

Hybrid Learning and Student Well-Being: A Narrative Review of Engineering Students' Post-Pandemic Experience

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Abstract— The worldwide shift to hybrid learning during the COVID-19 pandemic has radically reshaped the future of higher education. For engineering students, the new educational model brings with it a distinct set of challenges that touch not just learning outcomes but also social interaction, emotional strength, and mental health. As hybrid modalities demand increased self-regulation, technological literacy, and adaptability, students often experience heightened academic pressure, diminished peer support, and greater psychological strain. This narrative review examines the psychological and educational effects of hybrid learning on engineering students by investigating well-being, stress management, adjustment difficulties, and institutional responses. The examination of empirical studies from the Philippines, Europe, and the United States reveals intricate dynamics that influence student experiences in hybrid frameworks through access disparities, socio-emotional challenges, and cultural help-seeking behavior variations. The review identifies emerging best practices and institutional innovations which support students through mental health interventions, flexible learning environments, and inclusive pedagogical strategies. Research results emphasize the necessity of implementing student-focused methods alongside culturally tailored interventions within engineering education to achieve durable academic performance and mental health stability in blended learning environments.

Keywords— hybrid learning, engineering students, mental health, academic stress, post-pandemic education, student adjustment, higher education.

INTRODUCTION

Global education systems have been severely disrupted by the COVID-19 pandemic, which has resulted in a completely unanticipated shift to remote learning. As restrictions were loosened, most institutions shifted to hybrid learning models that blended online and in-person modalities. In order to maintain academic continuity while putting health and safety first, hybrid learning became a viable solution (Singh et al., 2022; Bashir et al., 2021). While the model has been seen positively for its flexibility and potential to expand educational access, it has also introduced complex challenges especially pronounced in high-intensity disciplines such as engineering.

Engineering education is unique in that it significantly emphasizes lab-based learning, theoretical knowledge, and cooperative problem-solving—pedagogical elements that flourish in experiential, interactive learning settings. The sudden shift to digital platforms and the erratic application of hybrid formats have caused these learning dynamics to be seriously upset. Morris et al. (2021) posited that first-year engineering students enrolled in hybrid chemistry classes did poorly academically. They expressed dissatisfaction with the approach, attributed to a lack

of fast teacher feedback, disjointed learning schedules, and a decline in peer connection. Although they offered flexibility, asynchronous components frequently caused further confusion and a feeling of academic alienation.

In the Philippines, a phenomenological study of first-year Filipino engineering students emphasized the combined strains of a heavier workload and fewer chances for social adjustment. Students reported feeling digitally connected but emotionally isolated, with difficulties forming friendships, sustaining collaboration, and establishing a sense of belonging in virtual spaces (Firmante, 2024).

Because of the fragmented nature of hybrid classrooms, students continued to suffer from cognitive overload even when in-person instruction was reinstated. AlMunifi and Alfawzan (2023) observed that while hybrid learning encourages autonomy and self-directed learning, it also imposes a heavy cognitive and emotional burden on students, many lacking the necessary skills for time management, motivation regulation, and digital navigation. This lack of preparedness contributes to unequal learning outcomes and exacerbates existing disparities among first-year students from underserved backgrounds.

Bashir et al. (2021) emphasized that many STEM programs, including engineering, lacked cohesive pedagogical frameworks suited for hybrid delivery. As a result, students and instructors encountered confusion, disengagement, and increased burnout—symptoms of a deeper structural misalignment between pedagogical demands and institutional capacities.

Emerging international studies provide additional context to these challenges. Adi Badiozaman, Ng, and Mung Ling (2024) found that while some higher education students demonstrated resilience during repeated transitions between learning modes, others experienced disorientation, reduced motivation, and emotional fatigue. Jayawardena et al. (2024) observed that students transitioning back to face-to-face instruction often faced lingering anxiety and uncertainty. Chiluiza et al. (2023) noted that students frequently struggled with maintaining engagement in synchronous hybrid settings and reported feeling unequally present compared to their in-person peers. Using motivational theories, Rahayu et al. (2024) demonstrated that student success in hybrid learning heavily depends on perceived competence and intrinsic motivation, factors that are often diminished under high-stress, low-support conditions. Likewise, Mokoena and Hattingh (2024), pointed to issues of digital inequality and inconsistent pedagogical quality as major barriers to effective hybrid learning.

Despite the growing volume of literature, several critical research gaps persist. Much of the current research emphasizes academic performance and technological implementation, with limited focus on students' mental health implications and socio-emotional experiences, particularly in engineering education. Furthermore, studies from high-income countries dominate the discourse, leaving a shortage of localized, context-specific insights from developing nations such as the Philippines. Although Firmante (2024) offers valuable qualitative insights into Filipino students' experiences, there remains a need to develop evidence-based interventions incorporating mental health support, resilience training, and social-emotional learning within hybrid models.

In addition, there have not been enough studies with a longitudinal design or intervention studies focused on how students adapt to the hybrid model over time or how targeted support initiatives, both academically and

psychologically, impact students. As technology progresses, hybrid learning is likely to evolve past its makeshift form, highlighting the necessity to transform it into a consistent and compassionate educational framework.

This research aims to fill such gaps by integrating multidisciplinary concepts of academic strain, psychological well-being, and student coping among Filipino engineering students in the context of hybrid learning. By conducting a narrative review, this study intends to contribute towards the development of pedagogy that facilitates the academic, emotional, and social integration of students into the demands of higher education in a post-pandemic world.

METHODOLOGY

This study employed a narrative review design to explore the relationship between hybrid learning and student mental health and well-being in higher education, particularly in the post-pandemic context. Unlike systematic reviews, narrative reviews enable a flexible, interpretative synthesis of diverse literature, making them ideal for examining complex, multidimensional topics that span disciplines, such as hybrid learning and student well-being (Ferrari, 2015; Baumeister & Leary, 1997; Greenhalgh et al., 2018). Narrative reviews are especially effective in developing conceptual frameworks, identifying thematic patterns, and integrating findings from qualitative, quantitative, and mixed-methods studies (Popay et al., 2006; Collins & Fauser, 2005). With an emphasis on finding recurrent patterns, theoretical insights, and gaps across many research, this design also enables a more contextualized and comprehensive literature evaluation (Skelly et al., 2019; Rammal, 2023).

Greenhalgh and colleagues (2018) have pointed out that narrative reviews are crucial when the subject calls for interpretive judgment instead of aggregation. This is especially true when comprehending the complex experiences of students navigating hybrid learning settings. A systematic literature search used five key academic databases: Scopus, PubMed, ERIC, ScienceDirect, and Google Scholar. Relevant search terms were combined using Boolean operators to locate a comprehensive body of literature. Keywords included: "hybrid learning," "blended learning," "online and face-to-face learning," "remote instruction," "academic stress," "mental health," "psychological well-being," "emotional well-being," "college students," "university students," "student experiences," "higher education," "coping strategies," "support systems," and "post-pandemic education."

The inclusion criteria were restricted to peer-reviewed journal papers and conference proceedings written in English, aimed at college or university students, and published between 2021 and 2024 to guarantee rigor and relevance. A few chosen studies focused on the influence of hybrid or blended learning modalities on students' well-being. These studies covered academic stress, mental health issues, coping strategies, and institutional reactions to the demands of hybrid learning. Studies were excluded if they (a) did not involve higher education populations, (b) lacked a focus on mental health or hybrid learning, (c) were not peer-reviewed, or (d) were published prior to 2021.

In order to better understand student well-being in hybrid learning situations, the selected articles were subjected to theme analysis and synthesis, which focused on their research contribution, conceptual coherence, and methodological rigor. Several themes emerged, including digital fatigue, feelings of isolation, challenges adapting to hybrid modalities, and the critical role of academic and psychosocial support systems. The analysis also

identified protective variables like flexible scheduling, easier access to mental health resources, and the value of student-teacher interactions. This narrative method provided a thorough, contextually aware understanding of how hybrid learning settings affect students' academic and mental health.

In addition, it identified important gaps in the literature, such as the limited availability of longitudinal studies, the underrepresentation of diverse student populations, and the need for culturally responsive research that can inform inclusive hybrid learning practices. The findings from this review lay the groundwork for future empirical studies and educational interventions that aim to improve student well-being in the evolving landscape of higher education.

RESULTS AND DISCUSSION

Academic Stress and Performance Challenges

Numerous studies have shown that hybrid learning increases academic stress, particularly among engineering students who must manage demanding course requirements. Students who engaged in hybrid learning reported significantly higher stress levels than those in traditional face-to-face classes (Losa-Iglesias et al., 2023). Asynchronous workloads, unstructured class periods, interrupted academic calendars, and technical issues were some of the causes of this uncertainty. Alexa et al. (2022) discovered engineering students found it difficult to participate in class discussions, meet deadlines, and maintain motivation in asynchronous settings. These difficulties were worsened when digital systems malfunctioned, or instructors were not trained in hybrid teaching approaches. Students frequently had a sense of disconnection from their teachers and assignments. Supporting this, Morris et al. (2021) studied first-year engineering students in a hybrid chemistry course and found that they experienced lower performance outcomes and reduced engagement. The absence of systematic in-person guidance and real-time feedback hindered deep learning. In addition, Bashir et al. (2021) noted that delivering complex scientific and engineering content became less effective in online or hybrid modes. Students entering laboratory courses post-lockdown often felt underprepared, contributing to academic anxiety and performance decline. These findings underscore a pattern: when hybrid learning is not well-supported structurally or pedagogically, it elevates academic stress, especially in demanding programs like engineering.

Social Isolation and Decline in Peer Relationships

Hybrid learning settings have an impact on students' emotional and social health in addition to their academic performance. According to several studies, students who previously depended on in-person encounters for peer collaboration and emotional support report feeling more alone. Khaskheli et al. (2024) emphasized that a lack of informal, spontaneous interaction significantly weakened students' sense of community and belonging. In particular, engineering students appear vulnerable to social withdrawal in hybrid setups. Jensen et al. (2023) found that norms in STEM culture where independence and toughness are valued made students less likely to seek help or express emotional struggles. This emotional suppression often led to internalized stress, disengagement, and symptoms of burnout. In a qualitative study by Firmante (2024), students described hybrid learning as emotionally disconnected. Many students indicated that they rarely received genuine emotional support, even if they had access to peers via online platforms. According to one student, "I'm logged in, but I don't feel present." This disconnect affected group projects and class engagement and increased the risk of impostor syndrome,

especially for students who struggle academically and are afraid to ask for help. These outcomes point to a consistent trend - hybrid learning may erode peer connection and emotional openness, creating a hidden mental health burden.

Student Adaptability and Institutional Responses

Despite the outlined challenges, many students demonstrated resilience and adaptability, mainly when supported by responsive institutional strategies. AlMunifi and Alfawzan (2023) pointed out that students who received early exposure to hybrid learning platforms, orientation programs, and counseling access adjusted more successfully. Similarly, Singh et al. (2022) observed that students felt less pressure when professors engaged in emotional check-ins, provided flexible learning resources, and had explicit academic goals. These actions resulted in stability and security, which are critical to students' well-being. Optimistic institutional interventions were outlined by Jensen et al. (2023), wherein peer mentorship programs were able to bridge the social and academic gap. These guides offered informal advice, emotional support, and community building, which decreased isolation. All these initiatives are consistent with the recommendations of the Philippine Department of Health (2023) promoting school-based mental health programs under Republic Act No. 11036 (Mental Health Act). Lastly, these results also show that supportive learning environments, clear communication, and policy-inclusive mental health can considerably reduce the psychological burden of hybrid learning.

CONCLUSION

The post-pandemic transition to hybrid instruction has created a multifaceted learning environment for engineering students. Although this learning modality offers flexibility and ongoing access to education, it also increases pre-existing stressors, especially for students in demanding programs. Academic stress, reduced peer support, and lack of engagement have significantly impacted the mental health and performance of engineering students.

However, students show resilience and adaptability when institutions provide targeted support through mental health services, student-centered teaching, and responsive communication. As hybrid learning becomes a permanent fixture in higher education, particularly engineering, universities must commit to holistic support systems that integrate academic guidance with psychological care.

Further research is needed to evaluate the long-term outcomes of hybrid education on student well-being, particularly in developing countries. Future interventions should prioritize culturally relevant, equity-driven approaches that account for the diversity of students' needs, access to resources, and mental health status.

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