Implementation of Kansei Engineering, Kano Model, and TRIZ in Improving the Quality of Fully Online Learning System

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Abstract

A sound learning system must have system components that support such as learning objectives, learning materials/materials, learning media, learning strategies, and the last is learning evaluation. Since the COVID 19 pandemic, there have been changes in implementing the learning method, which was initially carried out face toface, had to change immediately to an online learning system without any prior preparation. Several approaches are used in this study to improve the quality of the fully online learning system, namely Kansei Engineering, Kano Model, and TRIZ. This research distributes questionnaires and employs approximately 51 Institut Teknologi Sepuluh Nopember students as respondents with the criteria of active status, currently undergoing a minimum of 4 semesters, and students of the Faculty of Technology and Industrial Systems. The questionnaire explores complaints from students and the expectations of those students on the fully online learning system. The information is processed using Kansei Engineering and Kano Model methods. In the final stage of this research, the TRIZ principle is implemented in finding solutions for improving the quality of the fully online learning system. The solution obtained from this research is that lecturers need to make preparations before class starts, lecturers need to record and share recordings with students, lecturers are advised to give assignments to students sufficiently and not be burdensome, change learning evaluations by providing case studies or explaining there is a problem, the staff who vi is responsible for being responsible for the learning system that is carried out regularly, and provides study quotas to help make it easier for them to learn, suggests giving time off during the lecture process, and is advised to provide motivational knowledge about time management.

Keywords
Kansei Engineering, Kano Model, TRIZ, and Full Online Learning System.

1. Introduction
Education is one of the important aspects that must be considered in every country. In order to educate the nation's life, the quality of education needs to be improved as an effort for sustainable development in people's lives. In the past, the learning system in Indonesia applied a face-to-face system with the lecture method (the teacher always give and explain the material to the students). In Indonesia, there are many favorite universities like UI, ITB, IPB, ITS, UB, and etc. ITS (Sepuluh Nopember Institute of Technology) is one of the favorite universities with a large number of applicants and this university is located in the Sukolilo area, Surabaya, East Java. In 2019, ITS was ranked the 4th best Universities in Indonesia and at the international level, ITS was ranked the 3rd best Universities in Indonesia for Times Higher Education (THE) World University Ranking in 2019 and 2020. ITS has 7 faculties. While in this research choose Faculty of Technology and Industrial Systems to be the object of research which consists of 5 majors (Mechanical Engineering, Chemical Engineering, Physical Engineering, Industrial Engineering, and Materials and Metallurgy Engineering).

A sound learning system must have system components that support such as learning objectives, learning materials, learning media, learning strategies, and learning evaluation. Since the COVID 19 pandemic, learning system has been changed, from face to face to an online learning system without any prior preparation. The changes in the current system will automatically change the learning method that usually used. Several methods are used in this study to improve the quality of the fully online learning system like Kansei Engineering, Kano Model, and TRIZ.

The objective for this observation are : making changes to the learning system for the better, applying the Kansei Engineering and Kano Model methods to improving the learning system, provide the best solution that can be use with TRIZ method, and improve the effectiveness and quality of full online learning.

2. Literature Review

2.1 *Kansei Engineering*

Kansei is consists of two words, namely "Kan" and "Sei" which can be interpreted as a combination of sensitivity or sensitivity (Schütte 2002). Kansei is a word in Japanese that has the meaning of consumers' psychological feelings and images about a new product (Nagamachi 1995). Kansei is defined as customer psychological feeling and image of a new product, and it will lead to creative and innovations when understanding Kansei (Nagamachi 1995). Kansei Engineering is a theory and method that uses engineering to explore the relationship between users' emotional needs and product design features, and also reveals how these relationships are quantitative or semi-quantitative (Qingxing 2015). Kansei Engineering is defined as an ergonomic technology of customer oriented product development, and focuses on user feelings and user needs (Nagamachi 1995). Kansei Engineering helps product designers by explaining the relationship between customer feeling and appropriate design, This can also help consumers to choosing the product that suits with their needs. In the past, the Kansei Engineering application was only focused on product design such as designs for cars, designs for bottles, or designs for cellphones. However, at this time Kansei Engineering has begun to spread into service sector, this is evident from several previous studies that have shown that Kansei Engineering is able to be applied in the services. The application of Kansei Engineering include interior and design of cars (Mazda, Nissan, Mitsubishi), bras (Wacoal), homes, beverages, electronics (VTR, LCD), and services (restaurants, supermarket cashiers). The process of implementing Kansei Engineering is: Determining the domain, *Span of cementic space*, *Span the space of product properties*, *Synthesis.*

2.2 *Kano Model*

The Kano model was developed by Noriaki Kano, a professor from Japan. The Kano model is used to categorize product or service attributes based on how well the product or service can satisfy the customer needs. In this model, Kano distinguishes three types of desired products that can affect customer satisfaction. There are several categories used to determine the Kano model, they are Must Be Requirements, One Dimensional Requirements, Attractive Requirements, Reverse, Indifferent, Questionable. The steps for implementing the Kano Model are:

Step 1: Identify ideas from customer requests and analyze them.

Step 2: Create a Kano questionnaire. In making the questionnaire, one question has 2 parts : functional (positive) and dysfunctional (negative). For the answer, you can use the following five variables : I like it that way, it must be that way, I am neutral, I can live with it that way, I dislike it that way.

Step 3: Process the results of the questionnaire answers using the Tabulation of Surveys and then proceed to process the results using the Kano Evaluation Table.

Step 4: Analyze the results of the process, by positioning each question attribute using the average of the calculation of satisfaction and dissatisfaction.

Step 5: Determining the Kano category for each attribute using Blauth's Formula, namely:

    a. If the number of scores (one dimensional + attractive + must be) > the number of scores (indifferent + reverse + questionable), then the grade obtained is the maximum value of (one dimensional, attractive, must be).

    b. If the number of scores (one dimensional + attractive + must be) < the number of values (indifferent + reverse + questionable), then the grade obtained is the maximum value of (indifferent, reverse, questionable).

    c. If the number of values (one dimensional + attractive + must be) = the number of values (indifferent + reverse + questionable), then the grade obtained is the maximum value among all categories (one dimensional, attractive, must be and indifferent, reverse, questionable)

2.3 TRIZ

TRIZ (Theory of Inventive Problem Solving) is a method derived from the Russian acronym and developed by Genrich Altshuller. According to Rantanen and Domb (2002), TRIZ is a combination of several scientific disciplines, namely science that studies nature (biology, physics, chemistry, etc.), science that studies human life and habits in society (psychology and sociology), and also science that studies artificial objects (design, engineering engineering, root cause, etc.). In general, therefore, TRIZ is a problem-solving method based on logic and data, not intuition, that accelerates the project team's ability to solve problems creatively. So, TRIZ can be used to find

solutions to problems, by completing and filling the existing fun by getting concepts to solve these problems. TRIZ has advantages compared to other methods in solving the most difficult types of problems and the cause and direction of the search are unknown. (Zhang et al. 2003, Hsu et al. 2013, Wang et al. 2017). There are 4 stages in TRIZ, namely: *Innovation situation questionnaire*, *Situation model*, *Directions for innovation*, *Inventive principles*

3. Methods

3.1 Data collection

The data collection stage is the initial stage before the analysis is carried out in a study. The data needed at this stage include the complaints by students about the online learning system, and what are the suggestions from students about the online learning system. Data collection was carried out by distributing questionnaires to students who experienced online learning during the 2020/2021 lecture period. The respondent requirements are they must be active students of the Sepuluh Nopember Institute of Technology, they have background in the Faculty of Technology and Industrial Systems, and are currently taking semester 4 or more.

3.2 Identify Kansei Word

This stage uses the data that has been collected in the previous stage. The next step is to make the results of the questionnaire as the basis for making kansei words, usually the kansei word only consists of one word that is easy to understand and can represent the feelings / emotions of the respondents who categorize the kansei word, and the recapitulation of the kansei word. By using the Kansei Engineering method, the author will get the attributes that affect customer feelings.

3.3 Identify Attribute

At this stage, identification of service attributes will be carried out through the distribution of Kansei questionnaires. This questionnaire was distributed to the students of the Sepuluh Nopember Institute of Technology. Through this questionnaire, researchers can find out the attributes that will later affect the quality of the full online learning system.

3.4 Validity and Reliability Test

Next is the stage of testing the validity and reliability of the questionnaires that have been distributed to students. Validation test is used to show the extent to which the measuring instrument used in a study is used to measure whether or not a questionnaire is valid. This validation and reliability test was performed using Microsoft Excel. The questionnaire is said to be valid if R count > R table and is said to be reliable if Cronbach's alpha value is > 0.6.

3.5 Final Questionnaire Distribution

At this stage, the questionnaire was distributed again to students who experienced this online lecture. The scale used in this questionnaire is the linkert scale because behavior is a qualitative variable. The Linkert scale is the most commonly used measurement technique in marketing research, where a score of one means strongly disagree, and a score of five means strongly agree.

3.6 Processing *Kano Model Method*

The next stage is data processing using the Kano Model method. This stage is the application of the Kano Model in which each attribute is determined by the category of the Kano, based on the KANO grouping which includes Must-Be, Attractive, Indifferent, Reverse, and Questionable. The next step is to recapitulate the results of the questionnaire according to the category. And the next step is to determine the category based on the number of respondents.

3.7 Grouping the Importance of Each Attribute

After knowing the category of each existing attribute, the next step is to choose which attributes should be grouped for further improvement. For attributes that have Must-Be, One-Dimensional, and Attractive categories, they must be selected to find joint improvement solutions in the next stage. As for the attributes that have the Indifferent category, it is not necessary to choose because the presence or absence of these attributes will not affect customer satisfaction.

3.8 Repair Solution with TRIZ Method

At this stage, finding the best solution using the TRIZ method. Of the several attributes selected in the previous stage, the thing that must be done is to determine the best solution. To determine the best solution for these attributes, it must be done based on 39 TRIZ parameters and use one of the 40 TRIZ principles to be able to find out the best solution that must be given to each selected attribute.

4. Data Collection

ITS has 7 faculties consisting of many major, and because the number of departments is too many and too broad in scope, the researchers only focus on the Faculty of Technology and Industrial Systems which consists of 5 departments: Department of Engineering and Industrial Systems, Department of Engineering Chemistry, Department of Mechanical Engineering, Department of Physics Engineering, and Department of Materials and Metallurgy Engineering.

This research was conducted during the pandemic COVID 19 where the entire lecture system was closed, the researchers collected data with questionnaires by sending a google form link containing questions that must be answered by active ITS students. The distribution of this questionnaire is carried out via WhatsApp groups, private chats, and Instagram. This is to make the researcher easier to get data without to meet with respondents. Data collection has been carried out with the results of filling out questionnaires of 51 students with the following conditions:

1. The student was declared an active student of the Sepuluh Nopember Institute of Technology.
2. The student is from the Faculty of Technology and Industrial Systems (Department of Industrial Engineering and Systems, Department of Chemical Engineering, Department of Mechanical Engineering, Department of Physics Engineering, and Department of Materials and Metallurgy Engineering).
3. The student is in semester 4 or above.

Of the 51 students who have filled out the questionnaire by answering several questions in the google form link, and the data is obtained containing any complaints felt by students both about study time, teaching lecturers, learning systems, study materials, tools and equipment learning support, and etc. Then from all these complaints, researchers will get important points that can be managed at the data processing stage. When checking the results of the questionnaire answers found many of the same answers, the researchers summarized them. After being summarized, 36 complaints were obtained from students who had passed the full online learning system during this pandemic. These complaints are as follows:

Table 1. Kansei questionnaire recapitulation

No.	Customer Complain	No.	Customer Complain
1.	Online lectures are more efficient	19.	It's nice to be able to meet family at any time
2.	Lecturer explanations are difficult to understand	20.	Online lectures cause tired eyes and sleepiness
3.	Online lectures are more practical	21.	Less experience during college because it is done online
4.	It doesn't take long to attend classes	22.	Lecturers who only focus on providing materials and assignments without explaining
5.	Easy to shift focus	23.	Lecturers who are not ready to start class
6.	Online lectures help individuals to develop more	24.	Unclear job description
7.	It's easier to connect with friends even though it's far away	25.	The assignments given are not adjusted to the current situation (online)
8.	Online lectures are more difficult and troublesome	26.	The tasks given are irregular and excessive
9.	Online lectures are more tiring	27.	The assignments given are not adjusted to the number of group members
10.	Lecturers who are less than optimal in delivering material	28.	Online lectures cause backpain
11.	The workload that you get is more	29.	Online lectures drain the mind

Table 1. Kansei questionnaire recapitulation (cont.)

No.	Customer Complain	No.	Customer Complain
12.	Deadlines and the number of assignments given are not comparable	30.	The mental condition of students is not good because they only focus on laptops everyday
13.	Unstable internet when conducting online lectures	31.	Online lectures are stressful
14.	Lecture system that often error	32.	Online lectures make it easier to get emotional
15.	Lack of interaction between lecturers and students	33.	The number of quotas needed for online lectures is a lot
16.	Cannot do research or practicum directly	34.	Cheating committed during exams (final evaluation)
17.	Anxiety levels are increasing	35.	Difficulty coordinating with lecturers
18.	Online lectures are more boring	36.	It's difficult to discuss when there is a group assignment

From the complaints contained in Table 1, later will help researchers in doing the next step is recapitulation of kansei word. Kansei word is a word used to represent the feelings felt by students so that it is easier to understand and manage.

5. Results and Discussion
5.1 Kansei Word Identification
After recapitulating the results of the questionnaire in table 1, the next step is to change the attributes obtained from the questionnaire into Kansei Word form. Then obtained as many as 36 complaints felt by the students in Table 2 below:

Table 2. Recapitulation of kansei word

No.	Attribute	Kansei Word
1.	Online lectures are more efficient	Efficient
3.	Online lectures are more practical	
4.	It doesn't take long to attend classes	
6.	Online lectures help individuals to develop more	
7.	It's easier to connect with friends even though it's far away	
19.	It's nice to be able to meet family at any time	
2.	Lecturer explanations that are difficult to understand	Lack of preparation
10.	Lecturers who are less than optimal in delivering material	
22.	Lecturers who only focus on providing materials and assignments without explaining	
23.	Lecturers who are not ready to start class	
24.	Unclear job description	
5.	Easy to shift focus	Bored
15.	Lack of interaction between lecturers and students	
18.	Online lectures are more boring	
8.	Online lectures are more difficult and troublesome	Weight
9.	Online lectures are more tiring	
11.	The workload that you get is more	
12.	Deadlines and the number of assignments given are not comparable	

Table 2. Recapitulation of kansei word (cont.)

No.	Attribute	Kansei Word
16.	Cannot do research or practicum directly	Weight
21.	Less experience during college because it is done online	
25.	The assignments given are not adjusted to the current situation (online)	
26.	The tasks given are irregular and excessive	
27.	The assignments given are not adjusted to the number of group members	
31.	Online lectures are stressful	Weight
32.	Online lectures make it easier to get emotional	
35.	Difficulty coordinating with lecturers	
36.	It's difficult to discuss when there is a group assignment	
13	Unstable internet when conducting online lectures	Loss
14	Lecture system that often error	
33	The number of quotas needed for online lectures is a lot	
34	Cheating committed during exams (final evaluation)	
17	Anxiety levels are increasing	Sick
20	Online lectures cause tired eyes and sleepiness	
28	Online lectures cause backpain	
29	Online lectures drain the mind	
30	The mental condition of students is not good because they only focus on laptops everyday	

5.2 Attribute Identification

At this stage, this is done by adjusting existing complaints to the current state of the full online learning system. The attributes of the questionnaire that are formed can be seen in table 3 as follows:

Table 3. Questionnaire attributes

Attribute	Kansei Word	Attribute	Attribute Notation
Online lectures are more efficient	Efficient	Online lectures are more profitable in terms of time and place	1
Online lectures are more practical			
It doesn't take long to attend classes			
Online lectures help individuals to develop more			
It's easier to connect with friends even though it's far away			
It's nice to be able to meet family at any time			
Lecturer explanations that are difficult to understand	Lack of preparation	Lecturers prepare for online lectures, a few days before class starts kelas	2
Lecturers who are less than optimal in delivering material			

Table 3. Questionnaire attributes (cont.)

Attribute	Kansei Word	Attribute	Attribute Notation
Lecturers who only focus on providing materials and assignments without explaining	Lack of preparation	Lecturers prepare for online lectures, a few days before class starts kelas	2
Lecturers who are not ready to start class			
Unclear job description			
Easy to shift focus	Bored	The learning system for online lectures is more varied	3
Lack of interaction between lecturers and students			
Online lectures are more boring			
Online lectures are more difficult and troublesome	Weight	Assignments must be adapted to the student's abilities	4
Online lectures are more tiring			
The workload that you get is more			
Deadlines and the number of assignments given are not comparable			
Cannot do research or practicum directly			
Less experience during college because it is done online		Tasks are not burdensome	5
The assignments given are not adjusted to the current situation (online)			
The tasks given are irregular and excessive			
The assignments given are not adjusted to the number of group members		Assignments do not only focus on completion, but focus on students' understanding of the material.	6
Online lectures are stressful			
Online lectures make it easier to get emotional			
Difficulty coordinating with lecturers			
It's difficult to discuss when there is a group assignment			
Unstable internet when conducting online lectures	Loss	Intense repair and maintenance of the lecture system	7
Lecture system that often error			
The number of quotas needed for online lectures is a lot		Balanced distribution of quotas for all students without exception	8
Cheating committed when exam (final evaluation)			
Anxiety levels are increasing	Sick	Given a break during class hours	9
Online lectures cause tired eyes and sleepiness			
Online lectures cause backpain			
Online lectures drain the mind		Good knowledge of time management	10

5.3 Validity and Reliability Test

From the attributes that have been found, the next step is to test the questionnaire to find out whether the answers are valid and reliable to be able to proceed to the next stage. The following are the results of the validation and rehabilitation tests:

Table 4. Calculation of validity test

ATTRIBUTE Number-	R COUNT	R TABLE	INFORMATION
1	0.605336	0.279	Valid
2	0.677867	0.279	Valid
3	0.507921	0.279	Valid
4	0.495701	0.279	Valid
5	0.372851	0.279	Valid
6	0.5964	0.279	Valid
7	0.57651	0.279	Valid
8	0.458767	0.279	Valid
9	0.37375	0.279	Valid
10	0.432603	0.279	Valid

Table 5. Calculation of Reliability Test

	Odd	Even
Odd	1	
Even	0.996758	1

Based on table 4 above, all existing attributes are declared "Valid" because the result of the calculated R value for each attribute is worth > the R table value. These results indicate that the questionnaires that have been distributed are valid or valid. Based on table 5 above, it can be seen that the value is 0.99758, which means that the questionnaire is reliable.

5.4 Processing *Kano Model* Method

This method is carried out based on the importance of functional attributes with dysfunctional attributes. This is done with the aim of knowing the response and impact of service users if the service is provided or not provided. The questionnaire was distributed again in applying this method, and 47 students were found to be respondents. The following are the results of the recapitulation of the Kano Model questionnaire which are shown in table 6:

Table 6. Results of the recapitulation of the kano model questionnaire method

No	Attribute	A	M	O	I	R	Q	Total	Category
1	P1	11	15	8	13	0	0	47	M
2	P2	11	5	0	31	0	0	47	I
3	P3	0	4	0	43	0	0	47	I
4	P4	8	18	6	15	0	0	47	M
5	P5	6	2	0	39	0	0	47	I
6	P6	0	35	1	11	0	0	47	M
7	P7	14	11	17	5	0	0	47	O
8	P8	18	8	5	16	0	0	47	A
9	P9	6	19	13	9	0	0	47	M
10	P10	4	17	4	22	0	0	47	M

Then the priority attributes are those that have an influence on customer satisfaction and fall into the Must-Be, One-Dimensional, and Attractive categories. And the next step is to calculate the Better – Worse value. Here are the results of the Better – Worse value calculation for the Kano Model method:

Table 7. Calculation results for better – worse

Attribute	Attribute Notation	Category	*Better*	*Worse*
Online lectures are more profitable in terms of time and place	P1	M	0.404	-0.489
Assignments must be adapted to the student's abilities	P4	M	0.298	-0.511
Assignments do not only focus on completion, but focus on students' understanding of the material.	P6	M	0.021	-0.766
Intense repair and maintenance of the lecture system	P7	O	0.660	-0.596
Balanced distribution of quotas for all students without exception	P8	A	0.489	-0.277
Given a break during class hours	P9	M	0.404	-0.681
Good knowledge of time management	P10	M	0.170	-0.447

Based on table 7 the results of the calculation of the Better – Worse value, it is known for attribute P2 that customer satisfaction will increase by 29.8% if attribute 2 is improved and customer satisfaction will decrease by 51.1% if attribute 2 is not given.

5.5 Repair Solution with TRIZ Method

Proposed improvements are made using the TRIZ method. Because in the previous stage, the proposed service quality improvement solution was obtained that matched attribute 1, 4, 6, 7, 8, 9, 10, and the principles are principle number 3 (Local Quality), principle number 12 (Equipotentiality), principle number 15 (Dynamics), principle number 8 (Anti Weight), principle number 35 (Parameter Changes), principle number 19 (Periodic Action), and principle number 9 (Preliminary Anti-Action). The following are the TRIZ principles that are proposed for improvement solutions, including:

a) Principle number 3 (Local Quality)

So this principle supports and strengthens the initial solution, by means of the lecturer making initial preparations before the class starts to find out if there is indeed a problem with the learning media that will be used, and to minimize student misunderstanding related to the learning material that has been delivered, it is necessary to record during the lecture. and distribute it to students, so that when students forget or do not understand, they can repeat the learning material anytime and anywhere so that it is more efficient.

b) Principle number 12 (Equipotentiality)

So this principle supports and strengthens the initial solution, lecturers are not advised to give assignments at every lecture meeting, this is because it will make students feel burdened and overwhelmed to complete them. Because students do not only take one course but more, it can burden students and if students cannot complete it, it will have an impact on their grades and mental health.

c) Principle number 15 (Dynamics)

So this principle supports and strengthens the initial solution, to increase students' understanding of the learning material presented, so lecturers are expected to give assignments in the form of case studies which are then analyzed to evaluate the level of understanding of students. And students also should not underestimate the tasks given by the lecturers, and if it is felt that they do not understand the material that day, they are also expected to directly contact the lecturer and ask for material that is not understood.

d) Principle number 8 (Anti Weight)

So this principle supports and strengthens the initial solution, to support a smooth and successful learning system, it is necessary to carry out periodic repairs and maintenance in order to minimize the occurrence of errors or errors in the use of learning media.

e) Principle number 35 (Parameter Changes)

So this principle supports and strengthens the initial solution, changing internet quotas into special internet quotas for learning so that there is no misuse of quotas by irresponsible students, this can also support the course of the learning system because there is no reason for the problem of internet quotas anymore for students who feel object to setting up internet quota while attending online lectures.

f) Principle number 9 (Periodic Action)

So this principle supports and strengthens the initial solution, because many students complain of experiencing tired eyes, sleepiness, or even back pain due to taking online lectures, the best solution is during lecture hours the lecturer is expected to use a stopwatch to control his lecture time by giving rest time. 10 minutes per credit (50 minutes) of lecture hours so that students can take a break, or even stretch their waist for a while. Not only that, students should also prepare drinks and snacks beside them when doing lectures and exercise regularly 2-3 times a week, this will help to relax their bodies during online lecture hours.

g) Principle number 19 (Preliminary Anti Action)

So this principle supports and strengthens the initial solution, which is to give a break during online lectures by filling it in related to self-motivation that can be remembered or even providing a little knowledge about good time management, making a regular schedule when it's time to study, when it's time to do assignments. , and when the time for personal needs all of that need to be scheduled in order to help students manage their time well

6. Conclusion

Based on the results of the questionnaire distributed to about 51 students, it was found that there were about 36 complaints experienced by students while implementing the online learning system. Therefore it is necessary to make improvements in order to minimize the occurrence of existing complaints and can make the online learning system better. Based on the results of the Kansei Engineering method, 6 kansei words were obtained (efficient, lack of preparation, boredom, weight, loss, and illness). Furthermore, the results of the Kansei word and existing complaints are used to identify the attributes that will be used to support the Kano Model method. The last questionnaire was distributed with a total of 47 students and then the data was processed and using Kano Model to result the category of each attribute. The categories selected are the Must-Be, One-Dimensional, and Attractive. And the attributes selected for improvement are attributes P1, P4, P6, P7, P8, P9, and P10 or the complete list can be seen in table 7. For improvement solutions that can be suggested using the principle of the TRIZ method include lecturers need to make preparations before class starts, lecturers need to record and share recordings with students to increasing students' understanding of the material, lecturers are advised to give assignments for students that is not burdensome, changing the evaluation of learning by providing case studies or in the form of analysis of a problem, staff who are in charge of being responsible for the learning system please carry out regular maintenance, students are given study quotas to help make it easier for them to learn, lecturers are advised to provide rest time for students during the study, and lecturers are advised to provide motivation and knowledge about time management.

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Biography

Ratna Sari Dewi received her B.E. degree in Industrial Engineering and M.Tech. Degree in Industrial and System Engineering from Institut Teknologi Bandung (ITB), Indonesia, in 2003 and 2005, respectively. In 2017, she received her PhD degree in Industrial Management from National Taiwan University of Science and Technology (NTUST), Taipei, Taiwan. Her PhD research was on Human Factors/Ergonomics. She joined the Department of Industrial and Systems Engineering, Institut Teknologi Sepuluh Nopember (ITS), Surabaya, Indonesia in 2008 where she is currently an assistant professor and the Head of Ergonomics and Work System Design Laboratory. Her research interests are Human-Computer Interaction, UI/UX, Visual Ergonomics, Display Design, Work System Design, Occupational Health and System Safety, and Virtual Reality. She is a member of Perhimpunan Ergonomi Indonesia and International Ergonomics Associations.

Dianda Aryntya Firia Ferlania was born in Gresik on February 5, 1997 and currently 24 years old as a postgraduate student in Industrial Engineering, Sepuluh Nopember Institute of Technology. Ferla graduated from State Elementary School 2 Pongangan in 2009, then continued to Junior High School 2 Gresik and graduated in 2012. Ferla continued to High School 1 Manyar and graduated in 2015. From small to high school, Ferla has always been in the Gresik area and never migrated. However, when she started studying to be precise in 2015, Ferla decided to migrate to the Malang area, because she was accepted at the University of Muhammadiyah Malang majoring in Industrial Engineering. Ferla completed her bachelor's degree for 3.5 years and got the 2nd Best Student achievement of the Faculty of Engineering. Then after that, Ferla choose to continue her education to Strata 2 and took a concentration in Ergonomics and Industrial Safety at the Sepuluh Nopember Institute of Technology, Surabaya. And currently Ferla is finishing her thesis under the guidance of Mrs. Ratna Sari Dewi, ST, MT, Ph.D. During her education, Ferla was active in campus organizations and activities so that during her education she had a lot of experience.