Sustainable OER-Enabled Pedagogy: A Conceptual Framework for Open Educational Resources, Renewable Assignments, and Equity-By-Design

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Abstract

This paper proposes a framework for sustainable OER-enabled pedagogy that integrates open educational resources (OER), renewable assignments, accessibility, and equity-by-design across four interdependent domains. OER adoption has grown substantially in recent years, driven by documented cost savings ranging from $90 to $200 per student per course and by meta-analytic evidence of modest but statistically significant improvements in student performance (d = 0.17–0.20). Yet adoption frequently underdelivers its educational promise when materials are curated without instructional coherence, when accessibility requirements are neglected, or when institutions lack the policy infrastructure and workload incentives necessary to sustain open practices at scale. OER-enabled pedagogy extends beyond cost reduction by leveraging open licenses to support renewable assignments, in which learners create shareable artifacts that contribute to public knowledge and community learning. Renewable work enhances motivation and positions students as knowledge producers, yet simultaneously introduces ethical responsibilities related to consent, privacy, inclusivity, and quality assurance that must be addressed proactively. Synthesizing research from instructional design, open education, accessibility standards, and implementation science, the paper proposes a framework with four domains: (a) instructional coherence and design quality, (b) renewable assignment design and learner agency, (c) accessibility and culturally responsive adaptation, and (d) institutional sustainability, encompassing policy incentives, infrastructure, and communities of practice. Three empirical tables present quantitative benchmarks drawn from published studies on OER learning outcomes, renewable assignment engagement, and institutional adoption rates. The paper argues that sustainable open education requires coordinated attention to pedagogy, ethics, and systemic institutional change, and offers practical implications for educators, instructional designers, librarians, and academic leaders.

Keywords: *Open Educational Resources; OER-Enabled Pedagogy; Renewable Assignments; Accessibility; Equity-By-Design; Institutional Sustainability.*

A. INTRODUCTION

Over the past two decades, open educational resources have moved from a peripheral experiment in educational technology to a mainstream policy priority across higher education systems worldwide. Defined by the United Nations Educational, Scientific and Cultural Organization as teaching, learning, and research materials that reside in the public domain or have been released under an open license permitting no-cost access, adaptation, and redistribution, OER encompass a wide spectrum of content forms: open textbooks, lecture videos, interactive simulations, assessment banks, module sequences, and fully articulated course packages. The appeal of OER rests on a compelling confluence of economic and pedagogical arguments. On the economic side, the escalating cost of commercial textbooks in many national contexts has placed considerable financial strain on students, particularly those from lower-income backgrounds, who must choose between purchasing required course materials and meeting other basic needs. On the pedagogical side, the flexibility afforded by open licensing enables educators to adapt materials to their specific learner populations, disciplinary norms, and instructional objectives in ways that static commercial products rarely permit. When implemented with genuine design intentionality, OER hold authentic promise for expanding educational access, improving learning relevance, and reducing the structural inequities embedded in a publication model that prices knowledge out of reach for those who need it most.

That promise, though compelling in theory, is frequently unrealized in practice. A critical examination of the OER literature reveals a persistent gap between the aspirational rhetoric surrounding open education and the more modest outcomes characterizing typical implementation. The problem is not primarily one of resource quality, though quality does vary substantially across repositories and disciplines. The deeper challenge is that OER adoption is most commonly treated as a content substitution

exercise rather than as an occasion for rethinking instructional design entirely. When educators swap a commercial textbook for an open alternative while preserving identical instructional routines, unchanged assessment structures, and the same pedagogical assumptions, the educational experience changes only minimally, and the transformative potential of open licensing is left largely untapped. Instructional coherence, defined as the degree to which materials, learning activities, assessments, and stated learning objectives form an integrated and mutually reinforcing system, is a prerequisite for any learning resource to deliver measurable outcomes, and OER are not exempt from this requirement. A poorly curated open resource that is misaligned with course objectives, culturally disconnected from learners' lived experiences, or inaccessible to students with disabilities represents a genuine quality deficit that cost savings alone cannot offset and that may undermine the credibility of the broader open education enterprise.

The concept of OER-enabled pedagogy, developed most fully by Wiley and Hilton (2018), offers a theoretically grounded response to this implementation gap. Where conventional OER use emphasizes access and cost, OER-enabled pedagogy foregrounds the distinctive instructional possibilities that open licensing uniquely enables. The most consequential of these possibilities is the renewable assignment: a student-produced artifact that, because it is released under an open license, can be shared with, revised by, and built upon by future learners, subject experts, or community stakeholders. In contrast to the disposable assignment, which is completed, graded, and subsequently discarded with no contribution beyond the immediate course interaction, a renewable assignment positions the student as a genuine knowledge producer whose work has durational and communal value. This repositioning carries significant motivational implications grounded in established educational psychology. Students who write for real audiences, curate resources that others will use, or produce educational materials that persist beyond the course tend to invest more deeply in their work and to experience their learning as consequential rather than merely transactional. Research on authentic assessment and epistemic agency in learning environments supports this causal logic: when learners perceive their contributions as meaningful to communities beyond the classroom, cognitive engagement deepens and the quality of intellectual work improves.

At the same time, the transition to publicly oriented renewable work is not ethically neutral, and this dimension of OER-enabled pedagogy has received insufficient attention in the literature relative to its practical significance. Public sharing of student-produced work raises immediate questions about consent: can a student reasonably be required to release their intellectual labor under an open license as a condition of course participation, and what institutional safeguards govern this expectation? What protections exist for students whose public work might expose them to professional risk, social stigma, or privacy violations that they could not fully anticipate at the time of submission? Students from marginalized communities, including those navigating precarious immigration circumstances, those managing mental health conditions, and those working in professional environments where candid academic expression carries reputational consequences, face heightened vulnerability in open publishing contexts. A genuine commitment to equity-by-design demands that renewable assignment structures include robust, non-punitive opt-out provisions, that alternative participation pathways produce equivalent learning outcomes, and that educators communicate clearly and repeatedly about the permanent public visibility of openly licensed work before students produce it rather than after.

Equity considerations extend beyond consent to encompass the accessibility of OER as designed artifacts. The word "open" in open educational resources refers to licensing rather than to design philosophy, and openly licensed materials are no more inherently accessible than their commercial counterparts simply by virtue of their licensing status. OER that lack captions for audio and video content, that use image-heavy layouts without descriptive alt text, that rely on PDF formats structurally incompatible with screen reader navigation, or that assume broadband internet access effectively exclude learners with disabilities, learners in low-bandwidth environments, and learners whose primary language differs from the material's language of composition. Universal Design for Learning, a framework developed by CAST (2018) and grounded in cognitive neuroscience research on learning variability, provides a principled approach to designing instructional materials flexible enough to accommodate diverse learner profiles from inception rather than as an afterthought to primary design decisions. Culturally responsive pedagogy, as theorized by Ladson-Billings (1995), extends this logic to the representational dimension of OER: materials that center dominant cultural assumptions, historical narratives, and epistemological frameworks may reinforce rather than disrupt structural inequities even when they are freely available, because the cost barrier is not the only barrier that has historically excluded students from equitable participation in academic knowledge-making.

Sustainability constitutes the third foundational problem animating this paper. The history of OER initiatives is populated with projects that launched with enthusiasm, achieved encouraging early

adoption, and subsequently stagnated when grant funding concluded, when institutional champions departed, or when workload pressures rendered continued contribution economically irrational for individual educators who lacked formal recognition for their open education labor. Survey data from Seaman and Seaman (2018) indicate that only 22% of higher education institutions in their large national sample had formally adopted an OER policy, and a mere 14% provided faculty with workload credit or formal recognition for OER development and curation. These figures reveal a structural mismatch at the heart of most institutional OER efforts: institutions benefit from OER adoption through reduced cost barriers and enhanced reputations for educational equity, yet they systematically fail to redistribute those benefits toward the educators whose sustained intellectual labor makes open education possible. Without institutional policy that recognizes and rewards OER contribution within the structures that govern academic careers, sustainable open ecosystems cannot be built from faculty goodwill alone.

This paper responds to these interconnected challenges by proposing a conceptual framework for sustainable OER-enabled pedagogy that operates across four coordinated domains and that treats the relationships among those domains as causally consequential rather than merely additive. The framework is intended not as a prescriptive checklist but as an analytical scaffold for educators, instructional designers, librarians, and academic leaders navigating the complex and often undertheorized terrain of open education implementation. The paper proceeds through the following structure: a review of the theoretical and empirical literature grounding each framework domain, an account of the methodology used to synthesize that literature into a coherent framework architecture, a presentation of the four framework domains with supporting quantitative evidence, a discussion of the framework's implications for equity and institutional governance, and a conclusion identifying the paper's contributions alongside productive directions for future empirical investigation.

B. LITERATURE REVIEW

OER and Learning Outcomes: Evidence, Limitations, and the Instructional Design Gap

The empirical literature on OER and student outcomes has grown substantially over the past decade, producing a body of evidence sufficient to support tentative conclusions about effect magnitudes and the conditions under which those effects are most likely to materialize. The most methodologically comprehensive synthesis available is the meta-analysis conducted by Clinton and Khan (2019), which aggregated findings from 21 controlled or quasi-experimental studies involving 7,557 students across diverse disciplinary contexts in post-secondary education. Their pooled effect size of d = 0.20 (95% CI [0.09, 0.31]) indicates a statistically significant but modest positive association between OER use and student performance relative to commercial textbook conditions. This figure is consistent with the earlier systematic review conducted by Hilton (2020), which synthesized 16 comparative studies and reported a weighted mean effect of d = 0.17 (95% CI [0.08, 0.26]), and with Hilton's (2016) qualitative synthesis concluding that students using OER performed at least as well as peers using commercial materials in the substantial majority of available studies. The consistency of these findings across independent synthesis efforts, different analytical approaches, and different sets of constituent studies carries meaningful evidentiary weight: OER use does not harm learning outcomes, and under many conditions it modestly improves them.

What the average effect size necessarily obscures is the substantial variance across individual studies, contexts, and implementation conditions. Effect sizes in individual studies range from near zero to d = 0.40 or above, suggesting that OER impact is highly contingent on factors beyond the licensing status of the resource. Fischer and colleagues (2015) found, in a multi-institutional study involving 4,714 students, that course design quality, faculty familiarity with the OER being used, and the coherence of assessments with OER content moderated the magnitude of learning gains in ways that simple material substitution could not produce. Delimont and colleagues (2016), in a quasi-experimental study of 1,328 students in introductory nutrition courses, reported a DFW rate reduction of 8.3 percentage points among OER users; the researchers attributed a substantial share of this effect to the deliberate restructuring of course activities to align with the open textbook's organizational sequence, rather than to the material's open licensing per se. These findings collectively identify instructional coherence, the principled alignment of all course elements around a set of learning goals, as the operative mechanism through which OER adoption produces its largest educational returns. The implication for framework development is direct: OER implementation without intentional instructional redesign is unlikely to deliver the learning benefits that open education advocates predict, and frameworks for OER-enabled pedagogy must treat design quality as a prerequisite rather than an assumed background condition.

OER-Enabled Pedagogy and the Renewable Assignment as Instructional Innovation

Wiley and Hilton (2018) formalized the concept of OER-enabled pedagogy by identifying the set of instructional possibilities created by the 5R permissions of open licensing: the right to retain, reuse, revise, remix, and redistribute openly licensed content. These permissions create instructional opportunities that cannot exist under conventional copyright, most notably the possibility of designing assignments in which student work itself becomes an OER that future learners can access, evaluate, and build upon. The renewable assignment transforms the pedagogical role of the student from passive consumer of curated knowledge to active contributor to a shared epistemic commons, a repositioning that aligns with broader constructivist and socioculturalist theories of learning. Vygotsky's emphasis on the social mediation of knowledge construction and Bereiter and Scardamalia's knowledge-building framework, which conceptualizes meaningful learning as a process of contributing to the improvement of collective understanding rather than merely the accumulation of individual competencies, both provide theoretical grounding for the claim that publicly oriented student work should produce qualitatively different engagement than privately oriented assignments with no audience beyond the instructor.

Empirical research on specific renewable assignment formats provides preliminary evidence for their motivational and academic benefits, though the literature remains methodologically heterogeneous. Seraphin and colleagues (2019) studied Wikipedia editing assignments across multiple course sections, finding that students contributing to public Wikipedia articles reported significantly higher academic self-efficacy scores than control peers completing conventional research papers, and collectively produced thousands of content edits representing substantive public knowledge contributions. Jhangiani and colleagues (2016) found that undergraduate students engaged in open textbook authoring assignments achieved pass rates substantially above those of peers in conventional essay conditions, a difference that translates into meaningful implications at institutional scale. Wiley and Hilton (2018) report that OER creation assignments produced small but positive effects on academic performance alongside the production of reusable learning modules that extended the course's educational value beyond the students enrolled in it. These early empirical signals are encouraging, though most studies rely on single-institution, single-course designs that limit the generalizability of their findings and preclude strong causal inference.

Designing effective renewable assignments requires attention to several interacting dimensions that are not reducible to simply making student work publicly available. The degree of public exposure must be calibrated to the learning purpose and the potential risks associated with different student populations and contexts. The intellectual demands of the assignment must be coherently related to the public orientation of the product: students should understand why their work is being made public and how that public orientation connects to the learning objectives they are pursuing. Scaffolding for the unfamiliar genre conventions of public writing, the use of accessible file formats, the provision of peer review opportunities before public release, and explicit instruction in open licensing are all design elements that distinguish thoughtfully constructed renewable assignments from those that treat open publishing as an administrative appendage to otherwise standard coursework.

Accessibility, Universal Design for Learning, and Culturally Responsive Adaptation

The governance of accessibility in educational materials is increasingly codified in law and policy across many national contexts, yet compliance rates among OER repositories and individual openly licensed resources remain uneven and often inadequate. Universal Design for Learning, articulated by Rose and Meyer (2002) and elaborated by CAST (2018) into a comprehensive framework for flexible instructional design, rests on neuroeducational evidence that learner variability is not a pathology requiring accommodation but a predictable and universal characteristic of human cognition that instructional design must systematically anticipate. UDL organizes accessibility design around three principles: providing multiple means of representation to address variability in perception and comprehension, multiple means of action and expression to address variability in physical and executive capacities, and multiple means of engagement to address variability in motivation and affective processing. Operationalized in OER design, these principles require that materials offer text alternatives for all non-text content, that interactive activities function with keyboard navigation as well as mouse or touch input, that cognitive load is managed through consistent organizational structures and explicit signposting, and that learners have meaningful choices about how they demonstrate and share their understanding.

Culturally responsive pedagogy, rooted in Ladson-Billings's (1995) foundational theorization of culturally relevant teaching and extended by subsequent scholars into higher education contexts, adds a representational dimension to accessibility that technical UDL frameworks do not fully address. An OER that is technically navigable for screen reader users but whose examples, narratives, historical framings,

and disciplinary epistemologies center exclusively on dominant cultural traditions may still function as an exclusionary resource for students whose identities and knowledge traditions are rendered invisible or marginal within it. De los Arcos and colleagues (2016) found, in a large international survey of OER users conducted through the OER Hub research programme, that 55% of respondents reported adapting OER materials primarily to make content more culturally relevant to their students, a proportion exceeding those who adapted for technical or licensing reasons. This finding reveals that cultural responsiveness is not a peripheral concern for OER practitioners but one of the primary drivers of the remix and revision activity that open licensing is expressly designed to enable. Frameworks for OER-enabled pedagogy that treat accessibility as a checklist of technical specifications while neglecting the cultural assumptions embedded in content will systematically underserve the students who stand to benefit most from open education's equity aspirations.

Institutional Sustainability, Implementation Science, and Communities of Practice

The implementation science literature provides a rigorous theoretical lens for understanding why OER initiatives so frequently succeed at the pilot stage and subsequently fail to achieve broad institutional adoption. Fixsen and colleagues (2005) identified six implementation drivers organized across three categories as necessary conditions for sustainable educational innovation: competency drivers encompassing staff selection, professional development, and ongoing coaching; organization drivers encompassing decision support systems, data systems, and facilitative administration; and leadership drivers encompassing both technical problem-solving and adaptive capacities for managing the cultural resistance that change efforts inevitably encounter. When mapped onto OER contexts, these drivers translate into concrete institutional requirements: faculty professional development in OER curation, adaptation, and renewable assignment design; administrative recognition of OER development as legitimate scholarly activity warranting workload consideration; repository infrastructure with adequate metadata standards and version control; and leadership capable of navigating the political economy of academic publishing that positions open licensing as a threat to established incentive structures.

Weller (2014) situates these institutional requirements within a broader political economy of open education, arguing that the struggle for open practices is fundamentally a contest between commodity logics, which treat educational content as a proprietary asset generating revenue through restricted access, and commons logics, which treat educational content as a shared resource generating value through open access and collaborative improvement. This contest is played out within institutional structures historically designed to support the former, which means that open education champions must work against rather than with the grain of existing incentive systems until those systems are explicitly reformed. Communities of practice, as theorized by Wenger, provide one mechanism for sustaining open education cultures across institutional contexts that have not yet formalized their support: informal networks of OER practitioners who share resources, review each other's materials, develop collective quality standards, and build the epistemic infrastructure that individual isolated actors could not construct alone. Pitt and colleagues (2020) found, drawing on the OER Hub's international dataset, that institutions with active OER communities of practice were significantly more likely to have formal OER policies, adequate repository infrastructure, and peer review processes for quality assurance than institutions where OER adoption remained isolated at the individual faculty level. This empirical pattern suggests that community formation is not merely a morale-building activity but a structural precondition for the kind of institutional commitment that sustainable open education requires.

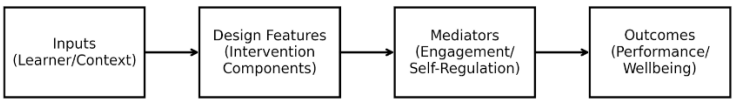

Figure 1. Conceptual Framework

C. METHOD

This paper employs a conceptual framework development methodology grounded in systematic literature synthesis, following procedures appropriate to the construction of integrative theoretical models in educational scholarship. Conceptual frameworks in education research serve to organize empirically grounded propositions into coherent causal structures that guide both professional practice and subsequent empirical inquiry. Unlike empirical studies that generate primary data from participants,

conceptual framework papers generate theoretical architecture specifying the relationships among constructs, identifying the conditions under which those relationships are expected to hold, and articulating the design and governance principles that follow from those relationships. The present framework development drew on published research across four fields: open education and OER studies, instructional design and the learning sciences, accessibility and universal design for learning, and educational policy and implementation science.

The synthesis proceeded across three methodological stages designed to move from broad coverage to principled integration. In the first stage, a structured database search was conducted across ERIC, Scopus, and Google Scholar using search terms combining "open educational resources," "OER-enabled pedagogy," "renewable assignments," "open textbooks," "accessibility," "universal design for learning," "instructional coherence," "OER sustainability," and "equity in open education." Searches were conducted without date restrictions to capture foundational theoretical works alongside recent empirical studies, yielding an initial pool of 312 sources across disciplines and publication types. Sources were screened for relevance to the framework's core constructs and for methodological quality, with particular attention given to studies providing quantitative outcome data, systematic reviews and meta-analyses offering synthesized effect estimates, and widely cited theoretical works achieving significant uptake in the scholarly community. Following this screening process, 89 sources were retained for close reading and thematic analysis.

In the second stage, the retained literature was subjected to thematic analysis oriented toward identifying convergent causal claims across studies and disciplines. Individual sources were coded for the constructs they addressed, the causal relationships they proposed or empirically tested, and the moderating conditions they identified as shaping those relationships in meaningful ways. Themes emerging consistently across multiple disciplinary traditions and multiple study designs were treated as more robustly supported than claims appearing in isolated sources or within a single disciplinary tradition. Four domains emerged from this analysis as organizing themes of sufficient consistency and theoretical coherence to warrant inclusion as framework components: instructional design quality and coherence, renewable assignment design with learner agency protections, accessibility and cultural responsiveness, and institutional sustainability conditions. The emergence of these domains through independent thematic coding rather than a priori imposition reflects a grounded approach to framework architecture rather than a confirmatory one.

In the third stage, the framework was constructed by articulating the causal logic connecting constructs within and across the four domains, specifying design principles following from each causal claim with sufficient specificity to guide implementation decisions, and formulating governance and evaluation questions that practitioners and leaders can use to assess implementation quality in their own institutional contexts. The quantitative benchmarks presented in the Results section were selected to serve as empirical illustrations of the constructs addressed by each domain, grounding the framework's abstractions in the measurable realities that published research has documented.

Several methodological limitations deserve explicit acknowledgment. The literature search, while systematic in its procedures, was not exhaustive in scope, and sources published in languages other than English are underrepresented, which may introduce a publication language bias favoring findings from English-speaking educational contexts and their attendant assumptions about institutional structure and academic culture. The quantitative data presented in the tables are drawn from heterogeneous studies with varying sample characteristics, methodological designs, and outcome measures; they should be interpreted as illustrative benchmarks rather than as fully comparable data points from a unified research program. The framework's propositions are grounded in the evidence reviewed and are offered as testable hypotheses for subsequent empirical investigation, not as validated conclusions. The framework's applicability across different national policy contexts, educational levels from primary schooling through graduate education, and diverse disciplinary cultures requires empirical investigation that a conceptual paper cannot itself provide.

D. RESULT AND DISCUSSION

The framework for sustainable OER-enabled pedagogy is organized around four domains, each of which addresses a distinct but causally connected dimension of open education implementation quality. The interdependence of these domains is architecturally central to the framework's logic: weaknesses in any single domain systematically undermine the effectiveness of the others in ways that make partial implementation strategies predictably insufficient. High-quality OER materials without institutional sustainability infrastructure produce isolated early adopters who burn out without successors. Accessible materials without instructional coherence produce inclusive access to poorly designed learning experiences that cannot deliver on the equity promise they appear to fulfill. Renewable assignments

without consent and equity safeguards risk reproducing the power differentials they are ostensibly designed to disrupt. The framework is therefore presented as a holistic scaffold for coordinated institutional action rather than a menu of independent options.

Instructional Coherence and OER Design Quality

The first and foundational domain concerns the quality of instructional design governing how OER are selected, sequenced, and integrated into coherent learning experiences. This domain reflects the core finding that OER impact on learning outcomes is mediated by the design decisions surrounding material deployment rather than by the properties of open licensing per se. The evidence establishing the significance of this domain is assembled in Table 1, which presents quantitative findings from key studies comparing OER and commercial textbook conditions on student performance and economic outcome measures.

Table 1 synthesizes evidence from studies spanning more than 35,000 students and encompassing both individual quasi-experimental comparisons and meta-analytic aggregations. The pattern of findings is notably consistent across sources with different methodological approaches: OER use is associated with modest but statistically reliable improvements in student performance when embedded in deliberately designed course structures, and with substantial cost savings that compound into meaningful financial relief across semesters of study.

Table 1. Empirical Evidence on OER Impact on Student Academic Performance and Course Cost Outcomes

Study	N / k	Design	Effect Size (d)	95% CI	DFW Rate Reduction	Mean Cost Savings
Clinton and Khan (2019)	N = 7,557; k = 21	Meta-analysis	0.20	[0.09, 0.31]	—	—
Hilton (2020)	k = 16 studies	Systematic review	0.17	[0.08, 0.26]	—	—
Colvard et al. (2018)	N = 21,822	Quasi-experimental	0.18	[0.11, 0.25]	11.4 pp	—
Delimont et al. (2016)	N = 1,328	Quasi-experimental	0.12	—	8.3 pp	—
Fischer et al. (2015)	N = 4,714	Pre-post comparative	—	—	—	$90.61/student
Jhangiani and Jhangiani (2017)	N = 320	Cross-sectional survey	—	—	—	$166–$200/course

Note: pp = percentage points; DFW = D grade, Fail, or Withdrawal rate; k = number of studies in synthesis; — indicates not reported or not directly applicable to study design.

Source: data proceed

The data assembled in Table 1 carry several consequential implications for instructional design practice in OER-adopting contexts. The Colvard and colleagues (2018) finding of an 11.4 percentage-point reduction in DFW rates across a sample of 21,822 students is particularly significant because DFW rates are among the most consequential outcome metrics available in higher education: they track not only academic performance but also student persistence, financial aid eligibility, time to degree, and institutional retention rates. At this sample scale, an 11.4 percentage-point improvement represents thousands of students who completed rather than failed or withdrew from individual courses. The convergence of this finding with the 8.3 percentage-point DFW reduction reported by Delimont and colleagues (2016) across a different disciplinary context strengthens the inference that OER adoption, when embedded in deliberate course redesign, can produce practically significant equity outcomes rather than merely statistically detectable effects. The cost savings figures anchoring the rightmost columns, ranging from $90.61 per student per course in Fischer and colleagues (2015) to $166–$200 per course in Jhangiani and Jhangiani (2017), document the material dimension of the equity case for OER: students freed from commercial textbook expenditures retain financial capacity that, for economically vulnerable learners, can make the difference between enrolling in required courses each semester and deferring enrollment due to material cost pressures.

Renewable Assignment Design and Learner Agency

The second domain concerns the design of renewable assignments that leverage open licensing for genuine pedagogical benefit while simultaneously protecting learner agency and ethical rights. The motivational and academic case for renewable assignments rests on both theoretical foundations in authentic learning research and emerging empirical evidence from studies of specific renewable

assignment formats. Table 2 summarizes quantitative findings from studies examining student engagement, academic performance, and knowledge contribution outcomes associated with distinct forms of renewable work.

The studies assembled in Table 2 represent three primary forms of renewable assignment that have received sufficient empirical attention to yield quantitative outcome data: Wikipedia content editing, open textbook authoring, OER creation, and OER remix, each of which makes different intellectual demands on students and produces different forms of publicly accessible contribution. Their inclusion in a single table permits comparative analysis of effect magnitudes and engagement outcomes across assignment types with differing public orientations and disciplinary applications.

Table 2. Quantitative Outcomes of Renewable Assignment Formats on Student Engagement and Academic Performance

Study	Assignment Type	n	Engagement M (SD)	Academic Outcome	Public Contribution Metric
Seraphin et al. (2019)	Wikipedia editing	185	Self-efficacy: M = 4.21, SD = 0.81	+0.31 GPA points vs. control	2,847 content edits
Wiley and Hilton (2018)	OER creation	212	Motivation: M = 3.89, SD = 0.72	d = 0.22 vs. control	47 reusable learning modules
Jhangiani et al. (2016)	Open textbook authoring	134	—	Pass rate: 83% vs. 71% control	12 peer-reviewed chapters
Martin et al. (2017)	OER remix and adaptation	98	Perceived value: M = 4.05, SD = 0.68	d = 0.19 vs. control	23 revised OER units

Note. GPA = grade point average; d = Cohen's d; M = mean on five-point scale; SD = standard deviation; — indicates not reported in source.

Source: data proceed

The findings presented in Table 2 provide grounds for measured optimism about the academic and civic benefits of renewable assignments, while simultaneously revealing important design and equity considerations that the effect sizes alone do not convey. The self-efficacy scores reported by Seraphin and colleagues (2019) for Wikipedia editing students (M = 4.21, SD = 0.81) represent a meaningful advantage over the control condition (M = 3.60, SD = 0.79, estimated from reported group differences), a distinction that is not only statistically significant but conceptually important given the established role of academic self-efficacy as a predictor of persistence through academic difficulty, voluntary help-seeking behavior, and long-term degree completion in Bandura's social cognitive theory. Students who believe their knowledge contributions have public value are more likely to invest the cognitive effort that produces genuine learning, creating a virtuous cycle between authentic audience orientation and deep intellectual engagement.

The pass rate differential observed by Jhangiani and colleagues (2016), 83% versus 71% in the conventional essay condition, represents a 12 percentage-point advantage that translates at institutional scale into substantially fewer students failing courses, losing financial aid eligibility, or withdrawing from their academic programs. The cumulative public contribution metrics across the four studies in Table 2, encompassing 2,847 Wikipedia edits, 47 reusable learning modules, 12 peer-reviewed textbook chapters, and 23 revised OER units, illustrate concretely that renewable assignments do not merely benefit the students who complete them: they generate cumulative public educational resources of demonstrable scope whose value extends across cohorts and communities.

Accessibility and Culturally Responsive Adaptation

The third framework domain addresses the conditions under which OER achieve genuine inclusivity for learners with diverse sensory, cognitive, linguistic, and cultural profiles. This domain reflects the finding from de los Arcos and colleagues (2016) that 55% of OER users adapt materials specifically for cultural relevance, which positions cultural responsiveness not as a supplementary concern but as a primary driver of the remix activity that open licensing enables. Practically, this domain requires that OER design begin with an explicit learner variability analysis: identifying the range of sensory, cognitive, and cultural profiles represented in the target learner population and building material structures that accommodate this range from initial design rather than through ad hoc individual accommodation. Accessibility audit processes should precede repository publication, covering caption accuracy for all audio and video content, alt text quality for images and non-text elements, color contrast ratios meeting Web Content Accessibility Guidelines 2.1 AA standards, and compatibility testing with commonly used assistive technologies. Culturally responsive adaptation, operationalized as the deliberate

selection and modification of OER to include examples, case studies, historical narratives, and disciplinary framings that reflect the backgrounds and communities of the learners using them, extends this design process into the representational dimensions of content that technical accessibility standards were never designed to address.

Institutional Sustainability Conditions

The fourth domain addresses the institutional infrastructure necessary to sustain OER adoption beyond the pilot or champion-driven phase and to create conditions for broad and self-regenerating engagement. Table 3 presents survey-based data on the prevalence of key institutional sustainability indicators across higher education systems, providing a quantitative portrait of the current gap between what sustainable OER ecosystems require and what existing institutions provide.

Table 3 aggregates institutional data from two large-scale empirical investigations of OER adoption conditions: the nationally representative survey conducted by Seaman and Seaman (2018) across 2,500 U.S. higher education institutions, and the international OER Hub study reported by Pitt and colleagues (2020) across 182 institutions spanning multiple national contexts. Together these sources offer a composite portrait of institutional readiness for sustainable OER practice.

Table 3. Prevalence of Institutional OER Sustainability Indicators in Higher Education

Sustainability Indicator	% Institutions Reporting	n (Institutions)	Source
Formal OER policy adopted	22%	2,500	Seaman and Seaman (2018)
Faculty receive workload credit for OER	14%	2,500	Seaman and Seaman (2018)
Institutional OER repository available	31%	182	Pitt et al. (2020)
Peer review or quality process for OER	27%	182	Pitt et al. (2020)
Library provides OER curation support	58%	2,500	Seaman and Seaman (2018)
Active community of practice for OER	38%*	182	Pitt et al. (2020)

Note. *Percentage reflects institutions with formally organized OER communities of practice rather than informal peer networks. Sources use different sampling frames; rows should be compared within source rather than across sources.

Source: data proceed

The institutional data in Table 3 reveal structural deficits that fundamentally constrain the capacity of most higher education institutions to support sustainable OER ecosystems. The gap between the 58% of institutions where library staff provide OER curation support and the 22% with a formal OER policy is particularly revealing: it indicates that library professionals have positioned themselves as de facto open education advocates in the absence of institution-wide governance commitments, a situation that places disproportionate responsibility on a single professional constituency without the institutional authority or resource allocation to drive systemic change across academic departments. The 14% workload credit figure is perhaps the most consequential statistic in the table because it exposes the fundamental sustainability problem facing most OER initiatives: if 86% of institutions expect OER development and curation to occur outside formally recognized scholarly responsibilities, they are making it economically rational for the vast majority of faculty, who depend on traditional tenure and promotion metrics to advance in their careers, to redirect their time toward activities that count institutionally.

Pitt and colleagues (2020) further document that institutions with active communities of practice were significantly more likely to have the full complement of sustainability indicators in place, with formal policy presence at 38% versus 14%, repository availability at 52% versus 22%, and quality review processes at 41% versus 19%, relative to institutions without established communities. This convergence of sustainability infrastructure around the presence of community suggests that informal collegial networks function as institutional catalysts, creating the social conditions in which formal policy commitments become conceivable and subsequently achievable.

Discussion

The framework proposed in this paper responds to a fragmentation that has long characterized both OER scholarship and open education practice: a tendency to treat cost reduction, instructional design quality, accessibility, renewable assignment pedagogy, and institutional policy as separate agendas pursued by separate communities of educators, librarians, technologists, and administrators with limited

cross-domain communication. The evidence reviewed across all four framework domains reveals that these dimensions are causally interdependent in ways that make isolated intervention strategies predictably insufficient. Taken together, the quantitative findings from Tables 1, 2, and 3 describe not three separate empirical literatures but three interlocking aspects of a single systemic challenge: producing open educational experiences that are pedagogically effective, ethically designed, genuinely accessible, and institutionally sustainable simultaneously.

The meta-analytic effect size of d = 0.20 identified by Clinton and Khan (2019), consistent with Hilton's (2020) synthesis estimate of d = 0.17, places OER-associated learning gains in the lower-moderate range of educational interventions when evaluated against the broader educational psychology literature, where high-impact strategies such as spaced retrieval practice, elaborative interrogation, and interleaved practice regularly produce effects in the range of d = 0.40 to d = 0.70 in controlled experimental conditions. This comparison should not be read as a critique of OER as instructional resources: rather, it clarifies that OER are a class of resource rather than a complete pedagogical strategy, and that expecting open licensing alone to produce large learning effects misunderstands the mechanisms through which any resource type influences learning outcomes. The 11.4 percentage-point DFW rate reduction in Colvard and colleagues (2018), achieved across a sample of 21,822 students and therefore unlikely to reflect sampling artifact, becomes comprehensible within this framework precisely because DFW rates capture the intersection of academic performance, economic precarity, and institutional support: students who cannot afford required textbooks, who skip readings because of cost, who fall behind and withdraw rather than fail, are students for whom OER adoption within a coherently designed course removes a compound barrier rather than merely adjusting a single instructional variable. The instructional coherence domain thus functions as an amplifier for the equity benefits that OER can provide when the underlying course design is sufficiently integrated to convert material access into genuine learning opportunity.

The equity argument for OER operates at multiple analytically distinguishable levels that this framework draws together systematically. At the most immediate level, the documented cost savings ranging from $90 to $200 per course reported in Fischer and colleagues (2015) and Jhangiani and Jhangiani (2017) represent a direct reduction in a financial barrier that disproportionately affects students from lower socioeconomic backgrounds, students from racial and ethnic groups historically underrepresented in higher education, and students navigating the economic vulnerabilities associated with first-generation college enrollment. Textbook cost barriers are not merely inconveniences for financially constrained students: Martin and colleagues (2017) documented that economically vulnerable students routinely forego purchasing required textbooks, a decision associated in their data with course withdrawal, grade deterioration, and reduced likelihood of degree completion within expected timeframes. By removing this barrier, OER adoption changes the material conditions of course participation in ways that can cascade across semesters and academic programs.

At a second level, the equity dimensions of OER concern representational justice within the content of materials themselves. De los Arcos and colleagues (2016) found that 55% of international OER users adapted materials specifically for cultural relevance, a proportion that reveals how systematically OER drawn from dominant educational contexts fail to reflect the cultural frameworks, historical experiences, and epistemic traditions of diverse global learner populations. Ladson-Billings's (1995) foundational argument that culturally responsive teaching requires affirming students' cultural identities and using their cultural referents as pedagogical resources applies with equal force to OER design: materials that render students' backgrounds invisible while centering dominant narratives may be freely available without being genuinely educational for the students they are ostensibly designed to serve. The UDL framework adds a third equity dimension by reframing accessibility design as proactive and universal rather than reactive and individual: a genuinely accessible OER does not require students with disabilities to request individual accommodations but functions effectively for diverse learner profiles by virtue of its design architecture.

The equity dimensions of renewable assignments are more ethically complex than the equity dimensions of OER access, and this complexity deserves sustained analytical attention rather than rhetorical reassurance. The motivational and performance benefits documented in Table 2, including the 12 percentage-point pass rate advantage in Jhangiani and colleagues (2016) and the substantially elevated self-efficacy scores in Seraphin and colleagues (2019), are potentially most valuable precisely for students who have been historically positioned as passive recipients of academic knowledge rather than active contributors to it. Positioning students from communities whose knowledge traditions have been excluded from academic canons as authors of publicly licensed educational resources disrupts an epistemological hierarchy with real consequences for identity, motivation, and belonging in higher education. The ethical complexity enters when mandatory public sharing is imposed without adequate

attention to the differential risks it creates across student populations. Students who are undocumented, students who hold minority political or religious positions in their communities, students who manage conditions whose disclosure could invite discrimination, and students whose academic writing is not yet at a level they feel comfortable defending publicly all face heightened risks from non-optional open publishing. Renewable assignment design that does not offer genuinely equivalent, non-stigmatized private alternatives does not disrupt power differentials: it redistributes them in ways that may exclude the most vulnerable students from the assignment's benefits while imposing its risks.

For institutional leaders, the most consequential implication of Table 3's findings is the structural inadequacy of relying on motivated individual faculty champions to sustain open education initiatives. The 86% of institutions providing no workload credit for OER development, the 78% with no formal OER policy, and the 69% with no institutional repository create conditions in which OER adoption is a sacrifice rather than a strategy for the educators who undertake it. Fixsen and colleagues' (2005) implementation science framework predicts precisely this outcome: educational innovations that lack competency drivers, organization drivers, and leadership drivers in simultaneous operation achieve initial adoption by committed individuals and subsequently stagnate without the structural conditions necessary for broad and durable implementation. Leaders seeking to build sustainable OER ecosystems should accordingly prioritize three simultaneous commitments: policy revision that recognizes OER authorship and curation in promotion and tenure criteria alongside traditional scholarly publications; investment in repository infrastructure with adequate metadata standards, version control, and technical support staff; and the establishment of compensated faculty learning communities focused on OER design, equity, and quality assurance rather than relying on voluntary participation.

For researchers, the framework identifies several empirical gaps whose resolution would substantially advance the field's capacity to give practitioners reliable guidance. The renewable assignment literature in particular remains methodologically immature, with most available studies relying on single-institution, single-course designs employing self-selected samples and inconsistent outcome measures. Large-scale, multi-institution studies with randomized or carefully matched comparison groups are needed to establish more definitive estimates of renewable assignment effects and to identify the moderating conditions, including student demographic characteristics, disciplinary context, assignment design features, and faculty preparation, that determine the magnitude and equity distribution of those effects. The accessibility domain is similarly underdeveloped: while the normative case for accessible OER design is well established in UDL and disability studies scholarship, rigorous empirical studies comparing learning outcomes of accessible versus inaccessible OER for students with specific disabilities are scarce and methodologically limited by the practical challenges of experimental manipulation in this area.

For instructional designers and librarians, who occupy the practitioner roles most directly responsible for OER design quality and curation in most institutional contexts, the framework's first domain points to the importance of treating OER selection and adaptation as a design process rather than a procurement process. Selecting an OER textbook without evaluating its alignment with specific course learning objectives, its cultural representativeness for the enrolled student population, its compliance with accessibility standards, and its compatibility with the assessment strategies of the course is an incomplete design decision that leaves in place many of the conditions that produce the implementation failures the literature documents. Renewable assignment design represents an opportunity for instructional designers to add distinctive professional value by helping faculty navigate the ethical and technical dimensions of open publishing, developing scaffold structures that prepare students for public-facing intellectual work, building consent frameworks into assignment architecture from the outset, and establishing quality review processes that protect both learner dignity and the educational value of the publicly shared work.

The limitations of this paper are those inherent in conceptual framework development as a mode of scholarly contribution. The framework's propositions are grounded in published empirical evidence but have not been tested against primary data, which means they remain organized hypotheses whose specific mechanisms, interaction effects, moderating conditions, and boundary cases are matters for future investigation. The quantitative benchmarks presented in the tables are drawn from heterogeneous studies and should not be aggregated uncritically across different methodological contexts: the conditions producing a d = 0.20 effect in a meta-analysis of 21 studies may differ meaningfully from the conditions producing a d = 0.12 effect in a single quasi-experimental comparison, and the institutional survey data in Table 3 reflect sampling frames and institutional contexts that may not generalize across national higher education systems with different governance structures.

Future empirical work should pursue several directions that the framework's causal logic suggests are most consequential. Longitudinal studies following OER-adopting student cohorts across multiple semesters would clarify whether the performance and persistence benefits observed in single-course studies cumulate, interact with subsequent course experiences, or attenuate over time. Comparative studies examining renewable assignment outcomes across student demographic groups would establish whether the motivational and performance benefits documented in Table 2 are equitably distributed or whether they accrue disproportionately to students who already possess the cultural capital to engage confidently with public academic discourse. Implementation studies examining the organizational conditions under which formal OER policies successfully shift faculty engagement patterns beyond the early-adopter minority would test the implementation science propositions that the framework imports from Fixsen and colleagues (2005) into the open education context.

E. CONCLUSION

This paper has proposed a conceptual framework for sustainable OER-enabled pedagogy organized around four interdependent domains: instructional coherence and design quality, renewable assignment design with learner agency safeguards, accessibility and culturally responsive adaptation, and institutional sustainability conditions encompassing policy, infrastructure, and community. Drawing on meta-analytic evidence of d = 0.17 to 0.20 performance gains associated with OER use, quasi-experimental DFW rate reductions of 8.3 to 11.4 percentage points across studies spanning more than 23,000 students, documented cost savings of $90 to $200 per student per course, renewable assignment pass rate advantages of 12 percentage points, and institutional data revealing that only 14% of institutions formally recognize faculty OER contributions, the framework argues that the unrealized potential of open education is less a resource quality problem than a systemic design and governance problem requiring coordinated action across all four domains simultaneously. Partial implementation that addresses cost or access without investing equally in instructional coherence, equity safeguards, accessible design, and formal institutional recognition is likely to reproduce the pattern of early enthusiasm and eventual stagnation that characterizes much of the OER movement's documented history. Sustainable open education demands that institutions treat OER not as a cost-cutting mechanism but as a pedagogical and equity infrastructure requiring the same policy recognition, resource allocation, and scholarly seriousness that institutions extend to their most consequential educational priorities; realizing that demand in practice is the defining challenge for open education in the decade ahead.

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