



## ANALYSIS OF MENTAL WORKLOAD FINAL YEAR STUDENTS DUE TO ONLINE LEARNING WITH NASA-TLX METHOD

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### Abstract

The covid-19 virus pandemic that is increasingly rampant today has an impact on teaching and learning activities in college lectures. Learning activities that are usually carried out directly in the classroom must adjust the situation and switch to online or online. In this research we will discuss the problem of mental workload felt by final year students when participating in online learning with the NASA-TLX method. The problem in this study is how, how much, and what causes the mental burden experienced by final year students due to online learning. The purpose of this study is to measure and analyze the mental workload factors experienced by final year students in online learning. The results of this study show that the majority of final year students have a high workload. It can be interpreted that final year students feel insecure, hopeless, offended, distracted during the work done in online learning. Therefore in this study we can suggest that it is necessary to reassess this online learning system, for example by not giving too many assignments during online learning, reducing online learning time, or by making interesting learning so that final year students feel safe, satisfied, and comfortable in carrying out online learning.

**Keywords:** Covid-19, Mental Workload, Final Year Students, NASA-TLX

### Introduction

The Covid-19 pandemic that still exists today has brought many changes to the pattern of teaching and learning activities in the academic world, including in lectures. Learning activities that are usually carried out directly in the classroom must adjust the situation and switch to online. As we know, the world of lectures is inseparable from college assignments given by lecturers. Especially with the relatively short processing time given and the time span between one task deadline and another which is quite close together causes students to experience a considerable mental workload. Mental workload is stated by Tarwaka and Sudiajeng (2004), where the performance or work ability of a worker depends on the ratio between the magnitude of work demands and the magnitude of the worker's ability, if the task demands are greater than the ability or capacity of the worker, it can cause overstress, fatigue, work accidents, injuries, pain, illness, and others. And if the task demands are lower than the worker's ability, it can cause understress, boredom, saturation, and others. This comparison is known as Mental Workload. In this study, we will discuss how much mental workload is experienced by final year students in completing lecture assignments given by lecturers.

From research conducted by Febrilliandika and Bayu (2020) with the title "Measurement of Mental Workload of Online Lectures of USU Industrial Engineering Students with the NASA-TLX Method" states that the mental workload of Industrial Engineering Students at the University of North

Sumatra gets a value of 74.79 so that it is included in the moderate category and aspects with the highest average value are in the Temporal Demand (TD) aspect which relates to the amount of time pressure felt during the work element. Another study conducted by Nofri and Try (2017) with the title "Measurement of Mental Load Among Students Using the NASA-TLX Method (Case Study: UNDIP Industrial Engineering Department Students)" states that the average mental workload experienced by students of the Department of Industrial Engineering, Diponegoro University semester 3 and 5 is 80.04 and the dominant aspect felt is Temporal Demand. The high aspect is caused by three things, namely the short time of working on reports and assignments, the existence of practicum with the same implementation time and the habit of delaying work owned by Respondents.

In this study, we find out how much mental workload is experienced by the average final year student in completing coursework. This research also finds out and analyzes the dominant problems felt. By measuring using the NASA-TLX (National Aeronautics and Space Administration Task Load Index) method, it can be seen how much mental workload is felt by final year students. The NASA-TLX method was developed by Sandra G. Hart from NASA Ames Research Center and Lowell E. Staveland from San Jose State University in 1981. This method is used to present the subject's mental workload by considering nine factors which are then simplified into six scales namely Mental Demand (MD), Physical Demand (PD), Temporal Demand (TD), Performance (P), and Frustration Level (FR). (Hidayat et al, 2013).

By knowing the mental workload experienced by final year students in online learning during this pandemic, it is hoped that it can be a consideration in the future, so that the amount of mental workload received can be reduced.

## Method

### *NASA TLX measurement stages*

The steps taken to obtain mental workload are as follows (Hart & Staveland, 1988):

a. Calculating Product

The product is obtained by multiplying the rating by the factor weight for each descriptor. This resulted in 6 product values for 6 indicators (MD, PD, TD, OP, FR, and EF)

$$\text{Product} = \text{Rating} \times \text{Workweight}$$

b. Calculating Weight Workload (WWL)

To get the WWL value can be done by summing up the six values product

$$\text{WWL} = \sum \text{Product}$$

c. Calculating Average WWL

To get the average value of WWL, it can be done by dividing WWL by the total weight.

$$\text{Score} = \frac{\text{WWL}}{15}$$

d. Interpretation of Score Value Results

In the NASA-TLX method, the workload score obtained is divided into five parts, namely:

**Table 1 Workload Score Nasa TLX**

Score	Description
0-20	Very low
21-40	Low
41-60	Medium
61-80	High
81-100	Very high

### Research Stages

The research began with a preliminary study related to the mental workload of students obtained from books, research results, and other sources. Based on the results of observations, problem identification and formulation can then be carried out. The next stage determines the research objectives, namely identifying and describing concepts or explaining and predicting mental workload in final year students due to online learning. After determining the objectives, data collection was conducted. The data used in this study are primary data with the population in this study are all final students who are studying at private universities or public universities on the island of Java with various majors, so the population size is not known with certainty.

This study used a sample of 40 students, who came from Diponegoro University, Politeknik Media Negeri Kreatif, Bandung Institute of Technology, Bogor Agricultural University, Jakarta State University, Yarsi University, As-Syafi'iyah Islamic University, University of Indonesia, Trisakti University, Gadjah Mada University, Sebelas Maret University, Bina Nusantara University, Kasgoro University, ISTN, Sepuluh Nopember Institute of Technology, Petra University, President University, Dian Nuswantoro University, UIN, Telkom University, UHAMKA, University 17 Agustus 1945 Surabaya, Pelita Harapan University with various majors.

The research instrument used in this research is the NASA-TLX questionnaire. The NASA-TLX questionnaire is used to measure the mental workload of workers consisting of Mental Demand, Physical Demand, Temporal Demand, Performance, Effort Level, and Frustration Level. Consists of two filling stages, namely weighting and rating. At the Analysis stage, the factors that influence the amount of mental workload in final year students are determined based on the questionnaires that have been distributed to the sample. Then given the proposed improvements and given conclusions and suggestions for future improvements.

## Result

### Score Calculation NASA TLX

The NASA-TLX method uses 2 measurements, namely weighting and rating to measure the mental workload of Respondents. The following is a description of data collection in the NASA-TLX method:

#### a. Weighting

In the research questionnaire, researchers used multidimensional measurement in the weighting process. Where the multidimensional measurement contains 15 statements with 2 choices of mental workload aspects. Respondents will choose 1 aspect of mental workload that is more dominant than the 2 choices of aspects given.

**Table 2 Multidimensional Measurement Data according to the proposed statement**

Statement to-	Choice	Total
1	MD	20
	EF	20
2	MD	28
	PD	12
3	PD	8
	TD	32
4	PD	19
	EF	21
5	TD	14
	MD	16
6	TD	25
	OP	15

7	TD	18
	FR	22
8	EF	16
	TD	24
9	EF	31
	OP	9
10	MD	33
	OP	7
11	FR	28
	OP	12
12	PD	25
	OP	15
13	FR	18
	MD	22
14	FR	23
	PD	17
15	EF	20
	FR	20

b. Rating

After weighting, in the research questionnaire the researcher used rating for each aspect of mental workload. Where rating is a measurement to determine the level of perceived mental workload. This assessment is given a rating of 1-10. The rating will be multiplied by 10 so that the scale becomes 10-100. Respondents will choose a scale on each aspect of mental workload. This research is subjective because it depends on the workload that is felt by the Respondents.

**Table 3 Indicator**

No	Indicator	Description
1.	<i>Mental Demand</i>	Feeling mentally exhausted due to the need for perceptual activities, such as thinking and remembering.
2.	<i>Physical Demand</i>	Feeling fatigue due to physical exertion that can occur in completing tasks.
3	<i>Temporal Demand</i>	Feeling chased by time in completing tasks due to short deadlines.
4	<i>Performance</i>	Perceived level of satisfaction with the performance provided during the task completion process.
5	<i>Effort</i>	The amount of effort put into the task.
6	<i>Frustration Level</i>	The level of stress felt when doing assignments.

After the recapitulation of weighting and rating, a recapitulation will be made for each Respondent containing weighting and rating according to each aspect of mental workload. In the following table presentation has been included with the WWL value, score, and mental workload grouping category of each Respondent. The following are the results of Respondent data processing with the NASA-TLX method:

**Table 4 Data Processing Results**

Name	Institution	Study Program	Aspect	Weight	Rating	WWL	Score	Description
Respondent 1	Diponegoro University	S1 – Actuarial	MD	4	80	1300	86,66	Very High
			PD	0	40			
			TD	4	100			
			OP	2	80			
			EF	4	90			
FR	1	60						
Respondent 2	Diponegoro University	S1 – Food Technology	MD	4	80	1170	78	High
			PD	0	50			
			TD	2	40			
			OP	1	80			
			EF	5	90			
FR	3	80						
Respondent 3	Politeknik Negeri Media Kreatif	D3 – Broadcast	MD	5	80	1220	81,33	Very High
			PD	1	30			
			TD	2	90			
			OP	0	70			
			EF	3	70			
FR	4	100						
Respondent 4	Bandung Institute of Technology	S1 – Mining Engineering	MD	5	90	1140	76	High
			PD	3	60			
			TD	1	90			
			OP	0	50			
			EF	2	50			
FR	4	80						
Respondent 5	Bogor Institute of Agriculture	D3 – Computer Engineering	MD	2	70	1100	73,33	High
			PD	4	70			
			TD	2	80			
			OP	2	60			
			EF	5	80			
FR	0	70						
Respondent 6	Jakarta State University	S1 – Business Education	MD	3	60	930	62	High
			PD	4	60			
			TD	4	50			
			OP	1	70			
			EF	3	80			
FR	0	40						
Respondent 7	Yarsi University	S1 – Library and Information	MD	4	80	1260	84	Very High
			PD	2	50			
			TD	2	70			
			OP	2	100			
			EF	3	100			
FR	2	100						
Respondent 8	As-Syafi'iyah Islamic University	S1 – English Education	MD	3	80	920	61,34	High
			PD	2	70			
			TD	2	60			
			OP	4	50			
			EF	2	70			
FR	2	40						
Respondent 9	University of Indonesia	S1 – Nutrition	MD	3	90	1400	93,33	Very High
			PD	2	90			
			TD	4	90			
			OP	0	70			
			EF	1	90			
FR	5	100						
Respondent 10	Trisakti University	S1 – Management	MD	3	90	1270	84,66	Very High
			PD	2	30			
			TD	5	100			
			OP	0	30			
			EF	1	80			
FR	4	90						

Respondent 11	Gadjah Mada University	S1 – Chemistry	MD	4	80	1250	83,33	Very High
			PD	1	70			
			TD	5	90			
			OP	1	30			
			EF	3	100			
			FR	1	80			
Respondent 12	Sebelas Maret University	S1 – Psychology	MD	4	80	1240	82,66	Very High
			PD	1	50			
			TD	3	90			
			OP	0	30			
			EF	2	50			
			FR	5	100			
Respondent 13	Bina Nusantara	S1 – International Marketing	MD	0	50	1170	78	High
			PD	3	70			
			TD	3	70			
			OP	4	80			
			EF	4	90			
			FR	1	70			
Respondent 14	Gadjah Mada University	S1 – Biology	MD	3	80	1300	86,66	Very High
			PD	2	70			
			TD	5	100			
			OP	1	60			
			EF	0	50			
			FR	4	90			
Respondent 15	Persada Indonesia Y.A.I University	S1 – Psychology	MD	5	60	980	65,33	Very High
			PD	2	50			
			TD	1	50			
			OP	1	10			
			EF	2	100			
			FR	4	80			
Respondent 16	Kosgoro Institute of Business & Informatics	S1 – Management	MD	2	50	830	55,36	Medium
			PD	3	40			
			TD	3	50			
			OP	1	80			
			EF	2	70			
			FR	4	60			
Respondent 17	National Institute of Science and Technology (ISTN)	S1 – Industrial Engineering	MD	3	70	910	60,67	High
			PD	1	60			
			TD	2	50			
			OP	2	80			
			EF	3	60			
			FR	4	50			
Respondent 18	Kosgoro Institute of Business & Informatics	S1 – Management	MD	2	20	980	65,33	Very High
			PD	3	50			
			TD	1	20			
			OP	4	80			
			EF	5	90			
			FR	0	10			
Respondent 19	Sepuluh Nopember Institute of Technology	S1 – Industrial Engineering	MD	2	60	1210	80,66	Very High
			PD	0	30			
			TD	4	70			
			OP	1	40			
			EF	3	90			
			FR	5	100			
Respondent 20	Diponegoro University	S1 – Computer Engineering	MD	3	80	1150	76,66	High
			PD	0	70			
			TD	2	90			
			OP	2	80			
			EF	3	90			
			FR	5	60			
Respondent 21	Petra University	S1 – Hospitality	MD	3	70	980	65,34	High
			PD	2	60			
			TD	2	50			
			OP	1	40			

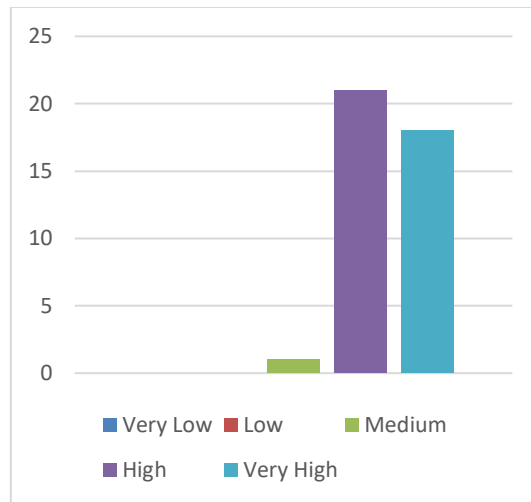
			EF	5	70			
			FR	2	80			
Respondent 22	University of Indonesia	S1 – Japanese Literature	MD	1	80	1310	87,33	Very High
			PD	2	80			
			TD	2	80			
			OP	3	90			
			EF	4	100			
			FR	3	80			
Respondent 23	President University	S1 – Business Administration	MD	3	80	1170	78	High
			PD	4	80			
			TD	1	60			
			OP	3	90			
			EF	2	80			
			FR	2	60			
Respondent 24	Kosgoro Institute of Business & Informatics	S1 – Informatics Engineering	MD	3	100	1350	90	Very High
			PD	4	80			
			TD	4	100			
			OP	1	60			
			EF	0	80			
			FR	3	90			
Respondent 25	Dian Nuswantoro University	S1 – Management	MD	2	70	1330	88,67	Very High
			PD	1	80			
			TD	4	100			
			OP	3	100			
			EF	4	90			
			FR	4	80			
Respondent 26	State Islamic University (UIN)	S1 – Psychology	MD	2	60	1160	77,33	High
			PD	3	70			
			TD	0	40			
			OP	1	60			
			EF	5	90			
			FR	4	80			
Respondent 27	Telkom University	S1 – Industrial Engineering	MD	3	70	1300	86,67	Very High
			PD	2	90			
			TD	4	100			
			OP	0	70			
			EF	1	60			
			FR	5	90			
Respondent 28	Prof. Dr. Hamka Muhammadiyah University (UHAMKA)	S1 – Accounting	MD	2	60	1050	70	High
			PD	3	60			
			TD	4	60			
			OP	0	60			
			EF	1	60			
			FR	5	90			
Respondent 29	Prof. Dr. Hamka Muhammadiyah University (UHAMKA)	S1 – Accounting	MD	2	80	1330	88,67	Very High
			PD	3	80			
			TD	5	100			
			OP	0	70			
			EF	3	90			
			FR	2	80			
Respondent 30	Prof. Dr. Hamka Muhammadiyah University (UHAMKA)	S1 – Accounting	MD	2	70	1180	78,67	High
			PD	3	70			
			TD	4	70			
			OP	1	90			
			EF	3	100			
			FR	2	80			
Respondent 31	Prof. Dr. Hamka Muhammadiyah University (UHAMKA)	S1 – Accounting	MD	5	80	1180	78,67	High
			PD	0	50			
			TD	4	70			
			OP	1	70			
			EF	3	90			
			FR	2	80			
Respondent 32	Prof. Dr. Hamka Muhammadiyah	S1 – Accounting	MD	0	50	1100	73,33	High
			PD	2	60			
			TD	4	70			

	h University (UHAMKA)		OP	1	80			
			EF	3	90			
			FR	5	70			
Respondent 33	Telkom University	S1 – Communicati on Science	MD	5	80	1250	83,33	Very High
			PD	2	80			
			TD	2	90			
			OP	1	70			
			EF	1	40			
			FR	4	100			
Respondent 34	Prof. Dr. Hamka Muhammadiya h University (UHAMKA)	S1 – Accounting	MD	5	80	1200	80	High
			PD	2	70			
			TD	0	60			
			OP	1	80			
			EF	4	70			
			FR	3	100			
Respondent 35	Prof. Dr. Hamka Muhammadiya h University (UHAMKA)	S1 – Accounting	MD	3	60	1100	73,33	Medium
			PD	2	60			
			TD	5	80			
			OP	0	70			
			EF	4	80			
			FR	1	80			
Respondent 36	Prof. Dr. Hamka Muhammadiya h University (UHAMKA)	S1 – Accounting	MD	1	60	1150	76,66	High
			PD	2	60			
			TD	3	70			
			OP	5	80			
			EF	4	90			
			FR	0	70			
Respondent 37	Bina Nusantara University	S1 - Psychology	MD	3	80	1300	86,66	Very High
			PD	1	80			
			TD	3	90			
			OP	0	70			
			EF	3	70			
			FR	5	100			
Respondent 38	University of August 17, 1945 Surabaya	S1 – Public Administratio n	MD	5	80	1130	75,33	High
			PD	4	80			
			TD	3	80			
			OP	1	30			
			EF	2	70			
			FR	0	90			
Respondent 39	University Pelita Harapan	S1 - Nursing	MD	1	30	990	66	High
			PD	1	30			
			TD	3	50			
			OP	4	90			
			EF	4	70			
			FR	2	70			
Respondent 40	National Institute of Science and Technology (ISTN)	S1 – Industrial Engineering	MD	2	100	950	63,33	High
			PD	3	70			
			TD	4	60			
			OP	2	50			
			EF	2	80			
			FR	2	20			

Of the 40 samples recorded, an average of 74.98 was obtained, which is quite high and it can be said that the workload received is high.

Students whose workload falls into the medium category are 1 student, 21 students are high, and 18 students are very high.





**Figure 1 Workload Categories**

## Discussion

The results of the analysis regarding the weighting carried out by providing 15 statements through 2 choices. Judging from the indicator comparison data, it can be explained as follows:

1. The comparison between the Mental Demand (MD) and Effort (EF) scales can be stated as the result, namely the MD and EF scales are balanced with a value of 20. It can be interpreted that Mental Fatigue (MD) and Effort made (EF) are felt to be balanced by the final students carrying out online learning.
2. The comparison between the Mental Demand (MD) and Physical Demand (PD) scales can be stated as a result, namely the MD scale is superior with a value of 28. Meanwhile, the value of the PD scale is 12. So it can be interpreted that Mental Fatigue (MD) is felt by Respondents more than Physical Fatigue (PD) when final students carry out online learning.
3. The comparison between the Physical Demand (PD) and Temporal Demand (TD) scales can be stated as a result, namely the TD scale is superior with a value of 32. Meanwhile, the value of the PD scale is 8. So it can be interpreted that Fatigue caused by Time (TD) is felt by Respondents more than Physical Fatigue (PD) when final students carry out online learning.
4. The comparison between the Physical Demand (PD) and Effort (EF) scales can be stated as a result, namely the EF scale is superior with a value of 21. Meanwhile, the value of the PD scale is 19. So it can be interpreted that the Effort made (EF) is felt by Respondents more than Physical Fatigue (PD) when final students carry out online learning.
5. The comparison between the Temporal Demand (TD) and Mental Demand (MD) scales can be stated as a result, namely the MD scale is superior with a value of 16. Meanwhile, the TD scale value is 14. So it can be interpreted that Mental Fatigue (MD) is felt by Respondents more than Fatigue caused by Time (TD) when final students carry out online learning.
6. The comparison between the Temporal Demand (TD) and Own Performance (OP) scales can be stated as a result, namely the TD scale is superior with a value of 25. Meanwhile, the value of the OP scale is 15. So it can be interpreted that Fatigue caused by Time (TD) is felt by Respondents more than Success and Satisfaction (OP) when final students carry out online learning.
7. The comparison between the Temporal Demand (TD) and Frustration Level (FR) scales can be stated as a result, namely the FR scale is superior with a value of 22. Meanwhile, the TD scale value is 18. So it can be interpreted that Frustration (FR) is felt by Respondents more than Fatigue caused by Time (TD) when final students carry out online learning.

8. The comparison between the Effort (EF) and Temporal Demand (TD) scales can be stated as a result, namely the TD scale is superior with a value of 24. Meanwhile, the EF scale value is 16. So it can be interpreted that Fatigue caused by Time (TD) is felt by Respondents more than the Effort made (EF) when final students carry out online learning.
9. The comparison between the Effort (EF) and Own Performance (OP) scales can be stated as the result, namely the EF scale is superior with a value of 31. Meanwhile, the value of the OP scale is 9. So it can be interpreted that the Effort made (EF) is felt by Respondents more than the Success and Satisfaction (OP) when final students carry out online learning.
10. The comparison between the Mental Demand (MD) and Own Performance (OP) scales can be stated as the result, namely the MD scale is superior with a value of 33. Meanwhile, the OP scale value is 7. So it can be interpreted that Mental Fatigue (MD) is felt by Respondents more than Success and Satisfaction (OP) when final students carry out online learning.
11. A comparison between the Frustration Level (FR) and Own Performance (OP) scales can be stated as a result, namely the FR scale is superior with a value of 28. Meanwhile, the OP scale value is 12. So it can be interpreted that Frustration (FR) is felt by Respondents more than Success and Satisfaction (OP) when final students carry out online learning.
12. The comparison between the Physical Demand (PD) and Own Performance (OP) scales can be stated as the result, namely the PD scale is superior with a value of 25. Meanwhile, the OP scale value is 15. So it can be interpreted that Physical Fatigue (FR) is felt by Respondents more than Success and Satisfaction (OP) when final students carry out online learning.
13. A comparison between the Frustration Level (FR) and Mental Demand (MD) scales can be stated as a result, namely the MD scale is superior with a value of 22. Meanwhile, the FR scale value is 18. So it can be interpreted that Mental Fatigue (MD) is more felt by Respondents than Frustration (FR) when final students carry out online learning.
14. A comparison between the Frustration Level (FR) and Physical Demand (PD) scales can be stated as a result, namely the FR scale is superior with a value of 23. Meanwhile, the value of the PD scale is 17. So it can be interpreted that Frustration (FR) is felt more by Respondents than Physical Fatigue (PD) when final students carry out online learning.
15. A comparison between the Effort (EF) and Frustration Level (FR) scales can be stated as the result, namely the EF and FR scales are balanced with a value of 20. So it can be interpreted that the Effort made (EF) and Frustration (FR) are felt to be balanced by final students implementing online learning.

The results of the calculation of the average rating of the 6 scales (MD, PD, TD, OP, FR, and EF). The analysis can be seen as follows:

1. Mental Demand (MD) has a score of 72.25 so it can be seen from the average rating that MD has a high value. Therefore, the demands in performing mental and perceptual activities (such as thinking, deciding, calculating, remembering, seeing and searching) can be felt that Mental Fatigue is quite high for final students who carry out online learning.
2. Physical Demand (PD) has a score of 62.25 so it can be seen from the average rating that PD has a high value. So the physical activities required in the job (e.g. walking, writing, searching for items) can be perceived that Physical Fatigue is quite high for final year students who carry out online learning.
3. Temporal Demand (TD) has a score of 74.25 so that it can be seen from the average rating that TD has a high value. So the time pressure felt during work or work elements takes place has a high enough effect for final students who carry out online learning.

4. Own Performance (OP) has a score of 65.75 so that it can be seen from the average rating that OP has a high value. So the level of success in achieving job targets is quite satisfied for final students who carry out online learning.
5. Effort (EF) has a score of 78.25 so that it can be seen from the average rating that EF has a high value. Then the amount of insecurity, despair, offense, annoyance, compared to the feelings of security, satisfaction, comfort, and self-satisfaction felt while doing work is quite high for final students who carry out online learning.
6. Frustration Level (FR) has a score of 75.75 so that it can be seen from the average rating that FR has a high value. So the amount of effort expended mentally and physically needed to reach the performance level is quite high for final students who carry out online learning.

In the final calculation, the mental workload scores of students from each university that have been calculated using NASA-TLX are obtained.

- a. At Diponegoro University students with the names Respondent 1, Respondent 2, Respondent 20 obtained a score value of 86.66; 78; 76.66 respectively which they got as final year students during online learning. From the results of the average calculation, a value of 80.44 is obtained so that it can be said to be a high mental load, with one person having a very high workload and two others having a high workload.
- b. At the Politeknik Negeri Media Kreatif student with the name Respondent 3, a score of 81.33 was obtained as a final year student during online learning. From this value it can be said that students have a very high workload.
- c. At the Bandung Institute of Technology student with the name Respondent 4 obtained a score of 76 which was obtained as a final year student during online learning. From this value it can be said that students have a high workload.
- d. At the Bogor Agricultural University student with the name Respondent 5, a score of 73.33 was obtained as a final year student during online learning. From this value it can be said that students have a high workload.
- e. At the Jakarta State University student with the name Respondent 6 obtained a score of 62 which was obtained as a final year student during online learning. From this value it can be said that students have a high workload.
- f. At Yarsi University students with the name Respondent 7 obtained a score of 84 which was obtained as a final year student during online learning. From this value it can be said that students have a very high workload.
- g. At As-Syafi'iyah Islamic University students with the name Respondent 8 obtained a score of 61.34 which was obtained as a final year student during online learning. From this value, it can be said that students have a high workload.
- h. University of Indonesia students with the names Respondent 9 and Respondent 22 obtained score values of 93.33 and 87.33 respectively which they got as final year students during online learning. From the results of the average calculation, a value of 90.33 is obtained so that it can be said that the mental load is very high and the two students have a very high workload.
- i. At Trisakti University students with the name Respondent 10 obtained a score of 84.66 which was obtained as a final year student during online learning. From this value, it can be said that students have a very high workload.
- j. At Gadjah Mada University students with the names Respondent 11 and Respondent 14 obtained a score value of 83.33 and 86.66 respectively which they got as final year students during online learning. From the results of the average calculation, a value of 84.99 is obtained so that it can be said that the mental load is very high and these two students have a very high workload.

- k. At Sebelas maret University students with the name Respondent 12 obtained a score of 82.66 which was obtained as a final year student during online learning. From this value it can be said that students have a very high mental workload.
- l. At Bina Nusantara University students with the names Respondent 13 and Respondent 37 obtained a score value of 78 and 86.66 respectively which they got as final year students during online learning. From the results of the average calculation, a value of 82.33 is obtained so that it can be said that the mental workload is very high with one student having a high mental workload and one other person having a very high mental workload.
- m. At the University Persada Indonesia Y.A.I student with the name Respondent 15, a score of 65.33 was obtained as a final year student during online learning. From this value, it can be said that students have a high mental workload.
- n. At Kosgoro University students with the names Respondent 16, Respondent 18, Respondent 24 obtained a score value of 55.36; 65.33; 90 respectively which they got as final year students during online learning. From the results of the average calculation obtained a value of 70.23 so that it can be said that the mental load is high with one student having a very high mental workload, one person has a high mental workload and one other person has a moderate mental workload.
- o. At the National Institute of Science and Technology students with the names Respondent 17 and Respondent 40 obtained score values of 60.67 and 63.33 respectively which they got as final year students during online learning. From the results of the average calculation, a value of 62 is obtained so that it can be said to be a high mental load and both have a high mental workload.
- p. At the Sepuluh Nopember Institute of Technology student with the name Respondent 19, a score of 80.66 was obtained as a final year student during online learning. From this value it can be said that students have a high mental workload.
- q. At Petra University students with the name Respondent 21 obtained a score of 65.34 which was obtained as a final year student during online learning. From this value, it can be said that students have a high mental workload
- r. President University students with the name Respondent 23 obtained a score of 78 which was obtained as a final year student during online learning. From this value, it can be said that students have a high mental workload.
- s. At Dian Nuswantoro University students with the name Respondent 25 obtained a score of 88.67 which was obtained as a final year student during online learning. From this value, it can be said that students have a very high mental workload
- t. At the State Islamic University student with the name Respondent 26, a score of 77.33 was obtained as a final year student during online learning. From this value it can be said that students have a high mental workload.
- u. Telkom University students with the names Respondent 27 and Respondent 33 obtained a score of 86.67 and 83.33 respectively which they got as final year students during online learning. From the results of the average calculation, a value of 85 is obtained so that it can be said to be a very high mental load and both have a very high mental workload.
- v. In Muhammadiyah Prof. Dr. Hamka students with the names Respondent 28, Respondent 29, Respondent 30, Respondent 31, Respondent 32, Respondent 34, Respondent 35, Respondent 36 obtained score values respectively 70; 88.67; 78.67; 78.67; 73.33; 80; 73.33; 76.66 which they got as final year students during online learning. From the results of the average calculation, a value of 77.42 is obtained so that it can be said that the mental load is very high with one person having a very high mental workload and seven other students having a high mental workload.

- w. At the University 17 August 1945 Surabaya student with the name Respondent 38, a score of 75.33 was obtained as a final year student during online learning. From this value, it can be said that students have a high mental workload.
- x. At Pelita Harapan University students with the name Respondent 40 obtained a score of 66 which was obtained as a final year student during online learning. From this value it can be said that students have a high mental workload

## Conclusion

Based on the existing data, it is concluded that the majority of final year students have a high workload. This can be based on the analysis of mental workload categories represented by 40 students who became Respondents in this study. Based on this data, 21 students or more than half of all Respondents fall into the high category, 18 students fall into the very high category, and 1 student falls into the medium category.

The calculation results in each aspect of the NASA-TLX show that the aspect that has the highest value is Effort (EF) with a score of 78.25. This means that final year students feel insecure, desperate, offended, disturbed, compared to the feelings of safety, satisfaction, comfort, and self-satisfaction felt while doing the work done in online learning.

At a very high mental workload in final year students, it is necessary to reassess this online learning system, for example by not giving too many assignments during online learning, reducing online learning time, or by making interesting learning so that final year students feel safe, satisfied, and comfortable in carrying out online learning.

For further research with the NASA TLX method, the number of samples should be increased. Thus, the results obtained will be more representative. But it is necessary to learn more about the method of measuring mental workload with this method, so that it can more easily explain it to the object of research.

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