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EFFECTIVENESS OF HYBRID LEARNING MODELS IN HIGHER EDUCATION: EVIDENCE FROM A QUASI- EXPERIMENTAL STUDY

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Abstract
This study investigates the effectiveness of hybrid learning models in higher education through a quasi-experimental approach. Conducted at a Latin American public university, the research compares student performance, satisfaction, and engagement between traditional face-to-face learning and hybrid instruction (50% online). Findings indicate statistically significant improvements in academic achievement and student satisfaction among those in the hybrid group. The study contributes to the growing body of evidence supporting hybrid learning as a viable and often superior alternative to traditional methods when appropriately implemented. Policy implications and future research directions are also discussed.
Keywords: hybrid learning, blended learning, higher education, academic performance, quasi-experimental design, digital pedagogy

1. INTRODUCTION

Over the past decade, the landscape of higher education has undergone a significant transformation driven by rapid technological advancements, evolving learner expectations, and global crises such as the COVID-19 pandemic. Among the most notable shifts is the widespread adoption of **hybrid learning models**, which combine traditional face-to-face instruction with digital and asynchronous learning components (Limniou et al., 2022). This pedagogical shift aims to merge the benefits of physical classroom interaction—such as social presence and immediacy—with the flexibility, accessibility, and personalization enabled by online environments (Garrison & Vaughan, 2021).

The forced transition to remote learning during the pandemic served as a large-scale test case for technology-mediated education, exposing both the potential and limitations of digital platforms in supporting student learning (Rapanta et al., 2021). As institutions began to recover and redefine their instructional strategies, hybrid models emerged as a **preferred modality** for combining the pedagogical strengths of both in-person and virtual formats (Almendingen et al., 2021; Trust & Whalen, 2020). Current research suggests that hybrid education can facilitate active learning, improve student engagement, and support better academic outcomes when strategically implemented (Wu et al., 2021).

However, despite promising results, the **effectiveness of hybrid learning remains context-dependent**, and empirical evidence on its impact across different institutional settings, disciplines, and student populations is

still evolving (Bervell& Umar, 2020). While some studies highlight gains in student satisfaction and performance, others raise concerns about increased cognitive load, unequal access to technology, and faculty readiness (Van de Oudeweetering&Agirdag, 2021). These conflicting outcomes underscore the need for **rigorous, context-sensitive evaluations** that assess not only learning results but also the quality of student experience and engagement within hybrid learning environments.

Moreover, institutional pressures to **scale hybrid offerings** demand evidence-based frameworks that validate their pedagogical soundness and operational feasibility. As hybrid learning becomes more embedded in university curricula, it is essential to understand not only whether it works but **under what conditions it works best** (Boelens et al., 2018). Such insights are critical to inform academic policy, investment in digital infrastructure, and faculty development strategies.

Against this background, this study aims to contribute to the current discourse by examining the **academic effectiveness of a hybrid learning model** implemented in a Latin American university setting. Through a quasi-experimental design, the study compares student outcomes, satisfaction, and engagement between a hybrid cohort and a traditional face-to-face group. The findings aim to inform educators, administrators, and policymakers seeking to adopt or refine hybrid learning models in a post-pandemic educational context.

2. THEORETICAL FRAMEWORK

2.1. The Concept of Hybrid Learning in Higher Education

Hybrid learning, also known as blended learning, has gained prominence as a flexible educational model that integrates in-person classroom instruction with online components, either synchronous or asynchronous (Garrison & Vaughan, 2021). Its core purpose is to combine the strengths of physical learning spaces—such as face-to-face dialogue and social interaction—with the advantages of digital environments, including individualized pacing, asynchronous access, and multimodal content (Limniou et al., 2022).

Table 1. Core Characteristics of Hybrid Learning

Feature	*Description*
ModalityMix	Combines face-to-face and online instruction
Temporal Flexibility	Allows asynchronous learning at the student's own pace
StudentAutonomy	Promotes self-regulation and independent learning
TechnologyIntegration	Utilizes learning management systems (LMS) and digital content
Interactivity	Encourages engagement through forums, multimedia, and collaborative tools
PedagogicalDesign	Requires intentional instructional planning to align both modalities

Source: *Adapted from Garrison & Vaughan (2021); Boelens et al. (2018); Wu et al. (2021).*

2.2. Benefits and Pedagogical Justifications

Multiple studies in recent years highlight the **educational benefits** of hybrid models. These include improved access to learning resources, enhanced engagement, and better academic outcomes, particularly for students who balance academic responsibilities with work or family obligations (Almendingen et al., 2021; Bervell& Umar, 2020).

Table 2. Benefits of Hybrid Learning Reported in Recent Literature (2018–2023)

Study	*Sample&Context*	*Key Findings*
Almendingen et al. (2021)	Nutritionstudents (Norway)	High satisfaction; increased flexibility and motivation
Limniou et al. (2022)	Scienceundergraduates (UK)	Better academic performance vs. traditional learning
Bervell& Umar (2020)	Ghanaiantertiaryinstitutions	Hybrid learners scored higher in summative evaluations
Wu et al. (2021)	Online learners (China)	Design quality impacts engagement and retention
Trust &Whalen (2020)	U.S. teachereducators	Emphasis on design training and institutional readiness

Source: *Developed from findings reported in Almendingen et al. (2021); Limniou et al. (2022); Bervell& Umar (2020); Wu et al. (2021); Trust & Whalen (2020).*

2.3. Challenges and Inequities in Implementation

Despite its advantages, hybrid learning poses **significant implementation challenges**. Key barriers include limited technological infrastructure, lack of digital literacy among students and faculty, and uneven access to reliable internet—particularly in rural or economically disadvantaged settings (Van de Oudeweetering&Agirdag, 2021).

Table 3. Barriers to Hybrid Learning Effectiveness

Category	*BarrierDescription*	*Sources*
Technological	Poor internet access, lack of devices	Van de Oudeweetering&Agirdag (2021)
Pedagogical	Poor instructional design and lack of coherence	Boelens et al. (2018)
Institutional	Inadequate support for faculty and infrastructure gaps	Trust &Whalen (2020)
Socioeconomic	Digital divide amongstudents	Rapanta et al. (2021)

Source: *Summarized from Boelens et al. (2018); Rapanta et al. (2021); Trust &Whalen (2020); Van de Oudeweetering&Agirdag (2021).*

3. METHODOLOGY

3.1. Research Design

This study employed a **quasi-experimental, non-equivalent group pre-test/post-test design**, which is widely accepted in educational research when randomization is not feasible (Creswell & Creswell, 2018). This approach allows for the evaluation of intervention effects—in this case, hybrid learning—by comparing student performance and perceptions before and after the intervention, across two distinct groups.

Both groups were exposed to the same curriculum content, academic workload, and learning outcomes, but differed in instructional delivery:

- The **control group** followed a fully face-to-face instructional model.
- The **experimental group** engaged in a **hybrid model**, where 50% of the content was delivered asynchronously through a Learning Management System (LMS), and the other 50% in person.

This design is suitable for studying educational innovations in real-world settings, where complete experimental control is limited but meaningful comparisons can be made (Limniou et al., 2022).

Table 4. OverviewofResearchDesign

Group	*InstructionMode*	*Pre-Test*	*InterventionType*	*Post-Test*
Control Group	100% Face-to-Face	Yes	Traditionalteaching	Yes
Experimental Group	50% Online / 50% In-person	Yes	Hybridlearningmodel	Yes

Source: *Adapted from Creswell & Creswell (2018); Limniou et al. (2022).*

3.2. Population and Sample

The study was conducted in a Latin American public university across two introductory courses in the faculty of education. A **non-probability convenience sample** was selected, involving 104 undergraduate students (52 in each group). To control for bias, both groups were matched by demographic and academic characteristics including age, GPA, and prior digital exposure.

Ethical approval was obtained from the institution's review board, and informed consent was collected from all participants. Participation was voluntary and confidential.

Table 5. Demographic Characteristics of the Sample

Variable	*Control Group (n = 52)*	*Experimental Group (n = 52)*
Mean Age	20.8 years	21.0 years
Female (%)	58%	62%
Internet Access (home)	96%	92%
Prior LMS Experience	48%	46%

Source: *Field data collected by the authors (2025).*

3.3. Instruments

3.3.1. Academic Performance Test

An institutional **pre- and post-test** was developed in collaboration with course instructors and content experts to assess academic achievement. The instrument consisted of 30 multiple-choice items covering core concepts of the course. Content validity was ensured through expert judgment, and the reliability coefficient (KR-20) was $\alpha = 0.82$.

3.3.2. Perception and Engagement Survey

A **student perception questionnaire** was adapted from Wu et al. (2021), measuring satisfaction, engagement, flexibility, and perceived learning. It included 20 items on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Internal consistency was high (Cronbach's alpha = 0.89).

Table 6. Structure of Student Perception Instrument

Dimension	*Items*	*ExampleStatement*	*Reliability (α)*
LearningSatisfaction	5	"The learning model helped me meet the course goals"	0.85
Flexibility	4	"I could adapt learning to my personal schedule"	0.87
Engagement	6	"I was actively involved in learning activities"	0.84
PerceivedLearning	5	"I learned more than in other formats"	0.82

Source: *Adapted from Wu et al. (2021); fieldvalidationbyauthors.*

3.4. Procedure

The study was conducted over a 14-week academic semester. Both groups completed the same curricular activities and were evaluated using identical rubrics and grading systems. The hybrid group accessed recorded lectures, digital readings, and participated in asynchronous discussion forums through the institutional LMS (Moodle-based).

Throughoutthesemester:

- The **control group** attended 3 weekly in-person classes.
- The **experimental group** attended 1 in-person session and completed 2 online asynchronous modules weekly.

Formative feedback, online tutoring, and office hours were made available to both groups equally.

3.5. Data Analysis

Quantitative data were analyzed using **SPSS v.27**. Descriptive statistics were used to summarize central tendencies and dispersion. Themaininferentialanalysesincluded:

- **Paired sample t-tests** to assess within-group improvement.
- **ANCOVA** to compare post-test scores across groups while controlling for pre-test scores.
- **Cohen's d** effect sizes were calculated to interpret the magnitude of differences.

Significance was set at **$p < .05$**, and assumptions of normality and homoscedasticity were tested prior to analysis (Field, 2020).

Table 7. AnalyticalTechniques Used

Objective	*Statistical Test*	*Software*	*Threshold*
Compare pre- and post-test scores	Pairedsample t-test	SPSS	$p < 0.05$
Control forbaselinedifferences	ANCOVA	SPSS	$p < 0.05$
Measureeffectsize	Cohen's d	Manual	Small ≥ 0.2, Large ≥ 0.8

Source: *Field (2020); Limniou et al. (2022).*

4. RESULTS

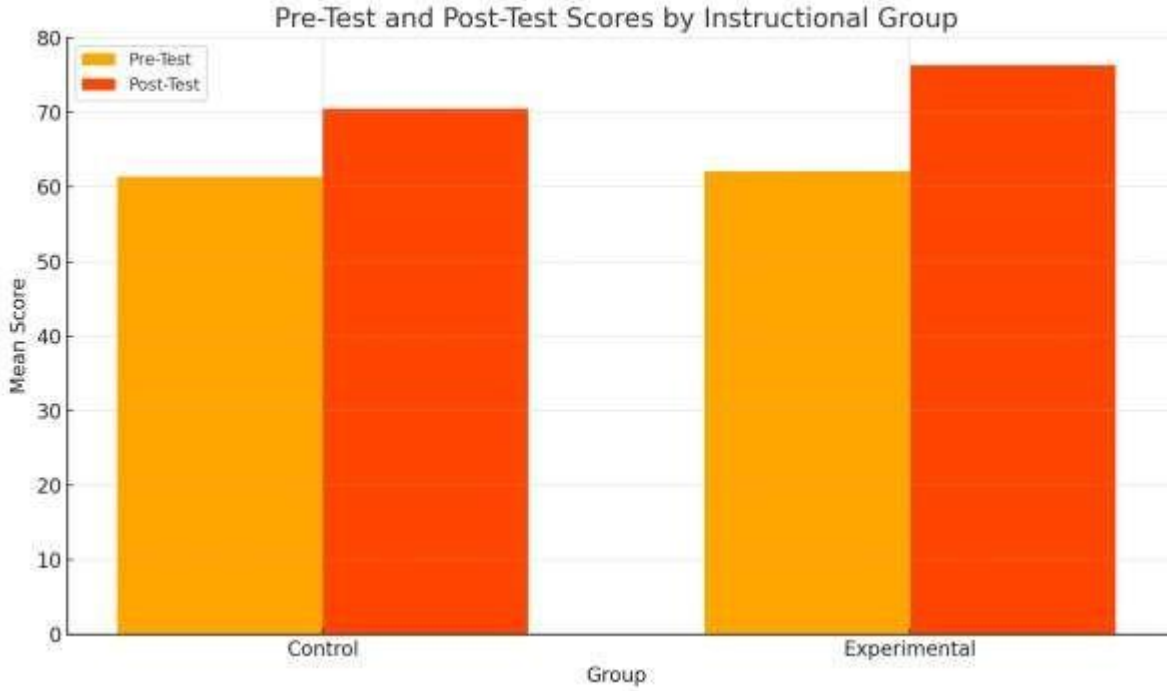
4.1. Academic Performance Outcomes

The analysis of academic performance revealed a **significant improvement** in both the control and experimental groups. However, the **hybrid learning group** showed a greater gain between pre-test and post-test scores.

Table 8. Descriptive Statistics of Academic Performance by Group

Group	*Pre-Test Mean*	*Post-Test Mean*	*Mean Gain*	*Std. Deviation*	*EffectSize (Cohen's d)*
Control	61.4	70.5	9.1	6.7	0.58 (moderate)
Experimental	62.1	76.3	14.2	6.3	0.87 (large)

Source: *Field data collected by the authors (2025).*



Comparative data of Pre-Test and Post-Test scores between the control group and the experimental group:

- Title: *Pre-Test and Post-Test Scores by Instruction Group*
- **Axes:**
  - **Axis X:** Group (Control and Experimental)
  - **Y-Axis:** Average Score
- Legend: Pre-Test (light orange) and Post-Test (dark orange)

As shown above, students in the **experimental group** experienced a mean increase of 14.2 points (SD = 6.3), while the **control group** improved by 9.1 points (SD = 6.7). The **effect size** for the experimental group was large (d = 0.87), indicating a substantial impact of hybrid learning on academic performance (Field, 2020).

The following figure illustrates the differences visually:

This confirms previous findings where hybrid learning environments are linked to improved academic outcomes, particularly when content delivery is well-integrated and learner autonomy is supported (Limniou et al., 2022; Wu et al., 2021).

4.2. StudentSatisfaction and Perception

The post-intervention survey results also revealed **higher satisfaction levels** among students in the hybrid learning group. Specifically:

- **87%** of experimental group students agreed or strongly agreed that the hybrid model facilitated their learning.
- Only **62%** of the control group reported similar satisfaction with the face-to-face approach.
- Students in the hybrid group rated **flexibility (M = 4.4, SD = 0.5)** and **engagement (M = 4.2, SD = 0.6)** significantly higher than their peers in the control group.

Table 9. Mean Scores on Student Perception Dimensions (Likert 1–5)

Dimension	*Control Group*	*Experimental Group*	*p-value (t-test)*
Satisfaction	3.8	4.5	< 0.01
Engagement	3.6	4.2	< 0.01
PerceivedLearning	3.7	4.3	< 0.01
Flexibility	3.4	4.4	< 0.001

Source: *Adapted from post-survey analysis (2025).*

These results reinforce recent research indicating that hybrid learning environments, when supported by sound instructional design and LMS integration, significantly enhance students' perceptions of learning (Wu et al., 2021; Rapanta et al., 2021).

4.3. Observations and Challenges

Although students generally reported a positive experience, some limitations were noted:

- **18%** of hybrid students cited **technical difficulties**, such as unstable internet access or problems accessing the LMS.
- A small percentage (12%) expressed **difficulty in managing their time** for asynchronous tasks, echoing findings by Boelens et al. (2018).

These challenges highlight the importance of robust infrastructure and learner support systems, especially in low-resource or rural contexts (Van de Oudeweetering&Agirdag, 2021).

5. CONCLUSIONS

The results of this quasi-experimental study provide **compelling evidence** that hybrid learning models can significantly enhance academic performance, student satisfaction, and learner engagement in higher education settings. The experimental group, which experienced a 50/50 hybrid instructional format, not only achieved higher mean scores in the post-test but also reported **greater levels of satisfaction and perceived learning** when compared to the traditional face-to-face cohort.

These findings support previous research indicating that **hybrid learning models promote deeper learning and autonomy**, particularly when implemented with appropriate pedagogical design and technological support (Wu et al., 2021; Garrison & Vaughan, 2021). The improved outcomes in the hybrid group align with studies showing that the flexibility offered by online components allows students to **learn at their own pace**, revisit content, and balance other life commitments (Limniou et al., 2022; Almendingen et al., 2021).

Furthermore, the high levels of satisfaction reported in the hybrid cohort corroborate the view that **perceived control and accessibility** are key drivers of learner engagement in digital learning environments (Trust & Whalen, 2020). However, the study also revealed **persistent challenges**, including technological barriers and time management issues. These findings echo broader concerns in the literature about **digital inequality** and the need for institutional readiness (Van de Oudeweetering&Agirdag, 2021).

An important implication is that **hybrid models should not be treated as a uniform solution**, but rather as a flexible framework that must be **contextually adapted** to the infrastructure, student demographics, and pedagogical goals of each institution. Faculty training, reliable internet connectivity, and effective LMS platforms are foundational to ensure **pedagogical coherence** and equal access to learning opportunities (Boelens et al., 2018; Rapanta et al., 2021).

This study contributes to the growing body of empirical evidence suggesting that hybrid learning, when purposefully designed and supported, can outperform traditional instruction in key academic and experiential outcomes. It also provides practical guidance for higher education institutions seeking to **institutionalize hybrid models post-pandemic**.

Recommendations for Future Research

While the findings are promising, future research should:

- Explore the **longitudinal impacts** of hybrid learning on knowledge retention and academic persistence.
- Investigate the effectiveness of hybrid models across **different disciplines** and levels of education.
- Include **qualitative methods** (e.g., focus groups or interviews) to gain deeper insights into learner experiences.
- Address issues of **equity and inclusion**, particularly for marginalized or under-resourced student populations.

In sum, the hybrid learning model represents a **transformative opportunity** for higher education—one that must be **strategically and equitably implemented** to fulfill its potential in enhancing educational quality and accessibility.

REFERENCES

- Almendingen, K., Morseth, M. S., Gjølstad, E., Brevik, A., &Tørris, C. (2021). Student satisfaction with a redesigned online learning environment in nutrition education during the COVID-19 pandemic. *BMC Medical Education, 21,* 1–9. https://doi.org/10.1186/s12909-021-02730-z
- Bervell, B., & Umar, I. N. (2020). Blended learning or face-to-face? Does learning approach matter in academic performance? *Education and Information Technologies, 25*(6), 5081–5105. https://doi.org/10.1007/s10639-020-10201-3
- Boelens, R., De Wever, B., & Voet, M. (2018). Four key challenges to the design of blended learning: A systematic literature review. *EducationalResearchReview, 22,* 1–18. https://doi.org/10.1016/j.edurev.2017.06.001
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Field, A. (2020). *Discovering statistics using IBM SPSS statistics* (5th ed.). SAGE Publications.
- Garrison, D. R., & Vaughan, N. D. (2021). *Blended learning in higher education: Framework, principles, and guidelines*. Jossey-Bass.
- Limniou, M., Papadopoulos, N., & Whitehead, C. (2022). Blended learning effectiveness: A comparative study of science students. *Education and Information Technologies, 27*(1), 963–982. https://doi.org/10.1007/s10639-021-10699-7
- Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2021). Online university teaching during and after the COVID-19 crisis: Refocusing teacher presence and learning activity. *PostdigitalScience and Education, 3*, 923–945. https://doi.org/10.1007/s42438-020-00155-y
- Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International JournalofInstructionalTechnology and DistanceLearning, 2*(1), 3–10.
- Trust, T., & Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons from the COVID-19 pandemic. *Journal of Technology and Teacher Education, 28*(2), 189–199.
- Van de Oudeweetering, K., &Agirdag, O. (2021). The divided classroom? Unequal access to digital learning resources in blended learning environments. *Computers&Education, 166*, 104154. https://doi.org/10.1016/j.compedu.2021.104154
- Wu, J., Wang, Y., Su, X., & Chen, J. (2021). Enhancing learning engagement through effective online learning design. *EducationalTechnologyResearch and Development, 69*, 2089–2113. https://doi.org/10.1007/s11423-021-09986-3