

Collective Online Learning Practice in Higher Education in Biak, Indonesia: Navigating Digital Disparity

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Abstract

Digital disparity significantly challenges online learning implementation in remote area in Indonesia, particularly in Papuan context. This study explores the unique online learning model adopted by English Education (PBI) students in private university in Biak, Papua as a resilient response to infrastructure limitations. Using a qualitative case study approach, data were gathered through semi-structured interviews and field observations. The study involved 25 students, along with key stakeholders and lecturers, to provide a comprehensive perspective on the local educational ecosystem. The results reveal that students navigate digital gaps through "collective online learning" practices, characterized by resource sharing, group-based digital access, and a hybrid synchronization of offline-online interactions. This model transcends simple technical usage, reflecting a socio-cultural adaptation to geographical and connectivity constraints. These findings suggest that in areas with high digital disparity, a collective approach is essential for educational sustainability. The study offers practical insights for policymakers to design hybrid frameworks that are culturally and technically situated for the Papuan context.

Keywords: *digital disparity, collective learning, English Education, higher education, case study*

INTRODUCTION

In the 21st century, the rapid evolution of digital technology has fundamentally reshaped the landscape of global higher education. This digital shift has drastically transformed the traditional pedagogical paradigm, moving classrooms into versatile online environments (Dixit et al., 2024; Kumar et al., 2023; Roa González et al., 2025). Driven by this acceleration, online learning has gained immense popularity due to its asynchronous flexibility and allowing students to learn anytime and from anywhere in the world (Du et al., 2022; Janthapass et al., 2024). Furthermore, this digital ecosystem accommodates diverse learning styles by providing tailored educational materials (Aksoy, 2023; Technol et al., 2023) while simultaneously fostering cross-border collaboration among students (Alsayer, 2023). As a result of these advantages, online learning is widely celebrated for its inherent flexibility and its profound ability to democratize knowledge (Anane & Adusei, 2024; Huang et al., 2023). However, the success of this transition hinges on the prerequisite that both educators and learners possess adequate computing devices and stable, high-speed internet access (Bucăța

& Tileagă, 2024). Therefore, when these infrastructural needs are met, online learning serves as a comprehensive mechanism that enhances both educational flexibility and global accessibility.

However, it will be different when these global educational trends migrate to the peripheral and geographically challenging regions with limited technological access. Implementing modern educational trends encounters severe limits when migrating to peripheral and geographically challenging regions (Grinshtain, 2022; Laine, 2025). In these areas, the universal digital model frequently collapses due to deep-seated inequalities and chronic infrastructure shortages (Mhlanga, 2024; Nthambeleni & Motadi, 2025). Furthermore, rural students are often burdened by limited socioeconomic capital, traditional family expectations, and severe geographic isolation (Drescher et al., 2022; Maliyat, 2025). Although online learning theoretically offers structural flexibility to mitigate these challenges, many learners remain fundamentally unprepared (Corbett et al., 2023; Yeh & Tsai, 2022). Consequently, these students frequently reject e-learning systems, preferring conventional classroom environments instead (Dejene & Tilahun, 2024). This global disconnect is perfectly mirrored by the current higher education phenomenon in Biak, Papua, Indonesia. Biak presents a striking paradox where the collective desire for modernization clashes with a stark reality of infrastructure deficits. While digitalization aims to bridge vast distances, Papua's unique topography and socioeconomic constraints instead erect a digital wall. This barrier threatens to further marginalize students who are already isolated from Indonesia's primary academic hubs.

The urgency of conducting this research stems from the critical need to document and validate indigenous survival strategies in the face of extreme digital disparity. In Biak, the implementation of online learning is not merely a matter of logging into a Learning Management System, but it is a complex logistical feat. Preliminary data reveals a staggering reality including in a cohort of 25 English Education (PBI) students, there is zero percent laptop ownership, and even smartphone access is not universal. Furthermore, the region is plagued by internet blind spots where connectivity is erratic at best. If these challenges are not addressed through situated research, there is a significant risk that standard digital education policies will continue to fail these students, leading to increased dropout rates and a widening of the intellectual gap between eastern and western Indonesia. Investigating the Biak Model, a collective approach where students gather in a single room to share a single device is essential to redefine what access means in a marginalized context.

Current academic literature on online learning predominantly focuses on individual user experience, self-regulated learning, and the efficacy of various digital platforms in stable environments (Dong et al., 2024; Sadigov et al., 2024; Zheng & Xiao, 2024). While there is a growing body of research on the digital divide in developing nations, most studies suggest solutions centered on increasing individual device distribution or improving regional signal strength (Afzal et al., 2023; Wang, 2024). However, there is a distinct research gap regarding collective-mediated virtual learning, where a physical moderator and a shared-screen environment serve as the primary interface between a remote expert and a group of students. This study offers a significant novelty by introducing the concept of collective online learning practice. Unlike traditional online models that emphasize individual autonomy, this practice relies on communal resilience and local facilitation to maintain pedagogical continuity. This research moves beyond technical troubleshooting to explore the socio-pedagogical dynamics of how collective presence can compensate for individual hardware poverty.

The primary objective of this research is to analyze the pedagogical and infrastructural realities of English Education students in Biak as they navigate these digital barriers. This paper seeks to explore how localized adaptations specifically the use of a shared LCD screen and a local lecturer acting as a moderator to facilitate and transfer of knowledge from external experts. By examining this unique classroom setup, the study aims to provide a framework for situated hybrid learning that is culturally and technically appropriate for remote areas. To guide this inquiry, the study addresses three pivotal research questions: (1) What specific infrastructural and pedagogical barriers necessitate a collective learning model in this context? (2) How does the presence of a local moderator facilitate student comprehension during virtual lectures from external experts? and (3) How do students perceive their academic engagement within a shared-screen environment compared to the standard individual learning model assumed by modern educational technology?

METHOD

Setting and Participant

This study employs a qualitative case study design to investigate the Collective Online Learning model in Biak, Papua. This approach allows for a deep exploration of how higher education institutions adapt to extreme digital disparities. The research is situated in a region characterized by challenging topography and internet blind spots, where online learning is transformed from an individual remote activity into a localized, collective experience to mitigate infrastructural failures.

Sample and Participant

The study used purposive sampling to select a total of 30 participants, comprising 25 English Education (PBI) students, 3 lecturers, and 2 stakeholders. The sample size of 25 students was determined based on the principle of data saturation, where subsequent interviews yielded no new insights regarding their digital challenges. The inclusion criteria for students strictly required that they lack personal laptop ownership, representing a major digital gap as verified through a preliminary demographic questionnaire. While 100% of these selected students do not personally own a laptop, they maintain access to technology by relying entirely on shared campus facilities for their academic work. Meanwhile, the lecturers were included based on their active teaching experience with this cohort, and the stakeholders were selected due to their involvement in managing campus academic infrastructure. These educators and stakeholders serve as in-class moderators who play a key role by giving direct explanations and encouraging students to stay active when the internet connection fails. Together, these participants show how limited hardware and strong institutional support work together in a remote learning environment

Instrument and data collection

Data collection was conducted using three primary instruments to capture the complexity of the collective learning model. First, semi-structured interviews were held with students and lecturers; these sessions explored the personal experiences of students navigating digital barriers and the pedagogical rationale used by lecturers to manage focus and clarify external materials. Second, direct observations were performed to document the Communal Portal setup, specifically focusing on the physical dynamics of the shared LCD screen and the real-time interactions between the local moderator and the students during

virtual lectures. Finally, the study utilized institutional documentation to analyze how the campus strategically centralizes its limited infrastructure. By reviewing records on resource allocation for laptops, internet access, and stable power, the researcher identified how the institution intentionally creates a conducive environment in a single classroom to compensate for individual hardware poverty. This multi-method approach ensures that the findings are triangulated across participant narratives, physical classroom realities, and institutional policies.

Data analysis

The qualitative data collected in this study were systematically analyzed using Thematic Analysis adhering to the rigorous six-phase framework established by (Braun & Clark, 2022). This systematic approach was selected to identify, analyze, and report patterns or themes within the qualitative data regarding collective learning practices. In the initial phase, data familiarization was achieved by repeatedly reviewing the raw datasets, which included interview transcripts from the 25 English Education (PBI) students and lecturers, field observation notes detailing the physical dynamics of the classroom setup, and institutional records regarding resource allocation. This deep immersion provided a thorough interpretive understanding of the local Papuan educational context and the unique structural constraints under investigation.

The second phase involved generating initial codes systematically across the entire dataset by labeling specific, meaningful segments of text. Descriptive open codes were assigned to capture essential socio-technical phenomena, such as *Hardware Poverty* to denote the total absence of personal student laptops, *Environmental Contingencies* for references to weather-dependent internet failures, *Inverted Mobility* for data describing the necessity of commuting to campus, and *Socio-Cultural Obligations* for non-negotiable Adat or religious ceremonies. Additionally, instances of disconnected or distorted virtual feeds were coded as *Technical/Interactive Fragility*, whereas students pooling their efforts to collaboratively reconstruct external lectures during signal drops were coded as *Cognitive Re-assembly*.

During the third and fourth phases, these initial codes were organized, reviewed, and refined into broader candidate themes that accurately reflected the raw patterns. To visually and conceptually bridge the data, a coding framework and a thematic map were developed to track how individual infrastructural constraints transform into localized, collective adaptations. Codes outlining structural barriers such as device shortages and geographic isolation were clustered together, while codes highlighting real-time instructional interventions, co-teaching, and contextual clarifications by the local faculty were grouped into a separate category representing localized pedagogical mediation.

In the fifth phase, the researcher polished and formalized the precise definitions and names of each theme to fully capture the essence of collective resilience in Biak. This process yielded three interconnected definitive themes:

1. Socio-Infrastructural Barrier: Navigating Hardware Poverty and Environmental Contingencies, which conceptualizes how severe structural deficits force localized congregation;
2. The Local Moderator as a Human-Buffer: Maintaining Pedagogical Continuity, which defines the critical role of the local lecturer in rescuing fragmented virtual deliveries; and
3. The Paradox of Engagement: Prestigious Access vs. Interactive Fragility, which highlights the tension between high academic motivation and the collaborative offline strategy of *Cognitive Re-assembly*.

Finally, in the sixth phase, these finalized themes were woven into a coherent, evidence-based narrative supported by empirical descriptions, demographic profiles, and direct participant quotes to explain how higher education in Biak successfully navigates digital disparity.

RESULTS

Demographic data

To provide a transparent overview of the socio-economic and technological baseline of the participants, a comprehensive demographic profile was constructed. The table below outlines individual student data, mapping out critical indicators of digital disparity including age, gender, personal device ownership, primary internet access mode, home connectivity status, and daily commuting distance to the centralized campus portal.

Table 1: Detailed Demographic Profiles of English Education (PBI) Students

Variable Category	Specific Metric / Range	Frequency (n)	Percentage (%)
Age	19 years old	5	20%
	20 years old	11	44%
	21 years old	6	24%
	22 years old	3	12%
Gender	Male	7	28%
	Female	18	72%
Personal Device Assets	Laptop Ownership (0%)	0	0%
	Smartphone Only	24	96%
	No Personal Device	1	4%
Primary Internet Access Mode	Cellular Data Bundle	24	96%
	No Independent Access (Relies on Peer)	1	4%
Home Connectivity Status	Unstable (Frequent lag; highly weather-dependent)	14	56%
	Extreme Blind Spot (Signal drops; requires outdoor movement)	8	32%
	No Coverage / Zero Signal (Complete regional digital dead zone)	3	12%
Campus Commute Distance	Short Distance (2–5 km)	11	44%
	Moderate Distance (6–10 km)	7	28%
	Long Distance (11–15 km)	7	28%

The table shows that the 25 English Education (PBI) students face major digital and infrastructure challenges in Biak, Papua. The group consists of 28% male and 72% female students, with a mean age of 20.24 years old. The data highlights a severe hardware gap: 100% of the students do not own a laptop, leaving 96% dependent only on smartphones and 4%

with no device at all. This problem is made worse by poor home internet, as 56% face unstable connections, 32% live in extreme blind spots, and 12% have zero signal. Because studying at home is impossible, students must commute up to 18km to campus just to access the internet, which explains why they must study together using a single shared screen.

The Socio-Infrastructural Barrier: Navigating Hardware Poverty and Environmental Contingencies

The primary finding reveals an absolute state of hardware poverty. In the English Education (PBI) department, the assumption of individual device ownership a prerequisite for modern e-learning is non-existent. With 0% laptop ownership and only 96% smartphone ownership, students are technically disenfranchised from the outset. This creates a state of "Inverted Mobility"; whereas online learning in urban centers is designed to liberate the student from a physical location, in Biak, the digital divide forces students to congregate in a single, centralized physical space the campus to access a shared "Communal Portal." However, this centralized access is fragile, as it is perpetually threatened by Biak's unpredictable tropical environment and socio-economic constraints. The topography creates "internet blind spots" that render home-based study impossible, while the lack of reliable transportation and extreme weather patterns act as physical gatekeepers to digital access.

"In our class, no one owns a laptop. We are entirely dependent on the campus LCD." (Student 1)

Furthermore, local cultural obligations such as sacred religious activities and mandatory Adat (customary) ceremonies present a unique barrier to the rigid timing of synchronous online learning. In the communal structure of Biak, family, tribal, and religious events are non-negotiable social duties that deeply impact student attendance. This tension between rigid virtual schedules and local cultural realities is vividly described by one of the students:

"In Biak, we cannot skip a mandatory religious event, our custom and culture always come first. Unfortunately, the rigid online schedules from lecturer outside Papua don't understand this reality. When we have to attend these ceremonies, we are forced to miss the virtual class, and the lecturers from outside often think we are just being lazy or undisciplined." (Student 2)

The necessity of a collective learning model in Biak is dictated by a "collision of barriers" where extreme hardware poverty, geographic isolation, and cultural obligations intersect. Unlike individualistic digital models, this context requires a centralized physical hub to transform private digital exclusion into a shared academic opportunity.

The Local Moderator as a Human-Buffer: Maintaining Pedagogical Continuity

A critical finding is the emergence of the local lecturer as a human buffer. His/her role is essential to prevent the total collapse of knowledge transfer. In this collective model, the moderator acts as the technical, pedagogical, and psychological anchor of the class. Because the virtual connection to external experts is characterized by choppy audio and visual freezing, the moderator must provide a constant stream of real-time interventions.

The data suggests that without this human mediation, the virtual lecture would be reduced to unintelligible digital noise.

"I am not just a teacher; I am a bridge. I lend my own laptop so the class can happen. When the voice of the lecturer from outside breaks, I immediately interrupt and re-explain. If the screen freezes, I am the one who keeps the discussion going offline until the signal returns." (Lecturer 1)

This human-buffering creates a hybrid-synchronous environment where the learning is online in terms of source but intensely offline in terms of facilitation.

"The moderator is the reason we don't give up. They ask us, 'Who hasn't understood?' and then they clarify it right there. They make a broken digital experience feel like a complete lesson." (Student 3)

The presence of a local moderator is the pedagogical bridge of the Biak model. By acting as a human buffer, the moderator effectively mitigates the technical failures of the internet, ensuring that comprehension is maintained through immediate local clarification and psychological encouragement.

The Paradox of Engagement: Prestigious Access vs. Interactive Fragility

The study uncovers a profound paradox regarding student engagement. Students perceive the collective model as an elevator of opportunity, providing them with unprecedented access to elite academic resources from outside Papua. However, the shared-screen setup and technical instability result in Interactive Fragility, where spontaneous dialogue is stifled by latency.

Students experience a sense of spectator-learning rather than participatory-learning:

"We feel proud to learn from famous professors in Java; it makes us feel that Biak is not left behind. But there is always a delay, and we feel shy talking to a giant screen while 24 other people are watching us. We are engaged in spirit, but frustrated by the machine." (Student 4)

Observations revealed that fragmented explanations force students to engage in Cognitive Re-assembly, working together to piece together the fragments of the lecture.

"We talk to each other during the breaks in the signal. 'What did he say?' 'I think he meant this.' The collective model makes our engagement a 'team sport' because we have to help each other understand." (Student 5)

Student engagement in a shared-screen environment is characterized by a high level of aspirational motivation but limited direct interactivity. While students feel a sense of inclusion in the global academic community, their actual engagement is transformed from an individual-to-screen interaction into a peer-to-peer collective understanding facilitated by the physical presence of their cohort.

DISCUSSION

The empirical findings of this study outline a unique educational phenomenon: the "Biak Model" of collective online learning. This model challenges mainstream westernized, individual-centric assumptions embedded in modern educational technology. By comparing and contrasting these findings with previous literature, this section elucidates how

geographical, infrastructural, and socio-cultural constraints reshape the implementation of e-learning in peripheral regions.

Socio-Infrastructural Barriers: Hardware Poverty vs. The Anytime, Anywhere Myth

The rapid evolution of digital technology in the 21st-century global higher education landscape has heavily promoted a pedagogical transition toward flexible, asynchronous learning environments. Mainstream literature widely celebrates this model for its ability to democratize knowledge, dismantle geographical boundaries, and enable students to learn anytime and from anywhere (Du et al., 2022; Janthapass et al., 2024). However, the empirical findings regarding English Education (PBI) students in Biak, Papua, radically deconstruct this idealized narrative. The foundational assumption of e-learning that every learner possesses adequate personal computing devices and high-speed internet access is entirely absent in this context (Bucăța & Tileagă, 2024). With a laptop ownership rate of 0% and absolute reliance on smartphones (96%), which are frequently shared or used rotationally, the technical prerequisites for independent education in the digital era are non-existent from the outset.

This infrastructural deficit forces a phenomenon termed "Inverted Mobility." While e-learning in urban centers is intentionally designed to liberate students from the physical constraint of the classroom (Huang et al., 2023), the digital divide in Biak forces the exact opposite. Students must mobilize physically and communally, traveling distances of up to 18 km through challenging geographical terrains, simply to gather in a single centralized campus classroom equipped with static electricity and a shared LCD projector. This reality stands in stark contrast to the promise of spatial liberation inherent in e-learning. Instead, it strongly confirms Mhlanga (2024) assertion that universal digital models frequently suffer a total collapse when migrated to peripheral regions due to a blatant disregard for deep-seated structural inequalities. The asynchronous flexibility praised by Western theorists transforms into physical rigidity in remote territories.

Beyond hardware poverty, these barriers are exacerbated by environmental contingencies and a tropical climate that create severe internet blind spots. Demographic data reveals that 56% of students face highly unstable, weather-dependent connections, while 12% live in total digital dead zones with zero signal. These environmental obstacles underscore the socioeconomic inequalities that restrict the acquisition of independent digital assets. Compared to research in developing urban areas where e-learning hurdles typically revolve around digital literacy or time management the barriers in Biak are existential and structural (Technol et al., 2023). Students are not choosing when they want to learn; they are gambling against the weather and the erratic signal strength of local telecommunication towers just to secure their basic right to educational access.

Furthermore, a profound epistemic clash occurs when the rigid, synchronous formats of external experts or lecturers (e.g., from prestigious universities in Java) are imposed onto the socio-cultural ecosystem of Papua. Global e-learning literature generally treats domestic or familial interruptions as minor variables that can be managed through student agency and self-regulated learning (Aksoy, 2023). Conversely, in Biak, cultural obligations such as customary ceremonies (Adat) and sacred religious events are non-negotiable communal duties. When rigid online schedules clash with these cultural realities, students face double marginalization: they not only lose academic content, but they are also frequently mischaracterized as lazy or undisciplined by context-blind external instructors. This directly echoes the findings of Corbett et al. (2023), who argued that rural and remote students

shoulder unique socio-demographic burdens that standard e-learning frameworks completely fail to accommodate.

Interestingly, the response of Biak students to these multi-layered barriers distinguishes them from the patterns of technology rejection documented in other developing nations. In Ethiopia, for instance, Dejene & Tilahun (2024) reported that infrastructural and psychological unreadiness drove students to completely reject e-learning systems, demanding a total return to conventional classrooms. In Biak, rather than rejecting the system or resigning to digital exclusion, students exhibit a high degree of communal resilience. They engage in tactical convergence by pooling their limited resources: sharing cellular data bundles, hitching rides on peers' vehicles to commute to campus, and gathering around a single shared LCD screen. This mode of adaptation proves that technological determinism where the absence of tools is equated with the absence of learning can be dismantled through indigenous survival strategies, redefining the meaning of access from individual ownership to communal utilization.

The Local Moderator as a Human Buffer: Redefining Pedagogical Mediation

The second research question explored how the presence of a local moderator facilitates student comprehension during virtual lectures delivered by external experts. In contemporary e-learning literature, the role of the instructor is frequently minimized, evolving away from traditional teaching toward becoming an abstract virtual facilitator or an asynchronous content curator within a Learning Management System (Aksoy, 2023; Kumar et al., 2023). This shift assumes that well-designed digital modules can autonomously guide a student through the learning process. However, the pedagogical reality in Biak sharply destabilizes this individualistic framework. Due to severe and unpredictable technical disruptions such as highly distorted, choppy audio and chronically freezing video feeds the physical, real-time presence of a local moderator becomes the absolute structural linchpin preventing the total collapse of knowledge transfer. Without this immediate human intervention, the remote expert's lecture would be reduced to unintelligible digital white noise.

This empirical finding stands in stark contrast to the modern digital autonomy model championed by theorists like Roa González et al. (2025). This model posits that as distance education technology advances toward more sophisticated virtual environments, the necessity for localized, physical oversight diminishes proportionally. In the Biak model, however, technological advancement without infrastructural stability achieves the exact opposite result, increasing rather than decreasing the reliance on a physically present educator. The local lecturer does not merely operate as a passive technical proctor or a standard classroom facilitator; instead, they step into the multi-faceted role of a human buffer. They actively co-teach, translate dense or distorted academic concepts into localized contexts, and psychologically anchor a classroom that is perpetually on the verge of frustration due to machine failure.

Consequently, this dynamic establishes an unprecedented hybrid-synchronous environment. When the external digital feed drops or lags, the pedagogical locus of control shifts instantaneously from an online, remote delivery mode to an intense, offline, face-to-face intervention. The local moderator seamlessly catches the fragmented pieces of the lecture and continues the instructional flow using traditional whiteboards or localized discussions until the digital connection is restored. This fluidity proves that in marginalized, technologically

impoverished environments, high-quality human capital must be actively deployed to compensate for severe hardware and network poverty. It challenges the technocentric assumption that platforms can replace personnel, demonstrating instead that the stability of the educational ecosystem in remote areas is entirely dependent on the agility of the local teacher.

Furthermore, these dynamics significantly expand upon and nuance the concept of cross-border collaboration discussed by Alsayer (2023). While Alsayer's framework focuses almost exclusively on digital, peer-to-peer collaboration facilitated across international or inter-regional borders via stable cloud networks, the Biak context reveals a critical prerequisite. Our findings demonstrate that in areas marked by high digital disparity, meaningful inter-regional collaboration with external experts cannot occur in a vacuum. It requires a foundational, highly structured intra-class collaboration. This internal alliance occurs between the local moderator and the students, who must work as a synchronized team to decode, re-assemble, and contextualize the sporadic digital input. Thus, the Biak model redefines pedagogical mediation: it moves from a simple pipeline of remote content delivery to an active, locally anchored rescue mission of knowledge adaptation.

The Paradox of Engagement: Prestigious Access vs. Interactive Fragility

The final research question focused on how students perceive their academic engagement within a shared-screen environment compared to the standard individual learning model assumed by modern educational technology. The empirical data uncovers a profound sociological and psychological paradox that introduces a critical, contextual nuance to the global discourse on democratizing education through digitalization.

Contemporary e-learning advocates and digital transformation theorists, such as Anane & Adusei (2024) as well as Huang et al. (2023), argue extensively that online education acts as a powerful institutional equalizer. They posit that virtual platforms promote equity and social justice by providing marginalized, socioeconomically disadvantaged, and geographically isolated students with unprecedented access to elite, global knowledge hubs that were historically out of reach.

The lived experiences of the English Education (PBI) students in Biak strongly validate this aspirational dimension. When given the opportunity to sit under the virtual tutelage of prominent, highly celebrated professors from major academic hubs in Java, the students express immense pride and elevated academic motivation a phenomenon this study terms prestigious access. This inclusion fosters a powerful psychological breakthrough, dismantling the geographic fatalism that often plagues peripheral regions and making the students feel genuinely connected to the broader, national academic community.

However, a stark, friction-filled contrast emerges when analyzing the physical and technical mechanism through which this elite access is delivered, revealing a state of severe Interactive Fragility. Modern educational tools, learning management systems, and pedagogical frameworks are inherently designed around a highly interactive, fluid, individual-to-screen engagement model. This mainstream framework assumes a setting where every student possesses their own personal workstation, microphone, web camera, and private chat interface to customize their learning experience (Dixit et al., 2024).

The shared-screen LCD setup in Biak structurally paralyzes this idealized model. The physical constraint of 25 students crowded into a single room, facing one projected screen, combined with persistent network latency and audio degradation, transforms a theoretically participatory lecture into a restrictive, one-way spectator-learning dynamic. Students report

feeling deeply intimidated by the prospect of shouting into a single shared microphone or addressing a giant screen while their entire cohort watches them in real-time. Spontaneous dialogue, immediate question-and-answer sessions, and intellectual debates are entirely stifled by the machine's latency. Consequently, while their psychological and intrinsic motivation is exceptionally high, their actual, direct virtual interactivity is fundamentally frozen.

To counter this digital silencing and prevent total cognitive alienation, the students in Biak do not disengage or succumb to passivity; instead, they invent an organic, highly collaborative coping strategy termed Cognitive Re-assembly. In standard e-learning literature, learning is frequently viewed as a solitary, internalized, and highly individualized act of self-regulated consumption, where success depends on the student's isolated cognitive focus (Technol et al., 2023).

In Biak, the students completely subvert this paradigm, turning the solitary act of listening into a collective "team sport." During the inevitable signal drops, audio freezes, or moments of extreme latency, the classroom instantly erupts into rapid, low-voiced, peer-to-peer review sessions. Students do not wait for the technology to recover in silence; instead, they immediately cross-reference their notes, whispering questions to one another such as, "What did the professor say right before the audio broke?" or "I think that chart meant this, did you catch it?" Through this collective behavior, they pool their fragmented pieces of individual understanding to construct a complete, unified comprehension of the lecture. This organic cooperation demonstrates that when individual digital autonomy is stripped away by hardware poverty, communal resilience step in as a vital compensatory mechanism.

Ultimately, this collective engagement model fundamentally redefines standard, Western-centric definitions of active learning and student engagement. Traditional educational metrics, learning analytics, and e-learning audits which systematically measure student engagement through individual screen-time clicks, forum posts, digital quiz submissions, or direct verbal participation on a video conference software would inevitably misclassify a silent, shared-screen classroom in Biak as disengaged, passive, or failing.

However, the Biak model proves that a lack of direct virtual participation does not equate to cognitive absence or academic failure. Instead, an intense, highly collaborative, and deeply critical engagement is happening offline in front of the screen. By shifting the locus of engagement from an individual-to-machine interaction to a peer-to-peer collective understanding, these students demonstrate a profound sociolinguistic adaptation. They prove that in developing, marginalized, and technologically impoverished regions, communal solidarity and local social networks rather than technological isolation and individual hardware ownership can and must become the primary drivers of educational sustainability and academic survival.

CONCLUSION

This study demonstrates that the universal, individualistic paradigm of modern e-learning collapses when confronted with the realities of remote regions like Biak, Papua, where English Education (PBI) students navigate absolute hardware poverty, geographic isolation, and rigid virtual schedules that clash with non-negotiable local socio-cultural duties. In response, the "Biak Model" emerges as a resilient socio-cultural adaptation through collective online learning, where students utilize a centralized campus portal, a single shared LCD screen, and the vital mediation of a local lecturer acting as a human buffer to transform

private digital exclusion into a collaborative, peer-to-peer team sport of cognitive re-assembly. However, this qualitative case study is limited by its small sample size (25 participants) within a single department at one private university, which may restrict its generalizability, as well as its exclusive focus on English pedagogy and short-term qualitative data. To address these limitations, future research should employ mixed-methods or longitudinal designs to track long-term academic outcomes, conduct cross-disciplinary and cross-regional comparisons across other peripheral Indonesian islands, and examine policy-to-practice frameworks that can formally fund, design, and integrate subsidized localized digital hubs with local co-teachers into national synchronous learning initiatives.

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