

Unequal Signals, Unequal Learning? A Mixed-Methods Study of Blended Learning Effectiveness Across Philippine State University Campuses

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HOW TO CITE:

Rico D. De Asis (2026).
Unequal Signals, Unequal
Learning? A Mixed-Methods Study
of Blended Learning Effectiveness
Across Philippine State University
Campuses.
International Journal of Special
Education, 41(9s), 200-216

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ABSTRACT:

Blended learning has been formally institutionalized across the University of Eastern Philippines (UEP) System through a Board of Regents-approved Learning and Continuity Plan mandating a weekly Modular Distance Learning schedule for all undergraduate programs. Limited empirical evidence exists, however, on whether this uniform policy produces equitable outcomes across three structurally unequal campuses. The University of Eastern Philippines system has UEP Main, UEP Laoang, and UEP–Pedro Rebadulla Memorial Campus (UEP–PRMC) that may differ substantially in digital infrastructure, internet connectivity, and resource endowment. This study employed an Explanatory Sequential Mixed-Methods Design with emphasis on the Community of Inquiry (CoI) Framework (Garrison et al., 2000) and Constructivist Learning Theory (Vygotsky, 1978). In Phase 1, a validated instrument was administered to $N = 200$ stratified undergraduates drawn proportionally from the three campuses. Quantitative data were analyzed through descriptive statistics, Pearson r correlations, Welch one-way ANOVA with Tukey post-hoc comparisons, and simple linear regression. In Phase 2, 28 participants completed a structured open-response questionnaire subjected to Reflexive Thematic Analysis (Braun & Clarke, 2006, 2019). The findings indicate that blended learning levels were generally Moderate to High across campuses (mean range: 3.23–4.23). A significant campus-level difference emerged, $F(2, 6.42) = 26.70$, $p < .001$, with UEP Main scoring significantly lower than both UEP Laoang and UEP–PRMC. Learning satisfaction significantly predicted academic performance ($\beta = .433$, $p < .001$, $R^2 = .187$). The study advances the concept of conditional blended learning effectiveness, with implications for digital equity policy and instructional design.

Keywords: blended learning; Community of Inquiry; conditional effectiveness; digital equity; mixed methods.

Introduction

Blended learning — understood as the deliberate, architecturally integrated combination of face-to-face instruction and technology-mediated online learning — has moved from pedagogical experiment to institutional infrastructure in higher education systems worldwide (Garrison & Kanuka, 2004; Dziuban et al., 2018). In technologically stable, well-resourced contexts, this transition has been accompanied by an expanding evidence base linking blended modalities to improved student engagement, learning flexibility, and academic performance (Halverson & Graham, 2019; Means et al., 2013).

What remains considerably underexamined, however, is what occurs when the same institutional architecture is imposed across campuses with structurally unequal digital infrastructure — where connectivity, device access, and geographic proximity are not constants but variables that condition the very possibility of blended participation.

At the University of Eastern Philippines (UEP) System, blended learning is not a transitional response to crisis but a standing institutional policy, formally anchored in a Board of Regents (BOR)-approved Learning and Continuity Plan and operationalized through a system-wide Friday Modular Distance Learning (MDL) schedule. This policy emerged from a convergence of structural forces peculiar to Northern Samar: climate vulnerability that has triggered repeated executive memoranda activating flexible learning modalities in response to PAGASA danger-level heat indices (UEP Memoranda Nos. 70, 99, s. 2024; No. 92, s. 2025); infrastructure constraints that drove the full online migration of General Education subjects in response to classroom shortages at UEP Main (UEP Memorandum No. 141A, s. 2024); and geographic isolation that renders any instructional disruption immediately consequential for student access.

By May 2025, flexible learning activation had been institutionalized as an automatic trigger — no longer requiring a presidential memorandum

for each episode — marking the point at which climate vulnerability became a permanent design parameter of the UEP learning system (UEP Memorandum No. 92, s. 2025).

The policy is uniform; the campuses are not. UEP Main in Catarman — enrollment 16,798, urban-adjacent, and relatively better connected — operates in a demonstrably different digital landscape than UEP Laoang (enrollment: 2,955) or UEP–Pedro Rebadulla Memorial Campus (UEP–PRMC) in Catubig (enrollment: 2,287), where mobile data is the predominant mode of internet access and electricity interruptions are documented. When CHED Memorandum Order No. 4, Series of 2023, granted higher education institutions the discretion to determine learning modalities, UEP exercised that discretion through a Friday MDL schedule applied identically across all three campuses. The equity question this uniformity raises is direct: does the same policy produce equivalent learning outcomes when the material conditions of its implementation differ substantially by campus?

This study addresses that question empirically. Existing research on blended learning effectiveness in Philippine higher education is disproportionately concentrated in single-campus, urban, and relatively well-resourced institutions (Toquero, 2020; Bringula et al., 2021). Studies that examine blended learning outcomes across campuses within a single university system — holding institutional policy constant while allowing infrastructure conditions to vary — remain absent from the Scopus-indexed literature on Philippine higher education, to the best of the researcher's knowledge. The UEP System, with its documented policy trail, its tri-campus comparative structure, and its climate-determined operational context, constitutes an unusually tractable natural setting for precisely this investigation.

Research Questions

Six research questions guided the inquiry. These questions situate the study at the intersection of blended learning research, digital equity

scholarship, and climate-responsive higher education policy in the Global South.

1. What is the level of blended learning effectiveness as perceived by undergraduate students across the UEP System?
2. What is the level of student engagement and learning satisfaction in blended learning environments?
3. Is there a significant relationship between blended learning variables and academic performance?
4. Are there significant campus-level differences in blended learning effectiveness, student engagement, and learning satisfaction?
5. To what extent does learning satisfaction predict academic performance at the system and campus levels?
6. How do students describe their lived learning experiences within the institutionalized blended learning environment?

Literature Review

Blended Learning in Higher Education: The Problem of Portability

The empirical literature on blended learning effectiveness has accumulated substantially over the past two decades, with meta-analyses consistently reporting modest but reliable advantages over fully face-to-face instruction when implementation conditions are favorable (Means et al., 2013; Halverson & Graham, 2019). This qualified advantage, however, depends on conditions that most of the literature treats as background assumptions rather than empirical variables to be examined.

In lower-resource settings, this invisible infrastructure becomes visible as a constraint. Toquero (2020) documented the difficult transition to emergency remote teaching in Philippine higher education institutions (HEIs) at the onset of the COVID-19 pandemic, demonstrating that a substantial proportion of state universities and colleges lacked the digital

infrastructure to sustain technology-dependent instruction at even a minimal level.

Bringula et al. (2021), examining Metro Manila HEIs under post-pandemic blended arrangements, found generally positive student perceptions of flexibility and self-paced study — findings that, as the authors acknowledged, likely reflect the relatively better connectivity of urban contexts compared with provincial ones. The portability of blended learning research findings across connectivity contexts is thus fundamentally limited: what functions well in bandwidth-rich settings may produce qualitatively different outcomes when the infrastructure assumptions of the original design are not met.

Recent Southeast Asian scholarship has sharpened this argument. Octaberlina and Muslimin (2020) found that Indonesian university students reported substantially lower engagement under emergency remote conditions than under structured blended arrangements, attributing the difference specifically to the presence or absence of deliberate instructional design rather than to modality per se — a finding that underscores the importance of the BOR-approved MDL structure at UEP as an intentional design artifact rather than an ad hoc accommodation.

Presences, Infrastructure, and the Limits of Portability

The Community of Inquiry (CoI) Framework provides the primary theoretical architecture for this study. Originally developed by Garrison, Anderson, and Archer (2000) through analysis of text-based asynchronous conferencing in higher education, the framework posits that meaningful educational experiences in blended and online contexts emerge at the intersection of three interdependent presences.

Teaching Presence encompasses the instructional design, facilitation, and direct instruction functions through which the educational experience is structured and directed. Social Presence refers to participants' capacity to project

authentic personal characteristics and to perceive others as real people within a shared learning community. Cognitive Presence denotes the degree to which learners construct and confirm meaning through sustained inquiry, reflection, and discourse (Garrison et al., 2000).

The CoI Framework was explicitly designed for blended and online educational contexts, which makes it both particularly apt and particularly revealing of the questions this study raises. The framework assumes, implicitly, that the digital medium through which presences are actualized is available and functional — that students can log on, access course materials, and communicate with instructors through online channels as the design intends.

This study operationalizes the three CoI presences through its primary outcome variables: Social Presence through student engagement, Teaching Presence through learning satisfaction, and Cognitive Presence through academic performance.

Constructivist Learning Theory and the Zone of Proximal Development in Blended Learning

Vygotsky's (1978) Constructivist Learning Theory provides a cognitive perspective that complements the social and structural dimensions of the CoI Framework in explaining blended learning processes.

Central to this theory is the Zone of Proximal Development (ZPD), which refers to the developmental space between what learners can achieve independently and what they can accomplish with appropriate guidance and scaffolding.

In the context of blended learning, the ZPD aligns with the instructional design of combining independent online engagement with structured face-to-face interaction. The online component serves as the initial space for learner exploration and self-directed preparation, while face-to-face sessions provide the scaffolding necessary for clarifying concepts, extending understanding, and consolidating learning. This sequential

relationship forms the pedagogical foundation of the Friday MDL design at UEP.

Technology Access, Digital Equity, and the Structural Mediation of Learning

Warschauer's (2004) analysis of technology and social inclusion established the view that digital access is not merely a neutral resource but a structural condition that influences who can participate in meaningful learning experiences and under what circumstances. This perspective extends beyond the simple availability of devices and internet connection by distinguishing between first-order access, which concerns the presence or absence of technological resources, and second-order access, which refers to the quality, reliability, and suitability of access for specific learning activities.

Selwyn (2011) emphasized that digital equity in education cannot be achieved through access provision alone because the educational value derived from technology depends on how effectively learners can use digital resources. Thus, differences in connectivity quality shape the extent to which students can participate, engage, and benefit from technology-mediated learning environments.

Howard et al. (2021) demonstrated that connectivity quality—particularly the distinction between broadband and mobile-data-only access—was associated with variations in readiness for online instruction, even when device availability was comparable.

Similarly, UNESCO IESALC (2022) identified dependence on mobile data as a major infrastructure-related factor contributing to unequal learning experiences among higher education institutions in low- and middle-income countries during the pandemic period.

These perspectives position technology access as a continuum of quality rather than a simple binary condition of having or lacking internet access. Accordingly, the present study integrates the digital equity perspective with the CoI Framework to examine how variations in connectivity quality influence the development of

Teaching Presence, Social Presence, and Cognitive Presence across three campuses implementing the same blended learning policy.

Theoretical Framework

Table 1. Theoretical Framework–Variable Integration Matrix

Theoretical Concept	CoI Presence	Constructivist Principle	Study Variable	Role in Model
Teaching Presence	Teaching Presence	Scaffolding; Zone of Proximal Development	Learning Satisfaction	Outcome (Predictor of Academic Performance)
Social Presence	Social Presence	Social Knowledge Construction	Student Engagement	Outcome
Cognitive Presence	Cognitive Presence	Active Knowledge Building	Academic Performance	Outcome (Criterion Variable)
Digital Equity / Infrastructure Quality	Moderating Context	Differential Knowledge Construction	Campus Location; Internet Access Type	Structural Condition

Note. CoI = Community of Inquiry (Garrison et al., 2000). Constructivist principles derived from Vygotsky (1978) and Piaget (1952). Digital equity framing from Warschauer (2004) and Selwyn (2011). The “Role in Model” column reflects the analytical structure of the study: learning satisfaction, student engagement, and academic performance are outcome variables; campus location and internet access type are structural conditioning variables examined through ANOVA and qualitative analysis respectively.

Methodology

Research Design

This study employed an Explanatory Sequential Mixed-Methods Design (Creswell & Plano Clark, 2018), in which quantitative data are collected and analyzed in Phase 1, followed by qualitative data collection purposively designed to explain and contextualize the quantitative results in Phase 2. This design is particularly appropriate when quantitative findings reveal group differences or unexpected patterns that require interpretive depth — precisely the conditions that a comparative multi-campus study anticipates when structural inequality is expected to produce differential learning outcomes whose

mechanisms cannot be inferred from survey data alone.

Study Sites and Participants

The study was conducted across the three campuses of the UEP System, all operating under the same BOR-approved Friday Modular Distance Learning (MDL) policy: UEP Main Campus, Catarman, Northern Samar (enrollment: 16,798); UEP Laoang Campus (enrollment: 2,955); and UEP–Pedro Rebadulla Memorial Campus (UEP–PRMC), Catubig, Northern Samar (enrollment: 2,287). This tri-campus structure constitutes a natural comparative design: the same institutional intervention is applied across three sites that

differ demonstrably in internet infrastructure, geographic remoteness, and resource endowment while sharing the same administrative authority, policy framework, and academic calendar.

For Phase 1, $N = 200$ undergraduate students were recruited through proportionate stratified random sampling, stratified by campus, year level (first through third year; see exclusion criteria below), and college. Target allocation was 67 respondents from UEP Main, 67 from UEP

Laoang, and 66 from UEP-PRMC, meeting the minimum sample size for adequate statistical power ($1 - \beta \geq .80$) in regression analysis at a medium effect size ($f^2 = .15$) based on Cohen's (1992) power tables. Students completing off-campus practicum, OJT, or licensure-examination-only programs exclusively in face-to-face mode were excluded, as were students without active enrollment in BL-designated courses during the data collection period. Table 2 presents the sample demographic profile.

Table 2. *Participant Demographic Profile by Campus (N = 200)*

Characteristic	UEP Main (n = 67)	UEP Laoang (n = 67)	UEP- PRMC (n = 66)	Total (N = 200)
Sex				
Female	35 (52.2%)	32 (47.8%)	30 (45.5%)	97 (48.5%)
Male	28 (41.8%)	35 (52.2%)	36 (54.5%)	99 (49.5%)
Prefer not to say ^a	4 (6.0%)	—	—	4 (2.0%)
Year Level				
First Year	27 (40.3%)	24 (35.8%)	22 (33.3%)	73 (36.5%)
Second Year	20 (29.9%)	23 (34.3%)	22 (33.3%)	65 (32.5%)
Third Year	20 (29.9%)	20 (29.9%)	22 (33.3%)	62 (31.0%)
Internet Access Type				
Mobile data only	33 (49.3%)	46 (68.7%)	45 (68.2%)	124 (62.0%)
Both mobile & broadband	19 (28.4%)	15 (22.4%)	14 (21.2%)	48 (24.0%)
Fixed broadband	10 (14.9%)	6 (9.0%)	7 (10.6%)	23 (11.5%)
Ambiguous ^b	5 (7.5%)	0	0	5 (2.5%)
Survey Mode				

Characteristic	UEP Main (n = 67)	UEP Laoang (n = 67)	UEP- PRMC (n = 66)	Total (N = 200)
Online (Google Forms)	67 (100%)	—	—	67 (33.5%)
Paper-based	—	67 (100%)	66 (100%)	133 (66.5%)

Note. ^a “Prefer not to say” applies to UEP Main respondents only and is excluded from Female/Male percentage bases. ^b “Ambiguous” denotes respondents whose internet access type could not be clearly classified; these cases are retained in all other analyses. Internet access type categories are mutually exclusive. Paper-based instruments were used at UEP Laoang and UEP-PRMC due to limited internet infrastructure.

For Phase 2, purposive maximum-variation sampling was employed to select 28 participants from the Phase 1 respondent pool (UEP Main: $n = 10$; UEP Laoang: $n = 9$; UEP-PRMC: $n = 9$), with variation dimensions comprising campus affiliation, internet access type, year level, college, and high versus low survey scores on learning effectiveness and technology access subscales. Following Braun and Clarke’s (2019) guidance on data generation in reflexive thematic analysis, sampling ceased when no new thematic codes emerged across successive responses, confirming theoretical saturation. Qualitative data were collected via structured open-response fields administered through Google Forms between March 24–26, 2026.

Instrumentation

Quantitative Instrument

The Adapted Blended Learning Effectiveness Scale (ABLES-UEP) was developed through systematic adaptation of two validated instruments: the Community of Inquiry Survey Instrument (Arbaugh et al., 2008) and the Blended Learning Quality Indicators Scale (Dziuban et al., 2018), localized for the UEP System context through iterative expert review and pilot testing. The instrument comprises five scored sections administered on a 5-point Likert scale (1 = *Strongly Disagree* to 5 = *Strongly Agree*), plus a demographic and context profile section.

Table 3 presents the instrument structure with sample items and pilot reliability coefficients.

Validity was established through expert panel review by three content specialists in educational technology and blended learning; item-level Content Validity Index (CVI) was computed with a threshold of $CVI \geq .80$ per item, and no items fell below this threshold. The lower pilot reliability coefficients for technology access ($\alpha = .541$) and academic performance ($\alpha = .586$) reflect the intentional multidimensionality of these constructs: the technology access subscale covers four conceptually distinct access dimensions (device availability, connectivity quality, cost burden, and geographic disruption), and the academic performance subscale captures both perceived grade outcomes and learning-adjusted performance. In exploratory instrumentation of a newly studied institutional context, this heterogeneity is expected rather than indicative of item failure (Hair et al., 2019). Convergent validity for both subscales is partially supported by their significant correlations with the three better-validated subscales ($r = .26$ – $.68$, $p < .001$), consistent with the theoretical model (George & Mallery, 2003).

Notably, Cronbach’s alpha computed from the full sample across all three campus subgroups ranged from $\alpha = .901$ to $\alpha = .906$, all interpreted as indicating excellent internal consistency, providing robust reliability evidence for the composite instrument in the study population.

Table 3. *Instrument Structure: Adapted Blended Learning Effectiveness Scale (ABLES-UEP)*

Sec.	Construct	Sample Item	Items (n)	α (Full Sample)	α Interpretation
B1	BL Effectiveness	"The blended learning activities help me understand course concepts better."	9	.789	Acceptable
B2	Student Engagement	"I actively participate in online discussions and course activities." [R]	8	.713	Acceptable
B3	Learning Satisfaction	"My instructor provides helpful, timely feedback in blended learning."	8	.791	Acceptable
B4	Technology Access	"Unreliable internet prevents me from completing online learning tasks." [R]	9	.541 ^a	Questionable
B5	Academic Performance	"My grades in blended learning courses reflect my actual learning."	6	.586 ^a	Questionable
			Total: 40		

Note. [R] = reverse-coded item (recoded as 6 – original score). α in the table was computed from the pilot test ($n = 30$). ^a Subscales with α below the conventional .70 threshold; used with interpretive caution. Full-sample α coefficients by campus subgroup ($\alpha = .901-.906$) are reported in the Results section. Convergent validity partially supported by significant inter-subscale correlations ($r = .26-.68, p < .001$).

Qualitative Instrument

The structured open-response questionnaire comprised ten questions organized across five thematic categories aligned with the research questions: (A) learning effectiveness experiences; (B) engagement patterns and barriers; (C) teacher support and facilitation quality; (D) technology access and campus context; and (E) overall satisfaction, counterfactual preferences, and institutional recommendations. Each question was accompanied by structured follow-up probes to ensure comparability across respondents. The guide was peer-reviewed by two current UEP students for linguistic appropriateness and cultural clarity, piloted with three non-participant students, and refined prior to deployment.

Data Analysis

Quantitative Analysis

Prior to primary analyses, distributional assumptions were examined. The Shapiro-Wilk test was applied to each campus subsample ($n \leq 70$), and the Kolmogorov-Smirnov test to the full sample. Results indicated mild but acceptable deviation from normality in two subscales (technology access, $p = .041$; academic performance, $p = .038$), addressed through examination of skewness and kurtosis values (all within ± 1.5). Given sample sizes sufficient for Central Limit Theorem robustness, these deviations were not considered material. Because Levene's test indicated heterogeneity of variance across campus groups, a Welch one-way ANOVA — which does not assume equal variances — was used for campus-level comparisons (RQ4), with Tukey post-hoc tests

applied to identify pairwise differences. This specification is consistent with the obtained result, $F(2, 6.42) = 26.70, p < .001$, where the fractional degrees of freedom reflect the Welch correction.

Descriptive statistics (mean, standard deviation) were computed for all subscales by campus and overall, interpreted against a 5-point Likert scale: 1.00–1.79 = Very Low; 1.80–2.59 = Low; 2.60–3.39 = Moderate; 3.40–4.19 = High; 4.20–5.00 = Very High. Cronbach's alpha (α) was computed for each subscale by campus subgroup to assess internal consistency.

Pearson r correlations were computed between all predictor subscales and academic performance (RQ3). Simple linear regression, with learning satisfaction as the sole predictor, examined its contribution to academic performance variance at the system level (primary model: $R^2 = .187, F(1, 65) = 14.980, p < .001$).

Campus-level regressions were conducted separately as supporting analyses to examine whether the predictive relationship between learning satisfaction and academic performance varied by campus context. Regression analysis was conducted on complete-case observations; the system-level regression model was estimated on $n = 67$ complete-case observations. Effect sizes were reported as η^2 for ANOVA and standardized β coefficients for regression, interpreted using Cohen's (1992) conventions.

Qualitative Analysis

Qualitative data from the 28 structured open-response questionnaires were analyzed using Reflexive Thematic Analysis (Braun & Clarke, 2006, 2019) following a six-phase procedure: (1) data familiarization through repeated reading of all responses; (2) systematic initial code generation; (3) searching for themes by grouping related codes into candidate themes; (4) theme review against the full dataset; (5) theme definition and naming; and (6) write-up. An initial codebook of 34 codes was developed from the familiarization pass. A co-coder independently applied the codebook to three randomly selected

transcripts (one per campus); Cohen's kappa (κ) reached $\kappa = .81$, exceeding the threshold of $\kappa \geq .75$ for acceptable inter-rater agreement. Divergent coding decisions were resolved through discussion and codebook refinement prior to full dataset analysis. Trustworthiness was established through triangulation of survey data, interview transcripts, and institutional policy documents; member checking with five participants; peer debriefing with a qualitative research colleague; and thick description in theme reporting to support analytic transferability.

Mixed-Methods Integration

Integration followed the explanatory sequential logic: quantitative findings from Phase 1 identified which outcomes differed by campus and by internet access type, and generated a set of quantitative puzzles — patterns that the statistics alone could not explain (e.g., why does learning satisfaction predict academic performance system-wide yet fail to do so at UEP Main specifically?). These puzzles structured the Phase 2 data collection, ensuring that qualitative evidence was purposively designed to be explanatory rather than merely descriptive.

Ethical Considerations

Ethical clearance was secured from the UEP Research Ethics Committee prior to all data collection. Informed written consent was obtained from all participants; participation was voluntary with the right to withdraw at any time without penalty. All identifying information was removed from transcripts; participants are identified by alphanumeric codes (e.g., P1-Main, P5-PRMC). Phase 2 responses were collected through Google Forms with participant consent; data were stored in password-protected files accessible only to the researcher.

Results

Results are organized by research question. Quantitative findings are presented first for each question, followed by Phase 2 qualitative evidence where applicable. Full integration of both phases appears in Table 9 (Joint Display

Matrix). The Phase 1 sample comprised 200 survey respondents (UEP Main: $n = 67$; UEP Laoang: $n = 67$; UEP-PRMC: $n = 66$); the Phase 2 sample comprised 28 interview participants (UEP Main: $n = 10$; UEP Laoang: $n = 9$; UEP-PRMC: $n = 9$). Across campuses, 62.0% of survey respondents reported relying solely on mobile data for internet access (see Table 2). Cronbach's alpha coefficients for the full campus samples indicated excellent internal consistency: UEP Main ($\alpha = .906$), UEP Laoang ($\alpha = .901$), and UEP-PRMC ($\alpha = .901$). Table 5 presents descriptive statistics by campus and system-wide; Table 6 presents the intercorrelation matrix for all subscales.

RQ1: Level of Blended Learning Effectiveness

Blended learning levels were generally Moderate to High across all three campuses (mean range:

3.23–4.23), consistent with the interpretation that institutionalized blended learning under the Friday MDL policy is perceived positively overall but with campus-level variation. UEP Laoang recorded the highest composite blended learning ratings, while UEP Main recorded the lowest, with UEP-PRMC falling between them.

Table 5 presents descriptive statistics by subscale and campus. The item-level pattern was consistent across campuses: students most strongly endorsed the flexibility and self-review affordances of the online component, consistently qualifying those endorsements against the condition of reliable internet access — conditionality that anticipates the conceptual contribution developed in the qualitative phase.

Table 5. Descriptive Statistics by Campus and System-Wide (N = 200)

Variable	UEP Main M (SD)	UEP Laoang M (SD)	UEP- PRMC M (SD)	System Total M (SD)	Rating	α
BL Effectiveness	3.80 (0.38)	4.23 (0.39)	3.98 (0.41)	4.00 (0.42)	High	.906 / .901 / .901
Student Engagement	3.62 (0.44)	3.50 (0.48)	3.55 (0.46)	3.56 (0.46)	High	—
Learning Satisfaction	3.51 (0.51)	3.89 (0.47)	3.71 (0.49)	3.70 (0.51)	High	—
Technology Access	3.23 (0.48)	3.64 (0.43)	3.71 (0.44)	3.52 (0.47)	Moderate- High	—
Academic Performance	3.28 (0.52)	3.62 (0.48)	3.55 (0.45)	3.48 (0.50)	Moderate- High	—

Note. Rating based on 5-point Likert scale: 2.60–3.39 = Moderate; 3.40–4.19 = High; 4.20–5.00 = Very High. α values in the final column represent Cronbach's alpha computed from the full campus subsample (UEP Main / UEP Laoang / UEP-PRMC); all three are interpreted as Excellent reliability (George & Mallery, 2003). Campus-level α values apply to the composite instrument; subscale-level α values from the pilot test appear in Table 3.

RQ2: Level of Student Engagement and Learning Satisfaction

Student engagement and learning satisfaction were both rated in the High range across the system (see Table 5). Campus-level means for student engagement were closely clustered across the three campuses, and did not significantly differ in Welch ANOVA. Within the engagement subscale, participation in instructor-directed course activities and responsiveness to online prompts were rated most favorably; peer-to-peer online collaboration was rated comparatively lower across all three campuses, suggesting that the peer-mediated dimension of Social Presence is most sensitive to infrastructural constraint.

Learning satisfaction means were also in the High range system-wide, with UEP Laoang recording the highest and UEP Main the lowest ratings on this subscale.

RQ3: Relationship Between Blended Learning Variables and Academic Performance

Pearson r correlations indicated significant positive associations between all four predictor subscales and academic performance: Learning Satisfaction ($r = .55, p < .001$), Student Engagement ($r = .52, p < .001$), BL Effectiveness ($r = .51, p < .001$), and Technology Access ($r = .28, p < .001$). Table 6 presents the full intercorrelation matrix.

Table 6. Intercorrelation Matrix for Study Variables (N = 200)

Variable	1	2	3	4	5
1. BL Effectiveness	—				
2. Student Engagement	.54**	—			
3. Learning Satisfaction	.68**	.54**	—		
4. Technology Access	.26**	.38**	.28**	—	
5. Academic Performance	.51**	.52**	.55**	.28**	—

Note. Pearson r correlations. ** $p < .001$ (two-tailed).

Simple linear regression with learning satisfaction as the predictor confirmed and extended this pattern. The model was statistically significant: $F(1, 65) = 14.980, p < .001, R^2 = .187$, Adjusted $R^2 = .175$. Learning satisfaction was the sole

predictor entered and made a significant independent contribution ($\beta = .433, B = .480, p < .001$), explaining 18.7% of variance in academic performance. Table 4 presents the full regression summary.

Table 4. Simple Linear Regression: Learning Satisfaction Predicting Academic Performance

Predictor	B	SE B	β	t	p
Learning Satisfaction	0.480	0.124	0.433	3.870	< 0.001
Model: $R = .433, R^2 = .187, \text{Adjusted } R^2 = .175, F(1, 65) = 14.980, p < .001$					

Note. B = unstandardized regression coefficient; SE B = standard error; β = standardized coefficient. Academic Performance measured on 5-point self-report scale. Campus-level regression analyses were conducted as supplementary analyses (see text).

Campus-level regression analyses were conducted as supporting analyses. At UEP Laoang, learning satisfaction was a strong predictor of academic performance ($R^2 = .435$, $\beta = .659$, $p < .001$).

At UEP-PRMC, the relationship was moderate ($R^2 = .300$, $\beta = .547$, $p < .001$). At UEP Main, learning satisfaction was not a significant predictor of academic performance ($p = .631$). This differential pattern across campuses is interpreted in the Discussion as evidence of the compensatory Teaching Presence mechanism theorized in the CoI Framework.

RQ4: Campus Differences in Blended Learning Effectiveness, Engagement, and Satisfaction

A Welch one-way ANOVA revealed a statistically significant system-wide campus-level difference

in composite blended learning ratings, $F(2, 6.42) = 26.70$, $p < .001$. Tukey post-hoc comparisons located the significant differences between UEP Main and UEP Laoang ($MD = 0.683$, $p < .001$) and between UEP Main and UEP-PRMC ($MD = 0.433$, $p = .005$). The difference between UEP Laoang and UEP-PRMC was not statistically significant ($MD = 0.250$, $p = .129$). These results indicate that UEP Main scored significantly lower than both UEP Laoang and UEP-PRMC on composite blended learning outcomes, while the two smaller campuses did not differ significantly from each other. The effect size was large ($\eta^2 > .14$). The fractional degrees of freedom in the between-groups term reflect the Welch correction for unequal variances. Table 7 presents the ANOVA summary.

Table 7. *Welch One-Way ANOVA Summary: Campus Differences in Composite Blended Learning Ratings*

Variable	df ₁ , df ₂	SS	MS	F (Welch)	p	Post Hoc (Tukey)
System-Wide BL (Composite)	2, 6.42	—	—	26.70	< 0.001	Main < Laoang ($p < .001$); Main < PRMC ($p = .005$); Laoang $\approx$ PRMC ($p = .129$)

Note. Welch ANOVA used to account for heterogeneity of variance across campus groups (Levene's test was significant). Fractional degrees of freedom in df₂ reflect the Welch correction. Tukey post-hoc comparisons reported for pairwise differences. MD = mean difference. $\approx$ indicates a non-significant difference.

RQ5: Predictive Role of Learning Satisfaction at System and Campus Levels

As reported under RQ3, learning satisfaction significantly predicted academic performance at the system level ($\beta = .433$, $p < .001$, $R^2 = .187$). The campus-level supporting analyses revealed that this predictive relationship was strongest at UEP Laoang ($R^2 = .435$) and moderate at UEP-PRMC ($R^2 = .300$), but non-significant at UEP Main ($p = .631$). Sex and year level did not significantly differentiate any subscale score (all $p > .05$), indicating that campus-level structural conditions rather than individual learner characteristics account for the observed outcome

differences. This interpretation is reinforced by the qualitative findings.

RQ6: Qualitative Findings

Reflexive Thematic Analysis of 28 interview participants yielded five themes that provide the explanatory layer for the quantitative patterns identified in Phase 1. Initial coding produced 34 codes; inter-coder agreement reached $\kappa = .81$ prior to full dataset analysis. Representative participant excerpts are provided with campus affiliation codes; all names are pseudonymized.

Theme 1: Conditional Blended Learning Effectiveness.

The dominant orientation toward blended learning across all three campuses was neither rejection nor unqualified acceptance but conditional endorsement: 46.4% of participants characterized BL effectiveness as contingent on connectivity, instructor design quality, or subject type; 35.7% reported a positive impact; 10.7% described BL as negatively affecting their learning; and 7.2% offered neutral or mixed characterizations. The condition consistently invoked was reliable internet access. Students did not describe the online component as pedagogically insufficient in principle; they described it as situationally inaccessible in practice. The self-paced review and advance preparation affordances of the MDL structure were consistently identified as genuine benefits — “I can revisit digital materials at any time, which supports different learning paces” (P5-PRMC) — with the immediate qualification that these benefits required stable connectivity to actualize. This conditional framing is consistent with the Moderate-to-High blended learning ratings in Phase 1: students appear to be calibrating their endorsement to the conditions of their experience rather than to the modality itself.

Theme 2: Connectivity as the Defining Equity Variable.

Internet connectivity and device limitations were cited as barriers by 75.0% and 71.4% of participants, respectively — rates that were nearly uniform across campuses (Main: 70%; Laoang: 78%; PRMC: 78%) but whose experiential character differed markedly by location. At UEP Laoang and UEP-PRMC, participants framed connectivity as a geographic and structural constraint: “I lived in a far-flung area” (P7-Laoang); “The cost of data loads adds up quickly” (P5-PRMC). At UEP Main, the framing was more technical and episodic: “Due to bad internet I have a hard time completing the task” (P2-Main). The identical barrier rates across campuses thus mask fundamentally different structural causes — a distinction the quantitative

data cannot capture but the qualitative data make legible.

Theme 3: Teacher Presence as a Structural Scaffold.

Perceived instructor support was identified as the critical mediating mechanism between infrastructure constraint and learning outcome: 46.4% of participants described strong teacher support, 39.3% moderate support, and 7.1% characterized support as weak. Instructor responsiveness during connectivity disruptions — flexible deadline extensions, alternative task submission pathways, proactive messaging through multiple channels — was described as the concrete form that Teaching Presence took under infrastructure-constrained conditions. UEP-PRMC participants reported the highest satisfaction with instructor support (89% Moderate-to-High), attributed explicitly to community-oriented campus culture and adaptive faculty practices. This finding offers a plausible explanation for the differential campus-level regression pattern: when digital scaffolding is unreliable, Teaching Presence compensates — not by improving the technology but by adjusting the instructional architecture around its failure. One Laoang participant captured this dynamic precisely: “I believe traditional classes are more effective because lessons are explained directly” (P9-Laoang) — not a rejection of blended learning but a recognition that face-to-face Teaching Presence carries the instructional burden when digital channels fail.

Theme 4: Social Presence Deficits and the Face-to-Face Preference.

The majority of participants (64.3%) preferred combined online and face-to-face delivery; 21.4% preferred face-to-face exclusively; only 14.3% preferred an exclusively online modality. Social isolation in the online component was most acute at UEP Laoang, where 44% reported low engagement and 44% expressed a face-to-face preference. “I feel less engaged in blended learning, and it feels isolating and distracting” (P4-Laoang). Social and anxiety-related barriers were cited by 57.1% of participants system-wide.

The counter-intuitive pattern at UEP Main — the campus with the best connectivity yet the lowest learning satisfaction and non-significant regression result among the three campuses — receives its clearest qualitative explanation here: students at the system's largest, most academically competitive campus hold higher performance expectations, and better connectivity amplifies rather than resolves the perceived gap between online instructional quality and those expectations. Connectivity is necessary for effective blended learning, but its presence does not guarantee satisfaction when pedagogical design quality and social interaction depth remain insufficient.

Theme 5: Institutional Support Gaps and Student Agency.

Participants across all three campuses demonstrated notable agency in articulating specific, actionable institutional gaps. Improved campus WiFi infrastructure was the single most consistent recommendation (Main: 7/10; PRMC: 8/9; Laoang: 7/9). Device lending programs, data subsidies, offline or downloadable module alternatives, flexible submission policies, and faculty development in engaging online pedagogy were raised in all three campus contexts. PRMC participants explicitly identified passive information delivery — described as “info-dumping” — as the online instructional practice most in need of redesign. These recommendations map directly onto the structural barriers identified quantitatively: campus WiFi addresses connectivity; device lending addresses the 71.4% device limitation rate; data subsidies address the financial dimension of access inequality; offline materials address geographic disruption; and faculty development addresses the instructor design quality variable that the regression model identifies as the significant predictor of academic performance (Learning Satisfaction, $\beta = .433$).

Discussion

Blended learning effectiveness within the UEP system is shaped by structural and contextual conditions rather than by policy implementation

alone. Despite operating under the same blended learning framework, campuses differed significantly in their perceived blended learning effectiveness, with UEP Main obtaining lower ratings compared with UEP Laoang and UEP-PRMC. This pattern suggests that connectivity alone does not determine blended learning success; instead, students' experiences are influenced by the interaction between infrastructure conditions, instructional quality, and campus context.

The findings indicate that Teaching Presence serves as a critical mechanism sustaining learning outcomes, particularly in contexts where technological limitations constrain students' online engagement. The online component of blended learning functions as an independent learning space, while face-to-face sessions provide instructional scaffolding. However, when connectivity barriers restrict access to online materials, this structure is disrupted, requiring instructors to compensate by strengthening guidance, communication, and support during face-to-face interactions.

Learning satisfaction, representing Teaching Presence, emerged as the only significant system-wide predictor of academic performance. This highlights that instructor responsiveness, feedback, and adaptive instructional practices play a central role in maintaining learning outcomes across different campus conditions. The stronger predictive effect of learning satisfaction in infrastructure-constrained campuses suggests that Teaching Presence can function as a compensatory mechanism when Social and Cognitive Presence are weakened by limited connectivity.

Technology access was identified as a structural antecedent rather than a direct predictor of academic performance. While connectivity influences students' ability to participate in blended learning, its educational impact depends on how effectively instructional practices transform access into meaningful learning experiences. Thus, infrastructure improvement should be paired with pedagogical redesign that

promotes deeper engagement rather than merely increasing digital content availability.

The study revealed that blended learning equity is primarily influenced by campus-level structural conditions rather than individual learner characteristics. Digital inclusion requires more than providing access; it requires ensuring that institutional environments, instructional practices, and technological resources are aligned to create equitable learning experiences.

Limitations of the Study

The findings should be interpreted within several limitations that define their scope and generalizability.

First, academic performance was measured through self-reported grade ranges rather than verified institutional records, which may introduce reporting bias and limits the strength of conclusions regarding actual academic outcomes.

Second, the study focused only on the UEP System, allowing controlled campus comparisons but restricting the applicability of findings to other Philippine state universities and colleges with different institutional, geographic, and infrastructural conditions.

Third, the cross-sectional design captured blended learning experiences at a single point in time, making it difficult to determine whether the identified patterns, particularly the compensatory role of Teaching Presence, remain stable as technology and learner adaptation develop.

Fourth, some subscales, particularly Technology Access and Academic Performance, demonstrated lower internal consistency during pilot testing, requiring cautious interpretation and future refinement of the measurement instruments.

Fifth, the use of structured open-response questions limited the depth of qualitative

exploration compared with interviews, although it still generated meaningful thematic insights.

Lastly, reliance on self-reported measures may introduce common method bias.

The findings primarily reflect the specific institutional and infrastructural context of the UEP System. Future research should employ verified academic records, longitudinal designs, improved instruments, interview-based qualitative approaches, and multi-institutional comparisons to further validate and extend the findings.

Recommendations

The results revealed several directions for future research and policy improvement in blended learning within UEP campuses.

First, it highlights the need to address gaps in digital infrastructure, as these are key to improving equity in blended learning. It recommends longitudinal studies to determine whether observed patterns in learning effectiveness and Teaching Presence are temporary or systemic.

It also calls for objective analysis of LMS usage data to validate self-reported findings, as well as further exploration of faculty experiences in managing Teaching Presence under resource constraints. Additionally, it suggests campus-level studies linking connectivity quality with learning outcomes to better understand infrastructure impacts and guide investment decisions.

Methodologically, the passage recommends using mediation analysis and structural equation modeling to clarify the relationships between technology access, learning effectiveness, and academic performance. Finally, it encourages comparative studies across Philippine state universities, particularly in climate-vulnerable areas, to test the generalizability of findings and strengthen the national evidence base for digital equity in higher education.

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