Lectures' Mental Workload During Covid-19 Pandemic Online Learning With NASA-TLX

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Abstract

The Covid-19 pandemic has affected all aspects of the field, one of which is education. The education process in Indonesia is carried out with a online learning system to minimize the spread of the COVID-19 virus. But the implementation of online learning can cause problems, namely the emergence of mental workloads for lecture. The purpose of this study is to compare the lecture's workload between online learning and face-to-face learning, identify the dominant dimensions and provide suggestions for improvement. This research was conducted at SMA Negeri 1 Gemolong with 36 lectures as respondents. From the results of the study, it was found that there was a significant difference between the mental workload of lectures between offline learning and online learning. So that online learning can increase the mental workload experienced by teachers. based on online learning, some dimensions dominate the dimensions of own performance by 22%, Effort by 21%, and Mental Demand by 18%. The proposal that is expected to reduce the mental workload of lectures during online learning is the implementation of periodically in-house training and increasing the competence of teachers in the IT field.

Keywords
Mental Workload, Lecture, Education, E-Learning, and Covid-19

1. Introduction

The world is amid the coronavirus disease 2019 (covid-19) pandemic. This virus was first discovered at the end of 2019 and caused more than 2600 deaths in February 2020, thus threatening health in various countries (Lin et al. 2020). The World Health Organization (WHO) made COVID-19 a global pandemic on March 11, 2020, this is because the development of cases of this virus has increased 13 times (WHO 2020). In addition, Mr. President Joko Widodo has also determined that this covid-19 is a national disaster based on Presidential Decree No. 12 of 2020 concerning the determination of non-natural disasters for the spread of coronavirus disease 2019 (covid-19). Various policies have been issued by the Indonesian government, one of which is the circular letter of the Minister of Education and Culture of the Republic of Indonesia number 4 of 2020 regarding the implementation of the online learning system.

Education is one area that is sensitive to the Covid-19 pandemic. This can be seen in the Instruction of the Minister of Home Affairs no. 03 of 2021 regarding the Enforcement of Restrictions on Micro-Based Community Activities. In the instruction letter, it is starting to allow community activities in various fields ranging from office activities, essential sectors, and restrictions on activities in restaurants, shopping centers, construction activities, places of worship, public facilities, and public transportation by observing the health protocols that have been established. However, in these instructions, the education sector is still emphasized to carry out teaching and learning activities carried out remotely.

The impact of the circular letter of the Minister of Education and Culture of the Republic of Indonesia number 4 of 2020 is a change in the learning system which is usually face-to-face learning to online learning (Alchamdani et al. 2020). This change in the learning system will change the habits of both students and the role of the teacher. In the Law of the Republic of Indonesia number 14 of 2005 concerning teachers and lecturers in article 1 paragraph 1 it is stated that teachers are professional educators with the main task of educating, teaching, guiding, directing, training, assessing, and evaluating students in early childhood education pathways; formal education, primary education, and secondary education. In addition to carrying out the main task, in online learning the teacher will also ensure the readiness of learning methods, students, and the development of life in the community (Wahyono et al. 2020).

According to Didin et al. (2020) quoted from Bower (2015) online learning can be done more flexibly in terms of time and place, this can be an advantage for students and teaching staff. On the other hand, there are technical problems and learning models (Gunawan et al. 2020). The problem of internet use and learning motivation can also be a source of new problems because it has a negative relationship on academic results (Reed and Reay 2015). In addition, online-based learning can cause problems, namely lack of technical support, poor professionalism and the availability of impractical platforms, inadequate online-based learning resources and curriculum, poor distribution of learning materials, poor management skills, and low evaluation skills (Jin and Li 2020).

High school students are individuals entering the phase of adolescence, where adolescence is vulnerable to various problems due to experiencing new changes in themselves (Emda 2018). In addition, according to Anna Freud, changes that occur during adolescence include changes in psychosexual development and relationships with ideals and parents (Cahyani et al. 2020). This is the reason researchers research the upper secondary level. Since the beginning of the Covid-19 pandemic, this change in the learning system has been experienced by educators at SMA Negeri 1 Gemolong. The implementation of online learning is carried out synchronously and asynchronously. The implementation of online learning uses several applications including Microsoft Kaizala, Zoom meeting, Google Meet, and other applications to be used during learning. There is a change in student learning time when compared to offline learning. Online learning time is only done 50 percent of the usual, and the maximum is done until 12 AM. This change in the learning system poses challenges for educators. The results of preliminary observations conducted found online learning problems, including limited media, tools, and support for teaching and learning activities, causing problems for teachers and students. This can increase the workload of teachers because outside of their main task as educators they face problems caused by changes in the learning system. Thus, it is known that the teachers have additional tasks because they have to adapt to changes in the learning system and face various problems that arise. Seeing from the various problems caused by online learning and the need for adaptation of online learning, especially by the teaching staff when online learning allows changes in mental workload. When a teacher has a mental workload that is too high or low, it will reduce his workability (Xiao et al. 2015).

Based on the description above, the researcher wants to know the mental workload of the teachers before and during the Covid-19 pandemic and to know the dimensions that dominate in influencing the mental workload of teachers during online learning during the Covid-19 pandemic. Calculation of mental workload will use the NASA-TLX (National Aeronautics and Space Administration Task Load Index) questionnaire method. This questionnaire method is the result of development based on subjective needs which is easier but more sensitive to measurement.

1.1 Objectives
The purpose of this study is that researchers want to measure and compare the mental workload of SMA Negeri 1 Gemolong teachers before and during online learning during the covid-19 pandemic. In addition, the results of the mental workload felt by the teacher during online learning, will identify the measurement dimensions that dominate the value of the teacher's mental workload during the implementation of online learning. And the final goal of this research is to provide suggestions for improvements that are expected to reduce the level of mental workload of SMA Negeri 1 Gemolong teachers when conducting online learning during the covid-19 pandemic.

2. Literature Review

2.1 Mental Workload
According to Hancock and Meshkati (1988) cited in Anisa (2020) mental workload is a difference between work demands and a person's psyche when in a motivating situation. When a person's mental workload is too high it can lead to confusion, anxiety, frustration, and various health problems. The long-term effect caused is stress and when stress is not handled immediately it will require great control and can even reduce productivity and performance.

In a job, there are several factors that can affect the mental workload, including the type of work, the situation at work, the time available to complete the work, and individual factors (level of motivation, fatigue, expertise, saturation, and allowable performance tolerance). In work psychology, problems regarding psychology in the workplace are related to self-factors, namely attitude, gender, age, personality, value system, physical characteristics, motivation, interests, education, and experience. These various self-factors are studied in ergonomics because everyone has personal (innate) factors that are unique and different from other people in their work. When a person does not match the work

he does, it can cause stress or frustration, when this occurs it will lead to low productivity, low quality of work, and high work accidents (Simanjuntak 2010).

3. Methods

In this study, measuring the mental workload of teachers during online learning and offline learning will use the NASA-TLX (National Aeronautics and Space Administration Task Load Index) method. This questionnaire method is the result of development based on subjective needs which is easier but more sensitive to measurement. The choice of this method is because when compared to other methods, the NASA-TLX method has measurements and compares between the six dimensions. so that respondents can provide measurements and provide comparisons between dimensions according to what they feel during online learning. According to Wulanyani (2013) quoted in Anisa (2020), the measurement of mental workload can be used with several methods, but the majority of researchers choose NASA-TLX because this method is faster and shows more accurate results than other methods. After knowing the results of processing mental workloads during online learning and offline learning, a paired sample t test will be carried out. The purpose of this test is to test whether there is a significant difference between the mental workload of teachers during offline learning and online learning.

The distribution of the NASA-TLX questionnaire uses google form. Each respondent will be given two NASA-TLX questionnaires, the first questionnaire is an assessment of the teacher's mental workload on offline learning and the second questionnaire is used to assess the teacher's mental workload on online learning. NASA-TLX has six measurement dimensions which are described in Table 1.

Table 1. NASA TLX rating scale definition

Indicator	Rating	Information
Mental Demand (MD)	Low/High	The mental activity required for: **thinking, deciding, counting, seeing, remembering, and searching.** Work activities that are easy or demanding, simple or complex, demanding or have leeway.
Physical Demand (PD)	Low/High	Physical activity required to: push, pull, turn, control, operate tools. Easy or demanding work activities, slow or fast, light or heavy.
Temporal Demand (TD)	Low/High	The amount of work pressure is related to the time felt during the work. **Is the work slow and relaxed or fast and frantic?**
Own Performance (OP)	Low/High	How big is the level of success in doing the work and how satisfied are you with the achievement of the work that has been done.
Effort (EF)	Low/High	How hard the effort required (physical or mental) to complete a job. Example: **motivation in doing work.**
Frustration (FR)	Low/High	How **insecurity, hopelessness, annoyance, stress, and irritation** compared to the sense of security, satisfaction, relaxation, and inner satisfaction felt while doing the job.

Respondents will provide an assessment with a scale of 0-100 on each dimension. A high-dimensional assessment means that the assessed dimension has a high influence on the perceived mental workload. Then respondents were asked to choose a comparison between dimensions with a total of 15 comparisons from the six dimensions. The selection of the 15 comparisons is used to determine the weighting and the rating is used for the multiplier in calculating the NASA-TLX Score. A comparison of each dimension can be seen in Table 2.

Table 2. NASA TLX comparison between dimensions

No	Indicator	Indicator	No	Indicator	Indicator
1	Mental Demand	Physical Demand	9	Physical Demand	Frustration
2	Mental Demand	Temporal Demand	10	Temporal Demand	Own Performance
3	Mental Demand	Own Performance	11	Temporal Demand	Effort
4	Mental Demand	Effort	12	Temporal Demand	Frustration
5	Mental Demand	Frustration	13	Own Performance	Effort
6	Physical Demand	Temporal Demand	14	Own Performance	Frustration
7	Physical Demand	Own Performance	15	Effort	Frustration
8	Physical Demand	Effort			

In the NASA-TLX calculation, the multiplication of the rating with the weighted results will produce a Weighted workload (WWL) value and the six measurement dimensions have their respective WWL values. The following is the formula used in calculating mental workload or it can also be called the average value of WWL.

$$\text{NASA-TLX Score} = \frac{((\text{WWL MD}) + (\text{WWL PD}) + (\text{WWL TD}) + (\text{WWL OP}) + (\text{WWL EF}) + (\text{WWL FR}))}{15}$$

After calculating the NASA-TLX Score, the next step is to interpret the score. So that the average value of WWL will be classified in the category of mental workload. The classification of score categories can be seen in Table 3.

Table 3. NASA TLX classification

Mental Workload Category	NASA TLX Score
Very Low	0-20
Low	21-41
Medium	41-60
High	61-80
Very High	81-100

Source: (Rahmanita and Al Ghofari 2017)

The next research step after knowing the value of the mental workload felt by the teacher when online learning and offline learning is to test the hypothesis is there a significant difference between the teacher's mental workload when online learning and offline learning.

4. Data Collection
Below are the results of the data collection process in this study. The results of data collection can be seen in Table 4.

Table 4. Respondent characteristic

Characteristic	n	%
Gender		
Male	19	53
Female	17	47
Age		
20-29	4	11
30-39	16	44
40-49	9	19
50-60	7	25

5. Result and Discussion
The following is part of the results and discussion of this research.

5.1 Numerical Results
From the results of processing and calculating teacher mental workload questionnaire data during offline learning and online learning on 36 respondents, it can be seen in Table 5 and Table 6.

Table 5. Offline learning mental workload result

Name	NASA TLX Score	Name	NASA TLX Score	Name	NASA TLX Score
Respondent 1	90.33	Respondent 13	75.33	Respondent 25	79.67
Respondent 2	76.67	Respondent 14	75.00	Respondent 26	83.33
Respondent 3	81.00	Respondent 15	79.00	Respondent 27	75.33
Respondent 4	75.33	Respondent 16	88.67	Respondent 28	78.00
Respondent 5	83.20	Respondent 17	77.67	Respondent 29	79.60
Respondent 6	84.13	Respondent 18	72.33	Respondent 30	61.33
Respondent 7	70.00	Respondent 19	77.33	Respondent 31	82.53
Respondent 8	89.47	Respondent 20	77.00	Respondent 32	61.67
Respondent 9	76.67	Respondent 21	83.00	Respondent 33	67.33
Respondent 10	76.33	Respondent 22	82.33	Respondent 34	62.67
Respondent 11	85.33	Respondent 23	86.20	Respondent 35	79.00
Respondent 12	87.47	Respondent 24	68.73	Respondent 36	78.07

Table 6. Online learning mental workload result

Name	NASA TLX Score	Name	NASA TLX Score	Name	NASA TLX Score
Respondent 1	92.33	Respondent 13	74.73	Respondent 25	84.73
Respondent 2	77.33	Respondent 14	75.00	Respondent 26	69.40
Respondent 3	82.67	Respondent 15	77.33	Respondent 27	72.67
Respondent 4	75.80	Respondent 16	86.67	Respondent 28	88.00
Respondent 5	80.87	Respondent 17	92.33	Respondent 29	79.00
Respondent 6	83.87	Respondent 18	77.33	Respondent 30	93.00
Respondent 7	70.00	Respondent 19	81.33	Respondent 31	82.67
Respondent 8	81.80	Respondent 20	79.33	Respondent 32	71.00
Respondent 9	70.67	Respondent 21	77.33	Respondent 33	84.73
Respondent 10	79.67	Respondent 22	78.00	Respondent 34	68.67
Respondent 11	84.33	Respondent 23	82.33	Respondent 35	80.00
Respondent 12	86.07	Respondent 24	83.40	Respondent 36	68.00

5.2 Graphical Results

From the results of the calculations that have been carried out, it can be shown the results of the graph in the image below along with the discussion. Figure 1 and Figure 2 are the results of processing mental workloads during offline learning.
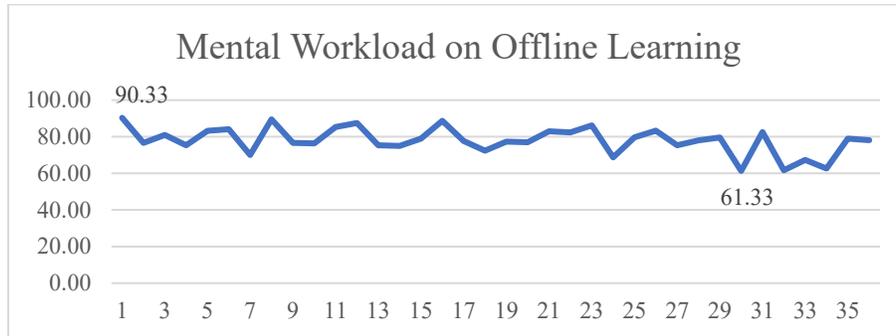

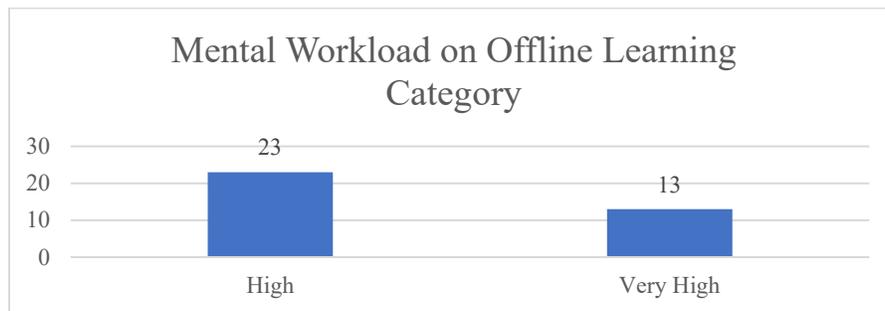Figure 1. Mental workload on offline learning result

Figure 2. Mental workload on offline learning category

Based on Figure 1 which is the result of the calculation and data processing of the NASA-TLX questionnaire, the average mental workload felt by the teacher during the implementation of Face-to-face Learning is 77.97 or it can be said that the average mental workload during implementation Face-to-face Learning is included in the High category according to the mental workload classification table in Appendix 4. The highest mental workload was felt by Respondent 1 with a value of 90.33 which was included in the "Very High" category and the lowest mental workload was felt by Respondents 30 with a mental workload value of 61.33 which falls into the "High" category. In addition, it can be seen in Figure 2 that there are 23 teachers who fall into the "High" category and there are 13 teachers who fall into the "Very High" category.
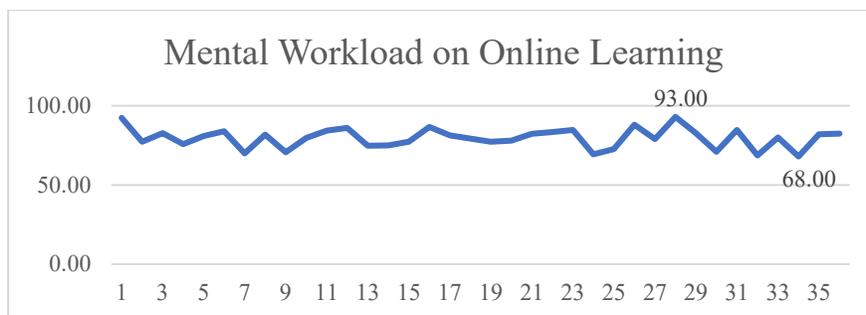

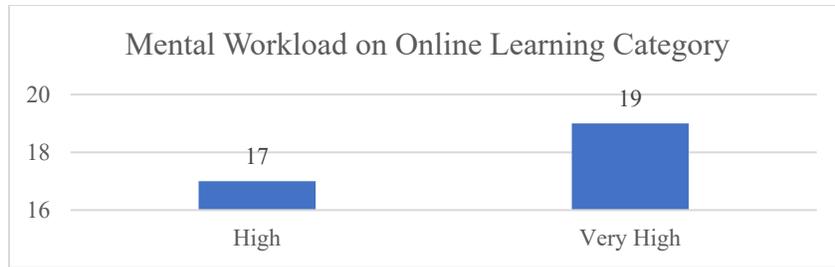Figure 3. Mental workload on online learning result

Figure 4. Mental workload on online learning category

Based on Figure 3 which is the result of calculation and data processing of the NASA-TLX questionnaire, the average mental workload felt by teachers during the implementation of Online learning is 79.56 or it can be said that the average mental workload during the implementation of Online learning is in the High category according to the mental workload classification table in Appendix 4. The highest mental workload during the implementation of Online learning is felt by Respondent 28 with a value of 93.0 which is included in the "Very High" category " and the lowest mental workload was felt by Respondent 34 with a mental workload value of 68.0 which was included in the "High" category. In addition, it can be seen in Figure 4 that 17 teachers fall into the "High" category and there are 19 teachers who fall into the "Very High" category.

Figure 5 is a graphical presentation of the percentage comparison of NASA-TLX dimensions when carrying out Online learning .
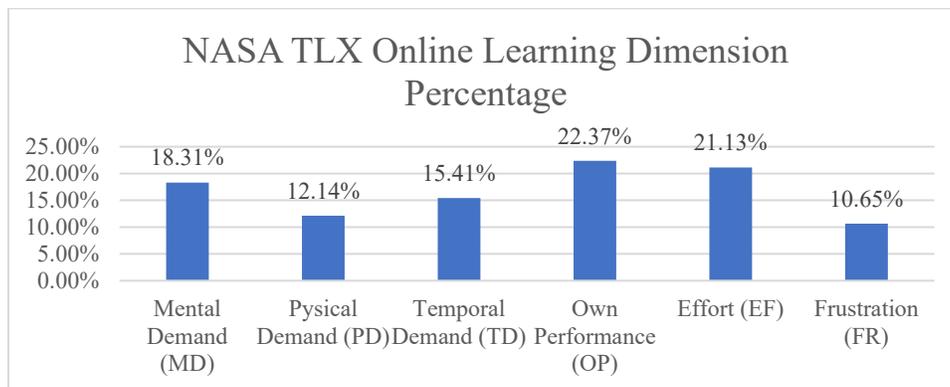

Figure 5. NASA TLX online learning dimension percentage

Based on Figure 5, the results of the NASA-TLX measurements during the implementation of Online learning , it was found that the own performance dimension became the most dominating dimension and was further dominated by the dimensions of effort and mental demand.

The first rank of the largest dimension that affects the mental workload of teachers during online learning is Own Performance. This dimension gives an influence of 22% of the value of the perceived mental workload. As explained above, this dimension relates to the level of success of the teacher in carrying out learning and the level of teacher satisfaction with the learning that has been carried out. Based on the results of interviews that have been conducted with the Principal of the school, that the success of implementing online learning cannot be as much as possible when compared to face-to-face learning. This is because when online learning is carried out between teachers and students, the composition is different from face-to-face learning. According to the deputy head of curriculum affairs for SMA Negeri 1 Gemolong, during online learning, it's still refers to the full national curriculum by adjusting the abilities of the respective subject teachers in delivering material, although in practice some subjects are only delivered 50% - 70% of the national curriculum. Thus, it can be said that at the time of online learning, the dimension of own performance has a fairly high role in determining the mental workload felt by the teacher. This is due to limited access and knowledge on the part of students and teachers when carrying out learning that refers to the full national curriculum. Based on the Exposure to Adjustment of Learning Policies in the Covid-19 Pandemic Period issued on the Ministry of Education and Culture's website, it was explained that one of the obstacles faced by teachers was the availability of

reduced learning time but teachers were still focused on completing the full national curriculum. So that the own performance dimension is related to high teacher satisfaction and performance causing the highest percentage of mental workload felt by teachers during online learning, this is following the constraints described in the Exposure to Adjustment of Learning Policies in the Covid-19 Pandemic Period issued on the Ministry of Education and Culture website.

The second dimension that dominates the mental workload teachers is the Effort dimension. This dimension relates to the efforts made by teachers in implementing and completing online learning during the Covid-19 pandemic, both from mental demand and physical demand. Based on the results of observations that have been made, it is found that several things cause the teacher's perceived effort to have the highest percentage after own performance. Among them is the delivery of material carried out by the teacher. During online learning, teachers are required to prepare teaching materials/materials that can be used during online learning. This change in the learning system requires each teacher to prepare teaching materials/materials that will be delivered at the time of learning. In online learning, teachers usually use teaching materials/materials using voice records, slide decks, learning videos, and so on according to the abilities of each teacher. This change in the learning system also forces teachers to adapt to the technology used for learning and must prepare teaching materials/materials, so that in online learning, teachers have an effort from both mental demand and physical demand which is high enough to be able to complete the work. Based on the results of interviews that have been conducted with the deputy head of curriculum affairs, it is also stated that there are some teachers who due to limitations in mastering technology experience obstacles in adapting to the technology used or in preparing teaching materials/materials that will be used in online learning. However, with the existing obstacles, teachers still pay attention to their students when learning online (Sukitman and Yazid 2020). Thus, this dimension does have a high percentage in accordance with the results of calculating the mental workload of teachers during the implementation of online learning.

The third dimension is mental demand. This dimension relates to the mental activities needed by the teacher in implementing online learning, whether the learning carried out is easy, simple, and loose or vice versa. In the results of processing the mental workload data of the teacher during online learning, it resulted that the percentage of mental demand was 18% or below the effort dimension. There are mental activities found during the implementation of online learning, namely at the beginning of the change in the learning system the teacher is required to think about determining the technology to be used for learning because determining the technology used is related to the technological capabilities controlled by the teacher, the limitations of the device and the access that students have. and the need for adaptation and preparation of teaching materials/materials to be used. In addition, the teacher also has the task of determining the assessment, the results of the interviews obtained showed that during the implementation of online learning many teachers had difficulty in providing an assessment of their students. The difficulty faced by the teacher is ensuring the suitability of the value obtained by students with their abilities, this can be difficult for the teacher because students may cheat in doing their assignments or exams. However, this problem is temporarily solved by checking during synchronous learning. In addition, there are still some teacher tasks that cause an increase in mental demand experienced by teachers, among others, namely designing teaching materials/materials, determining the learning methods used, and correcting the results of assignments and student exams. In addition, teachers are expected to continue to provide learning motivation to their students so that they remain enthusiastic about learning even in a pandemic atmosphere. The results of Sukitman's research (2018) explain that in a lesson the teacher must be able and required to actively provide learning motivation so that students can absorb the learning that has been done. The number of mental demands required by the teacher is by the results of the calculation of the mental workload of the teacher during the implementation of online learning.

5.3 Hypothesis test
After knowing the value of the teacher's mental workload during offline learning and online learning, namely doing a paired sample t-test with a value of 0.1. According to Putri dan Suhadak (2019) , two different types of tests can be used to test the hypothesis, namely the parametric test (Paired sample t-test) and the non-parametric test (Wilcoxon signed ranks test). When the condition of the sample in this study is normally distributed, it will use a parametric test and if the condition of the sample in this study is not normally distributed, it will use a non-parametric test. Therefore, before carrying out a different test, a normality test will be carried out first. This statistical test will use the IBM SPSS Statistics 26 application (Putri and Suhadak 2019). Table 7 is the result of the Normality test.

Table 7. Normality Test Result

Condition		Shapiro-Wilk		
		Statistic	df	Sig.
Mental Workload	Offline Learning	.951	36	.113
	Online Learning	.970	36	.439
*. This is a lower bound of the true significance.				
a. Lilliefors Significance Correction				

The normality test of the data used the Shapiro-Wilk Test with a significance level (α) of 0.1 using the SPSS version 20.0 for Windows program. Based on the results of the normality test in Table 4.3, the data obtained from processing mental workloads during Face-to-Face Learning and Online learning are normally distributed. This is because when the Face-to-Face Learning condition has a sig value. of 0.113 and when the Online learning condition has a sig value. of 0.439 and the significance value of both conditions has exceeded the significance level (α) of 0.1.

After obtaining normal data, hypothesis testing can be carried out using a paired sample t-test. The test hypotheses proposed in this study are:

    H0 : There is no significant difference between the mental workload of teachers when carrying out offline learning and online learning.

    Ha : There is a significant difference between the mental workload of teachers when carrying out offline learning and online learning.

Table 8 and Table 9 are the output results of the Paired sample t-test.

Table 8. Output Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Offline Learning	77.97	36	7.359	1.227
	Online Learning	79.64	36	6.304	1.051

Table 9. Output Paired Samples Test

		t	df	Sig. (2-tailed)
Pair 1	Offline Learning - Online Learning	-2,122	35	.041

Based on Table 4.6, the result of the paired sample test output can be seen that the significance value is 0.041 and the significance value is less than 0.1, so in this test, the initial hypothesis is rejected and the alternative hypothesis is accepted. The acceptance of the alternative hypothesis can be concluded that there is a significant difference between the mental workload of teachers when carrying out Face-to-face Learning and Online learning . Next is to compare the value of the t-count with the t-table. In Table 4.6 it can also be seen that the resulting t-count value is -2.122, which is less than the table value with 35 degrees of freedom, which is 1.68957, so in testing this hypothesis there is a rejection of the initial hypothesis and acceptance of the alternative hypothesis. So by using the second method, it can also be interpreted that there is a significant difference between the mental workload of teachers when carrying out Face-to-face Learning and Online learning as the results in the first method.

The test resulted that between the mental workload of teachers when carrying out Face-to-face Learning and when implementing Online learning there were significant differences. This significant difference can be seen by comparing the value of the workload of teachers during online learning and face-to-face learning . Based on the comparison of the average mental workload experienced by teachers, the average mental workload during Online learning is higher than during Face-to-face Learning . It can be interpreted that the significant difference is caused by an increase in mental workload when teachers carry out Online learning. Thus, it can be concluded that the implementation of Online learning can increase the mental workload of teachers, in this case, Online learning is carried out during the Covid-19 pandemic. Following the results of research Widyanti et al. (2020) which examined the mental workload, it was found that e-learning and classical learning also produced significant differences between the two learning methods.

5.4 Propose Improvement

Based on the discussion on the mental workload felt by the teachers during online learning, the following suggestions are expected to reduce the value of mental workload during the implementation of online learning:

1. In House Training and Evaluation periodically

Implementation of online learning, teachers have carried out In House Training activities at the beginning of the Covid-19 pandemic. This activity is carried out to introduce applications that are used for the implementation of online learning. The implementation of this activity is very helpful for teachers in implementing online learning. However, in practice, besides adapting learning media using applications, there are still many problems that are felt by the teacher after the evaluation. So in overcoming other problems, in-house training and evaluation can be carried out regularly. The implementation of In House Training is expected to develop the ability and broaden the knowledge of teachers in implementing online learning (Jamaluddin 2020). Thus the teachers can overcome the existing problems. So that by reducing online learning problems, it is expected to reduce mental workload during the implementation of online learning. As in Nurbaiti's research (2021), the implementation of In House Training can improve teacher competence, so that teachers can develop and broaden their horizons on the IHT being undertaken (Nurbaiti 2021).

2. Improving IT competence

Based on observations and interviews that have been conducted, some teachers have experienced problems regarding the technology used. In addition to regularly participating in In House Training, teachers can take advantage of YouTube, which contains a lot of content that can be used as material to add insight to teachers in the field of science and technology. Another alternative is that fellow teachers can help each other, especially teachers who have more abilities in the IT field (Wahyuningsih 2021). Thus teachers can deepen and improve their IT competencies so that teachers are expected to be able to master the use of the technology used. Improving IT competence for teachers can also provide variations in learning media, as in Nurbaiti's (2021) research to increase and add insight into IT, teachers can make variations of learning media including making learning videos. So that the mastery of IT in addition to facilitating the implementation of online learning can also provide a variety of teacher learning media.

6. Conclusion

Based on the stages of research that have been carried out, including data collection, data processing, and analysis of the results of processing and calculations, this research can be concluded as follows. There are 19 teachers in the category of very high mental workload and 17 teachers in the category of high mental workload during offline learning, and there are 13 teachers in the category of very high mental workload and 23 teachers in the category of high mental workload during online learning. The results of the paired sample t-test show that there is a significant difference between offline learning and online learning. The dominant dimensions are Own performance (22%), Effort (21%) and Mental Demand (18%). Based on mental workload analysis when online learning on each dimension produces suggestions for improvement, including implementing In House Training (IHT) and evaluation periodically and improving teacher competence in the IT field. The two proposals are expected to reduce online learning problems, to reduce the mental workload of teachers.

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