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Exploring the Influence of Mental Workload on Performance Factors: A Case Study in Education

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***Abstract*— Amid the COVID-19 pandemic, educational institutions in Indonesia, including vocational schools in Bontang, adopted remote learning policies to continue education. Surveys and interviews conducted with teachers at a vocational school revealed signs of stress, including quick temper, continuous mistakes in tasks, and forgetfulness. This study seeks to assess the level of mental workload, teacher performance, and the impact of mental workload factors on the performance of vocational teachers during the COVID-19 pandemic. Teacher performance is the dependent variable, while mental workload is the independent variable. Mental workload dimensions measured include time pressure, mental effort, and psychological stress, whereas teacher performance has work quality, accuracy/speed of work, initiative in work, workability, and communication. The study involved a sample of 20 teachers from a vocational school. Data analysis utilized simple linear regression processed using SPSS software. Subjective assessments of mental workload by teachers indicated that the highest proportion was the need for increased concentration during teaching activities. Regarding teacher performance, the highest ratios were associated with mastering teaching materials, managing the teaching-learning process, and leading the class during the COVID-19 pandemic. The simple linear regression testing results revealed a low influence of the existing mental workload on teachers' performance. The R square value indicated that mental workload affected teacher performance by 14.7%, with the rest influenced by variables outside the regression model.**

***Index Terms*—COVID-19, Mental Workload, Performance, Simple Linear Regression, Teacher**

I. INTRODUCTION

THE COVID-19 pandemic, declared by the World Health Organization (WHO) on March 11, 2020, significantly impacted various sectors in Indonesia, including education [1]-[3]. The government implemented measures to prevent the spread of the virus in education, issuing Circular Letter No. 4 of 2020 by the Minister of Education and Culture regarding educational policies during the pandemic [4]. The key points included the suspension of the 2020 National Examination, adopting remote learning, restrictions on in-person Final Exams for student graduation, adherence to COVID-19 protocols for new student admissions, and the allowance of School Operational Assistance (Dana BOS) for school supplies allocating.

The educational institutions adopted home-based learning policies, reshaping student and educator learning patterns from early to higher education. A vocational school implemented online learning, challenging educators to innovate and deliver effective teaching [5]. Despite emphasizing character formation as crucial for the industry, SMK Negeri 3 Bontang (Vocational School 3 in Bontang) faced practical challenges during the pandemic. Practical activities, integral to vocational education, were particularly challenging to conduct online, so the school adapted by organizing offline practical sessions and implementing a staggered system for functional groups.

In the context of this vocational school specializing in technical fields, the impact of the pandemic on education, especially in practical subjects, is investigated. The school, known for its emphasis on character building and practical skills, navigated the challenges posed by COVID-19, emphasizing the importance of hands-on learning in vocational education. The provided platforms, including WhatsApp, Google Meet, and Google Classroom, illustrated the shift to online learning during the pandemic.

Unlike the pre-pandemic era, when teachers could efficiently conduct face-to-face classes, the shift to online learning during the COVID-19 pandemic posed significant challenges [6]-[8]. Previously, teachers enjoyed the convenience of interacting directly with students, facilitating easier lesson delivery, and engaging in various activities in the classroom. Before or after the pandemic, teachers typically worked an 8-hour day, and their activities were centered on the school environment.

The transition to online learning demanded more significant innovation, creativity, and patience from teachers. Educators encountered the challenge of adapting to digital teaching methods, requiring patience as not all students were equally engaged in the online learning process. Some teachers experienced continued mistakes during their teaching activities, as emphasized by the school principal. The indications of decreased teacher performance during the pandemic included absence of attendance, suboptimal assessment of assignments in soft file formats causing eye strain, forgetfulness of duty schedules, and a backlog of student assignments leading to delays in grading.

Teachers also expressed concerns beyond stress indicators, such as physical fatigue due to age and underlying health conditions, students neglecting or not submitting assignments, network constraints, limited parental involvement in their child's learning, fluctuating enthusiasm and response from students during online classes, disappointment when all students did not attend planned online courses, and difficulties in teaching practical subjects, which required in-person interaction rather than online methods. The challenges experienced by teachers during the pandemic highlight the multiple impacts on education.

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In contrast to the pre-pandemic era, where face-to-face teaching was normal, the COVID-19 pandemic necessitated a swift transition to online learning, significantly challenging educators. Previously, teachers enjoyed the ease of direct interaction with students and the ability to conduct various activities within the school environment, working an 8-hour day before or after the pandemic.

Regarding the complex conditions explained above, this study aims to explore the varied challenges experienced by teachers at SMK Negeri 3 Bontang during the COVID-19 pandemic, emphasizing the shift to online learning and its impact on their workload, performance, and overall teaching experiences.

II. METHODS

A. Study Location and Context

This research investigates teachers' workload and performance within online learning at SMK Negeri 3 Bontang, Kalimantan Timur. Primary data encompasses a subjective workload assessment (SWA) conducted through a questionnaire. This assessment covers essential indicators, including time pressure, mental effort, and psychological stress. A subjective performance assessment (SPA) of teachers was also focused on dimensions like work quality, speed, initiative, ability, and communication. Secondary data involves comparative data derived from prior studies, particularly those related to regression analysis.

B. Data Collection Techniques

Unstructured telephone interviews are employed with school authorities and students. This methodology aims to gain insights into the nuanced dynamics of online learning during the COVID-19 pandemic. The distribution of questionnaires is facilitated through Google Forms, ensuring comprehensive feedback from all respondents. The questionnaire incorporates a mix of closed and open-ended questions. A diverse range of data is collated from various sources, including school records, online repositories, books, and recent journals. This data collection method enriches the understanding of the research problem by incorporating insights from different perspectives and sources.

C. Research Phases

See Fig. 1 for the research phases. Problem Identification: Identifying issues related to online learning within the school environment during the COVID-19 pandemic. See Fig. 1.

Problem Formulation: Formulating problems related to teachers' mental workload and performance during online teaching amid the Covid-19 Pandemic.

Determining Research Objectives: Defining research objectives aligned with the identified issues and complaints about teachers' mental workload.

Data Collection: Gathering data on teachers' subjective workload and performance through questionnaires employing Likert scale measurements.

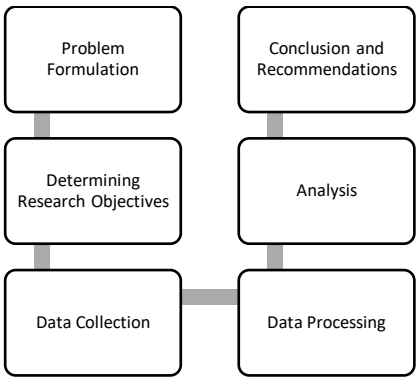


Fig. 1. Research Phases

Data Processing: Utilizing SPSS 20.0 for data processing, including validity and reliability testing, linear relationship testing, normality and heteroskedasticity tests, and simple regression analysis.

Analysis: Analyzing and interpreting data through graphical representation and providing insights into the findings.

Conclusion and Recommendations: Conclude the research findings and propose recommendations for addressing the challenges of mental workload and teachers' performance at SMK Negeri 3 during online teaching amid the COVID-19 pandemic.

III. RESULTS

A. Demographic profile

Table 1 shows the demographic profile of the study's respondents, including 30 teachers.

TABLE I. QUESTIONNAIRE USED IN THE STUDY

Categories	Freq.	Pct.
Gender		
• Male	12	40
• Female	18	60
Age		
• 20-30 years	2	6.7
• 31-40 years	16	53.3
• 41-50 year	11	36.7
• >50 years	1	3.3
Education		
• High school or equivalent	0	0
• Diploma or equivalent	0	0
• Undergraduate	22	73
• Magister	8	27
• Doctor	0	0
Marital Status		
• Married	27	90
• Unmarried	3	10
Experience		
• < 3 years	2	6.7
• 3-6 years	2	6.7
• 7-10 years	7	23.3
• >10 years	19	63.3

The data shows that out of 30 respondents, 12 are male (40%), and 18 are female (60%). It indicates a dominance of female teachers.

Teachers fall within the age range of 31 to 50 years. The majority, 16 respondents (53.3%), are between 31 and 40 years old, followed by 11 (36.7%) aged 41 to 50. Additionally, two respondents (6.7%) are aged 20-30

years, and one respondent (3.3%) is over 50.

A significant portion, 73%, holds an S1 (Bachelor's degree), while 27% are S2 (Master's degree) graduates. It affirms that teachers are well-qualified and meet the academic qualifications outlined in UU No 14 of 2005, Article 9.

The majority of respondents (90%) are married. It highlights their role as educators and contributes to household responsibilities. A considerable number, 63.3%, have taught for over ten years, showcasing their experience and competence in instructional methods and subject matter mastery. This wealth of experience indicates the teachers' ability to enhance their performance and classroom management skills.

B. Workload Variables

Table II shows the result of the participant response concerning the workload variable.

TABLE II. WORKLOAD VARIABLES

Dimension	1	2	3	4	5
Time load					
• Has little time availability	2	5	16	5	2
• Getting Distracted in Teaching	0	5	5	19	1
• Working on two or more jobs	1	1	7	17	4
Mental effort load					
• Requires high-concentration	0	0	0	27	3
• Doing decision-making	0	0	11	12	7
The burden of psychological distress					
• Changes in Teaching Models and Methods	0	3	3	22	2
• Psychological exhaustion	0	4	11	14	1

Remark: Rate agreement with each statement on a scale from 1 to 5, where one indicates "Strongly Disagree," and five means "Strongly Agree."

Respondents' workload intensity varies, with 53.3% disagreeing with their limited time availability. Administrative responsibilities contribute to varying workloads among teachers. 63.3% agreed with the statement "Getting Distracted in Teaching," emphasizing challenges such as network issues while teaching online. Furthermore, 56.7% agreed regarding the workload of handling multiple tasks simultaneously. It indicates the need for multitasking, especially during tight deadlines.

A substantial 90% of respondents agreed with the need for high concentration in their teaching activities during the COVID-19 pandemic. Regarding decision-making, 40% agreed, 36.7% disagreed, and 23.3% strongly agreed, indicating the importance of wise decision-making in and out of the classroom.

Respondents generally agreed (73.3%) with the challenges of adapting to changes in teaching models and methods during the online learning period. Respondents agreed with psychological fatigue, with 46.7% agreeing and 36.7% disagreeing. The open-ended interview revealed additional challenges, such as teaching in both online and offline modes and managing other responsibilities at home.

The responses highlight teachers' diverse experiences and challenges, emphasizing the need for adaptive strategies and support during online teaching, especially during the COVID-19 Pandemic.

C. Performance Variables

Table III shows the result of the participant response concerning the Performance variables.

TABLE III. PERFORMANCE VARIABLES

Dimension	1	2	3	4	5
Quality of work					
• Mastering material	0	0	0	23	7
• Managing the learning process	0	0	0	24	6
• Managing classes	0	0	5	25	0
Accuracy/speed of work					
• Using media or learning resources	0	0	1	16	13
• Mastering the foundation of education	0	2	1	17	10
• Doing teaching program planning	0	0	5	20	5
Initiative in work					
• Leading the way in class	0	0	0	24	6
• Managing learning interactions	0	0	5	18	7
• Assessing student learning outcomes	1	0	4	17	8
Employability					
• Using various methods in learning	0	0	1	16	13
• Performing tutoring functions and services	0	0	2	15	3
Communication					
• Understanding and administering school administration	0	0	3	20	7
• Interpretation of various research results to improve teaching quality	0	0	11	14	5

Remark: Rate agreement with each statement on a scale from 1 to 5, where one indicates "Strongly Disagree," and five means "Strongly Agree."

All respondents (100%) agreed (76.7% agreed, 23.3% strongly agreed) regarding their proficiency in the subject matter during online teaching. For the statement on effective lesson management during the pandemic, 80% agreed, and 20% strongly agreed. The school principal highlighted the teachers' preparation for online and offline classes. Regarding efficient class management during the pandemic, 83.3% agreed, and 16.7% disagreed.

All respondents (96.7%) agreed (53.3% agreed, 43.3% strongly agreed) with the effective use of teaching resources during online teaching, including case videos. Respondents generally agreed (90%) on the mastery of educational foundations, with 56.7% agreeing and 33.3% strongly agreeing. The educational foundations are based on the Minister of Education and Culture's decision regarding curriculum guidelines. Regarding effectively planning teaching programs, 66.7% agreed, 16.7% strongly agreed, and 16.7% disagreed.

The responses show that teachers have successfully adapted to online teaching challenges, demonstrating

subject matter mastery, lesson management, and effective use of teaching resources. Class management and teaching program planning continue to be challenged, highlighting areas for potential improvement and support.

Regarding the statement about effectively leading the class during the pandemic, 80% agreed, with 20% strongly agreed. Leadership during the learning process is essential for creating an effective and enjoyable learning environment. Regarding managing learning interactions with students, 60% agreed, 23.3% strongly agreed, and 16.7% disagreed. The teacher must understand and adapt to the learning situation during online teaching. On the other sides, regarding evaluating student learning outcomes during the pandemic, 56.7% agreed, 26.7% strongly agreed, 13.3% disagreed, and 3.3% strongly disagreed. Assessment includes essential aspects such as knowledge, skills, and attitude, and teachers implement techniques, including online tests and practical assignments.

In addition, the respondents generally agreed (96.7%) (53.3% agreed, 43.3% strongly agreed) that using various methods in teaching is crucial during the pandemic. Teachers utilize platforms like Edmodo, WhatsApp, Google Meet, Google Classroom, Zoom, and That Quiz for quizzes. In terms of performing guidance and learning counseling functions, the majority agreed. Fifty percent (50%) agreed, 43.3% strongly agreed, and 6.7% disagreed. In collaboration with the teaching team, the school conducts counseling activities, including updating teaching methods suitable for the pandemic.

The responses demonstrate the importance of teachers' initiative in leading the class, managing interactions effectively, and employing diverse methods and counseling services for student learning during the challenging circumstances of the pandemic.

Regarding effectively leading the class during the pandemic, 80% of respondents agreed, with 20% strongly agreed. Leadership during the learning process is emphasized for creating an effective and enjoyable learning environment. About managing learning interactions with students, 60% agreed, 23.3% strongly agreed, and 16.7% disagreed. It indicates the necessity of understanding the learning situation during online teaching and adapting to it. For assessing student learning outcomes during the pandemic, 56.7% agreed, 26.7% strongly agreed, 13.3% disagreed, and 3.3% strongly disagreed. The assessment involves integral aspects like knowledge, skills, and attitude, and teachers employ various methods, including online tests and practical assignments.

Besides, respondents generally agreed (96.7%) (53.3% agreed, 43.3% strongly agreed) that using various methods in teaching is crucial during the pandemic. Teachers utilized platforms like Edmodo, WhatsApp, Google Meet, Google Classroom, Zoom, and That Quiz for quizzes. Regarding performing guidance and learning counseling functions, fifty percent (50%) agreed, 43.3% strongly agreed, and 6.7% disagreed. The school conducts counseling activities in collaboration with the teaching team, including updating teaching methods to fit the pandemic.

The responses demonstrate the importance of teachers' initiative in leading the class, managing interactions effectively, and employing diverse methods and counseling services for student learning during the challenging circumstances of the pandemic.

D. Instrumentation Testing

A validity test was conducted to ensure the instrument's validity by testing each indicator. Validity testing involved calculating each indicator's correlation values (r) and comparing them with the critical value (r-table). An item is considered valid if (r-calculated) is more significant than (r-table). Based on the calculation, the invalid variables were Decision-making, Making many decisions, Managing the class well, Mastery of educational foundations, and Planning online teaching. Some indicators were considered weak and were excluded from further analysis.

The reliability test aims to assess the stability and consistency of respondents in answering the statements. The method operated Cronbach's Alpha reliability test with a decision criterion of a value greater than 0.60. Both variables, Mental Workload and Teacher Performance, showed Cronbach's Alpha values greater than 0.60, indicating those are reliable.

The normality test was conducted to ensure that data distribution was normal. It used the One-Sample Kolmogorov-Smirnov Test. The data for both variables were found to have a normal distribution.

On the other hand, the linearity test was also conducted to examine the possibilities of its linear relationship between independent and dependent variables. It employed ANOVA with linearity and deviation from linearity tests. The p-values for linearity (0.108) and deviation from linearity (0.452) were more significant than 0.05, indicating a linear relationship.

In conclusion, the research instruments were valid and reliable, and the data showed normal distribution and linear relationships, laying the groundwork for the subsequent analyses.

E. Regression Analysis Results

This method was applied to predict the extent of the positive relationship between mental workload and teacher performance and whether teacher performance will increase or decrease. Simple linear regression analysis using SPSS 20.0 was applied with mental workload as the independent variable and teacher performance as the dependent variable.

The results show that the significance level (Sig.) for the Mental Workload variable is 0.095 (> 0.05). It implies that the Mental Workload does not significantly influence Teacher Performance. The regression equation is

$$Y = 31.297 + 0.303X \quad (1)$$

A coefficient of 0.303 indicates an increase in mental workload (X) positively affecting teacher performance (Y). Regression model testing calculated the regression model based on assumed responses and Likert scale values. Respondents agreed that teacher performance can be influenced by mental workload. The regression model effectively predicted the impact of independent variables

on the dependent variable linearly.

The regression model effectively predicted that increased Mental Workload would positively influence Teacher Performance. Accurate field data supported the hypothesis that respondents agreed on the impact of Mental Workload on Teacher Performance. In conclusion, the simple linear regression analysis indicates a positive relationship between mental workload and teacher performance, implying that an increase in mental workload corresponds to a rise in teacher performance, as supported by both assumed and accurate field data.

F. Coefficient of Determination (R^2) Test

This method determined the proportion of variability in teacher performance explained by mental workload. The result shows R Square (R^2) value is 0.147 (14.7%). It signifies that mental workload affects teacher performance by 14.7%, while other variables exceeding this regression model influence the remaining variability. The obtained R^2 is a small value, indicating a weak influence of mental workload on teacher performance.

G. t-Test

T-test was used to test the individual influence of each independent variable on the dependent variable. The results show that the T-value (t_i) for Total Mental Workload (TMW) is 1.761. Significance level (Sig.) for TMW= 0.095 (greater than 0.05). It means that Mental Workload does not significantly influence teacher performance (Total performance or TP).

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	31.297	3.587		8.725	.000
	TMW	.303	.172	.383	1.761	.095

a. Dependent variabel: TP

The coefficient of determination (R^2) test reveals that mental workload explains only a small proportion (14.7%) of the variability in teacher performance. Additionally, the t-test indicates that the influence of mental workload on teacher performance is not statistically significant. Therefore, other factors outside the scope of this regression model likely contribute more substantially to variations in teacher performance.

IV. Discussion

The significance of mental workload on teacher performance was rigorously examined through statistical analyses, with the p-value of 0.095 surpassing the significance level of 0.05. Consequently, there is no significant impact of mental workload on teacher performance. It is further substantiated by the t-value for mental workload, which is 1.761, below the critical t-table value of 2.1009. The study underscores that despite the seemingly high mental workload, it does not substantially impact teacher performance. When decoded into the Likert scale, the average teacher performance value of 37.497 falls into the "disagree" category. The R-square (R^2) value of 0.147 (14.7%) implies that mental workload explains only a modest 14.7% of the variability in teacher performance.

The study found that mental workload has no significant effect on teacher performance. Notably, despite the challenges posed by the pandemic, teachers consistently demonstrated high performance, as evidenced by respondent feedback and field measurements. The findings showed teachers' agreement on the importance of intense concentration while teaching in the pandemic era. Additional insights from the responses reveal varying levels of agreement with statements about mental workload, with an apparent agreement on the importance of high concentration. The interview feedback from the school's principal emphasizes the significant responsibilities shouldered by teachers, which include preparation, teaching, assessment, and administrative tasks, particularly during the pandemic.

Furthermore, students confirmed the positive sentiments, emphasizing teachers' effective management of online classes. They acknowledged the teachers' proficiency in delivering lessons, conducting interactive sessions, and providing easy-to-understand materials. However, students expressed a yearning to return to offline learning due to internet connectivity and data usage challenges. The study aligns with previous research indicating that high mental workload doesn't necessarily lead to decreased performance. The positive correlation between high mental workload and teacher performance suggests that the challenges posed by mental workload can serve as a stimulus for improved performance, as seen in the cases of Type A individuals who thrive under constant time pressure.

Results resonate with other research, showing that mental workload positively correlated with performance in health service [9],[10], business [11], education [12],[13]. However, contrasting findings from Ref. [14] and [15] indicate a negative correlation between mental workload and performance. The variations highlight that multiple factors influence performance, and effective management is crucial. The study reveals that while teachers encountered a substantial mental workload during the COVID-19 pandemic, their performance remains elevated. The positive correlation indicates that effective management, adaptation to online teaching dynamics, and commitment to professional responsibilities contribute to sustaining performance [9]-[11]. The study contributes valuable insights into the complex interplay between mental workload and teacher performance in evolving educational landscapes during a global crisis.

While shedding light on the current situation, the study acknowledges its limitations and suggests areas for future investigation. Including more variables that may influence teacher performance could enhance the analysis. A qualitative approach, such as in-depth interviews, is proposed for delving deeper into teachers' nuanced experiences. Furthermore, considering external factors that may influence teacher performance could broaden the study's scope and provide a more holistic understanding of the dynamics of the teaching profession.

The COVID-19 pandemic has significantly altered the world of education, requiring teachers to adapt to new

challenges in providing effective online instruction. Despite these challenges, teachers encountered many issues, including difficulties in keeping attendance records, suboptimal assessment due to prolonged screen exposure causing eye strain, and difficulties in managing multiple responsibilities, such as correcting accumulating student assignments and forgetting duty schedules.

Teachers faced time constraints as they balanced various responsibilities, including curriculum planning, student affairs, personnel management, finances, correspondence, and archiving. Despite these challenges, their unwavering commitment to upholding high-quality teaching standards persisted. The teachers' ability to navigate their time constraints while maintaining teaching excellence reflects their dedication to their profession. The transition to online teaching presented several challenges, particularly juggling teaching and administrative responsibilities. This situation created palpable pressure to meet deadlines. Conversely, teachers responded to this challenge with resilience, demonstrating their adaptability and determination to provide effective online education despite the obstacles. The shift to online teaching necessitated a significant adaptation to new dynamics. This adaptation involved fostering effective coordination between teachers, students, and parents, an essential component for the success of online learning. Teachers responded to this challenge by embracing the need for enhanced communication and collaboration in the digital realm, showcasing their flexibility in adapting to the evolving education landscape.

Despite these challenges, the study revealed that the mental workload did not significantly affect teacher performance. Responses to the Likert-scale questionnaire indicated that teachers overwhelmingly agreed that they maintained high-quality teaching, effectively managed the learning process, and led their classes well. Notably, the indicators of mastering teaching materials, managing the learning process, and leading the class were 100% agreement among teachers.

Teachers demonstrated commendable preparedness by mastering instructional resources, meticulously planning online teaching programs, and ensuring students were adequately prepared for the digital learning environment. Providing training sessions and guidance on remote learning tools played a pivotal role in enhancing teachers' proficiency in managing online classes. This support mechanism enabled them to navigate the complexities of remote teaching effectively. Teachers exhibited versatility by incorporating diverse learning resources and media into their online teaching strategies. This approach enriched the learning experience and facilitated meaningful interaction between teachers and students during virtual learning. Efficient handling of administrative tasks, including curriculum management and correspondence, reflected the teachers' commitment to the overall administration of the school. This dual proficiency in teaching and administrative duties underscored the holistic approach adopted by the educators in ensuring the smooth functioning of the educational institution.

V. Conclusion

The findings paint a nuanced picture of resilience, adaptability, and commitment within the teaching community during these challenging circumstances. Teachers experienced numerous challenges, ranging from demanding administrative responsibilities to the complexities of online teaching dynamics. Noteworthy were the limited time availability for administrative duties, the hurdles in conducting practical online classes, and the necessity for adapting to the evolving dynamics of online learning. However, amidst these challenges, the teachers demonstrated unwavering dedication, ingenuity, and a commitment to maintaining the quality of education delivery. The Likert-scale responses and insights from interviews and student perspectives revealed a consistent theme of teachers exhibiting high-performance levels. From mastering teaching materials to adeptly managing the learning process and leading classes effectively, teachers at SMK N 3 Bontang showcased a commendable ability to navigate the intricacies of online education. Notably, the positive correlation between mental workload and teacher performance challenges preconceived notions that increased workload necessarily leads to diminished outcomes. Instead, the study aligns with research highlighting that specific individuals, akin to Type A personalities, can thrive under constant time pressure and demanding workloads. The study provides valuable insights into the resilience and adaptability of teachers facing heightened mental workloads during the pandemic. It reinforces the notion that effective management, adaptation to new teaching dynamics, and unwavering commitment can counterbalance the challenges posed by mental workload, sustaining high levels of teacher performance. As the world of education evolves, these findings add to the ongoing discussion about the dynamic interplay between mental workload and performance, offering practical implications for academic institutions and policymakers seeking to support and enhance teacher well-being and effectiveness in the post-pandemic era.

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