Overview of the Application Student Fatigue Surveillance at High School

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Abstract

The COVID-19 pandemic has presented numerous challenges and unprecedented issues related to social distancing, resulting in profound changes in various aspects of life, including education. Amidst the pandemic, the Ministry of Education and Culture directed the shift to online learning, necessitating the use of video conferencing, mobile devices, and computers/smartphones for educational activities. This transition from the traditional offline learning system to the digital realm required students to adapt, leading to negative consequences such as fatigue, which manifested as a loss of motivation, increased lethargy, stress, and insomnia. This research employs a qualitative approach, utilizing Focus Group Discussions (FGD) to examine the phenomenon of student fatigue during the COVID-19 pandemic. Conducted in 2020, the study involved data collection from eight informants, who were the heads/leaders of senior high schools (SMA) in the East Java region. The findings revealed a disparity among schools in terms of their student fatigue monitoring programs, with some lacking such initiatives. Additionally, some schools seemed unaware of the significance of monitoring student resilience. Therefore, it is imperative to institute policies mandating health surveillance in all schools, especially with regard to students' physical and mental well-being, to ensure effective monitoring and support for optimal learning outcomes.

Keyword: *High School, Student Fatigue, Surveilance*

Received 13 June 2023/Accepted 29 August 2023 ©Author all rights reserved

Introduction

Coronaviruses have been known to cause mild to moderate respiratory infections for over five decades. However, in late 2019, a novel coronavirus, now named SARS-CoV-2 (2019), emerged suddenly in Wuhan, China. These viruses belong to the Coronaviridae family, within the Coronavirinae subfamily, and are characterized by their crown-like appearance (Latin: Corona = Crown), hence the name "coronavirus." Seven human coronaviruses (HCoVs) have been identified, causing a spectrum of illnesses from common colds to severe and potentially fatal infections (Ganesh et al., 2021). The World Health Organization (WHO) declared this outbreak a public health emergency of international concern on January 31, 2020 (Bulut & Kato, 2020). As of July 15, 2022, the COVID-19 pandemic had spread globally, resulting in more than 500 million reported cases and over 6.3 million deaths. By August 26, 2022, Indonesia alone had reported over 6.3 million COVID-19 cases and more than 100 thousand deaths (Satgas Covid 19, 2022).

The COVID-19 pandemic introduced numerous unprecedented challenges, particularly in the context of social distancing, which significantly disrupted people's lives across various facets, including education. Bhutan was among the first countries to respond by temporarily closing educational institutions and reducing working hours in March 2020 (Kuensel, 2020). Consequently, many schools, colleges, and universities transitioned away from in-person teaching. In the field of education, the Ministry of Education and Culture of the Republic of Indonesia mandated a shift from face-to-face learning to online methods. This policy presented new hurdles for educational institutions as they had to adapt to enable teaching and learning to continue for students in their respective homes. This transition necessitated the use of video conferencing, mobile devices, and computers/smartphones for all educational activities (de Oliveira Kubrusly Sobral et al., 2022).

The shift from traditional offline learning to online education necessitates students to adapt to these new conditions, with one prominent adverse consequence being student fatigue. This fatigue arises from various factors, including the monotonous nature of online learning, the lack of direct interaction with peers and instructors (Huzaimah & Amelia, 2021), and the feelings of loneliness, which exacerbate boredom during learning (Vitasari, 2016). Furthermore, an ineffective online learning system can hinder the comprehension of educational materials (Rovi et al., 2022), leading

to increased workloads and ultimately contributing to student fatigue. Other factors related to student fatigue include uninteresting learning materials, which can make the learning experience monotonous, and insufficiently detailed explanations of the subject matter.

The impact of student fatigue extends beyond the realm of education, especially due to the COVID-19 outbreak, which has been associated with increased anxiety (Cao et al., 2020). Online learning can also have long-term effects on cardiovascular health, primarily linked to unhealthy lifestyles and heightened anxiety (Mattioli et al., 2020). In a general sense, fatigue denotes a state where the body lacks the energy to perform tasks, often accompanied by discomfort and muscle pain (Parwata, 2015). Student fatigue encompasses a range of symptoms, including diminished enthusiasm, increased laziness, heightened stress, and even insomnia (Pawicara and Conilie, 2020). Fatigue can be categorized into three types: sensory fatigue, physical fatigue, and mental fatigue (Muna, 2013). Sensory and physical fatigue can be mitigated with adequate rest, but mental fatigue is more insidious and often goes unnoticed, necessitating vigilant monitoring.

Unchecked mental fatigue can impact the effectiveness of learning and lead to increased stress among students, stemming from their perceived inability to meet academic obligations or resolve personal issues (Arnsten et al., 2015). Research indicates that a significant proportion of students' experience distress, with about 1 in 6 students reporting excessive distress (Wuthrich et al., 2020). Thus, early monitoring at the school level is essential. Surprisingly, there is a dearth of studies addressing the implementation of student fatigue monitoring. Therefore, this study aims to gather insights from various schools regarding their approaches to monitoring student fatigue, both before and during the COVID-19 pandemic, with the overarching goal of providing a comprehensive understanding of the surveillance landscape concerning student fatigue in the context of the pandemic.

Method

Participants

This research was conducted in 2020 and involved data collection through Focus Discussion Groups (FGD) with the heads/leaders of Senior High Schools (SMA) in the East Java region. A total of 8 informants participated in the study, and informed consent was obtained from all participants before commencing the data collection process.

Research Design

This study adopted a phenomenological approach, primarily utilizing quantitative primary data collected from student respondents. While phenomenology is typically considered a qualitative research method aimed at gaining a deep understanding of social issues, in this instance, it was applied to collect data from a specific group of individuals rather than relying on a statistically representative sample of the broader population. Despite the common use of this method in conservation research, there has been limited critical evaluation of its application (O. Nyumba et al., 2018).

Variables

The study encompassed 14 variables, which included perspectives on monitoring student fatigue, an overview of fatigue surveillance and risk, perspectives from staff members, evaluations of mobile data and computer equipment and software, opinions on fatigue monitoring guidelines, perceived benefits of surveillance systems, identification of the parties using the surveillance system, intended recipients of dissemination results/outputs, data confidentiality measures, strategies to alleviate student fatigue, assessments of the online learning system, methods employed during online learning, and the impact of media type and usage duration on student fatigue.

Data Collection

The research was conducted in September 2021, with data collection employing the Focus Discussion Group (FGD) method. The study's informants comprised 8 high school principals. The FGD sessions lasted for approximately 30 minutes each.

Top of Form

Data Analysis

The data collected for this study were subjected to thematic analysis, a method that can be descriptive, explanatory, and critical in nature. Thematic analysis allows researchers to define and describe a participant's reality based on their own written or spoken accounts. This approach involves summarizing participants' reports and identifying recurring patterns. Additionally, thematic analysis can serve as an explanatory tool, enabling the inference of meaning from experiences, perspectives, or belief systems within the framework of a particular conceptual or theoretical model (Lochmiller, 2021). In this research, all authors were actively engaged in formulating interview questions, conducting data collection, and performing data analysis. The process involved reading the entire content or transcript of the interviews to gain an understanding of the data. Subsequently, coding was carried out to categorize and organize the data. The research team then derived themes from the obtained codes and expanded on these themes by referencing existing research.

Trustworthiness

To ensure the validity and reliability of the data, researchers took measures to reconfirm the outcomes of discussions with the informants. The results of all discussions were documented using Zoom Meeting media, contributing to the transparency and accuracy of the data collection process.

Limitations

It should be noted that not all intended targets, specifically private schools, were included in the interviews, limiting the scope of the study to public schools only. This limitation may influence the comprehensiveness of the findings, as private schools may have different perspectives and experiences related to student fatigue monitoring during online learning.

Result

Based on the results of the analysis, significant findings emerged from the perspectives of school headmasters concerning the student fatigue surveillance system. These findings have been summarized in Table 1, which outlines the key themes and sub-themes identified in the study. One

major theme centers on the opinions of school headmasters regarding the student fatigue surveillance system. Within this overarching theme, several sub-themes have been elucidated, offering insights into different facets of the surveillance system's implementation and its implications for both schools and students.

Firstly, the sub-theme of "Surveillance of Student Fatigue and School Readiness" highlights the importance of monitoring student fatigue levels and how schools are preparing to address this issue. Secondly, the sub-theme of "Surveillance System and Data Confidentiality" underscores the significance of data security and confidentiality in the surveillance process. Lastly, the sub-theme of "Learning Media and Efforts to Prevent Student Fatigue" sheds light on the role of various learning media and the strategies employed to prevent and mitigate student fatigue during online learning. These findings collectively contribute to a comprehensive understanding of how schools perceive and engage with the student fatigue surveillance system, offering valuable insights into the challenges, benefits, and approaches associated with monitoring and addressing student fatigue in the context of online education.

Table 1.
Research Finding About Student Fatigue Surveillance System In High School

Theme	Sub theme
Heads master opinion about student fatigue surveillance system	Each opinions from head master
School Viewpoint on Student Fatigue Surveillance System	Surveillance Student Fatigue and School Readiness 1. Supporting Parties 2. Parties Involved 3. Readiness of school facilities (mobile data) 4. Readiness of school facilities (computer) 5. Guide Available 6. Surveilance system benefits Surveillance System and Data Confidentiality 1. Utilizing Parties 2. The receiving party of the Result 3. Data Confidentiality 4. Data Confidentiality Reasons Learning Media and Effort to Prevent Fatigue Student 1. Learning Media 2. Duration of learning 3. Effort to Prevent Fatigue Student

Heads Master Opinion About Student Fatigue Surveillance System

Most of the informants are in favor of monitoring student fatigue, with the exception of the Head of School 1, who expressed dissenting views by stating that...

"…There was no specific research on monitoring student fatigue, only in the form of evaluation through the teacher. In September 2021, face-to-face learning begins with a capacity of 30% rotation per grade level per week. Evaluation at the end of September all students who took part in face-to-face learning were in good health (not exposed to Covid-19) so that in October the percentage of capacity was increased to 50% with a hybrid system. At the time of the 2021 grade increase, there were reports that the majority of students could not concentrate so that online learning was less than optimal and had many

problems compared to face-to-face learning. Therefore, teachers are required to innovate in providing learning methods to reduce boredom."

The teachers agree if they make innovations so that students don't get bored during distance learning.

Meanwhile, according to the opinion of school leaders 2 to 8, monitoring student fatigue is important. School leaders 2 stated:

".. I believe that this can be done by monitoring student attendance and comparing online and offline schools. By analyzing risk factors, it is done once a year, but to be more accurate, it is done 2 times a year (every semester). In addition, the head of school 3 is of the opinion that monitoring student fatigue in online learning at SMA Sejahtera does not have a system/benchmark. However, the school provides online counseling services through the Google Classroom/WhatsApp class and opens the opportunity for students to be able to share their feelings about online learning." Teachers can influence student motivation through a class reward structure (Furrer & Skinner, 2003).

"*..The school once provided a questionnaire on the health of children and families, but the fatigue questionnaire was not available for fear that students would not be able to fight during the pandemic."*

Based on research, more than half of the students indicated lack of engagement in class, difficulty in maintaining their focus and Zoom fatigue after attending multiple online sessions (Asgari et al., 2021)

According to the head of school 4, student fatigue should receive special attention.

"…The importance of monitoring fatigue because it can affect fitness. In SMA Muhammadiyah 10 Surabaya, if there are special students (athletes), there are 3 different monitoring achievements, namely skills, psychology and nutrition. Fatigue monitoring conducted in schools focuses on student psychology. In this case the role is teachers, especially BK/BP teachers. According to the principal, monitoring before the pandemic and during the pandemic is not too different, because every student must report. This is because SMA Muhammadiyah 10 Surabaya is a talent school. The school also has an online monitoring system in the form of an application. In the application students report their condition. Monitoring is carried out in different schools, differentiated by students. If students excel, monitoring will be carried out

more often, such as once a month. If other students usually every 3 months. In a maximum of 1 year there are 4 times of monitoring."

Consistent with earlier research, external load monitoring involves the use of various monitoring devices, such as power output measuring tools and time-motion analysis. In addition, internal load units encompass factors like perceived effort, heart rate, training impulses, and blood lactate levels. The disconnection between external and internal load units can provide valuable insights into an athlete's state of exhaustion, as discussed by Halson (2014). Moreover, School Leader 5 posits that...

"…fatigue monitoring needs to be done because when there is learning the school does not know how the condition of students at that time, students are ready or not in receiving learning. In fact, the school needs to know how the condition of each student. However, at SMAN 1 Kediri there is no monitoring of student fatigue".

School leaders 6, stated that

"…fatigue monitoring is very necessary. Before the Covid-19 outbreak, the school had the view that student fatigue only came from the burden of school work, but after the implementation of online learning the school assumed that student fatigue arises because of the saturation factor during online learning, the burden and demands of the teacher for all students to be able to follow learning well, the demands of economic problems so that students have to work at night and in the morning do online learning with Google Classroom."

School leaders 7, stated that

"We did not monitor fatigue because they were still focused on preparing for face-to-face learning and had not thought that fatigue due to online learning could cause problems for students."

The head of school 8, stated that

> *"It is necessary to monitor student fatigue in order to know what causes student fatigue. According to the principal, the period of time when students feel tired is nearing the end of semester exam (UAS) because teachers begin to collect unfinished assignments so that fatigue monitoring can be carried out twice before the end of semester exams."*

According to the research findings, a substantial 56% of respondents acknowledged feeling less prepared for exams. While many students welcomed the enhanced flexibility offered by remote learning, they also highlighted several shortcomings that require attention. These include digital fatigue, reduced opportunities for participation, and the absence of hands-on learning experiences in areas such as clinical skills and laboratory work (Shahrvini et al., 2021).

School Viewpoint on Student Fatigue Surveillance System

The findings from the FGD sessions, as presented in Table 2, underscore the school's strong endorsement of the student fatigue monitoring program. The responsibility for conducting this monitoring primarily falls on teachers, particularly BK (Bimbingan Konseling) teachers or homeroom teachers, as well as the school's IT staff. To facilitate this process, schools are willing to provide necessary computer facilities and credit support. Notably, the absence of an established guide on monitoring student fatigue is a common concern among all schools, highlighting the pressing need for such guidance. Schools that endorse fatigue monitoring programs are in agreement that these initiatives hold significant benefits.

Surveillance System and Data Confidentiality

Table 3 reveals that the surveillance data will be utilized primarily by the school community, including teachers and students, along with the parents of the students. The dissemination of outputs will target teachers, especially homeroom and BK teachers, as well as parents and students. Regarding the delivery of information to students, it is preferable to provide direct explanations or involve parents in the process. Emphasis is also placed on the importance of maintaining data confidentiality. However, the extent of data disclosure will be determined by agreements among

the involved parties, with careful consideration given to what should and should not be made public.

Learning Media

Regarding learning media, the findings from FGD sessions, as outlined in Table 4, reveal that schools initiated online learning in March 2020 and transitioned to a blended approach, combining both online and offline learning, from July to August 2021. During online learning, students typically engage for five hours per day, while offline activities are conducted for 2-3 days, lasting for three hours each day, with a participation rate of around 50%. Various digital tools and platforms are employed in online learning, including Google Meet, Google Classroom, Zoom, Google Slides, and WhatsApp (WA) Group. The predominant online teaching methods involve discussions, material delivery, and assignment submission, utilizing a range of digital channels such as WA groups, Google Meet, Google Classroom, and even YouTube. Several schools have implemented strategies to combat student fatigue, including providing support from BK (Bimbingan Konseling), evaluating students from a psychological perspective using applications, and monitoring students' physical well-being. These measures collectively represent schools' efforts to enhance the online learning experience and address the challenges associated with student fatigue.

Table 2.
Surveillance Student Fatigue and School Readiness

School	Supporting Parties	Parties Involved	Readiness of school facilities (mobile data)	Readiness of school facilities (computer)	Guide Available	Surveilance system benefits
KBS	No	-	-	-	-	-
WH	Yes	IT staff	Yes	Yes	No guide yet	There are benefit
SS	Yes	IT staff and some teachers	No	Yes	No guide yet	-
MS	Yes	Phsycological teacher and team	No	Yes	No guide yet	There are benefit
KE	Yes	IT staff and counseling guidance teacher	Yes	Yes	No guide yet	There are benefit
PDK	Yes	Homeroom teacher, counseling guidance teacher, and IT staff	No	Yes	No guide yet	There are benefit
SA	Yes	-	-	Yes	No guide yet	There are benefit
SM	Yes	-	-	Yes	No guide yet	There are benefit

Table. 3
Surveillane System and Data Comfidentiality

School	Utilizing Parties	The receiving party of the Result	Data Confidentiality	Data Confidentiality Reasons
KBS	-	-	Yes	Other students must not know the results of other students' filling in
WH	-	-	Yes	Only student and counseling guidance teacher who knows
SS	Student and teacher	Homeroom teacher, counseling guidance teacher, and some teacher	-	-
MS	Student and teacher	Teacher (teacher who deliver to student)	According to conditions	Adjusting to the agreement that needs to be conveyed and not conveyed to the audience.
KE	Student, teacher, and student parent/student guardian	Homeroom teacher and delivered to the students in person	Yes	Results are still delivered to students
PDK	Student and teacher	Parents (if the student has a problem)	Yes	Very necessary because the data is personal
SA	Student and teacher	Teacher and student parent	Yes	Only the children, the BK teacher as a companion and the parents know
SM	Teacher and student parents/student guardian	Teacher and student parent	Yes	-

Tabel. 4
Learning Media and Effort to Prevent Fatigue Student

School	Learning Media	Duration of learning	Effort to Prevent Fatigue Student
KBS	Google Slide, Google Classroom, Google Meet/Zoom Meeting	• Online 5 hours/day (10 hour learning) • Offline 6 hours/week (including breaks)	-
WH	-	-	Providing assistance from the counseling guidance party
SS	Google Class Room dan Google Meet	34 hours online learning	-
MS	E-Learning	18 hours/week	There are applications for evaluating from a psychological approach
KE	Google Meet, Google Classroom, Zoom Meeting, E-Learning, Youtube, dan WhatApps	60 hours/week	-
PDK	Google Class Room	18 hours/week	Physical monitoring only
SA	WA grup, zoom meeting, gmeet	15 hours/week	Hold joint sports and relaxation activities
SM	Google Meet, Google Classroom, Zoom, Google Slide Dan WA Group.	30 hours/week	Ask students individually and help solve existing problems by providing solutions.

Discussion

Fatigue monitoring is undeniably crucial, as it encompasses not only physical fatigue, which can be visibly observed by the school, but also mental fatigue, which necessitates more comprehensive monitoring with the assistance of personal data from counseling and guidance teachers. School leaders have diverse perspectives on monitoring student fatigue, but the prevailing sentiment supports the implementation of fatigue surveillance programs during online learning. The

introduction of computer hardware and software enhances the professionalism and efficiency of those involved in monitoring student fatigue. This surveillance is instrumental in identifying students with health-related issues, enabling the development of preventive strategies. As one informant aptly put it, "The data generated will reveal the students' condition, and if fatigue is detected, it signals the need for a school evaluation of learning methods and approaches for students."

Surveillance data serves the crucial purpose of early identification and detection of student conditions during the learning process, especially changes in health status related to learning. It contributes to the formulation of school policies in response to these findings. To maintain confidentiality, not all parties have access to the data, and only authorized individuals can view it. This aligns with the informant's statement that emphasizes the need for mutual agreements regarding what information should and should not be shared with others. This approach resonates with Mansur's research (2017), which underscores the use of anonymous data for reporting to employers and management, including the monitoring of occupational health and safety programs. Such data covers assessments, exposure control, and health surveillance activities conducted as part of the health risk management process.

The onset of online learning can be traced back to March 2020, coinciding with the initial presence of COVID-19 in Indonesia. By 2021, several schools had adopted hybrid methods, combining both online and offline instruction. The use of online media presented challenges for students, leading to fatigue during learning sessions. Informants in the FGD interviews highlighted the link between learning and student fatigue and noted the pressures from parents to return to in-person schooling due to students feeling tired and stressed while studying from home. Challenges included network disruptions, reduced enthusiasm for online learning, limited facilities, and the cost of internet data. These challenges are consistent with prior research findings, which documented negative impacts of online learning, including difficulties in grasping the material, unreliable internet connectivity, decreased enthusiasm, limited resources, and the financial burden of internet data (Adi et al., 2021).

Conclusion

The results and discussions have revealed that some schools currently monitor student fatigue through physical assessments, rather than relying on specialized instruments or data. This monitoring process occurs twice a year, typically during the middle and end of the semester. Fortunately, all schools possess the necessary infrastructure to facilitate this program, including computers and an IT team. However, it's noteworthy that none of the schools have established guidelines for monitoring student fatigue, highlighting the urgent need for such guidance.

The data collected from student fatigue surveillance will be put to good use within the school community. This includes teachers, students, and the parents of students. Outputs from the surveillance program will be shared primarily with teachers, especially homeroom and guidance counselors, as well as parents and students themselves. When it comes to conveying this information to students, the preference is for direct explanations or, ideally, involving parents in the process. The importance of health surveillance, both physical and mental, is underscored, particularly for students. This proactive approach aims to ensure that students are in the best possible condition, both physically and mentally, to engage optimally in their learning activities.

Acknowledgment

Thank you for all informants who has join the FGD for this research.

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