factors on lecturers' readiness to adapt, the network and students' experience in attending online lectures will affect the comfort of students in attending online lectures. Second, whether students may prefer to have future online lectures in a COVID-free time. Answers to both problems are needed to determine the continuation of online lectures after the COVID pandemic.

LITERATURE REVIEW

United Nations' WHO had declared COVID-19 as a lethal pandemic that spread via human-to-human transmission and so recommended social distancing to prevent crowds of people that might spread the virus. The Indonesian government followed up by quickly formed a BNPB task force to carry out the prevention and handling of the crisis, as well as to disseminate information to the Indonesian people. The Ministry of Education and Culture issued guidelines in the field of education to prevent the spread of the virus, by emphasizing learning process from home. Urgent and necessary demands to conduct online learning process forced lecturers and students to adapt to various technology, such as the already existing WhatsApp groups, the relatively unknown Zoom, Google Meet, Google Class, Microsoft Team, and others. [2].

Learning is the process of acquiring new or different knowledge, behavior, skills or values [6]. Changes due to the pandemic necessitated learning institutions to adapt quickly. Lecturers' adaptation at the initial stages of online learning was quite a lot, starting with the use of technical means of communication with students, adjusting learning methods so that students could adapt more easily, and adjusting learning evaluation methods [7]. It took a lot of time for lecturers and students to adapt to technology and information systems for the learning process to ensure everything would go smoothly [3]. Online lectures reportedly took up about 82% of the study programs' schedules, while the rest of it was adjusted in agreement with students. This flexibility proved to be an advantage of online lectures [2]. The readiness of students to adapt at the beginning of the application of online lectures revealed that actually 60% of them were not ready [8]. Both parties obviously needed more time to adapt to the online learning process. Any impediment in student adaptation will result in them being confused, passive, and less creative which subsequently resulted in increased stress levels at the initial stages of online learning [9]. Students who were dissatisfied with online learning is reported to reach 78.5% in the thermodynamics courses [10]. Adaptation and involvement of lecturers in the online learning process had a strong influence on students' adjustment to online learning. In another study, engineering students were on average satisfied with the online learning method with an average satisfaction level of 3.7 out of 5 scales. Lecturers were easier to contact and more open to students when using communication media [11]. Student satisfaction in online learning during the pandemic was closely related to the achievement of student learning outcomes [12]. This difference shows that there is a gap that likely be caused by difference in facilities and infrastructures or differences in research periods regarding the outcomes of students and lecturers' adaptation processes.

The technical impediment of poor signal was experienced by 55% of students and lecturers [3]. This hindered students' adaptation in areas with scattered residences, where the signal strength was limited, or where they had limited access to internet data [8]. Obstacles in online learning experiences mostly included limitations in facilities such as limited cell phone capabilities, data packages, weak service signal, and limited Wi-Fi infrastructure. Weak internet signal and the relatively high cost of data were also a challenge for lecturers [13]. Complete and adequate facilities and infrastructure affected students' motivation to participate in the online process and affected their enjoyment in taking online lectures [14]. In Saudi Arabia, where online infrastructure facilities were well catered for by universities and the economy was relatively better than Indonesia, students reported satisfaction with online learning even during the height of COVID-19 pandemic [15].

The impact on human mobility due to the way the virus spreads has caused work activities to decrease except for those in online businesses. The decline in mobility directly results in a decrease in market demand and productivity. The Indonesian economy has experienced a decline in line with the decline in the world economy. The declining demand for trade between countries has impacted the country's economic growth which in turn impacted the people's economy [16]. The effects of the COVID pandemic were very much felt by people both in urban and rural areas [17]. The economic slowdown also resulted in increased layoffs and unemployment, which in turn resulted in the general economic decline of the community [18]. The economic decline due to the Pandemic in general impacted the income of the parents of students which directly affected the students' study budget, forcing some students to terminate their studies due to limited funds [5]. Funding constraints affected the budget to procure communication devices or hardware that suited the specifications of online learning [5]. The decrease in student budget also affected their budget to purchase data and credit needed to attend online lectures. The lack of student data packages were experienced by 62.1% of students [3].

At the beginning of the pandemic, students' comfort in online lecture process required more adaptation time because learning comfort was still influenced by economic conditions. The sudden process and lack of hardware and software support simultaneously affected student psychology in adapting to online learning process. The speed of adaptation processes varied; at the Industrial Engineering faculty in Tangerang, students were reportedly satisfied with online learning [11]. Their comfort was because extra time in assignment completion in the online learning process helped students to achieve good learning outcomes. The quality of online learning also affected on student learning outcomes [19]. Student satisfaction was also influenced by the quality of the learning services and subsequently affected their academic achievement [17]. The gradual changes in the online learning system had actually been initiated by DIKTI but was still in the process of being utilized by lecturers because these lecturers used a certain software which turned out to be not easy to use. However, the pandemic forced online learning process to be suddenly carried out for those who had been ready and those who had not. The benefits of online lectures might reduce the gap in the quality of higher education with cross-learning between universities [20].

METHOD

The research was conducted at the Industrial Engineering study program at W university with a population of 42 still active students. Sampling was conducted using the Solvin method with a degree of error of 5% and obtained a minimum number of sample of 36 samples. The input sample is 39 samples from the 42 questionnaires distributed.

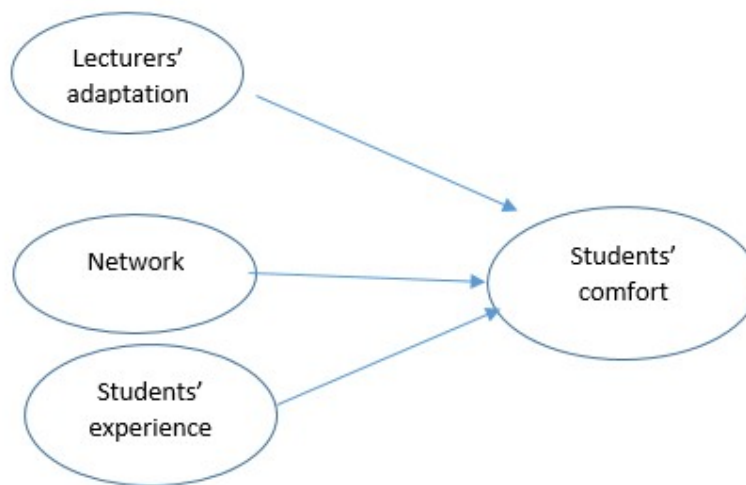


Figure 1 Research Model

The form of the expected linear equation is: $a x_1 + b x_2 + c x_3 + d = y$. Where (Y) is students' comfort in online lectures which is influenced by student perceptions of the adaptability of lecturers to online lecture system (x_1), students' perceptions of network quality, and students' experience of online lectures. The software used is SPSS 15 which tested the heterogeneity of the relationships x_1 , x_2 , x_3 to y , and tested the hypotheses of each relationship between: h1) the effect of lecturers' adaptation variable of student's comfort on students' comfort in online lectures; h2) the effect of students' perception variable of network quality on students' comfort in online lectures; h3) the effect of students' experience variable on students' comfort in online lectures.

The research data analysis method used descriptive method and linear relationship method to analyze the relationships between student adaptation variable, student perception of internet quality variable, and student experience in online lectures variable, on students' comfort in online lectures.

DISCUSSION

From the statistical data processing the following data is obtained:

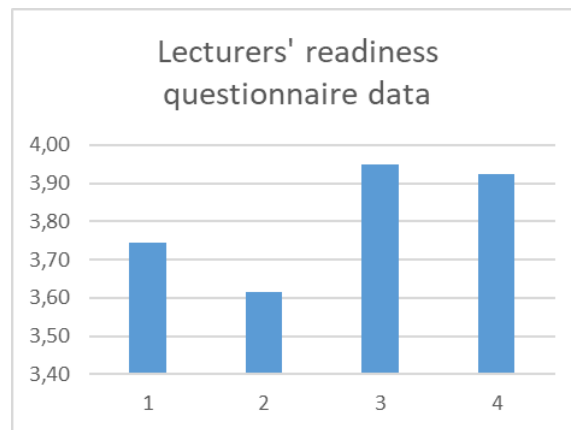


Figure 2 Lecturers' readiness for online lectures

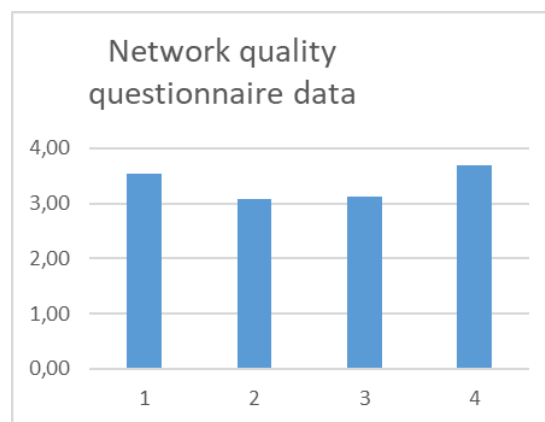


Figure 3 Network quality at students' homes

Figure 1 shows the questionnaire results on lecturers' readiness for online lectures due to the COVID pandemic. The lecturers' attendance during the COVID situation is sufficiently good with an average of 3.74. Whereas the effectiveness of online teaching time is also sufficiently good with an average of 3.62, despite some network disruptions, home noises, network disconnections, and sound volume problems, so that the average time for the effectiveness of online teaching time cannot reach 4. The average readiness of lecturers in online material shows that students are quite satisfied, reaching 3.95. Whereas the ability of lecturers to adapt to online lecture software is also sufficiently good/satisfactory for students with an average of 3.92.

Figure 2 shows that 55% of the Industrial Engineering students live in cities, while 45% live in villages. The network quality from the network quality graph shows that network strength was deemed sufficient. There are 3 respondents who answered that the internet network was bad, 6 respondents answered very good, and the rest answered good and sufficient. About 8% of the home areas still did not have good internet network. Temporary disconnections happened quite often but this was still considered normal by the students. The lecturers' PPT screens were quite clearly visible and visual disruptions were relatively small compared to sound disruptions, with an average of 3.69.

Students' consumption of internet data for college purposes is follows:

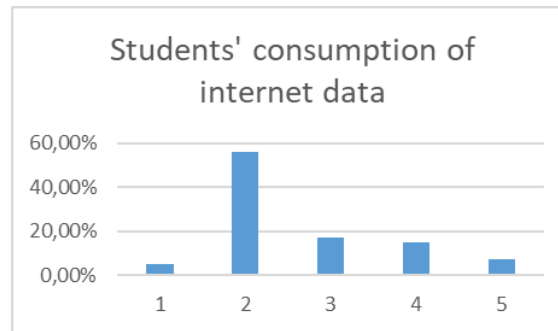


Figure 4 Students' consumption of internet data

The largest expenditure is around 30,000 to 60,000 by 56.1%, while the second largest is consumption of data at 60,000 to 90,000 by 17.07%. More than 90.000 - 120,000 rupiah per month was spent by 14.63% students, and more than 120,000 was spent by 7.32%. So the average data consumption by students for online lectures is 64,500 with 56.1% on an average of 45,000 rupiah. If the government's subsidies for online data for students is 100,000 on average, it will be sufficient, but there will be 7.32% of students who will still unable to afford the data. Students who stated that the most affordable data was still a little expensive for them, reached an average rating of 2.78, close to 3.

Online lectures have benefits such as more flexible, time-saving and cost-saving for transportation, which students clearly felt, as shown in figure 4 below:

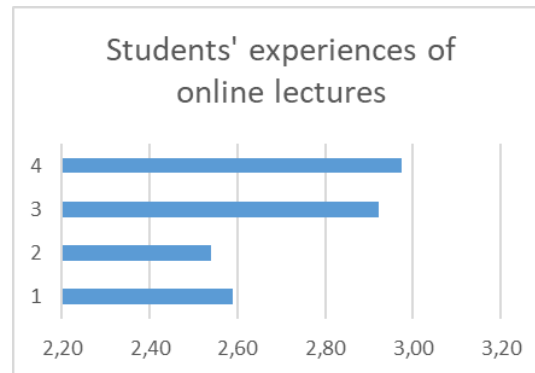


Figure 5 Students' perception of online lectures

After a year, it turns out that students do not feel more comfortable with 100 percent online lectures. Those who stated that they were not happy with 100 percent online lectures achieved an average score of 2.51, below the 'enough' score of 3. However, many students also admitted that online lectures saved costs by 2.95 or quite close to 3. Whereas students who acknowledged saving time by cutting transportation time did not stand out with an average score of 2.98, slightly below 3. Students supplied the following opinions on their experiences with online lectures:

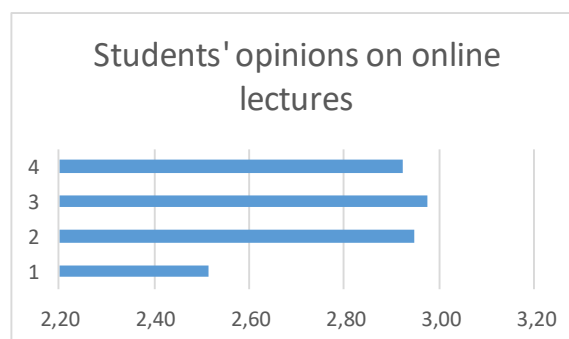


Figure 6 Students' opinions on online lectures

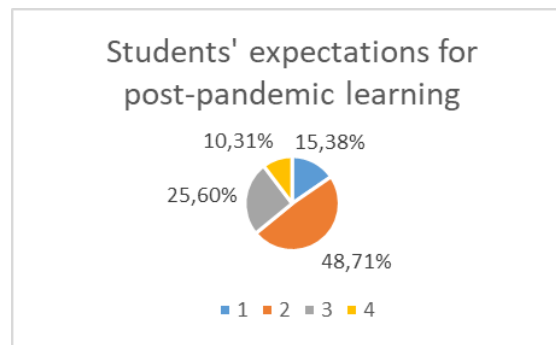


Figure 7 Students' expectations for post-pandemic learning

The first statement that online lectures are more comfortably flexible for students, turns out that many students do not feel comfortable with online lectures. This is revealed by the score 2.52 which is below 3. Indeed, with online lectures, lecturers are more directing students to study independently by giving assignments. This is what made students not comfortable with online lectures. Meanwhile, statement 2 which states that students are happy with online lectures is 2.94, slightly below number 3 as the average indicator, showing slightly more dissatisfaction with online lectures. On the other hand, students who have difficulty with using laptops or smartphones and with internet networks reach 2.96 and 2.92, respectively, meaning that there are slightly more problems in this area than before. Student experiences will influence the statements they submit when questioned about learning methods in post-pandemic period. When given the choices of alternative learning models. Most students (48.71%) prefer lectures with 50% online and 50% offline model, so the combination of offline and online is balanced. The second largest group (25.60%) prefer 75% offline and 25% online model. While those who prefer a full 100 percent online like during the pandemic are only 10.31 percent. On the other hand, those who prefer 100 percent offline (back to the pre-pandemic period) are 15.28% of students. If we take the average score of 60% offline and 40% online, it can cover about 74.31 percent of students' expectations for the post-pandemic teaching system. If the median number is taken, this means that 74.31% of students seem to prefer this composition for future lectures: 60% offline lectures combined with 40% online lectures.

The results of data analysis on SPSS are as follows:

Model Summary ^b										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	,795 ^a	,633	,601	,58653	,633	20,085	3	35	,000	1,994

a. Predictors: (Constant), x3, x2, x1

b. Dependent Variable: Y1

Figure 8 Model Summary

Table 1 Anova Table

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20,729	3	6,910	20,085	,000(a)
	Residual	12,040	35	,344		
	Total	32,769	38			

a. Predictors: (Constant), x3, x2, x1

b. Dependent Variable: Y1

A significant value of 0.000 shows that the relationship between student perceptions of lecturer adaptation (x1), student perceptions of internet network quality (x2), and student experience for a year of studying online (x3), on student comfort in online lectures (Y1), has a linear relationship.

Table 2 Coefficient
Coefficients(a)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Co-linearity Statistics	
	B	Std. Error	Beta	Tolerance	VIF	B	Std. Error
1 (Constant)	-,630	,684		-,921	,363		
x1	,160	,142	,123	1,127	,267	,887	1,128
x2	,310	,177	,189	1,748	,089	,896	1,116
x3	,691	,107	,690	6,484	,000	,927	1,079

a. Dependent Variable: Y1

The coefficient table shows that students' perceptions of lecturer adaptation to online lectures affect 0.16 on student comfort, student perceptions of internet network quality affect 0.31 on student comfort, and student experiences a year of attending online lectures affect 0.691 on comfort. The following equation shows the relationships:
 $0,16 x_1 + 0,31 x_2 + 0,691 x_3 + 20,08 = Y_1$

Hypothesis 1 on the influence of student perceptions of lecturer adaptation to online lectures on student comfort in online lectures is accepted. Students can accept the adaptations made by lecturers with a good level of satisfaction (average 3.92 out of 5 scale). Hypothesis 2 on the influence of student perceptions of the quality of the internet network on student comfort is accepted. Hypothesis 3 on the influence of student experience in online lectures on student comfort is accepted; the factor of student experience in online lectures has the greatest influence on student comfort in online lectures. For post-COVID times, 73.4% of students prefer a combination of 60% offline (regular) lectures with 40% online lectures. Only 12.5% of students prefer to a 100% offline lecture. It appears that online learning experiences have gradually shaped student learning behavior.

CONCLUSION

The relationships between students' perceptions of the ability of lecturers to adapt to the online lecture system, students' perceptions of the quality of the internet network, and students' experience of online lectures affect students' comfort in attending online lectures, both directly and collectively. They affect students' comfort in attending online lectures and in turn influence the students' choice of learning methods in post-pandemic period, in which the most preferred system is a combination of 60% offline and 40% online.

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