Informing Science:
the International Journal of
an Emerging Transdiscipline

An Official Publication
of the Informing Science Institute
InformingScience.org

Inform.nu

Volume 29, 2026

INFORMING FOR EQUITY: A SYSTEMIC FRAMEWORK FOR GENAI ASSESSMENT IN RESOURCE-CONSTRAINED HIGHER EDUCATION

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ABSTRACT

Aim/Purpose	To examine how Generative AI (GenAI) creates systemic informing failures in resource-constrained higher education institutions, producing cycles of inequity that fragmented interventions cannot resolve.
Background	This study introduces a Systemic Framework for Equitable GenAI Assessment that addresses breakdowns in information sharing across students, faculty, and administrators through three interlocking principles: infrastructure-based equity, transparent collaboration, and institutional scaffolding.
Methodology	A systematic literature synthesis of 47 sources, informed by critical pedagogy, digital equity theory, and institutional theory, with Philippine higher education as an illustrative case of informing system failure.
Contribution	The framework provides a novel informing systems model that explains how GenAI's equity challenges are causally interdependent and offers a phased implementation roadmap for improving institutional informing in resource-constrained contexts.
Findings	Infrastructural exclusion, pedagogical misalignment, and ethical displacement form a self-reinforcing informing failure system. Isolated interventions fail due to three causal mechanisms: *Pedagogical Coherence Constraint, Institutional Legitimacy Spiral,* and *Resource Allocation Trap.*
Recommendations for Practitioners	Institutions should adopt phased, integrated implementation beginning with institutional scaffolding, then small-scale pilots that coordinate informing across stakeholder groups.

Accepting Editor Grandon Gill | Received: December 1, 2025 | Revised: February 13. February 16, 2026 | Accepted: February 17, 2026.
Cite as: Espartinez, A. S. (2026). Informing for equity: A systemic framework for GenAI assessment in resource-constrained higher education. *Informing Science: The International Journal of an Emerging Transdiscipline, 29,* Article 4. https://doi.org/10.28945/5734

Recommendations for Researchers	Priority areas include longitudinal implementation studies, comparative validation across Global South regions, and research into how the framework applies to indigenous knowledge systems and non-Western epistemologies.
Impact on Society	The framework prevents GenAI from reinforcing digital coloniality by transforming institutional informing systems to support educational justice and equitable access.
Future Research	Empirical validation through participatory action research, disciplinary variation studies, and indigenous-led inquiry into GenAI's compatibility with oral and relational knowledge transmission.
Keywords	informing systems, generative AI, educational equity, digital divide, institutional scaffolding, resource-constrained contexts

INTRODUCTION

Generative AI (GenAI) is reshaping higher education at a pace that has outdone institutional readiness. In fact, its precipitous integration into academic work has created a paradox: GenAI can expand access to learning, yet it can also deepen longstanding inequities. This tension is most visible in Global South contexts, where infrastructural disparities, linguistic barriers, and colonial legacies shape the conditions of technological adoption (Espartinez, 2025a; Memon & Memon, 2025). Across the Philippines, for example, urban universities are experimenting with AI-driven learning, while rural institutions continue to struggle with unreliable electricity, intermittent internet connectivity, and limited access to devices (Espartinez, 2025a; Espinosa et al., 2025). Similar patterns across Sub-Saharan Africa (Salimi, 2025) and Southeast Asia (UNESCO, 2024) indicate an emerging "AI divide," where opportunities for participation in AI-enabled education depend more on geography and resources than on ability (International Telecommunication Union, 2025; Srinuan et al., 2010).

Yet the root problem extends beyond infrastructure to a fundamental crisis in institutional informing. In the absence of coherent policies and institutional strategies, many Higher Education Institutions (HEIs) have failed to effectively inform their stakeholders. Faculty lack clear guidance on pedagogical expectations, students receive inconsistent messages about acceptable AI use, and administrators operate without evidence-based decision-making frameworks. This informing vacuum has led institutions to respond with fragmented, reactive measures, most commonly punitive AI detection tools deployed without adequate communication about rationale, limitations, or alternatives (Bjelobaba et al., 2025; Memon & Memon, 2025).

This institutional failure to inform creates compounding problems. Faculty, uninformed about effective AI pedagogy, default to policing rather than teaching. Students, receiving mixed or absent signals about expectations, rationally adopt strategies of non-disclosure (Perkins, 2023). Administrators, lacking systematic information about faculty needs or student experiences, perpetuate the policy vacuum. GenAI thus becomes an informing systems failure. Institutions cannot effectively communicate expectations, share knowledge, or coordinate action across stakeholder groups.

This fragmentation discloses a critical gap in existing scholarship and practice. Current approaches normally treat infrastructural, pedagogical, and ethical challenges as isolated problems to be solved independently. However, recent evidence suggests that these challenges operate as a self-reinforcing system (Alfaleh, 2026). Infrastructural exclusion limits pedagogical innovation, pedagogical misalignment fuels integrity crises, and institutional inaction prolongs ethical displacement. Interventions that address only one dimension, whether access, pedagogy, or policy, repeatedly fail because they ignore the causal interdependency that breeds inequity.

To address this gap, this paper proposes a *Systemic Framework for Equitable GenAI Assessment* that synthesizes and extends existing equity scholarship for application in resource-constrained HEIs. This

paper formalizes GenAI equity challenges as a causally interdependent system and shows why integrated institutional responses are structurally necessary.

Three research questions (RQ) guide this inquiry:

1. What are the theoretically necessary components of an equity-centered response to GenAI disruption in resource-constrained contexts?
2. How do infrastructural, pedagogical, and institutional challenges form a self-reinforcing system requiring integrated intervention?
3. How can assessment practices be reconceptualized to prioritize transparency, pedagogical validity, and institutional responsibility?

LITERATURE REVIEW

This review synthesizes literature to determine the theoretical foundations for a systemic equity framework. It identifies three interconnected challenges (addressing RQ1), theorizes their causal interdependence (RQ2), and examines the validity crisis in assessment that requires reinvention (RQ3).

Scholarship has coalesced around the flaws of AI detection tools, particularly for non-native English speakers (Liang et al., 2023), as well as the emergence of process-oriented assessment models (Mollick & Mollick, 2023). However, this conversation remains largely situated within a Global North perspective, which highlights technical and pedagogical solutions in isolation from the structural inequities that define resource-constrained environments. This disparity has yielded a literature that is strong at diagnosing discrete problems but weak at providing integrated models for systemic change. This review bridges that research gap by weaving the literature into three core and interconnected challenges for an equity-based approach.

THREE INTERCONNECTED CHALLENGES

The disruption caused by GenAI is not a series of isolated issues but a system of interdependent crises. The following are the challenges that Global South HEIs face.

Infrastructural exclusion

Recent studies across the Global South consistently reveal a widening gap in access to artificial intelligence. This inequality is vividly illustrated in the Philippines, a paradigmatic case, where a 2023 CHED report cited by Espartinez (2025b) found that 89% of urban universities have reliable internet for AI, compared to a mere 17% of rural institutions. This profound urban-rural divide is not an isolated phenomenon but a recurring pattern, with similar trends documented in Indonesia by Achruh et al. (2024), in Kenya by Wainaina and Sun (2025), in Peru by Acosta-Enriquez et al. (2024), and in South Africa by Mwansa et al. (2025). Critically, this infrastructural exclusion is multidimensional. It extends beyond basic connectivity to encompass a "device quality" gap between shared, outdated equipment and personal laptops, as well as the prohibitive cost of mobile data versus unlimited institutional WiFi. Compounding these issues is a fundamental linguistic incompatibility. As Liang et al. (2023) confirmed, AI tools trained predominantly on English corpora systematically marginalize non-native speakers. All these barriers create an epistemic injustice (Dei, 2011; Omodan, 2023), where systemic infrastructure deficits determine and limit access to modern education and knowledge generation.

Pedagogical misalignment

Exposure of students to GenAI has caused a fundamental flaw in how we assess student learning. When a student can use AI to produce an excellent essay or solve a problem, the traditional assignment no longer measures what matters. We can no longer be certain whether a piece of work reflects a student's own writing skills, critical thinking, or understanding of the subject (Bjelobaba et al., 2025). This challenge poses a collapse in the logic of the assessment process.

What can be done to resolve this validity crisis? Some HEIs are moving away from grading polished final assignments toward assessing the deeper, more valuable skills required in an AI-driven world. This involves evaluating a student's ability to engage in AI-human interaction by refining AI-generated drafts through iterative processes and collaborating with AI tools in an ethical and intelligent manner (Mollick & Mollick, 2023). But this shift is exceptionally difficult to achieve in resource-constrained environments. For educators who are already overburdened, redesigning courses and assessments can be daunting. Consequently, the educational system in these contexts remains trapped, fundamentally misaligned with the new technological reality and failing to prepare students for it (Espartinez, 2025b).

Ethical displacement

Institutional failure to establish GenAI policies creates a vacuum of authority (North, 1990; Scott, 2013), leading to *ethical displacement*, the transfer of ethical decision-making to individuals lacking the resources or authority to manage it. With only 23% of faculty having institutional guidelines (EDUCAUSE, 2024), a policy vacuum exists, forcing each instructor to devise their own rules, creating a fragmented, inconsistent landscape of course-level policies (Weber-Wulff et al., 2023). Consequently, 58% of students report uncertainty about what constitutes cheating (Eaton, 2021) and rationally adopt strategies such as strategic non-disclosure to avoid punishment (Perkins, 2023). Ethical displacement is a significant contributor to dysfunction, exacerbating infrastructural and pedagogical challenges into systemic inequities.

An Informing Science Lens on Institutional Failure

These three challenges can be understood through an informing science framework as distinct but related informing failures. Cohen (2009) defines informing science as providing clients with information in a form, format, and schedule that maximizes its effectiveness. Applying this lens reveals that: (1) *infrastructural exclusion* creates informing access barriers – students cannot receive or act on pedagogical guidance requiring tools they cannot access; (2) *pedagogical misalignment* reflects informing content failures – faculty lack the information needed to design valid assessments in the AI era; and (3) e*thical displacement* occurs when there is no informing system in place. No authoritative source provides consistent, actionable guidance across the institution. This informing perspective explains why fragmented interventions fail: they address information delivery in one domain while leaving systemic informing breakdowns unresolved in others.

The Failure of Isolated Interventions

These challenges are tightly interlinked, and none can be solved in isolation. *Infrastructural exclusion* determines who can participate, *pedagogical misalignment* erodes the value of teaching, and *ethical displacement* leaves no one clearly responsible. They mutually reinforce inequality. These predictable breakdowns can be systematically mapped by aligning each core challenge with its dominant theoretical lens and its characteristic failure mode. Table 1 demonstrates why single-lens interventions consistently fail when applied in isolation.

Theorizing the Causal Mechanisms of Systemic Interdependence

The failure modes documented in Table 1 are theoretically predicted outcomes of specific, self-reinforcing causal mechanisms. I formalize this interdependence through three mechanisms adapted from established theory: the *Pedagogical Coherence Constraint*, building on Messick's (1989) construct validity framework, the *Institutional Legitimacy Spiral*, extending Scott's (2013) institutional theory, and the *Resource Allocation Trap* (applying David's (2007) path dependency to educational contexts). This section explains how these mechanisms operate to generate the systematic failures observed across resource-constrained institutions.

Table 1. Why single-lens approaches fail

Core challenge	Theoretical lens	Key insight	Failure when applied alone
Infrastructural Exclusion	Digital Equity Theory (Warschauer, 2004); Critical Pedagogy (Freire, 1968)	Equity requires device quality, AI literacy, and linguistic compatibility.	Providing access without pedagogical guidance yields no learning gains. Privileged students exploit AI, widening gaps.
Pedagogical Misalignment	Assessment-for-Learning Theory (Black et al., 2006); Critical Pedagogy (Freire, 1968)	Authentic assessment requires process-oriented evaluation of thinking and metacognition.	Redesigning assessments for an AI-world is counterproductive if we have not first ensured all students have equitable access and training. This makes innovation a new inequity.
Ethical Displacement	Institutional Theory (North, 1990; Scott, 2013)	Governance structures determine where accountability resides and how norms are enforced.	Creating policies without updating pedagogy or building capacity leads to compliance theater and pedagogical balkanization.

Note: This table shows that isolated interventions create cascading failures, as a well-intentioned solution in one area generates compounding problems in others.

Mechanism 1: The pedagogical coherence constraint

This mechanism traps institutions in pedagogical fixity through two pathways: (a) *validity erosion*, GenAI renders traditional assessments invalid regardless of access; and (b) *fairness constraint*: Unequal AI access makes pedagogical innovations requiring AI collaboration structurally unfair. Consider a typical case: an instructor who redesigns an assessment to require AI-supported drafting inadvertently disadvantages students with intermittent connectivity, rendering the innovation pedagogically invalid despite its conceptual soundness.

Mechanism 2: The institutional legitimacy spiral

Without formal governance, pedagogical innovators lack institutional backing (Scott, 2013), making them vulnerable to criticism. This triggers a predictable pattern (Bikhchandani et al., 1992), as faculty rationally avoid innovation by observing peers' inaction. Administrators interpret this conservatism as a lack of demand for policy, justifying continued institutional inaction. Meanwhile, investing in AI detectors is a costly distraction – surveillance masquerading as a solution, an expensive distraction that solves nothing. To illustrate: when a faculty member pilots transparent AI-use documentation without institutional backing, peer skepticism and administrative silence discourage further experimentation, reinforcing collective inaction.

Mechanism 3: The resource allocation trap

A pedagogical vacuum creates a crisis of integrity, prompting schools to invest in AI detection. This creates a costly path dependency (David, 1985), diverting limited resources from structural solutions (such as access and training) to surveillance. As detection tools prove unreliable, institutions exhibit escalating commitment (Staw, 1976), pouring more capital into a failing technological solution rather than addressing the root cause. A typical scenario: an institution allocating scarce funds to AI-detection software after integrity concerns arise, leaving no remaining resources for access support or faculty training, thereby reproducing the original inequities.

These mechanisms do not operate abstractly; they are activated by common institutional responses and generate predictable systemic failures. Table 2 maps these isolated interventions to the specific mechanisms they trigger and the resulting failure modes.

Table 2. Failure modes of isolated interventions

Isolated intervention	Activated mechanism	Resulting systemic failure
Infrastructure without pedagogy	Mechanism 1	Underutilized resources; no guidance for meaningful use
Pedagogy without infrastructure	Mechanism 1	Innovations that formally disadvantage under-resourced students
Policy without capacity	Mechanism 2	Policies ignored due to lack of training/resources
Detection without alternatives	Mechanism 3	Resources permanently diverted from structural solutions

Note: This mechanistic analysis demonstrates that the call for simultaneous intervention is structurally necessary, not merely aspirational.

An Integrated Informing Science Response to GenAI Equity

The distinct challenges of pedagogy, equity, and institutional change have converged into a synergistic crisis under the pressure of GenAI. In this new reality, our established theoretical traditions, while individually vital, are rendered insufficient in isolation. Critical pedagogy (Freire, 1968) provides the normative foundation for equitable education, while digital equity theory (Warschauer, 2004) establishes technological access as a fundamental precondition, and institutional theory (Scott, 2013) explains the organizational mechanisms required to enact change.

However, no single theoretical lens adequately addresses the systemic nature of GenAI disruption in resource-constrained contexts. The framework synthesizes critical pedagogy, digital equity theory, and institutional theory to explain how infrastructural, pedagogical, and ethical challenges form a self-reinforcing system that requires a coordinated response. This framework diverges fundamentally from existing "integrated" or "holistic" models, which typically assemble multiple dimensions into descriptive checklists without explaining their interrelationships. Unlike these approaches, this framework specifies causal mechanisms that explain why isolated interventions reliably fail. Its core contribution is to theorize interdependence not as a set of parallel requirements but as structurally generative, producing predictable failure modes when any single principle is neglected. This transforms integration from an aspirational ideal into a testable institutional necessity, enabling practitioners to anticipate which incomplete implementations will fail and why.

However, a crucial epistemological caveat applies: the framework is derived from documented patterns through abductive reasoning rather than validated against independent evidence. Its consistency with existing literature shows plausibility, not proof. The framework's validation depends on generating novel, falsifiable predictions about implementation contexts beyond the synthesis corpus, specifically, whether integrated interventions produce systematically superior equity outcomes compared to fragmented approaches in prospective studies. Until such validation occurs, this remains a theoretically grounded hypothesis rather than an empirically established model: a rigorous conceptual synthesis that awaits empirical testing while offering provisional guidance for practice.

METHODOLOGY

This study employs a *systematic literature synthesis* to develop the *Systemic Framework for Equitable GenAI Assessment*. The methodology was chosen for its capacity to integrate diverse theoretical and empirical scholarships into a coherent conceptual model that clarifies systemic relationships (Xiao et al., 2022). Philippine higher education contexts are used as paradigmatic, illustrative cases to give tangible form to abstract theoretical dynamics, making systemic inequities more concrete.

Research Design and Rationale

This is a conceptual study that builds a theoretical framework through systematic synthesis. The rationale for this approach is that the fragmented nature of the GenAI crisis demands an integrated model to reveal its systemic logic. From an informing science perspective (Cohen, 2009), this study examines not only what information institutions need about GenAI integration but also *how* informing systems must be structured to effectively deliver that information across multiple stakeholder groups with different needs, contexts, and decision-making authority.

The framework is empirically illustrated rather than validated by data from my previous research in Philippine higher education (Espartinez, 2025a, 2025b). I employ this context as a strategic 'paradigmatic case'; its intense concentration of structural inequities (from infrastructure gaps to colonial legacies) acts as a prism, making theoretical dynamics such as second-level digital divides (Hargittai, 2002) starkly visible. This methodological choice ensures the model remains generalizable while being concretely grounded.

Literature Search and Selection

A dual-phase search strategy addressed a fundamental challenge: pre-2022 literature is essential for conceptual grounding but cannot mention 'GenAI' or 'ChatGPT.' A PRISMA flow diagram documenting the complete search and selection process is provided in the Appendix (Figure A1).

Phase A: Systematic search for recent evidence (2022-2025)

A structured Boolean search across four databases (Scopus, Web of Science, ERIC, Google Scholar) for literature published January 2022–May 2024 used the search string: ("generative AI" OR "ChatGPT" OR "large language model") AND ("assessment" OR "evaluation") AND ("higher education" OR "university") AND ("equity" OR "fairness" OR "ethics" OR "digital divide"). An initial yield of 312 records underwent title/abstract screening against predefined criteria (Table 3), followed by a full-text review applying quality thresholds: studies required a clear methodology and transparent limitations; theoretical papers needed explicit grounding and logical coherence; and policy documents required official status and implementation guidance. This yielded 38 sources.

Table 3. Inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Publication date	January 2022 - May 2024	Published before 2022
Document type	Peer-reviewed articles, conference proceedings, institutional reports, doctoral theses	Books, editorials, brief blog posts, book reviews
Language	English	Non-English
Context	Focus on higher education	Primary/secondary education, corporate training
Content	Substantively addresses intersection of GenAI, assessment, AND equity/access concerns	Focuses solely on technical AI development without educational application
Quality	Displays methodological rigor or theoretical depth appropriate to document type	Opinion pieces without evidence, unsubstantiated claims

Note: These criteria were applied during title/abstract screening (312 records) and during the full-text review stage. For conceptual synthesis, "quality" emphasizes theoretical depth and methodological transparency, which are appropriate to the document type, rather than solely empirical rigor. The publication date criterion (January 2022–May 2024) applies only to Phase A systematic search; Phase B theoretical sampling included earlier foundational works.

Phase B: Theoretical sampling for foundational frameworks (pre-2022)

Following systematic literature synthesis principles, iterative searches identified foundational frameworks through backward citation chasing of key sources, forward citation tracking, targeted author

searches, and searches specific to the Philippines. This added nine sources, achieving conceptual saturation, as verified by the fact that five additional candidate sources (tested but not included) yielded no novel theoretical insights regarding the three core challenges, their relationships, or their manifestations across contexts.

The final analytical corpus consisted of 47 sources (38 recent + 9 foundational). An additional six pre-2022 supplementary works were identified through theoretical sampling to provide methodological and contextual support; these are documented in the Appendix but were not part of the core analytical synthesis.

The analysis employed iterative thematic synthesis guided by critical pedagogy (Freire, 1968), digital equity theory (Warschauer, 2004), and institutional theory (Scott, 2013). This involved three cycles of engagement: (a) *Initial Reading:* identified provisional themes across the corpus; (b) *Constant Comparison:* refined themes into the three core challenges (*Infrastructural Exclusion, Pedagogical Misalignment,* and *Ethical Displacement*) by comparing patterns across contexts and document types; and (c) *Systemic Mapping:* theorized relationships between challenges, identifying the three causal mechanisms that explain their interdependence.

To ensure analytical rigor, a confirmatory binary coding of the 38 recent sources was conducted for the presence/absence of the three challenges. Inter-rater reliability on a random 32% sample (n=12) showed substantial agreement (Cohen's $\kappa = 0.79$).

POSITIONALITY AND LIMITATIONS

The author's positionality as an educator with professional experience in both Philippine and the United States higher education institutions directly shapes this research. This bicultural perspective fosters a critical awareness of the infrastructural and pedagogical assumptions often embedded in Global North-centric AI-in-education literature. It has specifically sensitized the analysis to the fact that recommendations for GenAI integration frequently presume universal, high-bandwidth access and robust institutional support. These conditions are systematically absent in many resource-constrained contexts.

The framework's primary limitation stems from its conceptual nature; its practical efficacy and transformative potential must be validated through future implementation studies, as proposed in the Conclusion. Additional limitations include a potential selection bias, as the reliance on English-language sources may underrepresent regionally specific scholarship published in other languages. Finally, the framework's applicability in severely under-resourced contexts, which may lack the minimal organizational capacity required to initiate any coordinated response, remains a critical area for further testing and adaptation.

THE SYSTEMIC FRAMEWORK: ARCHITECTURE AND PRINCIPLES

This section presents the *Systemic Framework for Equitable GenAI Assessment,* which integrates established equity theories into a coherent model for addressing GenAI's systemic challenges. Developed through the systematic literature synthesis detailed in the previous chapter, this conceptual model offers a proactive, systemic response to the tripartite crisis of infrastructural exclusion, pedagogical misalignment, and ethical displacement.

I use 'systemic' to emphasize three defining features: (1) *interdependence*: the three challenges mutually reinforce one another; (2) *feedback dynamics*: deficits in one domain actively generate failures in others; and (3) *integrated intervention*: solutions must be advanced simultaneously, not sequentially, to interrupt self-reinforcing cycles. The core insight is that these challenges do not operate in isolation but form a dynamic, self-reinforcing system requiring an integrated, principled response rather than fragmented interventions. Figure 1 visualizes this systemic interdependence and the interlocking principles required to interrupt it.

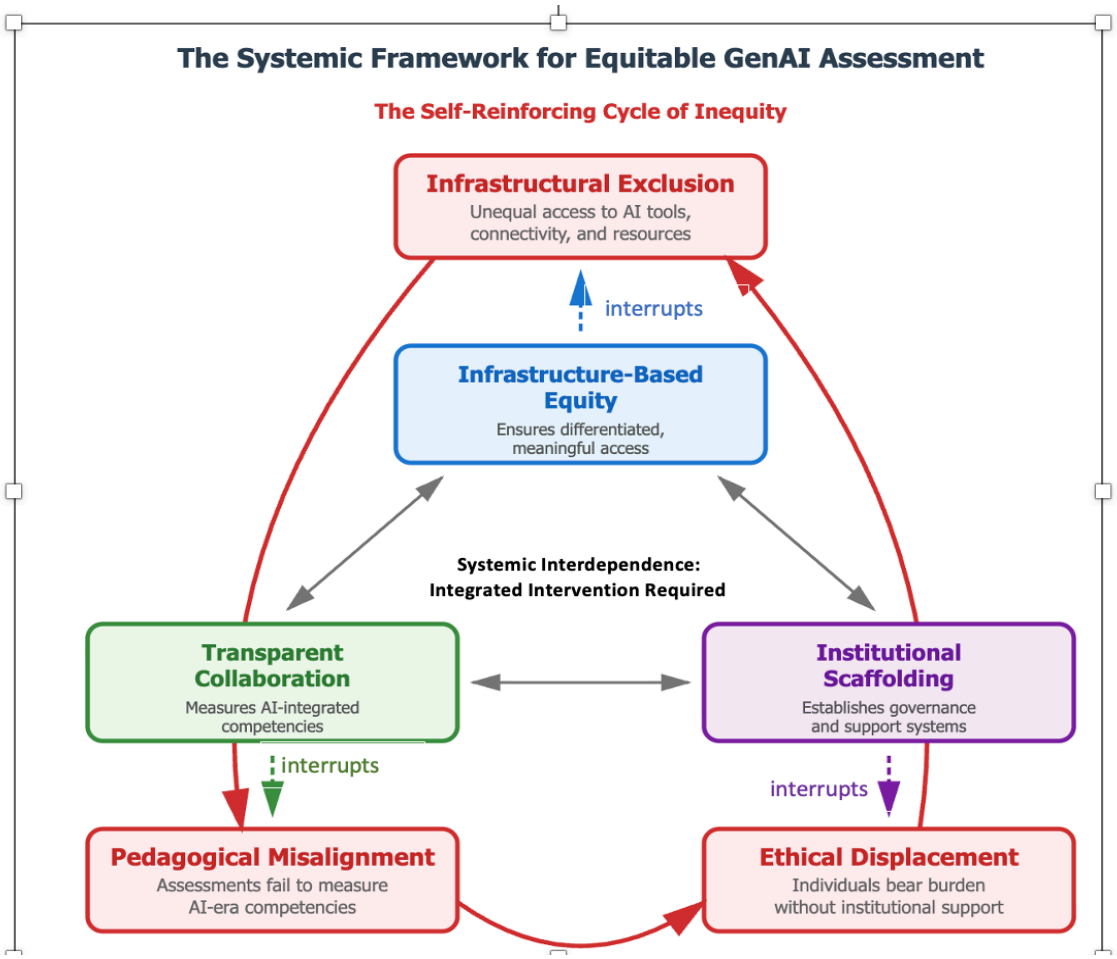

Figure 1. The systemic framework for equitable GenAI assessment

Note: Figure 1 visualizes the self-reinforcing cycle of core challenges (outer ring: *Infrastructural Exclusion, Pedagogical Misalignment, Ethical Displacement*) and the necessary, interlocking institutional responses (inner triangle: *Infrastructure-Based Equity, Transparent Collaboration, Institutional Scaffolding)*. The bidirectional arrows signify systemic interdependence, in which each principle both enables and is enabled by the others; isolated intervention in any single area is insufficient to interrupt the self-reinforcing mechanisms. The framework positions integrated intervention as structurally necessary rather than merely aspirational.

This interdependence explains why existing interventions fail: they address symptoms without recognizing the causal structure. A detection tool doesn't resolve pedagogical misalignment; an optional training workshop doesn't shift institutional accountability; a device lending program alone doesn't enable meaningful AI integration if assessments remain unchanged and policies are absent.

The Core Insight: Systemic Interdependence

The critical conceptual advance of this framework is the recognition that the three documented challenges form a causal system rather than a collection of co-occurring problems. This systemic interdependence means that each challenge intensifies the others, creating a cycle that perpetuates and deepens inequity. This is how this cycle operates in practice:

- *Without infrastructure equity*, pedagogical innovation becomes impossible. Faculty cannot redesign assessments requiring AI tools if students lack reliable access. This stalled innovation intensifies pressure to police AI use instead, fueling ethical displacement.

- *Without pedagogical alignment*, traditional assessments no longer work; students can use AI to bypass them. Institutions default to detection and punishment. This diverts scarce resources from infrastructure development to the purchase of surveillance technologies, worsening the access gap.
- *Without institutional scaffolding*, faculty lack the policy backing, training, and support necessary to take risks with pedagogical innovation, and institutional commitment to equitable access remains weak. This lack of support perpetuates both pedagogical misalignment and infrastructural neglect.

This systemic understanding, formalized through three causal mechanisms, explains why prevailing fragmented interventions, such as purchasing detection tools or offering one-off workshops, are inherently flawed and structurally destined to fail. They address symptoms without recognizing the crisis's causal structure. The framework proposed here responds with three interlocking principles that must be advanced simultaneously to interrupt these self-reinforcing mechanisms.

The Three Interlocking Principles

The framework addresses the three challenges through three interlocking principles. Each principle directly addresses one core challenge while being structurally dependent on the others. Table 4 operationalizes these principles through concrete institutional strategies.

Table 4. Operationalizing the systemic framework

Principle	Core mandate	Illustrative strategies
Infrastructure-Based Equity	Guarantee differentiated access as a prerequisite for pedagogical participation	• Device lending and connectivity subsidies • Offline-capable tools and multilingual resources • Dedicated campus access spaces with support
Transparent Collaboration	Assess AI-integrated competencies through process-oriented evaluation	• Tiered AI use policies with clear expectations • Documentation of AI interaction and critical revision • Process portfolios and oral defenses of work
Institutional Scaffolding	Establish policies, training, and resources that make innovation feasible	• Participatory policy development processes • Sustained faculty development and support roles • Incentives and recognition for pedagogical innovation

Note: These strategies must be adapted to institutional contexts and implemented in phases, depending on resource availability. The framework's efficacy depends on the coordinated implementation of all three principles, rather than isolated action in any single domain. Implementation guidance for varying resource contexts will be developed through future validation studies.

The principles are not intended for selective implementation, but rather for an integrated system. The framework's architecture reflects this interdependence:

- *Infrastructure-Based Equity* (addressing *Infrastructural Exclusion*) provides the material prerequisites that make transparent collaboration pedagogically coherent rather than structurally unfair.
- *Transparent Collaboration* (addressing *Pedagogical Misalignment*) reconceptualizes assessment to measure AI-integrated competencies, justifying infrastructure investment as an educational endeavor rather than merely a technological one.

- *Institutional Scaffolding* (addressing *Ethical Displacement*) establishes the governance structures, training programs, and resource allocation that make both equity and innovation institutionally viable**,** rather than relying on individual heroism.

Infrastructure-based equity: the ethic of justice

This principle enacts distributive justice (Rawls, 1971) by ensuring all students enjoy the material conditions necessary for pedagogical participation. As previously discussed, infrastructural exclusion operates across multiple dimensions: device quality, data costs, tool access, and linguistic compatibility.

- Core mandate: Move beyond connectivity to guarantee differentiated, meaningful access
- Illustrative strategies (see Table 4)
- Device-lending programs scaled to actual demand
- Data cost subsidies for educational AI platforms
- Offline-capable AI tools for intermittent connectivity
- Multilingual resources honoring students' linguistic repertoires

This principle interrupts Mechanism 1 (Pedagogical Coherence Constraint) by resolving the fairness constraint: faculty can legitimately require AI collaboration because infrastructure ensures equitable access.

Transparent collaboration: The ethic of integrity

This principle repositions GenAI from an integrity threat to a documented part of learning, responding to the construct validity crisis. When AI can generate competent essays, traditional assessments no longer measure target constructs (Messick, 1989).

- Core mandate: assess AI-integrated competencies through process-oriented evaluation
- Illustrative strategies (see Table 4)
- AI uses appendices documenting prompts, outputs, and revisions
- Oral defenses probing understanding beyond the final products
- Process portfolios showcasing iteration and critical judgment
- Rubrics rewarding metacognition, not penalizing AI use

This principle interrupts Mechanism 1 by resolving the validity erosion pathway: assessments measure authentic, AI-era competencies rather than pre-AI constructs.

Institutional scaffolding: The ethic of responsibility

This principle fills the accountability void, relocating ethical decision-making from individuals to institutional structures. As Scott (2013) theorizes, formal governance provides the regulative legitimacy necessary for coordinated action.

- Core mandate: establish policies, training, and resources that make innovation feasible, not merely permitted
- Illustrative strategies (see Table 4)
- Participatory policy development (avoiding hierarchical imposition)
- Sustained faculty development through communities of practice
- Dedicated support roles (e.g., AI pedagogy coordinators)
- Resource allocation enabling experimentation

This principle interrupts Mechanism 2 (Institutional Legitimacy Spiral) by providing the formal backing that breaks informational cascades, making pedagogical innovation safe rather than professionally risky.

THE FRAMEWORK AS AN INTEGRATED SYSTEM

The framework's potential lies not in the individual principles but in their systemic integration. The principles are a synergistic system where each enables and reinforces the others through specific mechanisms:

- *Infrastructure enables pedagogy (interrupting Mechanism 1): Transparent Collaboration* is pedagogically incoherent without *Infrastructure-Based Equity*, as students cannot be expected to document AI use that they cannot access. By ensuring equitable access first, institutions resolve the *Pedagogical Coherence Constraint*, making it pedagogically legitimate for faculty to redesign assessments requiring AI collaboration.
- *Pedagogy justifies infrastructure (interrupting Mechanism 3): Infrastructure-Based Equity* is economically and politically unsustainable without *Transparent Collaboration*, as investments in access require pedagogical justification. By demonstrating that AI collaboration is assessable and valuable (not merely circumvention), institutions can justify infrastructure investment as educational rather than merely technological, thereby preventing the *Resource Allocation Trap,* in which detection spending crowds out enabling investment.
- *Institutions enable both (interrupting Mechanism 2):* Both *Infrastructure-Based Equity* and *Transparent Collaboration* are practically meaningless without *Institutional Scaffolding*. Policies and training must be directed toward a specific, pedagogy-centered vision of AI integration. By providing clear policies backing faculty innovation and resources that make it feasible, institutions resolve the *Institutional Legitimacy Spiral*, making it safe for faculty to experiment.

The framework's call for simultaneity must be correctly interpreted. It refers to an integrated strategic commitment, not necessarily concurrent, full-scale execution. In resource-constrained contexts, it is often impractical to launch massive infrastructure, pedagogy, and policy initiatives all at once. However, initiatives in one domain must be consciously designed from the start to enable and motivate progress in the others. A phased rollout is not only possible but also necessary; however, each phase must incorporate elements of all three principles to avoid the generative failures that can occur with isolated interventions. The succeeding section details how to maintain this strategic integration through a feasible, phased implementation.

The interdependencies are causal, not merely conceptual**.** An institution that mandates transparency without ensuring equity will penalize disadvantaged students (Mechanism 1 operates). An institution that builds infrastructure without providing pedagogical scaffolding will see no innovation. An institution that creates policies without fostering faculty capacity will see them ignored (Mechanism 2 operates). The framework's power, therefore, lies in its insistence on simultaneous advancement across all three dimensions to interrupt the self-reinforcing mechanisms.

PHASED IMPLEMENTATION IN RESOURCE-CONSTRAINED CONTEXTS

Building on the concept of simultaneity as integrated strategic commitment, this section provides a practical roadmap for resource-constrained institutions. The core requirement is that action in one domain must be consciously designed to enable and motivate progress in others from the very beginning, even if resources for large-scale implementation are phased over time. The framework rejects isolated interventions that ignore systemic interdependence but are fully accommodated and, in fact, requires a strategically sequenced approach. For resource-constrained institutions, this means that action in one domain must be consciously designed to enable and motivate progress in others from the very beginning, even if resources for large-scale implementation are phased over time. The framework rejects isolated interventions that ignore systemic interdependence (e.g., investing only in detection software), but it fully accommodates and, in fact, requires a strategically sequenced approach.

The following principles guide a feasible, phased implementation that maintains systemic integrity:

- *Guiding Principle 1: Foundational Scaffolding Enables Coordinated Action.* Initiating the process by developing *Institutional Scaffolding* (e.g., a participatory task force to create a tiered AI use policy) is a low-cost, high-impact first step. This creates the essential legitimacy, shared vision, and strategic framework that justifies subsequent investments in infrastructure and guides pedagogical innovation, preventing fragmented and contradictory efforts. Without this foundation, infrastructure investments lack direction, and pedagogical innovations lack institutional backing.

- *Guiding Principle 2: Pilots Integrate All Three Principles at Manageable Scale.* Rather than attempting institution-wide transformation, resources should be directed toward integrated pilot programs**.** For example, an institution can:

  - Select 2-3 high-enrollment courses for a coordinated intervention
  - Provide targeted *Infrastructure-Based Equity* support (e.g., temporary device lending, data subsidies) for students in those courses
  - Simultaneously support instructors in redesigning assessments using *Transparent Collaboration* principles
  - Back this effort with the newly developed *Institutional Scaffolding* (e.g., a clear pilot policy, micro-grants, designated support)

This approach tests the framework's integrated logic at a small scale, generates evidence of success, and builds momentum for broader investment. Critically, even at the pilot scale, all three principles are present**.** The pilot is not "infrastructure only" or "pedagogy only" but shows their interdependence.

- *Guiding Principle 3: Strategic Sequencing Builds a Virtuous Cycle.* A feasible, multi-year roadmap respects resource constraints while maintaining strategic coherence (see Table 5).

This phased approach shows that the *Systemic Framework* is not a rigid, all-or-nothing prescription but a dynamic guide for strategic evolution. It acknowledges that while full execution may be phased, strategic planning and the enabling conditions for all three principles must be in place from the outset to avoid the generative failures documented in Table 1. Each step is consciously designed to create the conditions for the next to succeed, ensuring that progress in one dimension does not outpace the others to the point of systemic failure (see Figure 1).

Table 5. Three-year phased implementation roadmap

Phase	Focus	Key Actions
Year 1: Foundation & Pilot	Establish legitimacy & test integration	Form task force; develop tiered policy; launch 2-3 integrated pilots.
Year 2: Expand & Build Capacity	Scale success & develop faculty	Scale pilots; formalize faculty development programs; refine support.
Year 3: Scale & Institutionalize	Secure resources & embed change	Invest in scaled infrastructure; institutionalize support roles; refine policies.

Note: This roadmap shows how the framework's call for simultaneity can be operationalized as a strategic, phased commitment. While the specific timing and actions can be adapted, the core logic must be preserved: each phase consciously integrates elements of all three principles. Initiatives in one domain are designed from the outset to enable progress in the others, thereby preventing the cascading failures that can occur with isolated interventions (see Table 2). The goal is not concurrent, full-scale execution, but a coordinated evolution that builds a virtuous cycle of capacity and equity.

DISCUSSION

This study argues that the challenges of GenAI in education are not discrete problems but rather interconnected dimensions of a systemic crisis. The *Systemic Framework* offers a principled and integrated response to this crisis. This discussion interprets the framework's significance, engages critically with the broader literature to refine its claims, establishes its boundaries and falsifiability, and reflects on its theoretical and practical contributions.

THEORETICAL CONTRIBUTIONS: FORMALIZING INTERDEPENDENCE

The framework's primary theoretical contribution lies in formalizing the structural interdependence among equity, pedagogy, and governance challenges that existing scholarship has treated as separate domains. While prior work has documented infrastructural exclusion (Warschauer, 2004), pedagogical misalignment (Mollick & Mollick, 2023), and ethical displacement (Weber-Wulff et al., 2023) as distinct problems, this framework reconceptualizes them as interdependent informing system failures (Cohen, 2009), where breakdowns in one domain actively generate dysfunction in others.

Three levels of theoretical advancement

First, the framework generates novel predictions beyond the synthesis corpus. While Tables 1 and 2 synthesize known patterns, the framework predicts specific outcomes, such as institutions investing in AI detection without simultaneous pedagogical reform experiencing declining faculty morale and increased student-faculty conflict – a testable hypothesis not derivable from prior scholarship that treats detection as an isolated intervention.

Second, it formalizes causal relationships through three mechanisms adapted from established theory:

- The *Pedagogical Coherence Constraint* (construct validity theory) explains why infrastructure without pedagogy fails.
- The *Institutional Legitimacy Spiral* (institutional theory and information cascades) explains why pedagogy without policy fails.
- The *Resource Allocation Trap* (path dependency) explains why detection investments crowd out enabling investments.

These mechanisms propose testable causal pathways beyond descriptive synthesis. Critically, they remain hypotheses requiring empirical validation – their consistency with synthesis patterns is necessary but insufficient for proof.

Third, the framework reveals hidden prerequisites that existing theories overlook. *Digital equity theory* posits that access requires more than connectivity (Warschauer, 2004), yet it cannot explain why equity investments often fail to improve learning outcomes in GenAI contexts. The framework reveals that infrastructure becomes pedagogically meaningful only when assessment practices evolve (*Transparent Collaboration*) and institutional structures legitimize such evolution (*Institutional Scaffolding*). Neither tradition alone explains this dependency; their formal integration does.

Epistemological status and validation requirements

The framework's theoretical coherence does not constitute empirical proof. Three validation pathways are necessary:

- *Comparative prospective studies* testing whether integrated implementations outperform fragmented approaches in contexts beyond our synthesis.
- *Process tracing research* examining whether predicted mechanisms operate through observable indicators (faculty innovation rates, resource allocation patterns, equity outcomes).
- *Boundary condition research* identifying where predictions fail, thereby refining the scope.

Until validated, the framework should be treated as theoretically informed guidance rather than an empirically proven prescription. Its current value lies in: (a) synthesizing fragmented scholarship into coherent architecture, (b) generating falsifiable predictions for implementation research, (c) offering provisional guidance for practitioners, and (d) identifying conditions for invalidation. This positioning strikes a balance between epistemic humility and maintaining the framework's utility as a theoretically rigorous working hypothesis.

Engaging Counterevidence: Refining the Framework's Boundaries

Rigorous conceptual development requires examining evidence that appears to challenge the framework. Several studies document successful GenAI integration without the comprehensive investments that the framework emphasizes (Bond et al., 2025; Jin et al., 2025). Rather than invalidating the framework, careful analysis reveals how these cases clarify its scope and refine its claims, altering a potential weakness into evidence of its contextual sophistication.

Case Type 1: Well-resourced small-scale pilots

Studies in well-resourced, typically Global North universities have reported success with minimal intervention (Baron, 2024; Han et al., 2023). However, this approach is a luxury of privilege, reliant on conditions that are foundational in these contexts but systematically absent in the Global South: small class sizes, a homogeneous student body with universal high-speed access, faculty with ample time for pedagogical innovation, and robust, pre-existing institutional cultures of academic integrity.

Framework Refinement: These cases validate a key boundary condition. The framework is conditionally necessary**.** In contexts where infrastructure is already equitable and institutional cultures are robust, minimal intervention may be sufficient. The framework is most essential where its preconditions are most absent; where infrastructure is heterogeneous, policies are absent, and faculty lack support structures.

Case Type 2: Disciplinary exceptions

Research in engineering and lab-based disciplines displays the successful integration of AI using traditional hands-on projects and oral defenses that AI cannot complete (Wang et al., 2024). In these contexts, Pedagogical Misalignment is minimal due to inherently AI-resistant assessment traditions.

Framework Refinement: This suggests differential weighting across disciplines**.** The framework's three principles are not equally urgent for all fields. In text-heavy disciplines (Humanities, Social Sciences), all principles are critical. In practice-based disciplines (Sciences, Arts), *infrastructure-based equity* and *institutional scaffolding* remain important, but the urgency of *pedagogical misalignment* is reduced because existing assessment methods are already relatively AI-resistant.

Case Type 3: Institutional culture as a compensatory factor

Some institutions with strong cultures of trust and collaboration have navigated the integration of GenAI through organic, faculty-led dialogue, without relying on top-down mandates (Bond et al., 2025). This demonstrates that *informal cultural scaffolding*, such as encompassing shared norms, collaborative problem-solving, and mutual trust, can partially substitute for formal structures.

Framework Refinement: This clarifies the *institutional scaffolding* principle. Scaffolding can be achieved through either formal structure (policies, programs, resources), which are necessary in hierarchical or resource-constrained contexts, or cultural mechanisms that are sufficient in well-resourced, collegial contexts. In the Global South settings that motivate this study, formal scaffolding becomes necessary rather than optional because cultural mechanisms alone cannot compensate for material constraints and policy vacuums.

Critical Caveat: Notably, most studies reporting success with minimal intervention (Baron, 2024; Han et al., 2023) do not disaggregate outcomes by student access levels, leaving open the question of

whether such approaches inadvertently benefit already privileged populations while disadvantaging others, precisely the dynamic the framework aims to prevent.

Establishing Falsifiability and Scope

A conceptual framework achieves scholarly rigor not by being universally applicable, but by making falsifiable claims and specifying the boundary conditions within which it operates. The *Systemic Framework* presented here advances a core, testable hypothesis:

> In resource-constrained higher education contexts, integrating GenAI requires advancing infrastructure equity, pedagogical alignment, and institutional scaffolding in an interdependent manner. Addressing these challenges in isolation will trigger self-reinforcing failure mechanisms, leading to systematically worse equity outcomes.

The framework's core claim, that equitable GenAI integration in resource-constrained contexts requires interdependent advancement of all three principles, would be invalidated by demonstrations that:

- *Fragmented implementations succeed:* Institutions addressing only one principle achieve equity outcomes equivalent to integrated approaches (suggesting independence rather than interdependence).
- *Alternative sufficient conditions exist:* A single factor consistently predicts success regardless of framework principal implementation (suggesting the framework misidentifies necessary conditions).
- *Mechanisms fail to activate:* Predicted failure patterns (validity erosion, legitimacy spirals, resource traps) do not occur when principles are addressed in isolation.
- *Sequential approaches work:* Institutions successfully implement principles one-at-a-time without cascading failures.

Future validation studies should operationalize these conditions through comparative longitudinal research, process tracing of mechanism activation, and equity outcome measurement disaggregated by student access levels. Table 6 clarifies the framework's scope of applicability across different institutional contexts.

Table 6. Framework applicability across institutional contexts

Institutional context	Framework relevance	Rationale
Resource-constrained (target)	Essential	The preconditions for minimal intervention are absent; the three self-reinforcing challenges are fully active.
Moderate-resource	Highly relevant	Shifts from establishing basics to optimization, prevents the emergence of new inequities during scaling.
Well-resourced, high-capacity	Optional/ for refinement	The foundational equity and scaffolding may already be in place, reducing the necessity of integrated foundational action.
Severely under-resourced (no capacity)	Limited	Lacks the minimal organizational capacity required to initiate any coordinated, systemic response.

Note: This precise scoping makes the framework falsifiable, guides practitioners toward appropriate application, and clearly identifies the empirical work needed for future validation. It is a tool for transformation where the need is greatest, and the cycles of inequity are most entrenched.

Theoretical and Practical Contributions

Theoretical contributions

The framework's originality lies not in developing entirely new theories but in its *integrated synthesis* of *critical pedagogy, digital equity theory,* and *institutional theory*, demonstrating their necessary interdependence in the face of GenAI disruption. It formalizes this interdependence through three causal mechanisms (*Pedagogical Coherence Constraint, Institutional Legitimacy Spiral, Resource Allocation Trap)* that explain why addressing challenges in isolation produces worse outcomes than integrated approaches.

The framework provides a prototype for context-sensitive educational technology theory, grounded in the material realities of the Global South, and challenges the field's tendency toward universalist models that presume high-resource settings. By centering resource constraints as design parameters rather than implementation barriers, it offers a model for how educational technology scholarship can address the structural conditions that shape adoption.

Ultimately, the framework advances ethical displacement as a theoretical construct that extends institutional theory to GenAI contexts. This construct offers a lens for understanding how policy vacuums create systematic accountability voids that individuals cannot fill through personal initiative, a structural problem that requires institutional solutions. Its validation through implementation studies will test whether this construct has explanatory power beyond the patterns that motivated its development.

Practical contributions

Practically, the framework offers a pathway from reactive surveillance to proactive educational justice. Its principle-based (rather than prescription-based) approach enables local adaptation while maintaining conceptual coherence. The integration of implementation strategies directly within the framework's logic addresses faculty capacity through scaffolding, resource constraints through phased equity investments, and policy inertia through participatory development, making it immediately applicable rather than merely aspirational for institutions with constrained resources.

Applied Psychology insights further reinforce the framework's design. This approach aligns with principles that enhance institutional informing, such as reducing cognitive load through scaffolding (Sweller, 1988), which can be achieved through tiered AI-use policies and template resources, thereby lowering barriers to faculty innovation. Participatory policy development increases perceived autonomy and intrinsic motivation (Deci & Ryan, 1985) while communities of practice provide social proof for pedagogical change. These psychologically-informed strategies operationalize the framework's principles and help explain why integrated, participatory approaches are more effective than top-down mandates.

The Paradigmatic Shift: From Deficit to Empowerment

The collective impact of the Systemic Framework is a fundamental paradigmatic shift**.** It moves institutions from a deficit model**,** focused on detecting violations, to an empowerment model centered on building capacity and fostering critical collaboration. This is a shift grounded in explicit ethical commitments: *from neglect to justice* in resource distribution (infrastructure-based equity), *from opacity to integrity* in learning processes (transparent collaboration), and *from abandonment to responsibility* in institutional support (institutional scaffolding)

These ethical commitments are not abstract aspirations but operationalized through concrete principles that institutions can enact. The framework thus repositions GenAI from a threat requiring policing to an opportunity for advancing educational justice, provided that institutions commit to simultaneous intervention across infrastructure, pedagogy, and governance.

CONCLUSION

This study shows that generative AI presents not merely a technological disruption but a systemic equity crisis for resource-constrained higher education. The Systemic Framework developed here offers a principled pathway to transform this threat into a catalyst for educational justice, providing conceptual architecture to guide institutions from reactive, fragmented responses toward proactive, systemic integration.

CORE CONTRIBUTIONS

This study makes three interconnected theoretical advances that address the research questions:

RQ1: Establishing Structural Necessity

Rather than cataloging "best practices," the framework identifies which interventions are structurally required to interrupt self-reinforcing failure cycles. The three components – infrastructure equity, pedagogical alignment, and institutional scaffolding – are theoretically necessary because isolated interventions trigger the generative failures documented in Tables 1 and 2. This shifts scholarship from listing components to theorizing their interdependence through formal causal mechanisms.

RQ2: Formalizing Systemic Interdependence

Three mechanisms – *Pedagogical Coherence Constraint, Institutional Legitimacy Spiral, Resource Allocation Trap* – explain specific pathways through which deficits compound across domains. Critically, interdependence operates bidirectionally: infrastructure enables pedagogy, but pedagogical validity also justifies infrastructure investment. This mutual constitution distinguishes systemic frameworks from additive models. The framework predicts that integrated implementation produces emergent properties. It is equity outcomes achievable only through simultaneous intervention, while partial implementations generate the cascading failures documented in Table 2.

RQ3: Reconceptualizing Assessment as Equity Practice

The framework reframes assessment reform as an equity imperative rather than merely a pedagogical technique. *Transparent Collaboration* addresses the construct validity crisis (Messick, 1989), while *Infrastructure-Based Equity* ensures validity-restoring innovations do not advantage privileged students. Assessment practices cannot be equity-neutral in the GenAI era; only their simultaneous transformation, guided by *Institutional Scaffolding*, achieves justice.

Collectively, these contributions show that equitable GenAI integration requires coordinated transformation across infrastructure, pedagogy, and governance. The framework provides a conceptual architecture for such transformation, operationalized through principles that resource-constrained institutions can adapt via the phased implementation approach.

FUTURE RESEARCH AGENDA

The framework's practical efficacy awaits validation through implementation. Future research should proceed along several trajectories:

Implementation studies

Longitudinal participatory action research tracking framework adoption across institutions with varying resource levels (2-3 academic years), measuring changes in faculty confidence, assessment redesign rates, and equity metrics (e.g., rural/urban performance gaps). Mixed methods should combine quantitative tracking (student performance disaggregated by access level, faculty adoption rates, resource allocation patterns) with qualitative documentation (faculty reflections, student experiences, administrative challenges) and process tracing of phased implementation.

Comparative validation studies

The framework's central hypothesis, that effective GenAI integration in resource-constrained contexts requires interdependent advancement of all three principles, can be tested through comparative research examining whether institutions addressing challenges in isolation show the predicted failure modes (Table 2), whether integrated implementations yield synergistic gains exceeding additive effects, and how cultural and structural factors (colonial legacies, linguistic diversity, organizational capacity) moderate implementation across Southeast Asia, Sub-Saharan Africa, and Latin America.

Equity impact analysis

Studies examining whether framework adoption measurably reduces performance gaps for rural, low-income, and indigenous students across access equity (tool availability/usage), performance equity (achievement gaps on AI-integrated assessments), retention equity (persistence rates), and literacy equity (AI competency development across demographics).

Disciplinary variation research

Given that STEM fields with AI-resistant assessments (lab work, hands-on projects) may require different principle weightings than humanities fields, research should examine how professional programs (nursing, education, engineering) and creative disciplines (arts, design) implement the framework differently.

Indigenous knowledge systems and epistemic justice

The framework's most significant limitation concerns indigenous knowledge systems and non-Western epistemologies. During the discussion of infrastructural exclusion, the framework fundamentally assumes Western institutional structures: written documentation (*Transparent Collaboration),* individual authorship, and university-centered governance (*Institutional Scaffolding).* Indigenous communities across the Philippines, Sub-Saharan Africa, and Latin America possess knowledge transmission practices, such as oral storytelling, communal ownership, and place-based learning, that may be incompatible with text-based, individualized assessment models (Dei, 2011).

This establishes a critical boundary, *the framework addresses equity within Western educational paradigms,* even in Global South contexts where those paradigms remain contested legacies of colonization. Achieving epistemic justice requires research that indigenous scholars and communities must lead, examining whether GenAI tools can serve indigenous educational goals (language revitalization, oral history preservation) without imposing Western assessment structures, whether concepts like 'prompt engineering' translate meaningfully to oral and relational knowledge transmission, and whether alternative governance models can center indigenous sovereignty in technology adoption decisions. This is not a framework extension, but it may require a fundamental reconceptualization. Participatory action research with indigenous communities is essential to determine whether adapted versions of these principles serve indigenous educational contexts or whether entirely different frameworks are needed.

Implications and the Path Forward

The urgency of adopting a systemic approach cannot be overstated. Without it, GenAI will establish a new, digital coloniality in global higher education, where geography and resources, rather than potential, dictate educational futures. The default path of detection and surveillance offers only an illusion of control, one that erodes trust and forecloses the very pedagogical possibilities that make GenAI transformative.

The Systemic Framework provides an alternative pathway. Drawing on the principles of informing science (Cohen, 2009), it reconceptualizes GenAI integration as an institutional informing challenge that requires coordinated communication, knowledge sharing, and decision support across stake-

holder groups. It is more than a set of guidelines; it is a blueprint for redesigning institutional informing systems to ensure all stakeholders – faculty, students, administrators – receive the information they need, when they need it, in formats they can act on.

The question is no longer if AI will reshape education, but who it will empower. This framework provides the theoretical and practical means to ensure the answer is: all students. Its validation awaits the empirical work outlined above, but its necessity is established by the stark reality of the self-reinforcing cycles it seeks to break.

The work of implementation begins not with a massive budget, but with institutional courage, the courage to reject fragmented, symptomatic fixes and commit to the integrated, principled evolution of our educational systems. Architecture for a more equitable future now exists; the responsibility to build it is ours.

APPENDIX
LITERATURE CORPUS AND SEARCH STRATEGY

These supplementary materials document the 47-source corpus analyzed through systematic literature synthesis. The corpus employs a dual-strategy approach to address a fundamental challenge in GenAI education research: pre-2022 literature cannot mention "ChatGPT" or "generative AI" (the terms didn't exist), yet pre-2022 theoretical frameworks are essential for conceptual grounding.

PART 1: FOUNDATIONAL THEORETICAL SOURCES (PRE-2022)

This section documents the 15 pre-2022 sources identified through theoretical sampling (Phase B). These are subdivided to enhance transparency (Figure A1).

Core foundational frameworks (9 sources)

These are the primary theoretical pillars directly synthesized into the Systemic Framework, as referenced in the main text.

Supplementary Foundational and Methodological Works (6 sources)

These additional pre-2022 sources provided essential contextual depth, methodological guidance, or supporting theoretical perspectives for the literature synthesis.

Core Foundational Frameworks (9 Sources)

1. Freire, P. (2018). *Pedagogy of the oppressed* (50th anniversary ed.). Bloomsbury Publishing. (Original work published 1968)
   Type: Theoretical | Geographic Focus: Multi-regional (Global South origins) | Challenges: ED, IE (foundational) | Search Phase: Theoretical Sampling
2. Hargittai, E. (2002). Second-level digital divide: Differences in people's online skills. *First Monday*, 7(4). https://doi.org/10.5210/fm.v7i4.942
   Type: Theoretical | Geographic Focus: Multi-regional | Challenges: IE | Search Phase: Theoretical Sampling
3. Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. MIT Press.
   Type: Theoretical | Geographic Focus: Multi-regional | Challenges: IE | Search Phase: Theoretical Sampling
4. Abdi, A. A., Puplampu, K. P., & Dei, G. J. S. (2006). *African education and globalization: Critical perspectives*. Lexington Books.
   Type: Theoretical | Geographic Focus: Other Global South (Africa) | Challenges: IE, ED | Search Phase: Theoretical Sampling

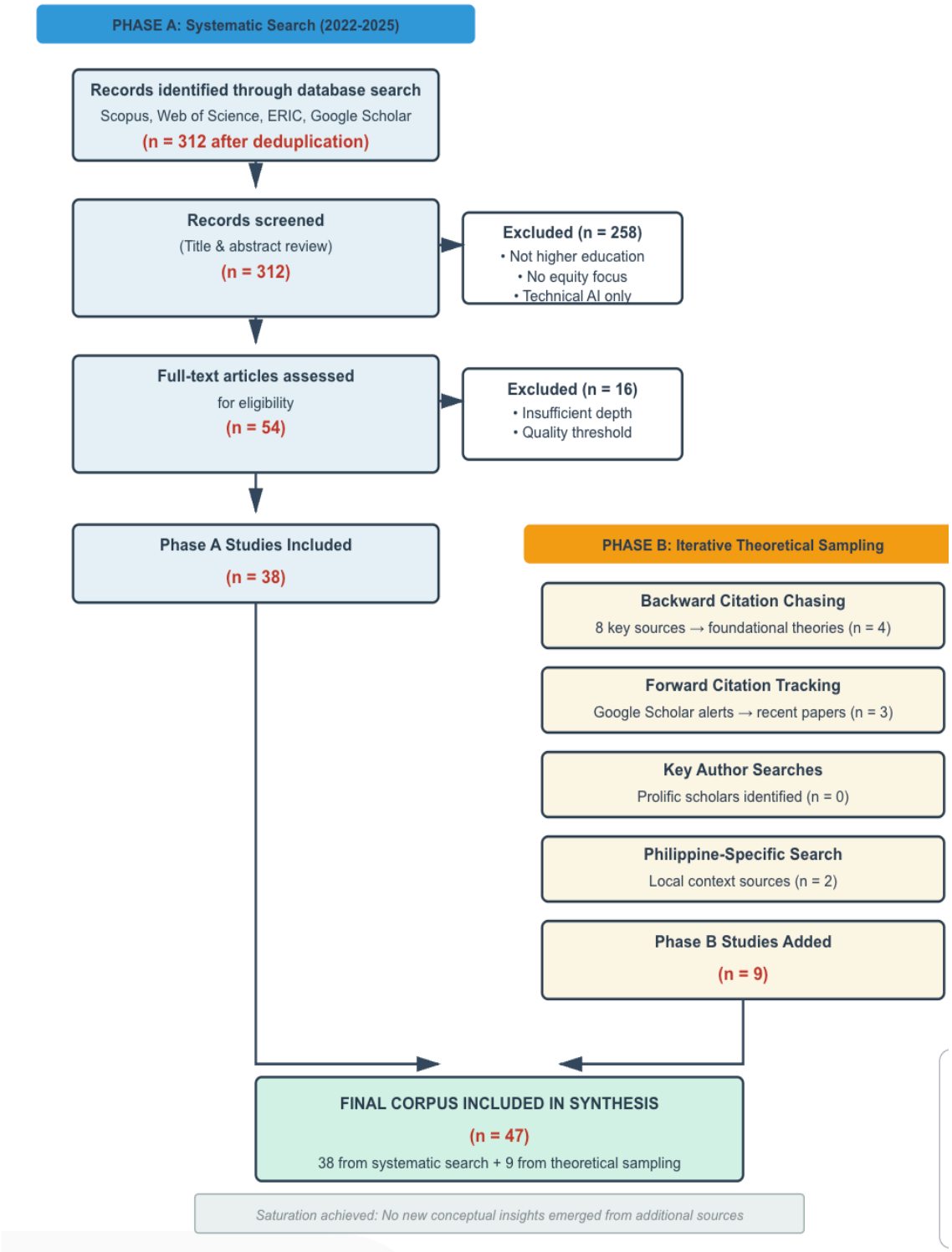

Figure A1. PRISMA Flow diagram: dual-phase critical synthesis

Note: This figure is a systematic literature search and selection process for Phase A (recent evidence, 2022-2025). The dual-phase approach is described fully in the main text. This diagram documents database searches, screening procedures, and inclusion decisions yielding 38 recent sources, which were supplemented by 9 foundational sources through theoretical sampling (Phase B).

5. Freire, P. (2018). *Pedagogy of the oppressed* (50th anniversary ed.). Bloomsbury Publishing. (Original work published 1968)
Type: Theoretical | Geographic Focus: Multi-regional (Global South origins) | Challenges: ED, IE (foundational) | Search Phase: Theoretical Sampling
6. Hargittai, E. (2002). Second-level digital divide: Differences in people's online skills. *First Monday*, 7(4). https://doi.org/10.5210/fm.v7i4.942
Type: Theoretical | Geographic Focus: Multi-regional | Challenges: IE | Search Phase: Theoretical Sampling
7. Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. MIT Press.
Type: Theoretical | Geographic Focus: Multi-regional | Challenges: IE | Search Phase: Theoretical Sampling
8. Abdi, A. A., Puplampu, K. P., & Dei, G. J. S. (2006). *African education and globalization: Critical perspectives*. Lexington Books.
Type: Theoretical | Geographic Focus: Other Global South (Africa) | Challenges: IE, ED | Search Phase: Theoretical Sampling
9. Black, P., & Wiliam, D. (2010). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, 92(1), 81–90. https://doi.org/10.1177/003172171009200119
Type: Theoretical | Geographic Focus: Global North (UK) | Challenges: PM (foundational) | Search Phase: Theoretical Sampling
10. Dei, G. J. S. (2011). *Indigenous philosophies and critical education: A reader*. Peter Lang.
Type: Theoretical | Geographic Focus: Multi-regional | Challenges: IE, ED | Search Phase: Theoretical Sampling
11. Scott, W. R. (2013). *Institutions and organizations: Ideas, interests, and identities* (4th ed.). SAGE Publications.
Type: Theoretical | Geographic Focus: Multi-regional | Challenges: ED (foundational) | Search Phase: Theoretical Sampling
12. North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press.
Type: Theoretical | Geographic Focus: Multi-regional | Challenges: ED (foundational) | Search Phase: Theoretical Sampling
13. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—Where are the educators? *International Journal of Educational Technology in Higher Education*, 16, 39. https://doi.org/10.1186/s41239-019-0171-0
Type: Literature Review | Geographic Focus: Multi-regional | Challenges: IE, PM | Search Phase: Theoretical Sampling

Supplementary foundational and methodological works (6 sources)

10. Dawson, P. (2021). *Defending assessment security in a digital world: Preventing e-cheating and supporting academic integrity*. Routledge. https://doi.org/10.4324/9780429324178
Type: Theoretical | Geographic Focus: Global North (Australia) | Challenges: PM | Search Phase: Theoretical Sampling
11. Depraetere, J., Vandeviver, C., Keygnaert, I., & Van Beken, T. (2021). The critical interpretive synthesis: An assessment of reporting practices. *International Journal of Social Research Methodology*, 24(6), 669–689. https://doi.org/10.1080/13645579.2020.1799637
Type: Methodological | Geographic Focus: Multi-regional | Search Phase: Theoretical Sampling
12. Wolgemuth, J. R., Hicks, T., & Agosto, V. (2017). Unpacking assumptions in research synthesis: A critical construct synthesis approach. *Educational Researcher*, 46(3), 131–139. https://doi.org/10.3102/0013189X17703946
Type: Methodological | Geographic Focus: Multi-regional | Search Phase: Theoretical Sampling

13. Selwyn, N. (2016). *Is technology good for education?* Polity Press.
Type: Theoretical | Geographic Focus: Global North (UK) | Challenges: IE, ED | Search Phase: Theoretical Sampling
14. van Dijk, J. A. G. M. (2020). *The digital divide*. Polity Press.
Type: Theoretical | Geographic Focus: Multi-regional | Challenges: IE | Search Phase: Theoretical Sampling
15. Biesta, G. J. J. (2015). What is education for? On good education, teacher judgement, and educational professionalism. *European Journal of Education*, 50(1), 75–87. https://doi.org/10.1111/ejed.12109
Type: Theoretical | Geographic Focus: Multi-regional | Challenges: PM, ED | Search Phase: Theoretical Sampling

PART 2: RECENT EMPIRICAL AND APPLIED LITERATURE (2022-2025)

1. Espartinez, A. (2025). Between innovation and tradition: A narrative inquiry of students' and teachers' experiences with ChatGPT in Philippine higher education. *Social Sciences*, 14(6), 359. https://doi.org/10.3390/socsci14060359
Type: Empirical Study | Geographic Focus: Philippines | Challenges: IE, PM, ED | Search Phase: Systematic (Philippine targeted)
2. Espartinez, A. (2025). Bridging the educational divide with ChatGPT's integration in Philippine higher education: Q methodology and narrative inquiry studies. *Journal of Information Technology Education: Innovations in Practice*, 24, 011. https://doi.org/10.28945/5526
Type: Empirical Study | Geographic Focus: Philippines | Challenges: IE, PM, ED | Search Phase: Systematic (Philippine targeted)
3. Liang, W., Yuksekgonul, M., Mao, Y., Wu, E., & Zou, J. (2023). GPT detectors are biased against non-native English writers. *Patterns*, 4(7), 100779. https://doi.org/10.1016/j.patter.2023.100779
Type: Empirical Study | Geographic Focus: Multi-regional | Challenges: IE, PM | Search Phase: Systematic
4. Weber-Wulff, D., Aizawa, A., Anthes, C., et al. (2023). Testing of detection tools for AI-generated text. *International Journal of Educational Integrity*, 19(1), 26. https://doi.org/10.1007/s40979-023-00146-z
Type: Empirical Study | Geographic Focus: Multi-regional | Challenges: PM, ED | Search Phase: Systematic
5. Mollick, E. R., & Mollick, L. (2023). Using AI to implement effective teaching strategies in classrooms: Five strategies, including prompts. *SSRN Electronic Journal*, 4391243. https://doi.org/10.2139/ssrn.4391243
Type: Theoretical/Practical | Geographic Focus: Global North (US) | Challenges: PM | Search Phase: Systematic
6. Cotton, D. R., Cotton, P. A., & Shipway, J. R. (2023). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*, 61(2), 228–239. https://doi.org/10.1080/14703297.2023.2190148
Type: Empirical Study | Geographic Focus: Global North (UK) | Challenges: ED, PM | Search Phase: Systematic
7. Jin, Y., Yan, L., Echeverria, V., Gašević, D., & Martinez-Maldonado, R. (2025). Generative AI in higher education: A global perspective of institutional adoption policies and guidelines. *Computers and Education: Artificial Intelligence*, 8, 100348. https://doi.org/10.1016/j.caeai.2024.100348
Type: Policy Analysis | Geographic Focus: Multi-regional | Challenges: ED, PM | Search Phase: Systematic

8. Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education*, 20, 43. https://doi.org/10.1186/s41239-023-00411-8
Type: Empirical Study | Geographic Focus: Multi-regional | Challenges: PM, ED, IE | Search Phase: Systematic
9. Bjelobaba, S., Waddington, L., Perkins, M., Foltýnek, T., Bhattacharyya, S., & Weber-Wulff, D. (2025). Maintaining research integrity in the age of GenAI: An analysis of ethical challenges and recommendations to researchers. *International Journal of Educational Integrity*, 21(1), 1. https://doi.org/10.1007/s40979-025-00191-w
Type: Theoretical/Policy | Geographic Focus: Multi-regional | Challenges: ED, PM | Search Phase: Systematic
10. Moorhouse, B. L., Yeo, M. A., & Wan, Y. (2023). Generative AI tools and assessment: Guidelines of the world's top-ranking universities. *Computers and Education Open*, 5, 100151. https://doi.org/10.1016/j.caeo.2023.100151
Type: Policy Analysis | Geographic Focus: Multi-regional | Challenges: ED, PM | Search Phase: Systematic
11. Chiu, T. K. F., Xia, Q., Zhou, X., Chai, C. S., & Cheng, M. (2024). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, 4, 100118. https://doi.org/10.1016/j.caeai.2022.100118
Type: Literature Review | Geographic Focus: Multi-regional | Challenges: PM, ED, IE | Search Phase: Systematic
12. Dempere, J., Modugu, K., Hesham, A., & Ramasamy, L. K. (2023). The impact of ChatGPT on higher education. *Frontiers in Education*, 8, 1206936. https://doi.org/10.3389/feduc.2023.1206936
Type: Empirical Study | Geographic Focus: Multi-regional | Challenges: ED, PM | Search Phase: Systematic
13. dos Anjos, J. R., de Souza, M. G., de A. Neto, A. S., & de Souza, B. C. (2024). An analysis of the generative AI use as analyst in qualitative research in science education. *Revista Pesquisa Qualitativa*, 12(30), 01–29. https://doi.org/10.33361/RPQ.2024.v.12.n.30.724
Type: Empirical Study | Geographic Focus: Other Global South (Brazil) | Challenges: PM, ED | Search Phase: Systematic
14. Bin-Nashwan, S. A., Sadallah, M., & Bouteraa, M. (2023). Use of ChatGPT in academia: Academic integrity hangs in the balance. *Technology in Society*, 75, 102370. https://doi.org/10.1016/j.techsoc.2023.102370
Type: Theoretical | Geographic Focus: Multi-regional | Challenges: ED, PM | Search Phase: Systematic
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Justification for the dual-strategy approach

The dual strategy addresses a terminology paradox: pre-2022 literature cannot mention "ChatGPT" or "generative AI" (terms did not exist), yet pre-2022 theoretical frameworks are essential for conceptual grounding. Standard systematic searches using GenAI terminology would exclude foundational theory. This approach is methodologically rigorous for critical synthesis, which prioritizes conceptual depth over exhaustive inclusion.

Quality thresholds applied

For empirical studies (2022-2025):

- Clear methodology with an appropriate sample size
- Transparent limitations acknowledged
- Substantive findings (not merely descriptive)
- Published in peer-reviewed venues or reputable preprint servers

For theoretical works (all periods):

- Explicit theoretical grounding
- Logical coherence in argumentation
- Recognized contribution to the field
- Relevance to one or more framework principles

For policy documents:

- Official institutional/governmental status OR
- Authoritative organization (UNESCO, OECD) OR
- Peer-reviewed policy analysis with systematic methodology

Evidence of conceptual saturation:

Theoretical saturation was achieved when:

- New sources (tested in the final 5 additions) yielded no novel conceptual insights
- All three core challenges were consistently documented across diverse contexts
- Theoretical traditions were adequately represented to ground all three principles
- Geographic representation included multiple Global South voices
- Negative cases were identified and analyzed

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