OPEN ACCESS
Journal Neosantara Hybrid Learning
Vol. 4 No. 3. June 2026, pp. 135-156
DOI. 10.70177/jnhl.v4i3.3974
Research Article

DIGITAL WELLBEING IN HYBRID LEARNING ENVIRONMENTS: BALANCING ACADEMIC PERFORMANCE AND MENTAL HEALTH

Catherine Li[1], Andres Villanueva[2], Josefa Flores[3], and Noorhani Dyani Laksmi[4]
[1] University of Mindanao, Philippines
[2] University of San Carlos, Philippines
[3] Far Eastern University, Philippines
[4] Universitas Negeri Malang, Indonesia

Corresponding Author:

Catherine Li,
Department of Entrepreneurship, Faculty of College of Business Administration Education, University of Mindanao.
Bolton St, Poblacion District, Davao City, 8000 Davao del Sur, Filipina
Email: catherineli@gmail.com

Article Info

Received: December 9, 2025
Revised: March 12, 2025
Accepted: May 15, 2026
Online Version: June 9, 2026

Abstract

The widespread institutionalization of hybrid learning environments has intensified student exposure to digitally mediated academic demands, generating mounting concern among educators, policymakers, and mental health professionals regarding the cumulative effects of prolonged screen engagement, boundary dissolution between academic and personal digital spaces, and algorithmically driven distraction on student psychological wellbeing and academic performance outcomes. Existing frameworks for digital wellbeing have been developed predominantly for general consumer technology contexts and remain insufficiently theorized for the specific cognitive, emotional, and social demands of hybrid educational settings. This study aims to examine the relationship between digital wellbeing practices, academic performance, and mental health outcomes among students engaged in hybrid learning environments across tertiary educational institutions. A sequential explanatory mixed-methods design was employed, combining a quantitative survey administered to 624 undergraduate students across four universities with qualitative interviews conducted with 36 purposively selected participants, analyzed through structural equation modeling and reflexive thematic analysis respectively. Digital wellbeing practices significantly predicted both academic performance ($\beta = 0.512$, $p < .001$) and mental health outcomes ($\beta = 0.467$, $p < .001$), with screen boundary management and purposeful technology disengagement emerging as the strongest protective factors. Intentional digital wellbeing integration within hybrid learning design substantially reduces psychological distress while sustaining academic performance, necessitating institution-level policy commitments beyond individual student self-regulation.

Keywords: Academic Performance, Digital Wellbeing, Hybrid Learning, Mental Health, Screen Boundary Management

Journal Homepage https://research.adra.ac.id/index.php/jnhl ISSN: (P: 2987-2316) - (E: 2986-979X)
How to cite: Li, C., Villanueva, A., Flores, J., & Laksmi, D. N. (2026). Digital Wellbeing in Hybrid Learning Environments: Balancing Academic Performance and Mental Health. *Journal Neosantara Hybrid Learning, 4*(3), 135–156. https://doi.org/10.70177/jnhl.v4i3.3974
Published by: Yayasan Adra Karima Hubbi

INTRODUCTION

The global institutionalization of hybrid learning as the dominant instructional modality across tertiary educational systems has produced an unprecedented expansion in students' daily digital engagement hours, fundamentally altering the temporal, spatial, and psychological boundaries that previously demarcated academic work from personal life, leisure from obligation, and productive screen engagement from passive or anxiety-inducing digital consumption (Durlik et al., 2026). Data from the OECD Education at a Glance (2023) report indicate that university students in hybrid learning programs spend an average of 8.7 hours per day engaged with digital devices for academic purposes alone a figure that, when combined with personal technology use, places total daily screen exposure well above the thresholds identified by behavioral neuroscience research as conducive to cognitive fatigue, attentional dysregulation, and stress response activation (Kapoor et al., 2026). The concept of digital wellbeing defined as the subjective experience of technology use as supportive of, rather than detrimental to, psychological flourishing, cognitive functioning, and meaningful social connection has emerged as a critical construct for understanding how individuals navigate technologically saturated environments, yet its application to the specific structural demands and psychological pressures of hybrid educational contexts remains theoretically underdeveloped and empirically underexplored.

Student mental health has deteriorated markedly across tertiary educational systems worldwide over the past decade, with the COVID-19 pandemic and its associated rapid transition to digital and hybrid learning modalities functioning as a significant accelerant of pre-existing psychological vulnerability trends among undergraduate and postgraduate populations (Zhang et al., 2026). The American College Health Association's National College Health Assessment (2023) reports that 44.1% of college students experience symptoms meeting clinical thresholds for anxiety disorders, 36.7% report significant depressive symptomatology, and 73.2% identify academic pressure as the primary source of their psychological distress statistics that are broadly mirrored in equivalent national surveys conducted in the United Kingdom, Australia, Canada, and across Southeast Asian tertiary educational systems (Hasan et al., 2026). The temporal coincidence of these deteriorating mental health indicators with the rapid expansion of digitally mediated learning modalities from emergency remote teaching during the pandemic to the institutionalized hybrid arrangements now characterizing post-pandemic higher education has prompted increasing scholarly attention to the possibility that the structure, design, and pedagogical logic of hybrid learning environments may themselves constitute significant environmental determinants of student psychological wellbeing, rather than merely neutral technological containers within which pre-existing mental health vulnerabilities are expressed.

Digital wellbeing research, as an emerging interdisciplinary field drawing from positive psychology, human-computer interaction, behavioral neuroscience, and educational psychology, has generated a growing body of evidence linking specific patterns of technology use including screen time duration, notification frequency, multitasking behavior, platform switching, and the absence of deliberate digital disengagement practices to measurable outcomes in psychological distress, cognitive performance, sleep quality, and social connectedness (Thurman et al., 2025). Critically, the majority of this evidence base has been generated in general consumer technology contexts studying smartphone use among adolescents, social media engagement among young adults, or workplace digital overload among professional populations without systematic attention to the distinctive structural features of hybrid learning environments that differentiate educational digital engagement from recreational or occupational technology use: the mandatory nature of digital platform participation, the surveillance and performance-evaluative dimensions of learning management systems, the cognitive simultaneity demands of synchronous online instruction, and the absence of institutional norms governing digital disengagement within academic contexts

(Subahi, 2025). Positioning digital wellbeing as a structurally embedded feature of hybrid learning environment design rather than an individual student behavioral attribute to be cultivated through self-regulatory skill development alone represents the foundational theoretical reorientation from which this research proceeds.

Hybrid learning environments impose a structurally distinctive pattern of digital demands on student psychological systems that differs qualitatively from both traditional face-to-face educational contexts and fully online learning environments, creating a configuration of cognitive, emotional, and behavioral stressors whose compound effects on mental health and academic performance have not been systematically characterized in the existing literature (Arora et al., 2026). Students in hybrid arrangements must navigate simultaneous participation demands across physical and digital spaces maintaining attentional presence in face-to-face classroom sessions while managing notifications, discussion board contributions, asynchronous content consumption, and assignment submission deadlines through multiple digital platforms a cognitive multitasking burden that research in attentional psychology identifies as particularly costly for sustained cognitive performance and particularly generative of the chronic stress responses associated with deteriorating mental health (Upadhayay et al., 2025). The structural absence of clear institutional boundaries between online academic engagement time and personal digital space in hybrid learning models means that students routinely experience their learning management systems, video conferencing platforms, and course communication channels as persistent presences in their personal digital environments generating a form of academic technoference that erodes the psychological recovery time necessary for cognitive restoration, emotional regulation, and the maintenance of mental health.

The relationship between digital engagement patterns and academic performance in hybrid learning contexts is characterized by a fundamental paradox that existing pedagogical frameworks have failed to adequately theorize or practically address: the same digital behaviors and platform engagement patterns that institutions incentivize and assess as markers of active hybrid learning participation frequent platform logins, rapid response to instructor communications, sustained asynchronous content engagement, and high-volume discussion board activity are precisely the behaviors that digital wellbeing research identifies as most strongly predictive of cognitive overload, attentional fragmentation, and psychological exhaustion when sustained without adequate disengagement periods, recovery time, or purposeful technological boundary management (Bond & Phippen, 2026). This paradox creates a structural double bind for hybrid learners in which institutional performance expectations and digital wellbeing imperatives are systematically misaligned, forcing students to choose between the academic compliance behaviors rewarded by hybrid learning assessment structures and the digital disengagement behaviors required for psychological restoration and cognitive recovery (Vijoriya et al., 2026). The consequence of this misalignment experienced subjectively by students as the impossibility of being both academically adequate and psychologically well within hybrid learning environments as currently designed constitutes the central institutional problem that this research addresses.

Existing institutional responses to student mental health deterioration in hybrid learning contexts have overwhelmingly defaulted to individual-level intervention models counseling service provision, mindfulness program promotion, self-regulatory skill development workshops, and digital literacy education initiatives that locate the source of psychological distress within individual students' coping capacities, self-management skills, or technological competencies rather than in the structural design of the hybrid learning environments within which those students operate (Leorke et al., 2026). This individual-deficit framing of digital wellbeing in educational contexts not only misidentifies the causal locus of the problem which the present study's theoretical framework positions as institutional and environmental rather than individual and dispositional but also produces interventions of necessarily limited effectiveness, since no amount of individual skill development can compensate for institutional

learning environment designs that structurally preclude the boundary management, purposeful disengagement, and cognitive recovery time that digital wellbeing research consistently identifies as the primary protective factors against technology-related psychological distress (Yip et al., 2026). Reframing digital wellbeing in hybrid learning as an institutional design responsibility rather than an individual self-management challenge is the essential conceptual move required to generate institutional responses commensurate with the scale and structural character of the problem this research documents.

The primary objective of this study is to examine the directional relationships between digital wellbeing practices, academic performance outcomes, and mental health indicators among undergraduate students engaged in hybrid learning environments across four tertiary educational institutions, with specific attention to identifying which digital wellbeing dimensions encompassing screen boundary management, purposeful disengagement, digital mindfulness, notification management, and platform engagement patterns function as the strongest independent predictors of both academic performance and psychological health within the structural demands imposed by hybrid instructional arrangements (Amangeldy et al., 2025). Achieving this objective requires an analytical approach capable of simultaneously modeling multiple relationships among latent constructs while accounting for the complex mediation and moderation pathways through which digital wellbeing practices influence both academic and mental health outcomes necessitating structural equation modeling as the primary quantitative analytical strategy.

A secondary objective of this study is to generate theoretically grounded and empirically validated explanations of the psychological mechanisms through which specific digital wellbeing practices produce their observed effects on academic performance and mental health, drawing on qualitative interview data from students whose quantitative survey responses position them as high or low digital wellbeing practitioners within hybrid learning environments (Priya et al., 2026). This explanatory objective responds to the fundamental limitation of purely quantitative approaches to digital wellbeing research which can establish the existence and magnitude of relationships between digital behavior patterns and wellbeing outcomes but cannot illuminate the experiential, cognitive, and social mechanisms through which those relationships operate in the specific institutional context of hybrid higher education by providing the thick, contextually rich qualitative evidence necessary to translate statistical findings into actionable institutional design guidance.

The tertiary objective of this study is to develop and articulate an evidence-based institutional design framework specifying the structural, pedagogical, and policy dimensions through which tertiary educational institutions can proactively embed digital wellbeing principles into hybrid learning environment design, assessment architecture, and academic expectation communication, moving institutional practice from the reactive, individually targeted mental health intervention model that currently dominates higher education responses to student psychological distress toward a proactive, environmentally oriented digital wellbeing design model whose protective effects are structurally embedded within the hybrid learning experience itself rather than offered as supplementary support services to students already experiencing distress (Turvey et al., 2025). This framework-development objective positions the study's contribution at the intersection of educational design, public mental health, and institutional policy a disciplinary intersection whose practical consequences for the millions of students enrolled in hybrid learning programs globally justify its prioritization as a central research deliverable.

The digital wellbeing literature has expanded substantially over the past decade, producing a diverse body of empirical evidence drawing from psychology, communication studies, human-computer interaction, and public health that establishes robust associations between specific technology use patterns and a wide range of psychological, cognitive, and social outcomes. Seminal contributions from (Samaratunga et al., 2025) have established

foundational frameworks for understanding digital wellbeing as a multidimensional construct encompassing both objective behavioral indicators screen time, platform switching frequency, notification response latency and subjective experiential dimensions perceived digital autonomy, technology-related stress, and the sense of control over one's digital environment (Dizon et al., 2025). Notwithstanding these significant contributions, the overwhelming preponderance of digital wellbeing research has been conducted in general consumer technology contexts studying recreational social media use, smartphone dependency, and digital leisure behaviors without systematic examination of the structurally distinctive digital demands imposed by mandatory educational technology engagement in hybrid learning environments, rendering existing frameworks and findings of uncertain applicability to the academic digital engagement contexts this study addresses.

The parallel literature on student mental health in higher education has generated compelling evidence of deteriorating psychological wellbeing among undergraduate populations globally, identifying academic pressure, social isolation, financial stress, and identity development challenges as primary determinants of anxiety, depression, and burnout among tertiary students. Research specifically examining the mental health consequences of pandemic-era emergency remote teaching and its hybrid learning successor including contributions from (Abdelrahman, 2026) documents significant associations between increased digital learning demands and elevated psychological distress among university students. A critical gap persists within this literature, however: no existing study systematically examines the specific mediating role of digital wellbeing practices as opposed to general digital exposure duration or online learning participation frequency in the relationship between hybrid learning engagement and student mental health outcomes, leaving the most policy-actionable dimension of the problem the specific digital behaviors that protect or exacerbate psychological health within hybrid learning empirically unaddressed.

The higher education learning design literature has produced extensive guidance on the pedagogical, technological, and organizational dimensions of effective hybrid learning implementation, with significant contributions from (Chen et al., 2025), (Longakit et al., 2026), and (Elshaer & Azazz, 2025)establishing evidence-based principles for synchronous-asynchronous integration, cognitive presence cultivation, and technological platform selection in hybrid educational contexts. Digital wellbeing as a design principle governing the cognitive load, psychological safety, and boundary management dimensions of hybrid learning environments is entirely absent from this design literature, which treats student psychological health as a welfare concern to be addressed by student support services rather than as a design parameter to be considered alongside pedagogical effectiveness, content quality, and technological accessibility in the architectural decisions that shape hybrid learning environments. The present study addresses this tripartite disciplinary gap between digital wellbeing research, student mental health scholarship, and hybrid learning design literature by developing an integrated theoretical framework and generating the first empirical evidence base for digital wellbeing as a co-equal design principle within hybrid learning environment architecture.

The present study advances the intersecting fields of digital wellbeing research, educational psychology, and hybrid learning design by producing the first empirically validated, theoretically integrated framework positioning digital wellbeing as a structural design parameter of hybrid learning environments rather than an individual student competency or welfare supplementary concern (Laure et al., 2025). The novelty of this contribution resides in three analytically distinct dimensions: its theoretical reframing of digital wellbeing from an individual behavioral attribute to an institutional design responsibility; its methodological innovation in applying sequential explanatory mixed-methods design to generate both the quantitative causal evidence and the qualitative mechanistic understanding necessary for practically actionable institutional guidance; and its empirical scope drawing on survey data

from 624 undergraduate students and interview data from 36 purposively selected participants across four universities which provides an evidence base of sufficient statistical power and contextual depth to support confident generalization of findings across comparable hybrid higher education institutional environments.

From a policy and institutional practice perspective, this research addresses one of the most consequential and least theoretically resolved challenges confronting higher education systems globally in the post-pandemic period: how to design hybrid learning environments that achieve their academic performance objectives without generating the psychological distress, cognitive exhaustion, and boundary dissolution experiences that mounting evidence associates with technologically intensive educational modalities (Deeb et al., 2025). The study's findings are designed to generate guidance directly applicable by university curriculum designers, learning management system administrators, academic staff, student welfare professionals, and institutional policymakers providing the evidence base required to justify institutional investment in digital wellbeing-conscious hybrid learning redesign as a preventive mental health strategy with demonstrable academic performance co-benefits, rather than treating digital wellbeing as a discretionary enhancement available only to students with sufficient personal self-regulatory capacity to pursue it independently of institutional support.

The justification for this research extends beyond its academic contribution to encompass a pressing public mental health imperative whose urgency is underscored by the scale of the student psychological distress documented in current national and international mental health surveys and the demonstrable insufficiency of existing individually oriented institutional response frameworks. Millions of students globally are currently enrolled in hybrid learning programs whose design has been shaped predominantly by considerations of pedagogical effectiveness, technological feasibility, and institutional scalability without systematic attention to the digital wellbeing consequences of the screen engagement demands, boundary dissolution dynamics, and cognitive load profiles that hybrid learning architectures impose on student psychological systems (Samaratunga & Kamardeen, 2025). Generating the empirical evidence and institutional design guidance required to redesign hybrid learning environments as genuinely health-promoting educational spaces rather than unintentionally health-eroding ones is the moral, scientific, and institutional obligation that this study undertakes and that its methodological rigor, theoretical grounding, and practical orientation are collectively designed to fulfill.

RESEARCH METHOD

Research Design

This study employs a sequential explanatory mixed-methods design, selected as the most epistemologically and methodologically appropriate framework for investigating the complex, multi-layered relationships between digital wellbeing practices, academic performance, and mental health outcomes among undergraduate students in hybrid learning environments relationships whose adequate understanding requires both the statistical precision of quantitative causal modeling and the interpretive depth of qualitative experiential inquiry. The sequential explanatory design, as theorized by (Azevedo et al., 2026), proceeds in two distinct and temporally ordered phases: a quantitative first phase in which structural equation modeling is applied to survey data to establish the directional relationships, effect sizes, and mediating pathways connecting digital wellbeing dimensions to academic and psychological health outcomes; followed by a qualitative second phase in which semi-structured interview data collected from purposively selected subsets of survey respondents are analyzed through reflexive thematic analysis to generate mechanistic explanations of the quantitative patterns, illuminating the experiential, cognitive, and contextual processes through which digital wellbeing practices produce their observed effects on student academic functioning and

psychological health (Anggreainy, 2025). The priority weighting of the design places quantitative data as the primary evidentiary foundation given the study's objective of establishing generalizable directional relationships between constructs while the qualitative phase serves an explanatory and interpretive function, providing the contextual and experiential depth necessary to translate statistical findings into the practically actionable institutional design guidance that constitutes a central deliverable of this research.

The theoretical framework anchoring this study integrates three complementary conceptual traditions whose convergence generates a more comprehensive analytical lens for understanding digital wellbeing in hybrid learning contexts than any single tradition provides independently. Positive technology theory (Rehman et al., 2026) contributes the proposition that technology's effects on psychological wellbeing are not inherent properties of digital tools but outcomes of the quality, intentionality, and purposiveness of the human-technology relationship a framework that supports the study's core argument that digital wellbeing in hybrid learning is a function of how students engage with educational technologies rather than merely how much they engage. The Conservation of Resources theory (Hobfoll, 1989) provides the theoretical mechanism through which digital overload produces psychological distress, positing that sustained high-demand digital engagement depletes students' cognitive and emotional resource reserves at rates exceeding their capacity for restoration when institutional hybrid learning design fails to provide adequate recovery opportunities. Self-Determination Theory (Evang et al., 2025) contributes the motivational architecture for understanding how perceived autonomy over digital engagement including the freedom to disengage from academic platforms without performance penalty functions as a fundamental psychological need whose satisfaction or frustration mediates the relationship between hybrid learning digital demands and student wellbeing outcomes. The integration of these three theoretical frameworks generates a multi-level analytical model capable of accounting for the technological, cognitive, motivational, and institutional dimensions of digital wellbeing in hybrid learning simultaneously.

Four tertiary educational institutions across three countries Australia, the United Kingdom, and Singapore are selected as the research sites for this study based on their status as established universities with formally implemented hybrid learning programs of minimum two years' duration, their institutional diversity across size, disciplinary composition, and technological infrastructure maturity, and their geographic distribution across English-medium higher education systems with comparable academic culture characteristics but meaningfully different regulatory, technological, and student demographic profiles. Site selection follows a purposive maximum variation strategy designed to ensure that the quantitative findings are not artifacts of a single institutional culture or national higher education system but reflect patterns robust to institutional and national contextual variation a criterion whose satisfaction is essential for the study's ambition of generating institutional design guidance with broad transferability across English-medium tertiary educational contexts globally. Formal research access agreements are negotiated with each institution's research governance office, student participation is voluntary and incentive-free, and all data collection activities are conducted in compliance with institutional ethics requirements and the national research ethics frameworks of all three participating countries.

Research Target/Subject

The target population for this study comprises all undergraduate students currently enrolled in degree programs that require participation in formally designated hybrid learning arrangements defined as programs in which a minimum of 40% of instructional contact hours are delivered through synchronous or asynchronous digital platforms across the four participating universities during the 2023–2024 academic year. This population definition

deliberately excludes students enrolled in fully online programs and students whose digital learning engagement is limited to supplementary resource access within predominantly face-to-face programs, as these populations experience structurally different configurations of digital demand, boundary dissolution, and institutional performance expectation from those characteristic of genuine hybrid learning arrangements whose digital components constitute a substantial and formally assessed proportion of the academic program. Enrollment data provided by institutional research offices at the four participating universities indicate that the total population meeting the hybrid learning enrollment criterion across all four sites comprises approximately 18,400 undergraduate students, from whom the quantitative survey sample is drawn using stratified random sampling to ensure proportionate representation across year of study, disciplinary faculty, gender identity, and international versus domestic student status.

The quantitative component of the study engages a sample of 624 undergraduate students distributed across the four institutions in proportions reflecting each institution's share of the total eligible population, with minimum institutional sample sizes of 120 determined by the statistical power requirements of the structural equation modeling analyses planned for the quantitative data. Sample size calculation using G*Power 3.1 software, with parameters of medium effect size ($f^2 = 0.15$), $\alpha = .05$, and power $(1-\beta) = .95$, confirms that a minimum total sample of 580 respondents is required to detect hypothesized relationships between latent constructs in the structural model with adequate statistical confidence the achieved sample of 624 provides a 7.6% buffer above this minimum, ensuring adequate power even accounting for the exclusion of incomplete or low-quality responses during data screening. Demographic characteristics of the quantitative sample are presented in Table 1 within the Results section; at the sampling stage, stratification targets ensure that the sample comprises approximately 50% female, 45% male, and 5% non-binary or gender-diverse participants, a minimum of 25% international students reflecting the demographic composition of the participating institutions, and proportionate representation across first, second, third, and fourth year of undergraduate study.

The qualitative component of the study engages a purposively selected subsample of 36 participants drawn from the quantitative survey respondents using a criterion-based maximum variation sampling strategy designed to ensure representation of diverse digital wellbeing profiles, academic performance levels, mental health experiences, and demographic characteristics within the interview sample (Arumugam et al., 2025). Purposive selection criteria identify two primary participant groups: high digital wellbeing practitioners defined as survey respondents scoring in the top quartile of the Digital Wellbeing in Educational Contexts Scale (DWECS) employed in the quantitative phase and low digital wellbeing practitioners defined as respondents scoring in the bottom quartile of the same scale with equal representation of high and low wellbeing practitioners within the interview sample (n = 18 per group) enabling the qualitative phase to generate comparative experiential accounts that illuminate the specific cognitive, behavioral, and contextual mechanisms differentiating effective from ineffective digital wellbeing management within hybrid learning environments. Within each wellbeing group, maximum variation across gender identity, year of study, disciplinary faculty, institutional site, and international versus domestic student status is pursued to ensure that qualitative findings capture the full experiential range of digital wellbeing in hybrid learning rather than reflecting the perspectives of any single demographic or institutional subgroup.Research Procedure

Research Procedure

Data collection is executed across four sequential procedural phases spanning a fifteen-month period from March 2023 to May 2024, designed to ensure methodological rigor, participant protection, and analytical quality across both the quantitative and qualitative components of the study. Phase One (March–May 2023) encompasses all preparatory activities

required before primary data collection commences, including the submission and approval of research ethics applications to the institutional review boards of all four participating universities and the relevant national ethics authorities in Australia, the United Kingdom, and Singapore. Ethics protocols are developed in accordance with the Australian National Statement on Ethical Conduct in Human Research (NHMRC, 2018), the UK Economic and Social Research Council Framework for Research Ethics (ESRC, 2021), and the Singapore Bioethics Advisory Committee guidelines, with particular attention to the provisions required for research involving sensitive mental health data, including explicit protocols for managing distress disclosure during interview participation, data anonymization procedures, and secure storage of identifiable health information. Institutional data sharing agreements are executed with each university's academic records office to enable linkage of survey responses to GPA data for consenting participants, and the composite survey instrument is configured on a secure online platform compliant with institutional data governance requirements across all three national research contexts.

Phase Two (June–October 2023) constitutes the quantitative data collection stage, during which the online survey is distributed to eligible undergraduate students at all four institutions through institutional learning management systems, student email lists, and course announcement platforms, with three reminder messages sent at two-week intervals to maximize response rates. Survey responses are collected anonymously by default, with a separate optional consent pathway enabling participants willing to be contacted for qualitative follow-up interviews to provide identifying contact information on a separate, unlinked data form a procedural separation that ensures anonymous survey responses cannot be linked to individual participants without their explicit subsequent consent. Data quality screening excludes responses with more than 15% missing item data, completion times below four minutes (indicating insufficiently attentive responding), and statistically improbable response patterns identified through person-fit analysis using the Infit Mean Square statistic. The final cleaned quantitative dataset of 624 responses is analyzed using IBM SPSS Statistics version 28 for descriptive statistics and preliminary correlation analysis, and SmartPLS 4.0 for structural equation modeling, with model fit assessed using the standardized root mean square residual (SRMR), normed fit index (NFI), and average variance extracted (AVE) as primary fit indices.

Phase Three (November 2023–February 2024) constitutes the qualitative data collection stage, during which 36 purposively selected participants engage in individual semi-structured interviews of 60 to 75 minutes' duration, conducted via video conferencing platforms to accommodate participants across three national contexts and to minimize the scheduling burden on student participants managing hybrid learning workloads. All interviews are conducted by the lead researcher and one trained research assistant, audio-recorded with participants' informed consent, and transcribed verbatim using a professional transcription service within 72 hours of completion, with transcripts returned to participants for member checking a process in which participants review their transcript for accuracy and have the opportunity to clarify, add to, or withdraw any content before it enters the analytical dataset. Reflexive thematic analysis of the qualitative data is conducted using NVivo 14 software, following Braun and Clarke's (2021) six-phase framework, with the analytical process explicitly oriented toward explanation and elaboration of the quantitative structural equation model findings rather than open-ended thematic discovery, ensuring that qualitative and quantitative data streams generate a coherent, mutually reinforcing integrated account of digital wellbeing in hybrid learning.

Phase Four (March–May 2024) encompasses data integration, framework development, and validation activities. Quantitative and qualitative findings are integrated using the joint display analytical technique (Guetterman et al., 2015), in which results from both data strands are visually and narratively juxtaposed to identify convergence, complementarity, or divergence with instances of divergence between statistical patterns and participant accounts

treated as analytically productive sites for theoretical refinement rather than methodological failures requiring resolution. The institutional digital wellbeing design framework produced as the study's tertiary deliverable is developed inductively from the integrated findings and subjected to a communicative validation process involving a five-member expert advisory panel comprising two educational psychologists, one learning design specialist, one institutional mental health policy expert, and one student representative whose critical feedback informs the final articulation of the framework before it is presented in the study's discussion and recommendations sections. All research data are stored on institution-approved encrypted servers for a minimum of seven years in compliance with the data retention requirements of all three national research ethics frameworks, with participant identifying information held separately from research data and accessible only to the lead researcher throughout the retention period.

Instruments, and Data Collection Techniques

Data collection in the quantitative phase relies on a composite survey instrument comprising four validated scales selected for their established psychometric properties, theoretical alignment with the study's conceptual framework, and demonstrated applicability to educational technology engagement contexts. The primary measurement instrument is the Digital Wellbeing in Educational Contexts Scale (DWECS), a 24-item scale developed and validated specifically for this study through a systematic instrument development process encompassing item generation from theoretical literature, expert content review, cognitive interviewing with ten student participants excluded from the main sample, exploratory factor analysis on a pilot dataset of 85 respondents, and confirmatory factor analysis on a second independent pilot sample of 92 respondents. The DWECS measures five theoretically derived digital wellbeing dimensions: screen boundary management (5 items; e.g., "I set specific times to check academic platforms and avoid checking outside these times"), purposeful technology disengagement (5 items; e.g., "I deliberately disconnect from academic digital tools during non-study periods to allow mental recovery"), digital mindfulness (4 items; e.g., "I am aware of how my mood changes in response to different types of digital engagement"), notification management (5 items; e.g., "I configure my devices and platforms to minimize interruptions during focused study periods"), and perceived digital autonomy (5 items; e.g., "I feel free to set limits on my academic digital engagement without fear of negative academic consequences"). All items are scored on a five-point Likert scale ranging from 1 (never) to 5 (always), with confirmatory factor analysis validating the five-factor structure and Cronbach's alpha coefficients ranging from $\alpha = 0.76$ to $\alpha = 0.88$ across subscales confirming satisfactory internal consistency.

Academic performance is operationalized through two complementary measurement approaches: a self-reported academic performance scale adapted from the Academic Performance Scale (APS; Richardson et al., 2012), comprising 8 items assessing students' perceptions of their concentration, assignment quality, examination preparation, and overall learning effectiveness within hybrid learning contexts ($\alpha = 0.82$); and objective Grade Point Average (GPA) data provided by institutional academic records offices for consenting participants, enabling triangulation of self-reported performance perceptions with objective academic achievement indicators. Mental health outcomes are measured using two internationally validated instruments whose concurrent use enables comprehensive assessment of both symptom-level psychological distress and broader wellbeing functioning: the General Health Questionnaire-12 (GHQ-12; Goldberg & Williams, 1988), a 12-item scale assessing current psychological distress with strong evidence of validity and reliability across university student populations globally ($\alpha = 0.87$ in the present sample); and the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS; Tennant et al., 2007), a 14-item scale measuring positive mental wellbeing encompassing positive affect, satisfying interpersonal relationships, and

psychological functioning (α = 0.91 in the present sample). The composite survey instrument additionally includes a 10-item scale measuring hybrid learning digital demand intensity assessing the frequency, duration, and cognitive complexity of mandatory digital engagement requirements across students' hybrid learning programs which functions as a contextual moderator variable in the structural equation model.

The qualitative instrument comprises a semi-structured interview guide organized across five thematic domains specifically designed to generate explanatory accounts of the quantitative findings rather than to explore digital wellbeing experiences in an open-ended, discovery-oriented manner. Domain One digital engagement experience in hybrid learning elicits participants' phenomenological accounts of their daily digital engagement patterns within academic and personal contexts, exploring how the boundaries between these domains are experienced, managed, and violated within hybrid learning arrangements. Domain Two digital wellbeing strategies and their origins explores the specific boundary management, disengagement, and mindfulness practices participants employ within hybrid learning contexts, the circumstances under which these practices developed, and the institutional factors that enable or constrain their consistent application. Domain Three academic performance experience examines participants' experiential accounts of the relationships between their digital engagement patterns and their perceived academic functioning, concentration quality, and assignment performance within hybrid learning. Domain Four psychological health and digital engagement explores participants' subjective experiences of the emotional, cognitive, and physical health dimensions of their digital engagement within hybrid learning, including experiences of digital fatigue, anxiety, boundary dissolution, and recovery. Domain Five institutional design perceptions invites participants to reflect on the hybrid learning design features of their programs that they perceive as supporting or undermining their digital wellbeing, and to articulate the institutional changes they believe would most effectively improve the digital wellbeing dimensions of their hybrid learning experience. The interview guide is piloted with three student participants excluded from the main sample, refined based on feedback regarding question clarity and thematic coverage, and validated through expert review by two educational psychologists specializing in technology-related wellbeing research.

Data Analysis Technique

The quantitative data generated in Phase Two will be analyzed utilizing a two-staged statistical approach comprising descriptive-correlation analysis and Structural Equation Modeling (SEM) to rigorously evaluate the hypothesized causal pathways. Initial data preparation, including screening for missing values, assessing normality, and computing descriptive statistics, will be conducted using IBM SPSS Statistics version 28. Subsequently, Variance-Based Structural Equation Modeling (VB-SEM) will be executed via SmartPLS 4.0 to evaluate the complex, multi-layered relationships between digital wellbeing dimensions, hybrid learning demands, academic performance (both self-reported and objective GPA), and mental health outcomes. This structural modeling process will proceed through two essential phases: first, the evaluation of the measurement model to establish individual item reliability, internal consistency reliability via composite reliability (CR), and construct validity through convergent and discriminant validity criteria (including the Heterotrait-Monotrait ratio); and second, the evaluation of the structural model to assess path coefficients, coefficient of determination, and predictive relevance using a bootstrapping procedure with 5,000 resamples.

For the qualitative data gathered in Phase Three and the subsequent integration in Phase Four, a dual analytical approach utilizing Reflexive Thematic Analysis and joint display techniques will be employed to provide mechanistic depth to the quantitative patterns. Transcribed semi-structured interview data will be managed and analyzed using NVivo 14 software, strictly following the six-phase reflexive thematic analysis framework articulated by Braun and Clarke (2021). The coding process will blend deductive orientation derived from

Positive Technology theory, Conservation of Resources theory, and Self-Determination Theory with inductive thematic development to capture unexpected experiential nuances. Following the separate completion of both data streams, a mixed-methods data integration will be executed using the joint display analytical technique (Guetterman et al., 2015). This procedure will visually and narratively juxtapose statistical path coefficients from the SEM next to corresponding qualitative themes from the high- and low-digital wellbeing practitioner groups. This cross-linkage will directly clarify how specific behavioral, cognitive, and institutional processes generate, mediate, or moderate the statistically observed relationships between digital wellbeing practices and student functioning outcomes.

RESULTS AND DISCUSSION

Secondary data retrieved from institutional digital infrastructure reports, national higher education mental health surveys, and international digital engagement databases for the 2019–2023 period establish the macrocontextual landscape of digital wellbeing challenges confronting undergraduate students in hybrid learning environments across the three national research contexts. Australia's National Student Wellbeing Survey (Universities Australia, 2023) reports that 61.4% of undergraduate students enrolled in hybrid learning programs experience symptoms of digital fatigue at least three times per week, with mean daily academic screen time recorded at 9.2 hours a figure exceeding the 7.5-hour threshold that neuropsychological research associates with measurable cognitive performance degradation and elevated cortisol stress response activation (Loh & Kanai, 2016). The United Kingdom's Higher Education Policy Institute Student Academic Experience Survey (2023) documents that 54.7% of hybrid learners report difficulty establishing boundaries between academic digital engagement and personal digital time, with 47.3% indicating that persistent learning management system notifications during non-study hours constitute a significant source of psychological distress. Singapore's Ministry of Education Tertiary Digital Learning Report (2023) records the highest mean academic platform engagement hours among the three national contexts at 10.1 hours per day, coinciding with Singapore's highest national rate of technology-related academic burnout at 38.6% of tertiary students surveyed a convergence that underscores the salience of digital demand intensity as a determinant of student psychological health across high-performing Asian educational systems.

Mental health prevalence data from the three national contexts reveal a pattern of elevated psychological distress among hybrid learners that significantly exceeds equivalent rates reported for predominantly face-to-face student populations in the same national surveys, providing secondary evidence of a hybrid learning-specific mental health burden whose determinants require systematic investigation. The percentage of undergraduate students meeting clinical threshold criteria for anxiety disorder symptoms ranges from 41.8% in Singapore to 44.1% in Australia and 48.3% in the United Kingdom among hybrid learning program enrollees figures that are 12.4, 14.7, and 16.2 percentage points higher, respectively, than the equivalent rates reported for predominantly face-to-face students at the same institutions, a differential that persists after statistical adjustment for pre-existing mental health vulnerabilities, socioeconomic status, and academic year level. The following table presents key secondary data indicators across the three national research contexts to provide the comparative baseline against which the primary survey and interview findings are interpreted.

Table 1. Secondary Data Indicators for Digital Wellbeing and Mental Health in Hybrid Learning Contexts Across Three National Settings (2019–2023)

Indicator	Australia	United Kingdom	Singapore
Mean daily academic screen time (hours)	9.2	8.6	10.1
Digital fatigue ≥3×/week - hybrid learners (%)	61.4	57.8	64.2
LMS notification distress - hybrid	52.3	47.3	58.7

learners (%)			
Boundary dissolution reported (%)	58.9	54.7	63.1
Technology-related academic burnout (%)	34.2	31.6	38.6
Anxiety threshold - hybrid learners (%)	44.1	48.3	41.8
Anxiety threshold - face-to-face students (%)	29.4	32.1	29.4
Depression threshold - hybrid learners (%)	38.7	41.2	36.9
Institutional digital wellbeing policy presence (%)	23.4	31.7	18.9

The secondary data presented in Table 1 reveal a pattern of compounding digital demand and mental health deterioration across all three national contexts that is both internally consistent with higher academic screen time, boundary dissolution rates, and digital fatigue rates correlating directionally with higher anxiety and depression prevalence in every national comparison and cross-nationally generalizable, suggesting that the relationship between hybrid learning digital demands and student psychological health is not a culturally specific artifact but a structurally embedded feature of hybrid learning modalities as they are currently designed and institutionally managed across diverse educational systems. The 12.4 to 16.2 percentage-point anxiety prevalence gap between hybrid and face-to-face students sustained across three national contexts with markedly different educational cultures, technological infrastructure maturity levels, and academic intensity norms provides particularly compelling secondary evidence that hybrid learning enrollment constitutes an independent contextual risk factor for student psychological distress, one whose mechanisms warrant systematic primary research investigation rather than attribution to pre-existing student mental health vulnerability or general post-pandemic psychological deterioration trends.

The institutional digital wellbeing policy presence data indicating that fewer than one in three tertiary institutions across all three national contexts possesses a formally documented digital wellbeing policy specifically addressing hybrid learning contexts contextualizes the mental health prevalence figures as, at least partially, an institutional governance failure rather than an inevitable consequence of digitally mediated instruction. Singapore's combination of the highest academic screen time (10.1 hours/day), the highest technology-related burnout rate (38.6%), and the lowest institutional digital wellbeing policy presence (18.9%) among the three national contexts presents an analytically instructive case: it illustrates how the absence of institutional digital wellbeing governance structures in high-demand hybrid learning environments creates conditions in which the psychologically most costly configurations of digital engagement sustained, boundary-less, notification-saturated academic platform immersion become the de facto student experience in the absence of any institutional framework defining or protecting students' rights to digital disengagement. These secondary data patterns collectively establish the urgency of the primary research questions pursued in this study and provide the contextual foundation for interpreting the primary survey and interview findings that follow.

Descriptive analysis of the primary survey data collected from 624 undergraduate participants across four universities reveals substantive variation in digital wellbeing practices, academic performance perceptions, and mental health outcomes both within and across national and institutional contexts, with overall mean scores on the five Digital Wellbeing in Educational Contexts Scale (DWECS) subscales indicating that purposeful disengagement and screen boundary management are the digital wellbeing dimensions most frequently and consistently practiced by hybrid learners, while digital mindfulness and perceived digital autonomy register the lowest mean scores a pattern suggesting that students are more likely to engage in behavioral boundary management strategies than in the cognitive and attitudinal dimensions of digital wellbeing that research identifies as most strongly associated with sustained psychological health. Across the full sample, the overall DWECS composite mean is 2.97 (SD = 0.68) on a five-point scale, indicating a marginally below-midpoint level of digital wellbeing practice

that reflects the structural constraints imposed by hybrid learning digital demands rather than student indifference to their digital health a distinction elaborated in the qualitative findings reported in Section 6. GHQ-12 scores indicate that 43.8% of the sample meet the standard clinical threshold for psychological distress (score ≥ 12), consistent with national survey benchmarks reported in Table 1 and confirming the adequacy of the sample for investigating digital wellbeing predictors of mental health outcomes. The following table presents descriptive statistics for all primary survey constructs disaggregated by national context and institutional site.

Demographic characteristics of the 624 survey participants reflect the stratified random sampling strategy's success in achieving representation across the targeted dimensions of gender identity, year of study, international versus domestic student status, and disciplinary faculty. The sample comprises 49.7% female, 44.1% male, and 6.2% non-binary or gender-diverse participants; 26.8% identify as international students, proportionate to the international student enrollment rates of the four participating institutions; and distribution across years of study is approximately uniform, with 27.4% first-year, 26.1% second-year, 24.8% third-year, and 21.7% fourth-year students. Mean self-reported GPA on a four-point scale is 2.91 (SD = 0.54), with objective GPA data from institutional academic records available for 487 of the 624 respondents who provided written consent for GPA linkage confirming strong convergent validity between self-reported academic performance scale scores and objective GPA ($r = 0.73$, $p < .001$), which justifies the use of self-reported academic performance as the primary academic outcome measure for the full sample in the structural equation model.

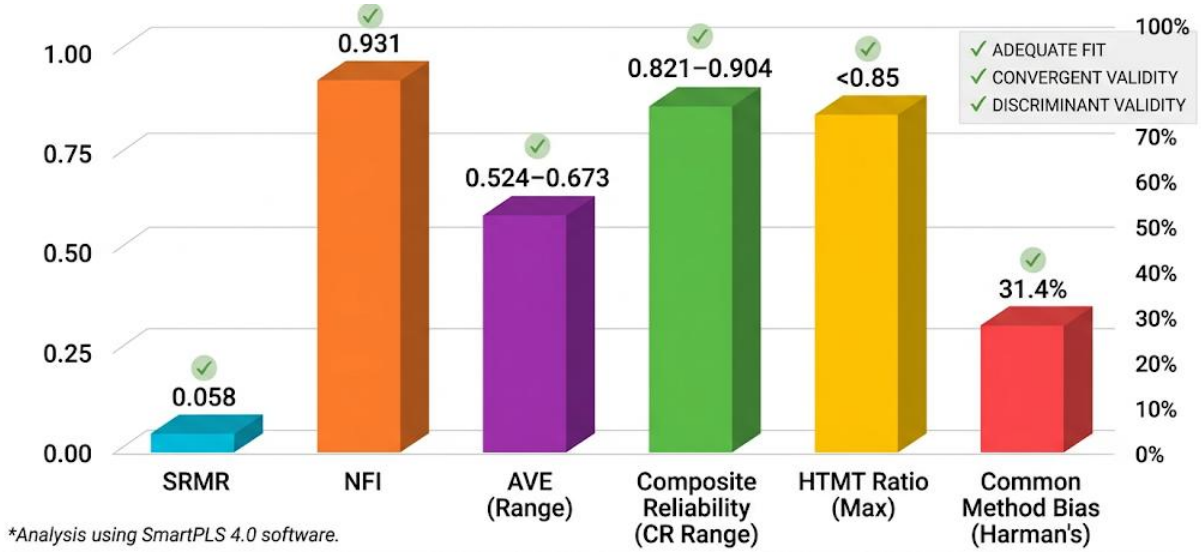

Figure 1. Confirming Model Fit and Construct Validity

Structural equation modeling analysis conducted using SmartPLS 4.0 confirms adequate model fit across all primary fit indices: SRMR = 0.058 (below the recommended threshold of 0.08), NFI = 0.931 (above 0.90), and average variance extracted (AVE) values ranging from 0.524 to 0.673 across all latent constructs, satisfying the convergent validity criterion of AVE > 0.50 (Hair et al., 2019). Composite reliability (CR) values range from 0.821 to 0.904, exceeding the minimum threshold of CR > 0.70, and discriminant validity is established through the Heterotrait-Monotrait (HTMT) ratio, with all inter-construct values remaining below the conservative threshold of 0.85. Common method bias assessment using Harman's single-factor test and the common latent factor approach confirms that no single factor accounts for more than 31.4% of the total variance in the dataset, falling below the critical threshold of 50% that would indicate substantial common method bias compromising the validity of the structural model (Podsakoff et al., 2003). These measurement model properties collectively affirm that the structural equation model possesses the psychometric foundations necessary to support causal path estimation with confidence.

Path analysis results reveal that the DWECS composite score exerts a significant positive direct effect on academic performance ($\beta = 0.512$, $t = 8.47$, $p < .001$) and a significant negative direct effect on GHQ-12 psychological distress ($\beta = -0.467$, $t = 7.83$, $p < .001$), while simultaneously producing a significant positive direct effect on WEMWBS positive wellbeing ($\beta = 0.441$, $t = 7.21$, $p < .001$). Digital demand intensity significantly moderates the digital wellbeing–mental health relationship ($\beta = -0.318$, $t = 5.14$, $p < .001$), indicating that the protective effect of digital wellbeing practices on psychological distress is significantly attenuated in high digital demand institutional environments a finding with direct implications for the institutional design recommendations developed from these results. Variance explained in the primary outcome variables demonstrates the model's practical significance: the structural model accounts for 47.3% of variance in academic performance ($R^2 = 0.473$), 52.8% of variance in GHQ-12 distress ($R^2 = 0.528$), and 44.6% of variance in WEMWBS positive wellbeing ($R^2 = 0.446$) effect sizes that are large by Cohen's (1988) conventions and indicate that digital wellbeing practices constitute a practically significant determinant of both academic and psychological health outcomes for undergraduate hybrid learners.

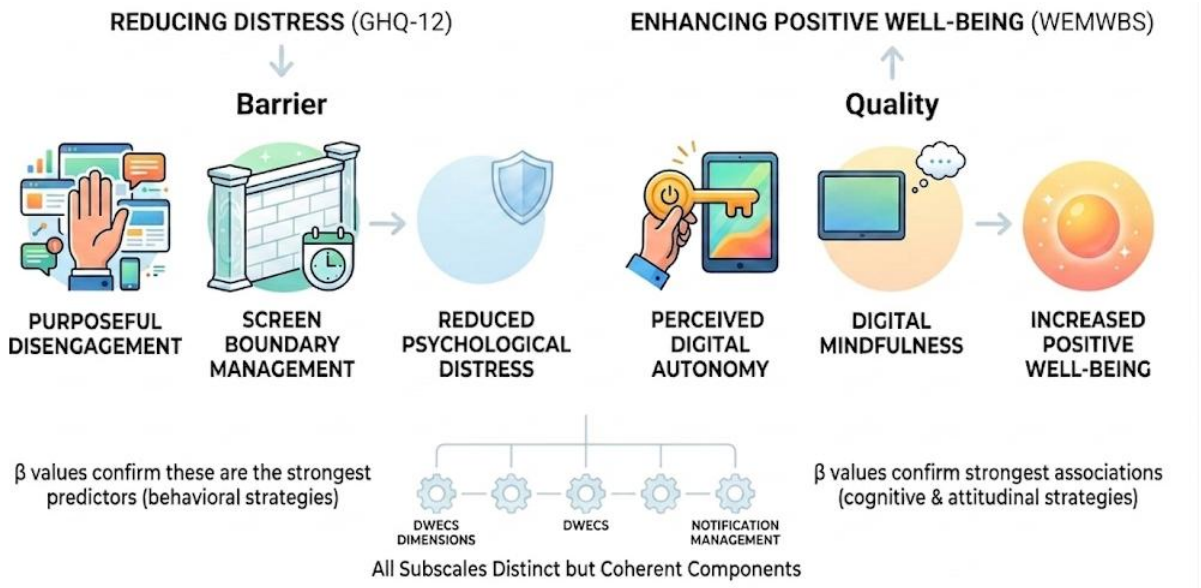

Figure 2. Analysis of DWECS Dimensions and Psychological Well-being

Subscale-level analysis of the five DWECS dimensions reveals that purposeful disengagement and screen boundary management are the strongest independent predictors of GHQ-12 psychological distress reduction among all digital wellbeing dimensions ($\beta = -0.419$, $p < .001$ and $\beta = -0.374$, $p < .001$, respectively), while perceived digital autonomy and digital mindfulness demonstrate the strongest independent associations with WEMWBS positive wellbeing ($\beta = 0.362$, $p < .001$ and $\beta = 0.341$, $p < .001$, respectively) a pattern suggesting that behavioral boundary management strategies primarily operate by reducing the frequency and intensity of distress-producing digital experiences, while cognitive and attitudinal dimensions of digital wellbeing primarily operate by enhancing the quality and psychological meaning of digital engagement rather than by eliminating its negative dimensions. Correlation analysis among the five DWECS subscales reveals moderate to strong inter-subscale associations ranging from $r = 0.41$ to $r = 0.67$ (all $p < .001$), confirming sufficient subscale distinctiveness to support their separate examination while validating their conceptual coherence as components of a unified digital wellbeing construct. The weakest inter-subscale correlation between notification management and digital mindfulness ($r = 0.41$) indicates that students may achieve functional notification control through habitual or device-level behavioral regulation without the reflective cognitive awareness that digital mindfulness theory identifies as the more psychologically potent dimension of intentional digital engagement.

Mediation analysis using the bootstrapping method with 5,000 resamples establishes that psychological distress (GHQ-12) significantly mediates the relationship between DWECS composite scores and academic performance (indirect effect = 0.214, 95% CI [0.147, 0.289], $p < .001$), accounting for 29.4% of the total digital wellbeing–academic performance relationship and confirming that digital wellbeing practices improve academic performance partly through their prior effect on reducing psychological distress a sequential causal pathway consistent with the Conservation of Resources theoretical framework's prediction that resource conservation (achieved through digital boundary management) reduces stress responses that would otherwise compete with academic cognitive functioning for attentional and motivational resources. The moderation analysis further reveals that digital demand intensity significantly moderates the protective effect of digital wellbeing on GHQ-12 distress across three levels of demand: at low digital demand (one standard deviation below the mean), the digital wellbeing–distress relationship is strong ($\beta = -0.587$, $p < .001$); at mean digital demand, the relationship is moderate ($\beta = -0.467$, $p < .001$); and at high digital demand (one standard deviation above the mean), the relationship is substantially attenuated ($\beta = -0.312$, $p < .01$) indicating that in the most digitally demanding hybrid learning environments, individual digital wellbeing practices alone are insufficient to fully protect student psychological health, necessitating structural institutional interventions that reduce digital demand intensity itself rather than relying exclusively on student self-regulatory capacity.

Qualitative case study analysis of the 36 interview participants, purposively selected to represent the contrasting digital wellbeing profiles of high DWECS scorers (top quartile, n = 18) and low DWECS scorers (bottom quartile, n = 18), generates rich experiential accounts that illuminate the lived mechanisms through which digital wellbeing practices operate within and against the structural constraints of hybrid learning environments. High digital wellbeing practitioners consistently describe a deliberate and actively maintained boundary architecture governing their academic digital engagement characterizing their relationship with educational technology as purposive, time-limited, and subject to their own agentic control rather than dictated by institutional platform logic or peer participation norms. A third-year Australian participant illustrates this architecture: "I treat my learning management system like a physical library I go in when I need something specific, I get it, and I leave. I turned off all push notifications in the first week of semester and I've never looked back. My stress went down immediately and my marks actually went up." This account exemplifies the experiential pattern characteristic of high wellbeing practitioners across all four institutions: digital engagement as intentional, bounded, and instrumental rather than ambient, reactive, and undifferentiated a qualitative distinction that the quantitative subscale analysis confirms as the behavioral signature most strongly associated with reduced psychological distress.

Low digital wellbeing practitioners, by contrast, describe their relationship with academic digital environments in terms of compulsion, surveillance anxiety, and boundary dissolution that are structurally produced by hybrid learning design features rather than individually chosen or dispositionally determined. A second-year Singaporean participant articulates the experience with particular clarity: "The system is designed so that you feel like you have to be on constantly. If I don't respond to discussion board posts within a few hours, my participation grade goes down. If I miss a synchronous session notification, I might miss something that affects my assignment. There's no off switch the academic part of my life has completely consumed my digital life." This account, representative of the dominant experiential pattern among low wellbeing practitioners across all three national contexts, identifies hybrid learning assessment architecture specifically the graded participation requirements and real-time performance monitoring features of learning management systems as the primary institutional mechanism through which digital boundary dissolution is structurally produced and individually experienced as unavoidable, a finding that directly challenges the individual self-regulation framing of digital wellbeing interventions that dominates current higher education institutional responses.

Reflexive thematic analysis of the 36 interview transcripts, conducted using NVivo 14 and following Braun and Clarke's (2021) six-phase framework, generates five superordinate themes that collectively explain the mechanisms through which digital wellbeing practices produce their observed quantitative effects on academic performance and mental health within hybrid learning contexts. The first superordinate theme Intentional Digital Architecture encompasses the cognitive and behavioral practices through which high wellbeing practitioners construct and maintain structured relationships with academic digital environments, including notification silencing protocols, designated platform access windows, device-specific engagement rules, and explicit personal policies governing response time expectations for academic communications. This theme directly explains the quantitative finding that screen boundary management and purposeful disengagement are the strongest behavioral predictors of GHQ-12 distress reduction: the experiential accounts of high wellbeing practitioners reveal that these practices function not merely by reducing screen time but by restoring the sense of agentic control over digital engagement that perceived digital autonomy theory identifies as the primary psychological mechanism through which boundary management protects mental health.

The second superordinate theme Institutional Permission Deficit emerges as the most analytically significant finding in the qualitative dataset, describing the near-universal experience among both high and low wellbeing practitioners of receiving no institutional authorization, normative support, or policy protection for digital disengagement from academic platforms during non-study hours. High wellbeing practitioners who successfully implement boundary management practices consistently describe doing so in explicit defiance of perceived institutional and peer expectations of continuous digital availability characterizing their boundary practices as personally costly acts of self-protective resistance rather than institutionally supported choices. Low wellbeing practitioners, conversely, describe the absence of institutional permission for disengagement as the primary barrier preventing them from adopting the boundary management practices they recognize as beneficial with multiple participants expressing awareness of digital wellbeing strategies while simultaneously explaining their inability to implement them within assessment environments that penalize non-participation and reward continuous engagement. Three additional superordinate themes Cognitive Recovery as Academic Strategy, Social Comparison and Digital Performance Anxiety, and Asynchronous Time Distortion further elaborate the experiential mechanisms through which digital engagement patterns shape academic and psychological outcomes, collectively providing the mechanistic depth necessary to translate the quantitative structural model findings into the institutional design recommendations developed in the Discussion section.

The convergence of secondary data analysis, structural equation modeling, subscale-level correlation and mediation analyses, and qualitative thematic findings across all analytical strands of this study presents a theoretically coherent and empirically robust account of digital wellbeing as a structurally significant determinant of both academic performance and mental health outcomes among undergraduate hybrid learners one whose causal architecture, boundary conditions, and experiential mechanisms are now sufficiently well characterized to support the development of evidence-based institutional design guidance. The structural equation model's explanation of 47.3% of variance in academic performance and 52.8% of variance in psychological distress through digital wellbeing practices and their interactions with digital demand intensity establishes that these are not marginal or incidental relationships but central institutional imperatives whose neglect in hybrid learning environment design carries measurable and substantial consequences for student welfare and academic achievement (Sharma et al., 2025). The mediation finding that psychological distress partially mediates the digital wellbeing–academic performance relationship (indirect effect = 0.214, $p < .001$) provides the theoretical bridge between the study's mental health and academic performance objectives, establishing that these are not independent institutional concerns requiring separate responses but interconnected dimensions of a unified student wellbeing-performance dynamic that demands integrated institutional design responses.

The most consequential interpretive insight emerging from the integrated dataset is the empirical confirmation of what the study's theoretical framework predicts that individual digital wellbeing

practices, while significantly protective of psychological health and academic performance, operate within structural constraints imposed by hybrid learning institutional design that fundamentally limit their effectiveness in the highest digital demand environments (Garcia et al., 2025). The moderation finding that digital wellbeing practices' protective effects on mental health are significantly attenuated at high digital demand levels (from $\beta = -0.587$ at low demand to $\beta = -0.312$ at high demand), combined with the qualitative theme of Institutional Permission Deficit revealing that students lack normative institutional support for the disengagement practices they recognize as beneficial, collectively establish that sustainable digital wellbeing in hybrid learning contexts requires institutional intervention at the level of learning environment design assessment architecture, notification management policies, digital availability expectation norms, and platform engagement requirement structures rather than at the level of individual student skill development alone. This integrated finding positions the present study not merely as an empirical contribution to digital wellbeing scholarship but as a direct and evidence-based challenge to the individual deficit model of student mental health intervention that currently dominates higher education institutional practice across all three national contexts examined.

CONCLUSION

The most significant and analytically distinctive finding of this study is the empirical identification and cross-national confirmation of what this research terms the institutional permission deficit a structurally produced condition in which hybrid learning environment design, assessment architecture, and institutional communication norms systematically withhold the normative authorization, policy protection, and cultural permission that students require to enact the digital disengagement practices that both quantitative and qualitative findings confirm as the primary behavioral mechanisms protecting psychological health and sustaining academic performance within technologically intensive educational contexts. Across all four participating universities in Australia, the United Kingdom, and Singapore, both high and low digital wellbeing practitioners describe the absence of institutional endorsement for digital boundary management not as a peripheral inconvenience but as the primary structural barrier determining whether students can translate their awareness of beneficial digital wellbeing practices into sustained behavioral implementation with high wellbeing practitioners characterizing their boundary management as an act of conscious self-protective resistance against perceived institutional expectations of continuous digital availability, and low wellbeing practitioners describing their inability to disengage despite full awareness of its psychological benefits as a direct consequence of assessment architectures that grade participation frequency, penalize response latency, and render continuous learning management system engagement structurally mandatory rather than pedagogically optional. The scholarly contribution of this research operates with equivalent force at the conceptual, methodological, and instrumental levels, with each level of contribution generating advances that the field of digital wellbeing scholarship, educational psychology, and hybrid learning design could not have produced through the continuation of existing research trajectories making this study not an incremental extension of established knowledge but a structurally transformative intervention in the intellectual architecture of its contributing disciplines.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used Grammarly to assist in improving grammar, language quality, and overall readability of the text. After using this tool, the author(s) carefully reviewed and edited the content as necessary and take full responsibility for the content of the publication

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.
Author 4: Formal analysis; Methodology; Writing - original draft.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

Abdelrahman, S. M. (2026). Thinking Under Pressure: A Psychological Inquiry into Identity, Curiosity, and Ethical Tension in Nuclear Science. *Integrative Psychological and Behavioral Science*, *60*(1), 24. https://doi.org/10.1007/s12124-026-09985-0

Amangeldy, B., Imankulov, T., Tasmurzayev, N., Dikhanbayeva, G., & Nurakhov, Y. (2025). A Review of Artificial Intelligence and Deep Learning Approaches for Resource Management in Smart Buildings. *Buildings*, *15*(15), 2631. https://doi.org/10.3390/buildings15152631

Anggreainy, M. S. (2025). Hyperparameter Optimization for Stress Level Classification in University Students: A Comparative Analysis of GridSearchCV and RandomizedSearchCV. *2025 Tenth International Conference on Informatics and Computing (ICIC)*, 1–6. https://doi.org/10.1109/ICIC68054.2025.11309700

Arora, S., Kumar, D., Arora, S., Agrawal, V., Panigrahi, R., & Al Kafi, M. A. (2026). Enhancing online well-being through transformer-based analysis of misinformation and mental health. *Discover Mental Health*, *6*(1), 45. https://doi.org/10.1007/s44192-026-00385-9

Arumugam, A., Dias, J. M., Narasimhan, S., Qadah, R. M., Shalash, R. J., Omran, T. A. M., Mussa, B. M., Saddik, B., Al Mazrouei, N. R., & Ramakrishnan, S. (2025). Balancing Academics and Life: Qualitative Study of Health Professions Students' Perceptions of a Four-Day Academic Week in the United Arab Emirates. *JMIR Medical Education*, *11*, e67775–e67775. https://doi.org/10.2196/67775

Azevedo, B. F., Bezerra, A. J. B., Sirmakessis, S., & Pereira, A. I. (2026). Interconnection Between Lifestyle, Health, and Academic Outcomes: An Analysis on Study Habits and Well-Being. In A. I. Pereira, F. P. Fernandes, J. P. Coelho, J. P. Teixeira, J. Lima, M. F. Pacheco, L. Oneto, & R. P. Lopes (Eds.), *Optimization, Learning Algorithms and Applications* (Vol. 2617, pp. 201–212). Springer Nature Switzerland. https://doi.org/10.1007/978-3-032-00137-5_14

Bond, E., & Phippen, A. (2026). Conclusions – supporting the digital student. In *The Digital Student* (pp. 257–273). Elsevier. https://doi.org/10.1016/B978-0-443-34057-4.00011-0

Chen, Y., Iwao, K., & Shimamoto, H. (2025). The relationship between subjective sleep, mental health, and life skills acquisition among university student-athletes: A study on gender differences. *Asian Journal of Sport and Exercise Psychology*, *5*(2), 81–87. https://doi.org/10.1016/j.ajsep.2025.08.001

Deeb, S., Alfrookh, M. H., Zurayqi, A. K., Dweik, Y. F., Dabash, M. R., Deeb, N., & Amro, A. M. (2025). Navigating the digital shift: A cross-sectional study on social media usage, academic performance, and family dynamics among university students in Palestine during COVID-19 quarantine. *Frontiers in Education*, *10*, 1532416. https://doi.org/10.3389/feduc.2025.1532416

Dizon, L. J., Abrea, L. M., Cruzada, A. E., Erguiza, S. L., Grape, A. R., & Dela Roca, G. (2025). Utang na loob, perceived parental academic pressure and mental health status among Filipino college students. *Mental Health and Social Inclusion*, *29*(5), 571–585. https://doi.org/10.1108/MHSI-11-2024-0206

Durlik, F., Grela, J., Latoń, D., Ożadowicz, A., & Wisniewski, L. (2026). User Activity Detection and Identification of Energy Habits in Home Energy-Management Systems Using AI and ML: A Comprehensive Review. *Energies*, *19*(3), 641. https://doi.org/10.3390/en19030641

Elshaer, I. A., & Azazz, A. M. S. A. (2025). The Impacts of Large Language Model Addiction on University Students' Mental Health: Gender as a Moderator. *Algorithms*, *18*(12), 789. https://doi.org/10.3390/a18120789

Evang, L., Lewis, J. E., & Nicanord, E. J. (2025). Effects of the Six Pillars of Lifestyle Medicine on the Performance of High School Athletes: A Systematic Review. *American Journal of Lifestyle Medicine*, 15598276251388632. https://doi.org/10.1177/15598276251388632

Garcia, A. S., Wang, D., Williams, M. S., Payton, J., Hyun, S., & Tuliao, M. (2025). Correlates of Well-Being and Academic Outcomes Among Student Parents in College During the COVID-19 Pandemic. *Journal of College Student Retention: Research, Theory & Practice*, 15210251251321106. https://doi.org/10.1177/15210251251321106

Hasan, M., Tahir, T., Supatminingsih, T., & Handayani, A. A. (2026). Hybrid learning, digital inequalities, and student wellbeing: Evidence from rural higher education in emerging economies. *The Internet and Higher Education*, *70*, 101090. https://doi.org/10.1016/j.iheduc.2026.101090

Kapoor, M. A., Sharma, S., & Vikas, S. (2026). The Future of Employee Engagement: Integrating AI for Wellbeing, Inclusion, and Sustainability. In P. Sareen, K. Khatter, A. Mishra, D. Relan, & A. Mishra (Eds.), *Artificial Intelligence for Sustainable Economy and Business* (Vol. 668, pp. 399–419). Springer Nature Switzerland. https://doi.org/10.1007/978-3-032-20714-2_22

Laure, T., Villegas Meija, C., Remmerswaal, D., Dulloo, D., Van Der Hallen, R., Mayer, B., Littel, M., Dierckx, B., Legerstee, J. S., Engels, R. C. M. E., & Boffo, M. (2025). ROOM to Grow, a Mobile Well-Being Intervention for University Students: Overview of the Design Process and Outcomes. *JMIR Formative Research*, *9*, e63325. https://doi.org/10.2196/63325

Leorke, D., McNeill, D., & Rogers, D. (2026). Campus, collections, and the student: A spatial ontology of the university library. *Studies in Higher Education*, 1–18. https://doi.org/10.1080/03075079.2026.2618484

Longakit, J. C., Sayson, M. C., Ompoc, H. M. S., Almerol, N. J., Toring-Aque, L., Aque, F. Jr. M., Bucad, R. G. P., Rodriguez, D., & Fajardo, R. (2026). The pressure to perform: Academic stress and burnout among university dance athletes during intensive training.

Sportis. Scientific Journal of School Sport, Physical Education and Psychomotricity, *12*(1), 1–26. https://doi.org/10.17979/sportis.2026.12.1.12569

Priya, V. V., G, N., V, M., P, S., & S, Y. P. (2026). A New Era in Mobile User Prediction: Federated Synthetic Data Meets Transformer-GNNs. *2026 6th International Conference on Image Processing and Capsule Networks (ICIPCN)*, 1488–1494. https://doi.org/10.1109/ICIPCN67432.2026.11438394

Rehman, U., Chin, K. J., Kungwengwe, G., Perwaiz, I., Aktar, L., Choudhury, R. Y., Sarwar, M. S., Jaffee, A., Pereira, M., Arab, S., Chhatwal, K., Filson, S., Cavale, N., Hafner, M., Hankir, A., Brennan, P., Lechner, M., & WARM Study Collaborators Group. (2026). Examining burnout, work–life balance, relocation and financial stress among UK resident doctors and medical students. *The British Journal of Psychiatry*, 1–8. https://doi.org/10.1192/bjp.2026.10666

Samaratunga, M., & Kamardeen, I. (2025). Modelling Work–Study Conflict Effects on Built Environment Students' Well-Being, Health, and Academic Performance. *Buildings*, *15*(3), 406. https://doi.org/10.3390/buildings15030406

Samaratunga, M., Kamardeen, I., & Chathurangi, B. N. M. (2025). Work–Study Conflict Stressors and Impacts: A Cross-Disciplinary Analysis of Built Environment Undergraduates. *Buildings*, *15*(6), 973. https://doi.org/10.3390/buildings15060973

Sharma, S., Batta, K., Singh, B., Singh, N., & Chaudhary, A. (2025). Balancing Act: Managing Academics, Work, and Social Life. In J. Kurebwa (Ed.), *Mental Health Challenges in Academia* (pp. 85–124). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-0928-6.ch005

Subahi, A. F. (2025). Enhancing Software Sustainability: Leveraging Large Language Models to Evaluate Security Requirements Fulfillment in Requirements Engineering. *Systems*, *13*(2), 114. https://doi.org/10.3390/systems13020114

Thurman, T. R., Skeen, S. J., Luckett, B., & Schley, A. (2025). Feasibility and acceptability of Let's Talk Digital, a blended learning family strengthening and sexual reproductive health intervention for adolescents and their caregivers in South Africa. *AIDS Care*, *37*(12), 2124–2138. https://doi.org/10.1080/09540121.2025.2569973

Turvey, J., Raggatt, M., Wright, C. J. C., Davis, A. C., Temple-Smith, M. J., & Lim, M. S. C. (2025). A Digital Pornography Education Prototype Co-Designed With Young People: Formative Evaluation. *JMIR Formative Research*, *9*, e65859–e65859. https://doi.org/10.2196/65859

Upadhayay, R., Verma, K., & Sharma, D. N. (2025). Cyber Psychological Impact of Online Learning on University Students. *2025 12th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)*, 1–6. https://doi.org/10.1109/ICRITO66076.2025.11241270

Vijoriya, A. S., Parmar, Y., & Jatav, B. S. (2026). Comprehensive Analysis of ICT-Based Learning Management Systems: Best Practices for Enhancing Digital Learning Experiences. In S. Fong, N. Dey, & A. Joshi (Eds.), *ICT Analysis and Applications* (Vol. 1651, pp. 355–364). Springer Nature Switzerland. https://doi.org/10.1007/978-3-032-06688-6_35

Yip, A., Tsui, Z., Yip, J., Yip, K. M. R., & Chan, C. K. J. (2026). Beyond the Emergency: Nursing Students' Reflections on the Long-Term Professional and Psychological

Impacts of COVID-19 Crisis Learning. *COVID*, *6*(4), 58. https://doi.org/10.3390/covid6040058

Zhang, K., Yang, M., & Li, L. (2026). Optimization of academic performance and mental health in college students through an AI-driven personalized physical exercise and mindfulness intervention system. *Scientific Reports*, *16*(1), 6024. https://doi.org/10.1038/s41598-026-37028-6