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Collaborative Knowledge Building in Hybrid Higher Education: Scaffolding Epistemic Agency Through Digital Knowledge Forums and Structured Peer Critique

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ABSTRACT

Hybrid higher education multiplies opportunities for students to co-construct knowledge across face-to-face and digital spaces, yet many courses still treat discussion boards as repositories of opinion rather than as sites of progressive knowledge building. This narrative review synthesises research on collaborative knowledge building, epistemic agency, digital knowledge forums, and structured peer critique in higher education. Anchored in Scardamalia and Bereiter's knowledge-building pedagogy and complementary work on computer-supported collaborative learning, the review examines how community knowledge goals, improvable ideas, and authoritative sources can be scaffolded in hybrid designs. Evidence indicates that well-designed knowledge forums and peer critique protocols can strengthen idea improvement, disciplinary discourse, and shared responsibility for community advances, while weak designs reproduce participation inequality, superficial commenting, and fragmented threads. The review proposes a design framework linking community knowledge objects, epistemic roles, critique routines, and hybrid orchestration, and identifies research priorities for equity, assessment of collective advances, teacher orchestration load, and culturally situated implementations beyond the dominant research geographies.

1. INTRODUCTION

Higher education institutions increasingly operate in hybrid configurations that combine scheduled face-to-face encounters with asynchronous and synchronous digital activity [1]. In principle, these configurations expand the time and media available for students to articulate, refine, and integrate ideas. In practice, many hybrid courses continue to organise digital participation as task compliance: post once, reply twice, and move on. Such patterns rarely produce the progressive improvement of ideas that characterises collaborative knowledge building as a pedagogical commitment rather than a technological feature [2]. Related scholarship develops this point further [3].

Knowledge building, as developed by Scardamalia and Bereiter, treats ideas as improvable conceptual artefacts and positions learners as members of a community with collective responsibility for advancing shared understanding [2]. Converging evidence is reported in additional work [4]. Epistemic agency names the capacity and responsibility of learners to set knowledge goals, identify problems of understanding, and regulate inquiry, rather than only completing teacher-assigned exercises [5]. Parallel findings support the same conclusion [6]. Digital knowledge forums, historically including Knowledge Forum and related environments, were designed to externalise this work through scaffolds, rise-above notes, and community knowledge views [2]. Subsequent studies reach a similar position [7]. Structured peer critique extends the

same logic into revision cycles where peers evaluate claims, evidence, and coherence against public criteria [8]. Further research reinforces this interpretation [9].

These strands matter for interdisciplinary learning and knowledge sciences because hybrid higher education now sits at the intersection of pedagogy, digital infrastructure, and assessment culture. Courses that claim to develop critical thinking and collaborative competence need designs in which students do more than exchange reactions; they need designs in which the community's knowledge objects actually improve over time [3]. Related scholarship develops this point further [10]. At the same time, algorithmic mediation of educational activity raises questions of agency, accountability, and justice when platforms shape who is heard, what is recommended, and how contribution is scored [11]. Assessment alternatives that move beyond discrete individual grades are likewise required if collective knowledge advances are to be recognised rather than ignored [12].

This narrative review addresses four questions. First, what does collaborative knowledge building require conceptually in higher education? Second, how can digital knowledge forums scaffold epistemic agency in hybrid courses? Third, under what conditions does structured peer critique advance idea improvement rather than social comparison or formulaic praise? Fourth, what design principles and research gaps should guide hybrid implementations? The contribution is an integrative design framework that links community knowledge objects, epistemic roles, critique routines, and hybrid orchestration for JILKS-relevant practice and research.

2. Theoretical and Conceptual Framework

2.1 Knowledge Building as Community Practice

Knowledge building differs from activity-centred collaborative learning that merely distributes labour. Its defining commitment is the continuous improvement of ideas of value to a community [2]. Converging evidence is reported in additional work [4]. Parallel findings support the same conclusion [13]. Subsequent studies reach a similar position [14]. Principles articulated across the knowledge-building literature include real ideas and authentic problems, improvable ideas, idea diversity, rise above, epistemic agency, community knowledge and collective responsibility, democratising knowledge, symmetric knowledge advancement, pervasive knowledge building, constructive uses of authoritative sources, knowledge-building discourse, concurrent assessment, and transformative assessment [2]. Further research reinforces this interpretation [15]. Related scholarship develops this point further [16]. Converging evidence is reported in additional work [17]. Not every principle must be maximised in every module, but designs that omit improvable ideas and collective responsibility tend to collapse into conventional discussion.

Authoritative sources occupy a distinctive place: students are expected to engage research literature, data, and disciplinary canons as resources for idea improvement rather than as material to be summarised and abandoned [2]. Parallel findings support the same conclusion [18]. This orientation connects knowledge building to academic literacy and to interdisciplinary synthesis, where competing frameworks must be brought into productive relation rather than merely listed [14]. Subsequent studies reach a similar position [19]. Related work on knowledge practices emphasises that technology-mediated learning should support progressive inquiry practices rather than only content delivery [13].

2.2 Epistemic Agency and Shared Regulation

Epistemic agency involves learners' initiative in defining knowledge problems, choosing strategies, and evaluating progress [5]. Further research reinforces this interpretation [6]. In collaborative settings, agency is partly individual and partly distributed: groups negotiate what counts as a worthwhile problem and when an idea is ready to be risen above [6]. Related scholarship develops this point further [20]. Self-regulated and socially shared regulation research clarifies that productive collaboration depends on joint planning, monitoring, and reflection, not only on cognitive exchange [20]. Converging evidence is reported in additional work [21]. For hybrid higher education, the implication is that digital tools should make regulatory moves visible (goal setting, synthesis, critique, rise-above) rather than only counting posts.

2.3 Computer-Supported Collaborative Learning and Hybrid Orchestration

Computer-supported collaborative learning (CSCL) research has long examined how scripts, scaffolds, and representations shape joint meaning-making [3]. Parallel findings support the same conclusion [10]. Subsequent studies reach a similar position [22]. Further research reinforces this interpretation [23]. Scripts

can reduce free-riding and focus discourse, but over-scripting can suppress authentic inquiry [22]. Related scholarship develops this point further [24]. Argumentation-oriented CSCL further shows that confronting cognitions through structured debate can deepen conceptual understanding when socio-emotional balance is maintained [25]. Converging evidence is reported in additional work [26]. Hybrid orchestration adds a temporal and spatial design problem: which knowledge work is best done face to face, which asynchronously in forums, and which in synchronous online sessions [1]. Parallel findings support the same conclusion [27]. Subsequent studies reach a similar position [28]. Effective hybrid knowledge building therefore requires pedagogical design of the whole ecology, not only selection of a platform [29]. Further research reinforces this interpretation [30].

3. Review Approach

This article is a narrative design-oriented review rather than a PRISMA systematic review. Literature was identified through iterative searches of scholarly databases and key journals using combinations of "knowledge building," "epistemic agency," "Knowledge Forum," "computer-supported collaborative learning," "peer critique," "peer feedback," "hybrid learning," and "higher education." Priority was given to peer-reviewed theoretical and empirical work from the mid-1990s to 2026, with emphasis on higher education or transferable post-secondary contexts.

Sources were retained when they contributed to at least one of the four review questions. Foundational knowledge-building scholarship is included alongside contemporary studies of digital peer feedback, hybrid course design, and collaborative discourse. Approximately fifty sources are cited. Limitations include possible selection bias and uneven geographic representation in the published corpus; contested findings are flagged rather than smoothed.

4. Collaborative Knowledge Building in Higher Education: Evidence and Tensions

4.1 From Participation Metrics to Idea Improvement

A recurring finding across CSCL and knowledge-building studies is that quantity of participation is a weak proxy for knowledge advance [3]. Related scholarship develops this point further [10]. Converging evidence is reported in additional work [31]. Threads rich in social acknowledgement may remain epistemically shallow, whereas smaller groups engaged in sustained problem definition and theory building may produce deeper conceptual change [2]. Parallel findings support the same conclusion [7]. Subsequent studies reach a similar position [32]. Higher education implementations often inherit learning-management defaults that privilege visible activity over idea quality. Without community knowledge goals and public criteria for improvement, forums become archives of parallel monologues [31]. Further research reinforces this interpretation [33]. Related scholarship develops this point further [34]. Dialogic teaching research similarly warns that talk must be accountable to knowledge, not only socially lively [35]. Converging evidence is reported in additional work [36]. Parallel findings support the same conclusion [37].

Studies of knowledge-building communities in tertiary settings report gains in explanatory coherence, conceptual integration, and engagement with authoritative sources when scaffolds explicitly support problem identification, theory revision, and rise-above synthesis [7]. Subsequent studies reach a similar position [15]. Further research reinforces this interpretation [16]. Related scholarship develops this point further [38]. Gains are less consistent when the same platforms are used without principle-based design, reinforcing that technology is not a sufficient condition for knowledge building [3]. Converging evidence is reported in additional work [10]. Parallel findings support the same conclusion [29].

4.2 Epistemic Agency Under Curriculum Constraint

University modules are time-bounded, assessment-heavy, and often content-dense. These constraints can squeeze the open-ended inquiry that knowledge building prefers [18]. Subsequent studies reach a similar position [39]. Productive adaptations treat knowledge building as a sustained strand within a course rather than as an unstructured free-for-all: students work on authentic problems aligned to learning outcomes, while retaining agency over how ideas are improved [5]. Further research reinforces this interpretation [15]. When every epistemic move is pre-specified by the teacher, agency becomes performative. When no structure is offered, novices may flounder and status hierarchies dominate [6]. Related scholarship develops this point further [22].

4.3 Interdisciplinary and Professional Programmes

Interdisciplinary programmes are natural sites for knowledge building because they require integration across frameworks, methods, and evidence standards [18]. Converging evidence is reported in additional work [19]. Professional programmes (education, business, health, engineering) can use practice problems as real ideas of value, provided that critique targets knowledge quality and not only workplace conformity [12]. Parallel findings support the same conclusion [19]. The risk in professional contexts is reducing collaboration to project management; the opportunity is treating practice dilemmas as improvable knowledge objects shared by a cohort.

5. Digital Knowledge Forums as Scaffolds for Community Knowledge

5.1 Designed Features Versus Generic Discussion Boards

Purpose-built knowledge-building environments differ from generic discussion boards in their support for idea-centred views, scaffold supports (for example, “My theory,” “I need to understand,” “This theory cannot explain”), referencing, and rise-above notes that synthesise groups of contributions [2]. Subsequent studies reach a similar position [7]. Generic boards can approximate some of these functions through carefully designed prompts, tagging, and synthesis assignments, but they rarely make community knowledge progress as visible as specialised environments [7]. Further research reinforces this interpretation [33].

Empirical work suggests that scaffolds influence the epistemic quality of notes when students are taught why scaffolds matter and when teachers model their use [7]. Related scholarship develops this point further [38]. Scaffolds used as mandatory sentence starters without understanding tend to produce formulaic text. Visibility of promising ideas and of synthesis notes helps communities notice advances; invisibility keeps strong contributions buried in chronological threads [2]. Converging evidence is reported in additional work [31].

5.2 Hybrid Temporal Designs

Hybrid courses can sequence knowledge work so that face-to-face sessions launch problems and negotiate criteria, asynchronous forums sustain idea improvement between meetings, and later face-to-face or synchronous sessions are used for rise-above synthesis and public defence of improved ideas [1]. Parallel findings support the same conclusion [27]. This division of labour uses each mode for what it affords: presence for negotiation and relationship, asynchrony for reflective writing and source engagement, synchrony for rapid clarification [27]. Subsequent studies reach a similar position [40]. Designs that dump all collaboration into the forum without classroom uptake waste the hybrid opportunity; designs that never return to forum ideas in class signal that digital work is peripheral.

5.3 Teacher Orchestration and Analytics Without Reductionism

Teachers orchestrate knowledge-building communities by highlighting promising ideas, prompting deepening questions, protecting minority views, and timing rise-above moves [15]. Further research reinforces this interpretation [38]. Learning analytics can assist orchestration by mapping participation, network structure, or linguistic indicators of explanation [31]. Related scholarship develops this point further [41]. Yet analytics that optimise only engagement risk recreating the compliance culture knowledge building seeks to escape [11]. Converging evidence is reported in additional work [41]. Orchestration support should help teachers see idea trajectories and neglected problems of understanding, not only who has posted.

6. Structured Peer Critique as Epistemic Practice

6.1 Critique Versus Appraisal Comments

Peer feedback research distinguishes generic praise from critique that targets claims, evidence, warrants, and clarity against shared criteria [8]. Parallel findings support the same conclusion [9]. Subsequent studies reach a similar position [42]. Further research reinforces this interpretation [43]. For knowledge building, peer critique is productive when it treats ideas as improvable and publicly owned, not as extensions of

personal identity [2]. Related scholarship develops this point further [8]. Converging evidence is reported in additional work [44]. Training in feedback literacy and use of rubrics or critique protocols improves specificity and uptake [9]. Parallel findings support the same conclusion [42]. Subsequent studies reach a similar position [45]. Further research reinforces this interpretation [46]. Meta-analytic evidence indicates that well-designed peer assessment can improve academic performance, though effects vary with design quality [45]. Related scholarship develops this point further [47]. Without such support, peer comments often remain affective, vague, or status-driven [8]. Converging evidence is reported in additional work [44]. Parallel findings support the same conclusion [48].

6.2 Protocols that Support Idea Improvement

Structured protocols may include claim-evidence-reasoning checks, devil's-advocate roles, compare-and-contrast of competing explanations, and revision contracts that require authors to report how critique changed their idea [8]. Subsequent studies reach a similar position [22]. Further research reinforces this interpretation [23]. Related scholarship develops this point further [45]. Double-blind or idea-blind variants can reduce identity bias in early rounds, while later identified dialogue can support accountability and clarification [44]. Multi-peer critique increases the diversity of perspectives but raises cognitive load; designs should limit the number of criteria and the number of artefacts under review at once [9]. Converging evidence is reported in additional work [21]. Parallel findings support the same conclusion [24]. Providing critique can itself deepen the reviewer's understanding when tasks require analytical judgement rather than surface editing [48].

6.3 Assessment Alignment

If only individual final products are graded, students rationally minimise investment in peers' idea improvement [12]. Subsequent studies reach a similar position [39]. Concurrent and transformative assessment principles from knowledge building call for assessing contribution to community knowledge as well as individual understanding [2]. Further research reinforces this interpretation [15]. Practical options include process portfolios of idea trajectories, documented rise-above syntheses, peer-critique quality rubrics, and group knowledge products with individual reflective components [12]. Related scholarship develops this point further [19]. Assessment alternatives in digitally mediated education remain under-used relative to conventional grading cultures [12].

7. Equity, Inclusion, and Algorithmic Mediation

Collaborative environments can amplify existing inequalities. Students with greater linguistic capital, majority cultural styles of argumentation, or high-speed connectivity may dominate hybrid forums [6]. Converging evidence is reported in additional work [44]. Parallel findings support the same conclusion [49]. Quiet expertise can remain invisible when platforms reward speed and volume [31]. Subsequent studies reach a similar position [49]. Inclusive knowledge building requires multiple modes of contribution, explicit norms that value questioning as much as asserting, and facilitation that invites under-heard voices into the community knowledge space [6]. Further research reinforces this interpretation [15].

Platform algorithms and automated moderation introduce further stakes. Ranking, recommendation, and automated scoring can quietly redefine what counts as valuable participation [11]. Related scholarship develops this point further [41]. Governing algorithmic agents that shape educational opportunity is therefore part of pedagogical design, not an external technical afterthought [11]. Ethical hybrid knowledge building prefers transparent criteria, human oversight of high-stakes judgements, and contestability when automated systems misread contributions, including those of second-language writers and students using non-dominant knowledge practices [11]. Converging evidence is reported in additional work [44].

8. An Integrative Design Framework

Synthesising the literature, this review proposes a four-component framework for collaborative knowledge building in hybrid higher education. Figure 1 depicts the components; Table 1 details design questions and failure modes.

Table 1. *Design Framework for Hybrid Collaborative Knowledge Building*

Component	Primary function	Core design questions	Typical failure mode
Community knowledge objects	Make ideas public, improvable, and shared	What is the authentic problem? What artefact improves over time?	Tasks that produce only private or one-shot submissions
Epistemic roles and agency	Distribute responsibility for inquiry regulation	Who sets knowledge goals? How do novices gain initiative?	Teacher monopolises all epistemic decisions
Critique routines	Improve claims, evidence, and coherence	What criteria guide critique? How is uptake documented?	Vague praise, identity threat, or unused comments
Hybrid orchestration	Align face-to-face, async, and sync activity	Which mode for launch, deepen, synthesise, assess?	Forum activity ignored in class; class activity not extended online

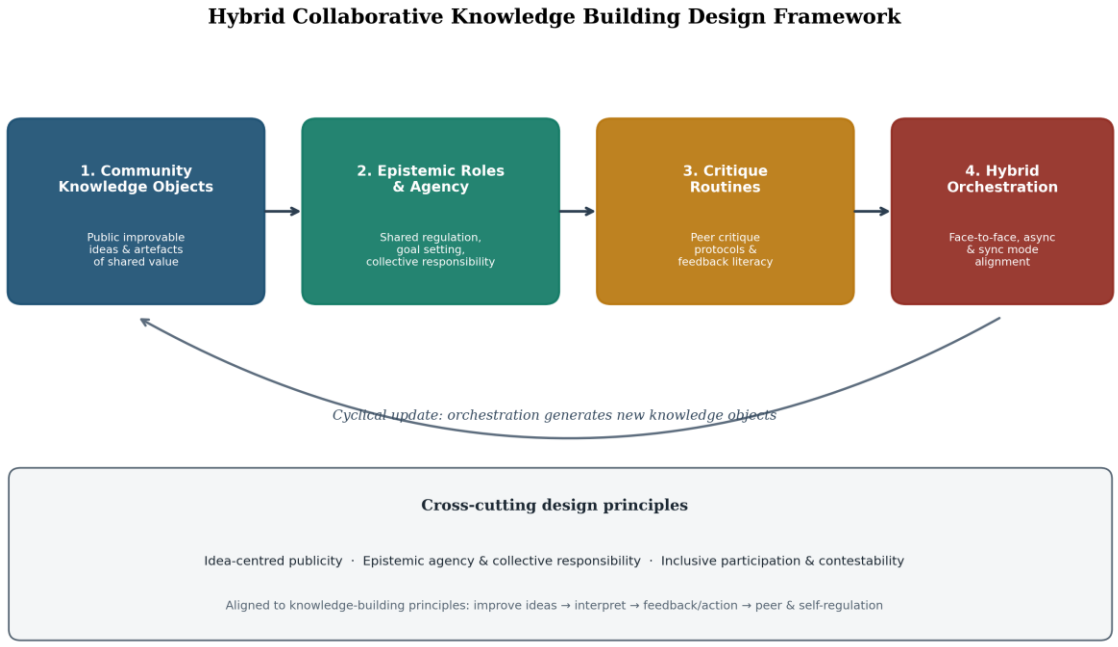

Figure 1. Integrative design framework for collaborative knowledge building in hybrid higher education

Figure 1. Integrative design framework linking community knowledge objects, epistemic agency, critique routines, and hybrid orchestration.

Two cross-cutting principles apply. First, *idea-centred publicity*: if ideas remain private to individuals or buried in unsearchable threads, collective responsibility cannot form [2]. Parallel findings support the same conclusion [7]. Second, *assessment honesty*: assessment must recognise contribution to community advances, or students will treat knowledge building as optional decoration around high-stakes individual grading [12]. Subsequent studies reach a similar position [15]. Digital tools should serve these principles rather than define them.

9. Research Gaps and Agenda

Several gaps limit confident generalisation. First, many studies still report participation and satisfaction more robustly than rigorous measures of idea improvement or conceptual change [3]. Further research reinforces this interpretation [31]. Related scholarship develops this point further [32]. Second, hybrid orchestration designs are under-specified in published reports, making replication difficult [1]. Converging evidence is reported in additional work [27]. Parallel findings support the same conclusion [28]. Third, equity analyses of who benefits from knowledge-building implementations remain thinner than overall effect narratives [34]. Subsequent studies reach a similar position [44]. Further research reinforces this interpretation [49]. Fourth, teacher professional learning for knowledge-building facilitation in large

enrolment courses needs scalable models that respect orchestration load [15]. Related scholarship develops this point further [16]. Converging evidence is reported in additional work [38]. Fifth, culturally and linguistically diverse higher education systems, including South Asian contexts, require situated design research rather than uncritical transfer of North American school-based knowledge-building models [18]. Parallel findings support the same conclusion [19]. Subsequent studies reach a similar position [30]. Sixth, the interaction between generative artificial intelligence tools and knowledge-building discourse needs careful study: automated drafting may accelerate text production while undermining students' investment in idea ownership and critique [11]. Further research reinforces this interpretation [45]. Related scholarship develops this point further [50]. Seventh, assessment research should test practical models for valuing collective knowledge advances without erasing individual accountability [12]. Converging evidence is reported in additional work [39]. Parallel findings support the same conclusion [47].

10. Discussion

The literature supports a qualified claim: collaborative knowledge building can thrive in hybrid higher education when designs centre improvable community ideas, cultivate epistemic agency, institutionalise structured peer critique, and orchestrate modes deliberately [2]. Subsequent studies reach a similar position [3]. Further research reinforces this interpretation [8]. Related scholarship develops this point further [15]. Converging evidence is reported in additional work [16]. Where any component is missing, digital collaboration tends to revert to compliance posting or fragmented opinion exchange [31]. Parallel findings support the same conclusion [33]. Subsequent studies reach a similar position [34].

This conclusion is neither a rejection of instructional guidance nor a celebration of unstructured discussion. Knowledge building requires sophisticated design: authentic problems, scaffolds that teach discourse moves, critique protocols that protect dignity while demanding rigour, and assessment that makes collective progress count [5]. Further research reinforces this interpretation [9]. Related scholarship develops this point further [12]. Converging evidence is reported in additional work [24]. Hybrid infrastructures multiply channels; only pedagogy turns those channels into a knowledge-building community [28]. Parallel findings support the same conclusion [29]. Dialogic and accountable talk traditions reinforce that epistemic quality depends on norms of reasoning, not only on access to platforms [35]. Subsequent studies reach a similar position [36]. Further research reinforces this interpretation [37].

Boundary conditions deserve emphasis. Short modules may support only modest idea trajectories; laboratory-heavy courses may need hybrid objects that combine inscriptions, data, and explanations; large classes may require nested communities with inter-group rise-above events [27]. Related scholarship develops this point further [30]. Converging evidence is reported in additional work [38]. Across settings, the knowledge sciences contribution is stable: learning improves when communities treat knowledge as a shared, revisable public good rather than as a private possession certified by terminal grades [2]. Parallel findings support the same conclusion [4]. Subsequent studies reach a similar position [10]. Further research reinforces this interpretation [14]. Reviews of AI in higher education further caution that educator roles must remain central when new tools enter collaborative writing and critique [50].

11. Conclusion

This narrative review examined collaborative knowledge building in hybrid higher education through the lenses of epistemic agency, digital knowledge forums, and structured peer critique. The central argument is that hybrid technology expands possibility but does not guarantee progressive idea improvement. Principle-based design is required to make community knowledge objects public and improvable, to distribute epistemic responsibility, to organise critique as a routine of knowledge work, and to orchestrate face-to-face and digital modes into a coherent inquiry ecology.

The proposed four-component framework offers a practical map for course designers and a research agenda focused on idea-quality outcomes, equity, teacher orchestration, culturally situated implementation, and assessment of collective advances. Realising knowledge building at scale will depend less on any single platform feature than on institutional willingness to value community knowledge as a legitimate higher education outcome.

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