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Workload Analysis using National Aeronautics and Space Administration - Task Load Index

Analisis Beban Kerja Mental dengan National Aeronautics and Space Administration - Task Load Index

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Abstract

Objective: This study aims to analyze the mental workload felt by the Principal of the Center for Community Learning Activities (PKBM) in the South Jakarta area using the National Aeronautics and Space Administration - Task Load Index (NASA - TLX) method.

Methods: This study used a descriptive method with a quantitative approach by calculating mental workload using the NASA-TLX questionnaire. The research was conducted from July 2020 to March 2021.

Results: The result of this research showed that 16% of respondents had a very high workload during the Covid-19 pandemic, while 81% of respondents were in the high category, and 3% were in the normal category.

Conclusion: Based on this assessment, strategic steps are needed to reduce the workload each PKBM Principal feels, especially those in the High and Very High categories.

Keywords: Workload, covid-19 pandemic, national aeronautics space administration - task load index.

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Introduction

Human activities require a certain amount of energy to complete the workload they have[1], including educational activities. As stated in the 1945 Constitution (UUD) Article 31 Paragraph 1, education is the right of every citizen that must be fulfilled; where to fulfill this mandate, the government of the Republic of Indonesia established Law (UU) Number 20 of 2003 concerning the National Education System. Article 1 and Article 26 of Law no. 20 of 2003 explain that there are three channels of education, namely formal, non-formal, and informal. Education units that fall into the non-formal category, namely educational pathways outside of formal education with the implementation of activities in a structured and tiered manner, including Early Childhood Education (PAUD) and Equality Education, where both types of education can be implemented in the Community Learning Activity Centers (PKBM).

During the Covid-19 Pandemic, the learning process in schools and PKBM changed from the classical method to Distance Learning (PJJ)[2], PJJ is education in which students are separated from educators, with the learning process using various sources, such as through communication technology, information, and other media. In general, in this process, educators and students carry out the learning process using the help of devices to convey the tasks and information needed. While carrying out PJJ, PKBM tutors carried out work activities in the form of teaching from home (Work from Home), where based on research, the majority of workers experienced an increase in workload in that period, especially mental workload[3].

The workload is a series of activities that must be completed by workers or an organizational unit within a certain period of time[4]. In another explanation, the workload is defined as several activities that require expertise and must be done within a certain period, both physically and psychologically[5]. The workload is divided into two, namely physical workload and mental workload. The physical workload is an employee's burden in carrying out a job related to his physiological conditions, such as the level of noise, vibration, and cleanliness of the work environment. Generally, lousy working conditions will create symptoms that can be seen physically, such as hypertension, diarrhea, constipation, and others[6]. Meanwhile, the mental workload is defined as a point of a person's mental capacity needed to complete a task. The greater the mental capacity required to complete a task, the higher the ability to think, which in much literature is

known as a high mental workload, which leads to the possibility of a decrease in the quality of one's work performance[7].

Mental workload is an important variable in understanding a person's work performance[8]. he mental workload can be measured using various methods, both objective and subjective. However, measuring mental workload using objective methods is rarely done because it requires a lot of money and is not worth the inaccurate results provided[9], Therefore, another alternative has been developed to measure mental workload, namely by using subjective methods. The workload measurement method that is popularly used is NASA-TLX (NASA Task Load Index). The method developed by Sandra G. Hart from the NASA Ames Research Center and Lowell E. Staveland from the University of San Jose in 1988 measures six dimensions used to determine the amount of a person's workload, namely Mental Demand (Mental Demand or KM), Physical Demand (Physical Needs or KF), Temporal Demand (Time Needs or KW), Performance (Performance or P), Frustation (Frustration Level or TF), and Effort (Effort Level or TU).

Methods

This study uses a quantitative method with data collection techniques in the form of documentation studies and the dissemination of NASA-TLX standard instruments. The population of this study was 39 people who were all PKBM school principals in Region 2 of the South Jakarta Education Sub-Department, with ages ranging from 35-74 years. This study uses a saturated sampling technique which is included in the category of nonprobability sampling, which is a sample selection technique that does not provide equal opportunities for each member of the population to be selected as a sample. The saturation sampling technique takes the entire population in the study as a sample, so that in general, it produces data with a very small error rate[10].

NASA-TLX is one of the most commonly used methods of measuring subjective mental load, using six different dimensions, namely mental, physical, and time requirements, work performance, effort, and level of frustration. The dimension with the highest score is the factor that influences the most significant mental workload. The workload categories are divided into five in the following table[11]:

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Table 1. Distribution of Workload Categories Based on Weight Work Load (WWL)

Scores	Categories
0-9	Very Low
10-29	Low
30-49	Normal
50-79	High
80-100	Very High

Workload measurement with the NASA-TLX method is carried out in two stages; the first stage is weighting; at this stage, each variable will be paired with the other and determined which variable is heavier by each respondent subjectively ticking the more dominant dimensions. In the second stage, respondents will give a value of the influence of each dimension on the workload they feel at work from a scale of 1-100; this stage is called the rating scale. After getting the results of the two stages, the first and second stage values are multiplied, which are then divided by the number of questions in the weighting stage to determine the final result, the Weight Work Load (WWL).

Results and Discussion

After all respondents filled out the questionnaires provided, tabulation of the observed data was carried out for calculating and grouping workloads. The following are the results of calculations from the data contained in the questionnaire:

Table 2. Data from Questionnaire Analysis Results

Respondent	KM	KF	KW	P	TU	TF	Total	WWL	Categories
Respondent 1	80	150	210	160	400	0	1000	66.67	High
Respondent 2	240	320	160	210	160	80	1170	78.00	High
Respondent 3	320	70	280	80	280	70	1100	73.33	High
Respondent 4	90	360	140	320	360	0	1270	84.67	Very High
Respondent 5	160	300	200	400	360	0	1420	94.67	Very High
Respondent 6	70	210	280	160	350	0	1070	71.33	High
Respondent 7	70	210	280	160	350	0	1070	71.33	High
Respondent 8	70	320	280	140	280	0	1090	72.67	High

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Respondent	KM	KF	KW	P	TU	TF	Total	WWL	Categories
Respondent 9	120	300	140	0	240	80	880	58.67	High
Respondent 10	100	250	120	0	240	140	850	56.67	High
Respondent 11	80	160	280	270	350	0	1140	76.00	High
Respondent 12	80	360	500	180	100	160	1380	92.00	Very High
Respondent 13	280	70	50	240	350	50	1040	69.33	High
Respondent 14	210	60	180	120	420	0	990	66.00	High
Respondent 15	0	360	360	270	180	20	1190	79.33	High
Respondent 16	210	160	400	0	320	80	1170	78.00	High
Respondent 17	140	160	140	240	400	80	1160	77.33	High
Respondent 18	160	240	400	240	160	0	1200	80.00	Very High
Respondetn 19	0	320	320	180	360	60	1240	82.67	Very High
Respondent 20	120	70	200	240	240	0	870	58.00	High
Respondent 21	160	160	280	160	320	60	1140	76.00	High
Respondent 22	160	160	240	240	350	0	1150	76.67	High
Respondent 23	80	100	180	100	160	120	740	49.33	Normal
Respondent 24	140	240	450	160	240	0	1230	82.00	Very High
Respondent 25	60	80	150	320	120	40	770	51.33	High
Respondent 26	70	140	240	240	400	0	1090	72.67	High
Respondent 27	70	210	250	160	280	0	970	64.67	High
Respondent 28	70	140	200	240	350	0	1000	66.67	High
Respondent 29	70	140	200	240	350	0	1000	66.67	High
Respondent 30	120	240	160	140	180	0	840	56.00	High
Respondent 31	150	180	150	70	300	0	850	56.67	High

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Respondent	KM	KF	KW	P	TU	TF	Total	WWL	Categories
Respondent 32	90	70	20	300	360	40	880	58.67	High
Respondent 33	70	140	210	320	350	0	1090	72.67	High
Respondent 34	100	210	120	80	210	200	920	61.33	High
Respondent 35	70	140	250	240	280	0	980	65.33	High
Respondent 36	70	140	250	240	280	0	980	65.33	High
Respondent 37	70	140	250	240	280	0	980	65.33	High

Based on the results of the workload analysis that was carried out using NASA-TLX, 6 respondents were in the Very High category, 30 respondents were included in the High category, and 1 respondent was included in the Normal category.

The following table describes the percentage of respondents who fall into each category:

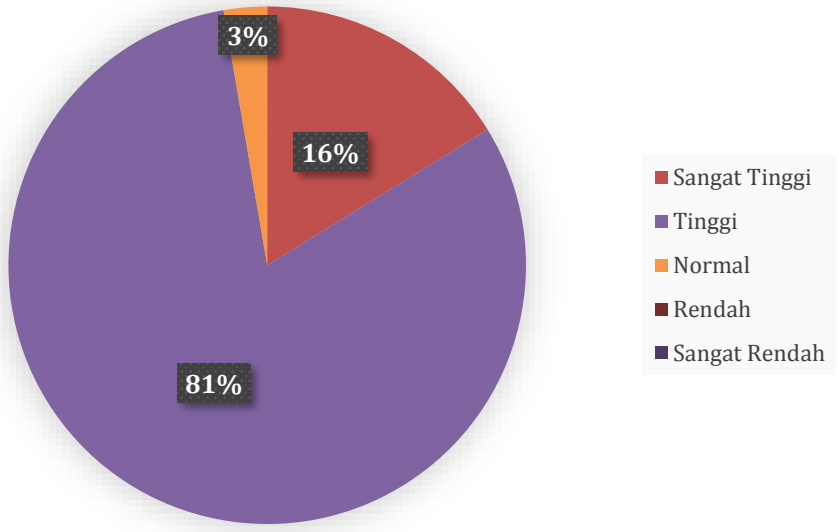

Figure 2. Percentage of each category of respondents

From a total of 37 respondents, overall, there were 81% of respondents were included in the High category, 16% of respondents were in the Very High category, and 1 respondent was included in the Normal category. The following is a graph showing the product value of all respondents:

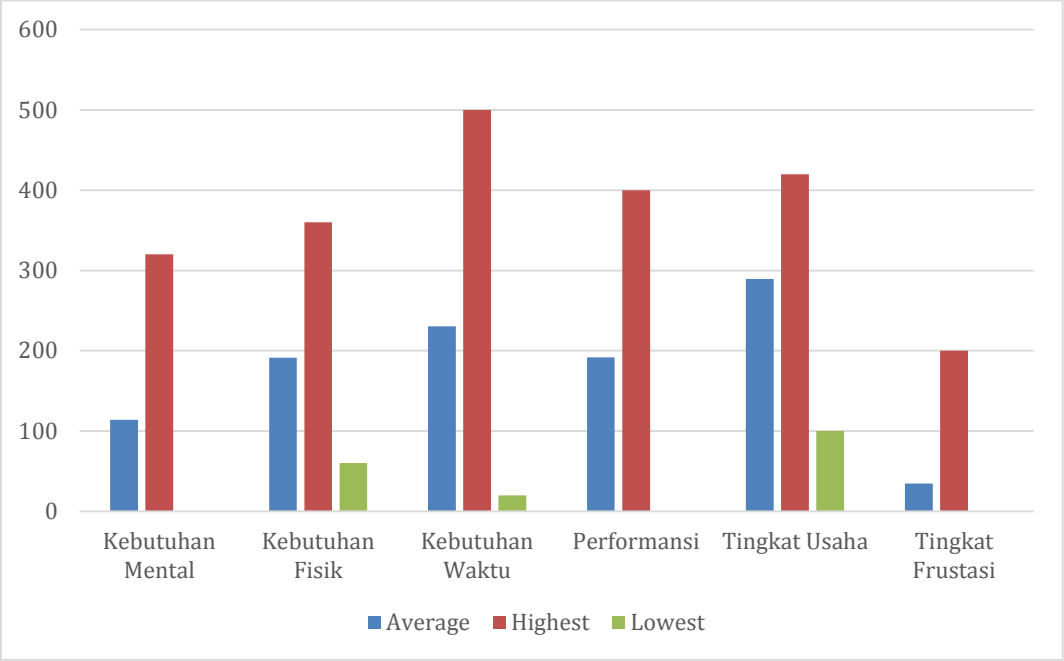

Figure 3. Product Total Value

Several previous studies analyzed workload during a pandemic using NASA-TLX. Some of these studies support the results of this study, including the research of Giyanti and Fachrizal (2021), research with the object of teachers at Pondok 2 Nguter Public Elementary School, Sukoharjo Regency found that homeroom teachers and subjects have a high mental workload when implementing the learning system online.

Conclusion

Based on this assessment, strategic steps are needed that can reduce the workload felt by each PKBM Principal, especially those in the High and Very High categories. Besides, this study has several limitation. It is necessary to carry out research restrictions so that they can be well-directed and there are no deviations from the subject matter, in this study limitations were made, among others is that this study only analyzes the workload felt by school principals in the target areas of the South Jakarta Education Office Region 2. Also workload research was conducted using a subjective method in the form of NASA-TLX. The subjective method was chosen because the objective method requires a lot of money and is not worth the inaccuracy of the results given.

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