MindScape: Journal of Psychology
https://ejournal.unuja.ac.id/index.php/sphy

E-ISSN: 3090-8655
P-ISSN: 3090-7853

Experiences of Mental Fatigue among University Students in a Digital Academic Ecosystem

Muhamad Furqon[1]✉, Ramadani[2]
Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia

Abstract:
Digital academic ecosystems have intensified students' exposure to continuous screen-based demands, raising concerns about mental fatigue. This study aims to explore how university students experience mental fatigue within digitally mediated academic routines. Using a qualitative case study design, data were collected from 18 informants consisting of undergraduate and postgraduate students, lecturers, and academic staff through in-depth interviews, non-participant observation, and document analysis. The findings show three interconnected patterns: Digital overload generates cognitive exhaustion, indicated by slowed comprehension, reduced attention span, and repeated confusion when processing tasks; Blurred boundaries reduce mental recovery, evidenced by academic notifications and LMS activities entering private spaces and late-night hours; and Multitasking decreases focus and motivation, visible in rapid tab-switching, interrupted workflow, delayed task initiation, and deadline-driven completion. The novelty of this study lies in conceptualizing mental fatigue as a structural outcome of continuous connectivity rather than individual weakness. The study recommends clearer communication windows, simplified platform use, and institutional policies that protect recovery time.

Article History
Received April 2025
Revised May 2025
Accepted July 2025

Keywords
Mental Fatigue; Digital Academic Ecosystem; Cognitive Exhaustion; Multitasking.

✉Corresponding Author: mfurqon774mail@gmail.com
DOI: https://doi.org/10.61987/spsyc.v1i2.000
Cite in APA style as:
Furqon M., & Ramadani R. (2025). Experiences of Mental Fatigue among University Students in a Digital Academic Ecosystem. *Spectrum: Journal of Psychology, 1*(2), 65-79.

INTRODUCTION

The rapid digital transformation of higher education has reshaped how university students learn, communicate, and complete academic responsibilities. This shift matters to society because the quality of university learning directly influences the future workforce, national competitiveness, and human capital development (Eroshenkova et al., 2021; Wahyono et al., 2023; R. Wang et al., 2021). However, the expansion of digital learning environments also brings psychological costs that are often overlooked. Many students report mental fatigue due to prolonged screen exposure, constant cognitive demands, and the expectation to multitask across

platforms. This condition is not merely an individual problem but a broader social issue, as mental fatigue can reduce productivity, weaken academic performance, and increase the risk of dropping out (Chen et al., 2021; Zia et al., 2021). Evidence from contemporary educational contexts suggests that digital overload has become a common experience among students. Therefore, studying mental fatigue in digital academic settings is essential to protect student wellbeing and sustain educational quality.

In real academic contexts, digital ecosystems create learning rhythms that feel continuous and difficult to escape. Students interact daily with learning management systems, online lectures, virtual group discussions, automated deadlines, and academic communication across multiple platforms. Field observations and student narratives frequently reveal symptoms such as reduced attention span, emotional exhaustion, diminished motivation, and disrupted sleep patterns (Al Maamari, 2024; Shin et al., 2022). These symptoms are intensified when academic tasks overlap with digital distractions, social media demands, and constant notifications. Moreover, the new academic norm often expects immediate responses to emails, messages, or online submissions, which fosters a persistent "always online" mentality (Li et al., 2023; Shu et al., 2023). As a result, students struggle to maintain psychological recovery spaces between academic and personal life. This phenomenon indicates that mental fatigue has become an emerging challenge within universities, requiring systematic investigation to understand its patterns, triggers, and consequences.

Previous studies have examined student burnout, academic stress, and cognitive overload, yet many still treat mental fatigue as a general outcome rather than a lived experience within digital ecosystems. Schwartz et al. (2025) and Siregar (2024) argued that student mental exhaustion is closely linked to academic pressure and weak time management. Imjai et al. (2024), Abed et al. (2020), and Wahyuni et al. (2022) found that heavy digital device usage correlates with reduced concentration and increased academic burnout. Wang et al. (2022) and Abyan (2020) highlighted that digital multitasking increases cognitive load and contributes to emotional fatigue. Mahmudah et al. (2023), Patti (2020), and Ribeiro et al. (2024) emphasized that burnout escalates when academic demands exceed students' recovery capacity. While these studies provide valuable insights, they often rely on survey-based measurements and rarely explore how students subjectively experience mental fatigue in digitally saturated academic environments. This gap is significant because mental fatigue is shaped by context, meaning, and daily practices. Addressing this limitation is necessary for deeper understanding.

The novelty of this study lies in its focus on mental fatigue as an experiential phenomenon emerging from the interaction between students and the digital academic ecosystem. Rather than framing fatigue solely as the result of workload, this research conceptualizes it as a complex outcome of continuous connectivity, fragmented attention, screen-based learning, and blurred boundaries between study and personal life (Naveed et al., 2023; Rasheed, 2023). The study also treats mental fatigue as multidimensional, encompassing cognitive strain, emotional depletion, and behavioral disengagement simultaneously. In terms of state of the art, the research aims to move beyond simplified burnout indicators by mapping the lived realities of students navigating digitally mediated academic life (Seo et al., 2024; Vitale et al., 2021).

This approach is particularly important because digital education is no longer temporary or exceptional; it has become structurally embedded in university systems. Therefore, investigating mental fatigue through a contextual and experience-based lens is both timely and urgent for improving digital learning sustainability.

Based on the above context, this study is guided by the central research problem: how do university students experience mental fatigue within a digital academic ecosystem? This main question is further developed into several key inquiries, including: what digital and academic factors most strongly trigger mental fatigue among students? How does mental fatigue affect students' attention, motivation, decision-making, and academic engagement? In addition, the study asks how students interpret the fatigue they experience whether they perceive it as normal, as a personal weakness, or as a consequence of structural demands within digitally organized education. These questions are essential because mental fatigue is not only measurable through psychological scales but also meaningful through students' narratives and interpretations. By addressing these research problems, the study seeks to produce findings that are not merely descriptive but also explanatory, offering a deeper understanding of student wellbeing in digitally mediated higher education contexts.

The main argument of this study is that mental fatigue among university students in digital academic ecosystems is not simply an individual issue but a structural consequence of academic systems designed around constant connectivity and uninterrupted performance. A preliminary assumption is that mental fatigue emerges from the accumulation of cognitive load caused by digital multitasking, automated deadlines, persistent notifications, and the loss of recovery spaces. The originality of this study lies in its effort to document mental fatigue through students' lived experiences, allowing richer insight into how fatigue is produced, felt, and managed in everyday academic life. Academically, this research contributes to the growing discourse on student mental health by offering a contextual framework that connects digital learning environments with psychological outcomes. Practically, the findings may inform university policies on digital learning design, workload management, and mental health support strategies to make digital academic ecosystems more humane and sustainable.

RESEARCH METHOD

This study employed a qualitative case study design to explore the lived experiences of mental fatigue among university students within a digital academic ecosystem (Finn, 2022). A qualitative approach was selected because mental fatigue is not merely a measurable psychological score, but a complex experience shaped by students' perceptions, meanings, daily academic practices, and interactions with digital systems. The case study strategy was chosen to allow an in-depth investigation of a bounded phenomenon, namely mental fatigue within a specific institutional and technological learning context while capturing the richness of contextual factors such as academic workload structures, learning platform use, and communication norms. This design is appropriate because the study aims to understand how mental fatigue is experienced, interpreted, and managed, rather than to test hypotheses or generalize statistically across populations.

The research was conducted at a public university that has implemented a fully integrated digital learning ecosystem, including a Learning Management System (LMS), institutional email, online academic advising, and routine blended or online learning practices. This location was purposively selected for three main reasons. First, the university represents a typical contemporary higher education environment where digital platforms are structurally embedded in academic administration and teaching. Second, the institution has high student engagement with online learning tools, which makes it a relevant setting to observe and explore mental fatigue as a digital learning consequence. Third, the university provides diverse student populations across faculties, enabling the study to capture variations in mental fatigue experiences across academic disciplines, learning cultures, and digital task demands. The selected site therefore offered an appropriate context for examining mental fatigue as a phenomenon emerging from continuous connectivity, digital workload, and blurred academic-personal boundaries.

Participants were selected using purposive sampling with maximum variation to ensure rich and diverse perspectives (Sun et al., 2020). Informants were chosen based on their direct experience with intensive digital academic engagement, such as frequent LMS use, online task submission, virtual communication with lecturers, and participation in online learning activities. In addition, participants were included if they reported experiencing symptoms associated with mental fatigue, such as concentration decline, cognitive overload, emotional exhaustion, and reduced academic motivation. To strengthen contextual understanding, the study also included a small number of supporting informants (lecturers and academic staff) to provide triangulation regarding institutional digital learning practices, workload distribution, and student engagement patterns. The total number of informants was determined based on data saturation, meaning recruitment continued until no substantially new themes emerged.

Table 1. Total Informants and Selection Rationale

Category of Informants	Total (n)	Educational Background	Rationale for Selection
Undergraduate Students (Years 1–2)	6	Early-stage university students across faculties	Selected to capture adaptation challenges, transition stress, and early exposure to digital academic demands.
Undergraduate Students (Years 3–4)	6	Senior undergraduate students across faculties	Selected to explore cumulative fatigue, long-term digital learning exposure, and thesis/task intensification.
Postgraduate Students	3	Master's students	Selected to capture advanced academic workload, research pressure, and digital supervision dynamics.
Lecturers	2	Academic staff (Master's/PhD)	Selected for triangulation on digital teaching practices, communication expectations, and assessment design.
Academic/Administrative Staff	1	University staff responsible for LMS or academic services	Selected to clarify institutional digital systems, workflow, and academic policy related to online learning.
Total	18		Data collection continued until thematic saturation was reached.

Data were collected through multiple qualitative techniques to ensure depth and credibility (Morgan, 2022). The primary technique was semi-structured in-depth interviews with student participants, focusing on daily academic routines, experiences of digital overload, cognitive and emotional symptoms, coping strategies, and interpretations of mental fatigue. Interviews were conducted in a flexible manner to allow participants to elaborate on personal experiences, while still addressing the core research questions. In addition, non-participant observation was used to examine students' digital learning practices in natural settings, such as studying with laptops, managing LMS tasks, attending online meetings, and responding to academic notifications. The study also employed document analysis of institutional digital artifacts, including LMS announcements, academic schedules, course task structures, and relevant digital academic policies. These sources provided contextual evidence about how digital learning is structured and how it may contribute to mental fatigue.

Data analysis followed the interactive model of Miles, Huberman, and Saldaña, consisting of data condensation, data display, and conclusion drawing or verification (Im et al., 2023). First, data condensation was conducted through systematic transcription, coding, and reduction, where raw interview and observation data were summarized into meaningful units and categorized into initial themes such as cognitive overload, digital multitasking, emotional exhaustion, sleep disruption, and loss of recovery space. Second, data display was performed by organizing themes into matrices, thematic maps, and narrative clusters to compare experiences across participant groups and educational backgrounds. This stage helped identify patterns, contrasts, and relationships between digital ecosystem factors and mental fatigue symptoms. Third, conclusion drawing and verification were conducted by refining themes into more stable findings, testing interpretations against raw data, and checking whether the emerging conclusions were consistent across multiple sources. Verification was strengthened through iterative analysis, repeated reading, and revisiting initial codes to avoid premature conclusions.

To ensure trustworthiness, the study applied credibility, transferability, dependability, and confirmability strategies. Credibility was ensured through triangulation of data sources (students, lecturers, staff), triangulation of methods (interviews, observation, document analysis), and member checking, where selected participants reviewed summaries of their interview results to confirm accuracy. Transferability was supported by providing thick description of the research setting, participant characteristics, and digital learning context, enabling readers to evaluate relevance to other institutions. Dependability was addressed through maintaining an audit trail of interview guides, coding procedures, and analytical decisions. Confirmability was strengthened by reflexive notes documenting the researcher's assumptions, potential biases, and analytic reflections, ensuring that findings were grounded in participants' accounts rather than researcher preferences. Through these procedures, the study sought to produce rigorous qualitative findings that accurately represent student experiences of mental fatigue within a digitally mediated academic ecosystem.

RESULT AND DISCUSSION

Result

This section presents the main findings of the study on university students' experiences of mental fatigue within a digital academic ecosystem. The results are organized into three interconnected sub-findings that reflect how digital learning demands shape students' cognitive and emotional conditions. Each sub-finding is described through empirical evidence from interviews, observation, and documentation to provide a clear and contextual understanding of the phenomenon.

Digital overload triggers cognitive exhaustion

In the context of this study, digital overload is understood as a condition when students receive too many academic demands through digital media simultaneously, either from LMS, class WhatsApp groups, lecturer emails, video conferencing platforms, or online assessment systems. This overload is not only in the number of tasks, but also in the intensity of notifications, the expected response speed, and the frequency with which applications switch in a short period of time. Meanwhile, cognitive exhaustion is defined as mental fatigue characterized by difficulty focusing, slow comprehension of material, easy forgetfulness, loss of the ability to think clearly, and the appearance of a feeling of "fullness" in the head even though physical activity is not strenuous. In the field, students describe this fatigue as a condition when the brain feels "depleted" before the task is completed, so they continue to learn but are no longer able to process information effectively. These sub-findings suggest that academic digitization not only moves activities to the screen, but also increases cognitive load.

The results of the interviews show that digital overload is felt as mental pressure that accumulates quickly and is difficult to stop. An informant stated, "If you open the LMS, it feels like being bombarded, there are assignments, announcements, quizzes, deadlines. After just finishing one, another one appeared." Another informant added, "I'm not physically tired, but I'm tired in my head. It's like thinking about it, but no one is coming in." The researcher interprets that overload does not only come from the number of activities, but also from a digital pattern that is continuous exposure students are constantly dealing with academic information without a clear break. In this condition, the brain is forced to work in standby mode, processing many instructions at once. Cognitive fatigue arises when a student's mental capacity is no longer able to filter information effectively. This gives rise to a paradoxical learning experience: students look active, but mentally experience a decline in thinking function.

In addition, interviews also show that digital overload often causes specific cognitive symptoms, such as slowing down to understand the material and losing focus even though the study time is quite long. One student explained: "I could sit in front of a laptop for three hours, but after that I couldn't remember what I read. It feels empty." Another informant said, "If I have a lot of assignments online, I can easily make mistakes, read instructions many times but am still confused." Based on this data, researchers interpreted that digital overload triggers fatigue because students face fragmented attention their attention is divided between assignments, notifications, lecturer communication, and group discussions. As a result, the thought process does

not take place in depth, but is intermittent. Cognitive fatigue arises not only because of long learning, but because of digital learning patterns that demand a quick shift in focus. Students end up experiencing a decline in the quality of information processing, which leads to frustration and loss of academic confidence.

The observation results strengthened the findings of the interviews, especially in the behavior patterns of students when facing digital academic loads. The researchers observed that students often open multiple tabs at once, move from LMS to WhatsApp, then return to assignment files, and then open a learning video platform in a short span of time. In some cases, students are seen reading assignment instructions over and over again, but still show a confused expression, a long pause, or a sigh before continuing. The researchers also noted that students tend to procrastinate when notifications keep coming in, then work in a hurry before the deadline. The restatement of these findings is that digital overload pushes students to a state of "constant busyness", but the ability to think clearly decreases. The data patterns showed a consistent relationship: the higher the intensity of exposure to tasks and digital communication, the greater the signs of cognitive exhaustion such as loss of focus, slow comprehension, and decreased learning effectiveness. These findings illustrate that fatigue is not due to lack of learning, but due to too much digital cognitive load.

Blurred boundaries reduce mental recovery

In this study, blurred boundaries are understood as the blurring of the boundaries between academic space and students' personal space due to a digital learning system that is constantly connected. This blurred boundary occurs when academic activities (working on assignments, class discussions, consulting lecturers, reading materials, or receiving announcements) enter a time and space that should be a mental recovery area, such as the bedroom, living room, mealtime, evening, or weekend. Meanwhile, mental recovery is defined as the process of psychological and cognitive recovery after undergoing academic activities, which is characterized by clear breaks, relaxation, quality sleep, and a sense of "detachment" from academic demands. In the field, blurred boundaries make it difficult for students to really quit academic activities, because notifications, deadlines, and digital communication are still present in personal spaces. These sub-findings suggest that mental fatigue is not only triggered by tasks, but also by a loss of stable recovery space.

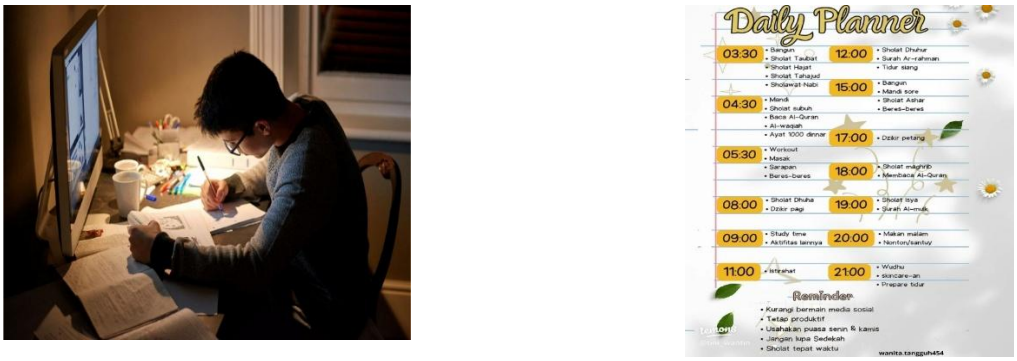

Figure 1. Digital academic demands → Academic messages enter personal space → No clear break time → Reduced recovery → Prolonged fatigue

The results of the field documentation show that students' academic activities actually penetrate the personal recovery space. In some photos, students can be seen working on assignments in the bedroom with their laptops on and the LMS tab open, while the room shows breaks. Other documentation shows a phone screen displaying class group notifications at night, along with conversations about task revisions, deadlines, and group work breakdowns. Researchers also found documentation of academic activities being carried out in the living room or dining table, which was supposed to be a non-academic social space. The researchers' interpretation shows that the digital academic ecosystem encourages students to bring "classes" into personal spaces without a clear transition. As a result, students do not have a psychological separation between study and rest. When the recovery room turns into an academic room, the body may stop moving, but the mind continues to work, so the recovery process becomes suboptimal.

In simple terms, these findings show that students have difficulty recovering mentally because digital academic activities do not know the boundaries of space and time. Assignments, lecturer communication, group discussions, and academic notifications go into the area that should be a resting place. Students don't really "finish college" when formal lectures end, because the digital demands are still present through the devices they always carry. This makes it difficult for students to create a clear pause to recover. As a result, mental recovery that usually occurs through sleep, leisure time, or personal activities is disrupted. In other words, the main problem is not just the number of tasks, but the disappearance of the boundaries that separate the academic world from personal life. These findings show that mental recovery requires clear space and time, but both are becoming blurred in the digital academic ecosystem.

The main pattern that emerged from the documentation data was the consistency of the entry of academic activities into the personal space of students, especially at times that should be the recovery period. Students tend to stay connected to academic activities through their phones and laptops, even at night, on weekends, or when they are at home. Another pattern suggests that the more often students receive academic notifications outside of lecture hours, the less likely they are to experience psychological breaks. The documentation also shows that private spaces such as bedrooms have changed their function into learning rooms, so that the psychological association with the rest room has also changed. Overall, this pattern confirms that blurred boundaries create incomplete recovery conditions: students are seen to be physically rested, but remain mentally active. The accumulation of this condition prolongs fatigue and increases susceptibility to ongoing mental fatigue.

Multitasking decreases focus and motivation

In this study, multitasking is understood as the behavior of students who carry out several academic and non-academic activities simultaneously through digital devices, such as opening an LMS, doing assignments in Google Docs, watching lecture materials, while moving to WhatsApp, Instagram, or other applications in close proximity. Multitasking doesn't just happen in the form of using multiple apps, but also

in fragmented attention patterns, such as reading material while responding to group chats or checking notifications repeatedly. Meanwhile, decreased focus is defined as a decrease in the ability to maintain attention on one academic task consistently, which can be seen from the frequent breakdowns of students, repeating instructions, or losing the flow of work. Decreased motivation is defined as a decrease in the drive to complete a task, which is apparent from procrastination, expressions of frustration, and behavioral changes from active to passive. These sub-findings emphasize that multitasking is not just a habit, but has a direct impact on the quality of concentration and motivation to learn.

Table 2. Table of Observation Results and Indicators

Field Observation	Indicator
Students opened the LMS, Google Docs, and YouTube lecture materials simultaneously	Academic activities were performed concurrently within the same time period
Students switched tabs or applications every 1–3 minutes	Fragmented attention and short focus duration
Students stopped working on assignments when notifications appeared, then returned after several minutes	Digital distractions interrupted the workflow
Students reread task instructions repeatedly before starting to type	Reduced comprehension and task focus
Students replayed videos/lecture materials because they missed key parts	Unstable focus during information processing
Students delayed starting tasks even though the screen was already open	Decreased motivation and resistance toward tasks
Students sighed, remained silent for long moments, or stared at the screen without typing	Signs of mental fatigue and reduced drive
Students completed assignments in a rushed manner close to the deadline	Motivation shifted into pressure-driven completion

Based on the observation table, the researcher interprets that multitasking produces a fragmented learning condition, making it difficult for students to sustain focus on a single academic activity for an adequate duration. Rapid switching between applications suggests that students' attention is not concentrated, but distributed across multiple digital stimuli that continuously emerge. When notifications appear, students tend to stop their primary task and then require additional time to rebuild their thinking flow. This pattern slows and lessens the effectiveness of learning, even though students appear highly active in front of their devices. A restatement of this finding is that multitasking does not increase students' productivity; instead, it reduces the quality of focus and weakens motivation to complete academic tasks. The decline in motivation is visible through repeated delays, reduced energy to initiate tasks, and behavioral changes from early engagement to passive disengagement. Therefore, multitasking functions as a significant factor that intensifies mental fatigue in the digital academic ecosystem.

The primary pattern emerging from the observational data is that multitasking occurs repeatedly and becomes an automatic habit in students' academic routines. Students do not work within a stable task flow; instead, they move through a recurring cycle: opening an assignment, being distracted by notifications, switching applications, returning to the task, losing focus, and rereading instructions. The second pattern indicates that the more frequently students switch tabs and applications, the more likely they are to lose their cognitive flow, which is reflected in long pauses, repeated content viewing, or delayed task initiation. The third pattern is a gradual motivational shift: students initially attempt to work, but after repeated interruptions, motivation declines and is replaced by feelings of heaviness and frustration. Eventually, students tend to complete assignments in a rushed state close to deadlines. Overall, these patterns demonstrate a consistent relationship between digital multitasking, reduced focus, and weakened learning motivation.

Discussion

The findings of this study confirm and extend existing scholarship on student mental fatigue in technology-mediated learning environments. The sub-finding that digital overload triggers cognitive exhaustion aligns with prior literature emphasizing that excessive digital academic demands increase cognitive load and reduce students' mental processing capacity. Earlier studies have often described overload in terms of workload intensity, but the present findings highlight a more contextual mechanism: the continuous stream of academic information across multiple platforms creates a "standby mode" of thinking, in which students are constantly anticipating tasks, messages, and deadlines (Fan et al., 2020; Supriyanto et al., 2024). This nuance strengthens the argument that fatigue is not only produced by the amount of work but also by the architecture of digital learning itself, which fragments attention and increases the frequency of cognitive switching. In this sense, the study supports existing claims about cognitive overload while offering a clearer experiential explanation of how digital academic systems intensify exhaustion even when students remain visibly active (Ho et al., 2024; Mulenga et al., 2020).

The second sub-finding, blurred boundaries reduce mental recovery, is consistent with literature on psychological detachment and recovery processes in academic and work settings, which suggests that recovery requires clear separation between demand periods and rest periods (Betti et al., 2022; Ma et al., 2023). This finding resonates with research that frames digital connectivity as a driver of constant availability, yet it also emphasizes that the loss of recovery is not merely a matter of personal discipline. Instead, it reflects an institutional and cultural expectation that students remain reachable and responsive beyond formal class hours (Owen et al., 2020; Sain et al., 2024). Therefore, the study offers a critical perspective: recovery problems are embedded in system design and academic norms, not simply in individual time management.

The third sub-finding, multitasking decreases focus and motivation, strongly corresponds with literature on attention fragmentation, media multitasking, and reduced deep learning. Previous studies have argued that frequent task-switching reduces concentration and increases error rates, and the observational evidence in this research supports that claim through visible patterns: students repeatedly switch tabs,

interrupt their workflow, reread instructions, and lose comprehension (Contreras et al., 2020; Mullins et al., 2020). Yet, this study also reveals an underexplored dimension: multitasking not only disrupts focus but gradually erodes motivation. The pattern observed suggests that repeated interruptions create a cycle in which students begin tasks with intent, then experience cognitive disruption, frustration, and eventually disengagement (El-Hussuna et al., 2021; Hanif et al., 2022). This expands the literature by connecting multitasking to motivational decline, demonstrating that the impact is not purely cognitive but also emotional and behavioral. In other words, multitasking is shown as a mechanism that turns learning into a tiring, pressure-driven routine rather than a meaningful academic process.

Theoretically, these findings contribute to a more integrated framework of mental fatigue in digital academic ecosystems by linking three processes into a coherent chain: digital overload increases cognitive exhaustion, blurred boundaries reduce recovery, and multitasking accelerates focus and motivation loss. Rather than treating fatigue as a single outcome, the study positions it as a dynamic condition produced by the interaction between institutional systems, digital communication patterns, and students' daily practices (Bruhn et al., 2024; Sciortino et al., 2022). This offers a conceptual advancement because it frames mental fatigue as structurally produced through digital learning design and social expectations of availability. Practically, the findings imply that universities should not only provide mental health campaigns but also redesign digital academic practices. For instance, institutions could establish clear "communication windows," reduce unnecessary platform redundancy, coordinate deadlines across courses, and promote learning designs that encourage single-task engagement (Sciortino et al., 2022; Zamroni et al., 2025). Without such structural adjustments, students may continue experiencing fatigue even if they attempt personal coping strategies.

Finally, the study's practical implications extend to lecturers, academic administrators, and students themselves. For lecturers, the findings suggest that learning effectiveness may be improved by simplifying digital task structures, limiting excessive announcements, and designing assignments that reduce unnecessary switching between platforms. For academic leaders, the evidence indicates the need for institutional policies that protect recovery time, such as limiting late-night academic communication and ensuring that digital systems do not normalize constant availability. For students, the findings highlight the importance of developing digital self-regulation strategies, such as notification management, time-blocking, and boundary-setting between academic and personal life. Overall, this discussion emphasizes that mental fatigue is not an inevitable consequence of digital education; rather, it is a manageable phenomenon when digital academic ecosystems are designed with human cognitive limits and recovery needs in mind.

CONCLUSION

This study concludes that students' mental fatigue within a digital academic ecosystem is not solely caused by heavy academic workload, but is primarily shaped by continuous digital pressures embedded in everyday learning practices. The key finding shows that fatigue develops through a chain of interrelated processes: information overload accelerates cognitive exhaustion, blurred boundaries between study and

personal life hinder mental recovery, and habitual multitasking gradually reduces focus and motivation. Thus, mental fatigue should be understood as a consequence of a learning system that demands constant connectivity, fragmented attention, and uninterrupted performance. The main scholarly contribution of this study lies in providing an integrated qualitative explanation of mental fatigue as a lived experience in digitally structured higher education, rather than treating it as a general outcome. However, the study is limited to a single institutional context and does not capture long-term physiological or psychological effects. Future research should involve comparative studies across universities, different disciplines, and intervention-based designs to test sustainable solutions for reducing digital academic fatigue.

ACKNOWLEDGMENT

The authors would like to express sincere gratitude to all participants who willingly shared their experiences and allowed the researcher to observe their academic routines. Appreciation is also extended to the university academic staff and lecturers who supported access to digital learning documents and field data. This study was completed with valuable encouragement from colleagues and reviewers who provided constructive feedback throughout the writing process.

REFERENCES

Abed, M. A., & Abed, A. H. (2020). Effect of Compaction Methods on the Morphology of Aggregates in Hot Mix Asphalt. In *IOP Conference Series: Materials Science and Engineering* (Vol. 671, Issue 1). https://doi.org/10.1088/1757-899X/671/1/012119

Abyan, G. S. (2020). Media Literacy Strategies of Mahasantri Gontor 2 in Preventing the Issue of Hoax. *SAHAFA: Journal of Islamic Communication*, *2*(2), 155–166.

Al Maamari, R. H. H. (2024). Enhancing Resilience to Climate Events: A Multi-Capital Approach in Social Work. *International Journal of Disaster Risk Reduction*, *113*. https://doi.org/10.1016/j.ijdrr.2024.104883

Betti, T., & Coudert, T. (2022). How Harmful are Cuts in Public Employment and Wages in Times of High Unemployment? *Bulletin of Economic Research*, *74*(1), 247–277. https://doi.org/10.1111/boer.12296

Bruhn J. (2024). The Effects of Elihu Katz: A Stepwise Enrichment of the Concept of Communication EffectsA Stepwise Enrichment of the Concept of Communication Effects. *International Journal of Communication*, *18*, 2497–2518.

Chen, P. L., Shen, M. S., & Hsu, Y. H. (2021). Psychological Capital as a Mediator: Effect of the Teaching Beliefs of Classical Reading Program Teachers on Classroom Management Effectiveness. *Journal of Research in Education Sciences*, *66*(2), 207–239. https://doi.org/10.6209/JORIES.202106_66(2).0007

Contreras & Philipp, A. M. (2020). Multilingual Two-Digit Number Naming: The Influence of Composition Rules on Language Switching. *Quarterly Journal of Experimental Psychology*, *73*(9), 1481–1494. https://doi.org/10.1177/1747021820916108

El-Hussuna, A., & Wexner, S. (2021). Patient-Reported Outcome Measures in Colorectal Surgery: Construction of Core Measures Using Open-Source Research Method. *Surgical Innovation*, *28*(5), 560–566. https://doi.org/10.1177/1553350621998871

Eroshenkova, E. I., Isaev, I. F., Eroshenkov, N. V., Tarasova, S. I., & Duplyakina, A. V. (2021). Formation of Human Capital and Pro-Social Attitudes of Future Teachers and University Students. *Perspektivy Nauki i Obrazovania*, *49*(1), 66–79. https://doi.org/10.32744/PSE.2021.1.5

Fan, T., Long, P., Liu, W., & Pan, J. (2020). Distributed Multi-Robot Collision Avoidance Via Deep Reinforcement Learning for Navigation in Complex Scenarios. *International Journal of Robotics Research*, *39*(7), 856–892. https://doi.org/10.1177/0278364920916531

Finn, V. (2022). A qualitative Assessment of QCA: Method Stretching in Large-N Studies and Temporality. *Quality and Quantity*, *56*(5), 3815–3830. https://doi.org/10.1007/s11135-021-01278-5

Hanif, R. Z., Handayani, N. U., Lestari, A. D., & Wibowo, M. A. (2022). Students Perspective in Service Quality for Improvement in Higher Education: A Case in Industrial Engineering Department, Diponegoro University, Indonesia. In *AIP Conference Proceedings* (Vol. 2433). https://doi.org/10.1063/5.0100255

Ho, C. Q., & Tirachini, A. (2024). Mobility-as-a-Service and the Role of Multimodality in the Sustainability of Urban Mobility in Developing and Developed Countries. *Transport Policy*, *145*, 161–176. https://doi.org/10.1016/j.tranpol.2023.10.013

Im, D., Pyo, J., Lee, H., Jung, H., & Ock, M. (2023). Qualitative Research in Healthcare: Data Analysis. In *Journal of Preventive Medicine and Public Health* (Vol. 56, Issue 2, pp. 100–110). https://doi.org/10.3961/jpmph.22.471

Imjai, N., Aujirapongpan, S., Jutidharabongse, J., & Usman, B. (2024). Impacts of Digital Connectivity on Thailand's Generation Z Undergraduates' Social Skills and Emotional Intelligence. *Contemporary Educational Technology*, *16*(1), 1–21. https://doi.org/10.30935/cedtech/14043

Li, C. Z., Razzaq, A., Ozturk, I., & Sharif, A. (2023). Natural Resources, Financial Technologies, and Digitalization: The Role of Institutional Quality and Human Capital in Selected OECD Economies. *Resources Policy*, *81*. https://doi.org/10.1016/j.resourpol.2023.103362

Ma, S., Li, M., Qiao, Y., He, H., & Luo, M. (2023). The Effective Learning of Discrete Trial Teaching: Evidence from Pre-Service Teachers of Children with Autism. *Acta Psychologica Sinica*, *55*(2), 237–256. https://doi.org/10.3724/SP.J.1041.2023.00237

Morgan, H. (2022). Conducting a Qualitative Document Analysis. *The Qualitative Report*, *27*(1), 64–77.

Mulenga, E. M. (2020). Social Media Usage among Pre-Service Secondary Mathematics Teachers in Zambia. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, *5*(2), 130–147. https://doi.org/10.23917/jramathedu.v5i2.9920

Mullins, R., Agnihotri, R., & Hall, Z. (2020). The Ambidextrous Sales Force: Aligning Salesperson Polychronicity and Selling Contexts for Sales-Service Behaviors and Customer Value. *Journal of Service Research*, *23*(1), 33–52. https://doi.org/10.1177/1094670519883344

Naveed, Q. N., Choudhary, H., Ahmad, N., Alqahtani, J., & Qahmash, A. I. (2023). Mobile Learning in Higher Education: A Systematic Literature Review. In *Sustainability (Switzerland)* (Vol. 15, Issue 18). https://doi.org/10.3390/su151813566

Ndari, W., & Mahmudah, F. N. (2023). Implementation of the Merdeka Curriculum and Its Challenges. *European Journal of Education and Pedagogy Www.Ej-Edu.Org RESEARCH*, *4*(3), 111–116. https://doi.org/10.24018/ejedu.2023.4.3.648

Owen, H. E., & Licorish, S. A. (2020). Game-based Student Response System: The Effectiveness of Kahoot! On Junior and Senior Information Science Students' Learning. *Journal of Information Technology Education: Research*, *19*, 511–553. https://doi.org/10.28945/4608

Patti, C. (2020). Slow Reading and Recovery: Tales of Educational Trauma and Transformation. *Communication Education*, *69*(4), 405–413. https://doi.org/10.1080/03634523.2020.1803380

Rasheed, Q. S. (2023). Transcending Binaries through Self-Empowerment and Personal Development. *South Asia Multidisciplinary Academic Journal*, *30*. https://doi.org/10.4000/samaj.8629

Ribeiro, S. D. C., Gerlin, M. N. M., & de Oliveira, V. C. (2024). The Development of Reading Skills in the School Library: Information Recovery and Promotion of Critical Reading in the Digital Age. *Revista Digital de Biblioteconomia e Ciencia Da Informacao*, *22*. https://doi.org/10.20396/RDBCI.V22I00.8673358

Sain, Z. H., Baharun, H., & Abdullah, N. B. (2024). Enhancing Higher Education Pedagogy with ChatGPT: Leveraging the Power of Generative AI. *Journal Emerging Technologies in Education*, *2*(3), 267–281. https://doi.org/10.70177/jete.v2i3.1189

Schwartz, W. A. H., Merchant, T. S., Sturla, I., & Neubauer, L. C. (2025). Digital Inequities and Emotional Resilience: Understanding the Impact of the COVID-19 Pandemic on Preclinical Medical Students. *Frontiers in Medicine*, *12*. https://doi.org/10.3389/fmed.2025.1559536

Sciortino, G. P., & Zarcone, G. (2022). The Challenges of Low-Cost Satellites for Space Services Ventures in the Developing World - a Focus on Africa. In *Proceedings of the International Astronautical Congress, IAC* (Vols. 2022-Sep).

Seo, M., Jun, E. Y., & Oh, H. (2024). Development and Effectiveness of a Mobile-Based Autonomy Support Program for the Prevention of Metabolic Syndrome in Middle-Aged Women. *Frontiers in Public Health*, *12*. https://doi.org/10.3389/fpubh.2024.1334988

Shin, M. B., Iribarren, S. J., & Gimbel, S. (2022). Evaluation of Women's Empowerment in a Community-Based Human Papillomavirus Self-Sampling Social Entrepreneurship Program (Hope Project) in Peru: A Mixed-Method Study. *Frontiers in Public Health*, *10*. https://doi.org/10.3389/fpubh.2022.858552

Shu, H., Wang, Y., Umar, M., & Zhong, Y. (2023). Dynamics of renewable energy research, investment in EnvoTech, and environmental quality in the context of G7 countries. *Energy Economics*, *120*. https://doi.org/10.1016/j.eneco.2023.106582

Siregar, A. R. (2024). Empathy Training and Bullying among Students at Boarding School. *Multidisiplinary Science Journal*, *6*(1), 98–113. https://doi.org/10.31893/multiscience.2024224

Sun, N., Wei, L., Shi, S., Jiao, D., Song, R., Ma, L., Wang, H., Wang, C., Wang, Z., You, Y., Liu, S., & Wang, H. (2020). A Qualitative Study on the Psychological Experience of Caregivers of COVID-19 Patients. *American Journal of Infection Control*, *48*(6), 592–598. https://doi.org/10.1016/j.ajic.2020.03.018

Supriyanto, A., Burhanuddin, B., Sunarni, S., Rochmawati, R., Ratri, D. K., & Bhayangkara, A. N. (2024). Academic Service Quality, Student Satisfaction, and Loyalty: A Study at Higher Education Legal Entities in Indonesia. *TQM Journal*. https://doi.org/10.1108/TQM-10-2023-0334

Vitale, E., Conte, L., Ercolani, M., & Lupo, R. (2021). Healthcare Workers Perceptions in the Difficult Moment of the End of Life and Coping Strategies Adopted during the Covid-19 Pandemic: An Italian Pilot Study. *Acta Biomedica*, *92*. https://doi.org/10.23750/abm.v92iS2.12090

Wahyono, N. D., & Wong, W. K. (2023). Improving Economic Welfare through Capital Development: Case Study of Smallholder Dairy Farmers in Pujon District. *Sustainability (Switzerland)*, *15*(11). https://doi.org/10.3390/su15118453

Wahyuni, S., & Avrilianda, D. (2022). The Development of e-Books Religio-humanistic Parenting as an Effort to Prevent Violence Against Children. In *Proceedings - 2022 2nd International Conference on Information Technology and Education, ICIT and E 2022* (pp. 168–174). https://doi.org/10.1109/ICITE54466.2022.9759843

Wang, C. H. (2022). Empowering College Students to Decrease Digital Distraction Through the Use of Self-Regulated Learning Strategies. In *Contemporary Educational Technology* (Vol. 14, Issue 4). https://doi.org/10.30935/cedtech/12456

Wang, R., Tan, J., & Yao, S. (2021). Are Natural Resources a Blessing or a Curse for Economic Development? The Importance of Energy Innovations. *Resources Policy*, *72*. https://doi.org/10.1016/j.resourpol.2021.102042

Zamroni. (2025). Artificial Intelligence as a Tool to Improve the Quality of Job-Ready Graduate Skills in Higher Education. *Proceedings of the 2025 IEEE International Conference on Industry 4.0, Artificial Intelligence, and Communications Technology, IAICT 2025*, 129–136. https://doi.org/10.1109/IAICT65714.2025.11101572

Zia, S., & Anser, M. K. (2021). Striving towards Environmental Sustainability: How Natural Resources, Human Capital, Financial Development, and Economic Growth Interact with Ecological Footprint in China. *Environmental Science and Pollution Research*, *28*(37), 52499–52513. https://doi.org/10.1007/s11356-021-14342-2