EPiC Series in Built Environment

Volume 7, 2026, Pages 167–176

Proceedings of Associated Schools of Construction 62nd Annual International Conference

Blended Learning in Construction Management Education: A Faculty-Focused Literature Review

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Blended learning (BL) is the purposeful integration of face-to-face and technology-mediated instruction and has become central to higher education. BL aligns closely with the hands-on, collaborative nature of construction education. While BL is widely recognized for promoting active learning and engagement, most existing research in construction management (CM) education emphasizes student outcomes rather than faculty experience. This research addresses that gap by performing a systematic literature review and synthesizing 35 publications that examine how CM faculty design, perceive, and implement BL. Analysis revealed that faculty primarily use BL to enable active, applied, and team-based learning but face persistent challenges related to time, technological proficiency, and limited instructional design support. Faculty generally report positive perceptions once BL is implemented, though adoption remains inconsistent and often under-supported institutionally. This review contributes to the body of knowledge by centering the faculty perspective and identifying critical gaps in understanding BL's adoption and sustainability within CM education. Future research should pursue longitudinal, comparative, and faculty-focused studies to develop discipline-specific models for effective blended instruction in construction education.

Keywords: Construction Education, Blended Learning, Blended Teaching, Active Learning

Introduction

Blended learning (BL), the purposeful combination of face-to-face (F2F) and technology-mediated instruction, has been characterized as higher education's "new normal" (Graham et al., 2013; Dziuban et al., 2018). Beyond simple technology enhancement, BL is frequently positioned as a lever for shifting instruction toward student-centered learning by reallocating in-class time to interaction, practice, and feedback while moving some information transmission online. The anticipated benefits of BL include greater pedagogical richness, improved social interaction, increased learner agency, and potential cost efficiencies (Osguthorpe & Graham, 2003; Garrison & Kanuka, 2004; Graham, 2006, 2009). These map closely with the pedagogical aims of Construction Management (CM) education, which prioritizes applied, hands-on, and collaborative experiences.

CM education has historically focused on student-centered teaching approaches that promote increased cognition, engagement, and active learning. Accordingly, CM programs have adopted BL in various forms, often reporting promising student outcomes (Kim & Lee, 2020; Lees, 2017; McWhirter & Shealy, 2018; Ożadowicz, 2020; Rogers & Martin, 2019; Rogers & Ohrn, 2007; Rogers & Tingerthal, 2013). Despite the rapid adoption of BL across higher education, CM education lacks a

coherent understanding of how and why faculty use it. Most published work centers on student satisfaction or course outcomes, leaving unexamined the experiences, beliefs, and challenges of the instructors who actually design and deliver blended courses. Moreover, faculty decisions about BL in CM education are shaped by applied curricular demands, course level, and institutional support structures, yet these contextual influences remain largely unexplored in the literature. This imbalance leaves key questions unanswered: How do CM faculty support hands-on, active learning through blended instruction? What are CM faculty perceptions of BL? What challenges do CM faculty encounter when implementing BL? Without examining faculty perspectives, BL risks being treated as a technical upgrade instead of a pedagogical shift. This review directly addresses that gap by synthesizing research on BL in CM education, centering on faculty design practices, perceptions, and implementation challenges.

Background

BL, commonly called blended or hybrid teaching, integrates F2F instruction with technology-mediated learning experiences. It is widely recognized as a means to enrich pedagogy, increase access to knowledge, and support more flexible and student-centered learning (Osguthorpe & Graham, 2003; Garrison & Kanuka, 2004; Graham, 2006). BL has been linked to stronger peer interaction, greater personal agency, and opportunities for students who might be less vocal in traditional classrooms to participate in synchronous or asynchronous settings (Graham, 2006; Rice et al., 2005). Although BL is described variously as e-learning, hybrid learning, or technology-mediated instruction (Driscoll, 2002; Oliver & Trigwell, 2005), the most widely accepted definition combines F2F and online modalities in a purposeful, pedagogically coherent design (Graham, 2006). Importantly, the mere use of technology does not constitute BL; rather, effective BL intentionally replaces portions of in-person instruction with online learning to optimize flexibility and student engagement, especially in subsequent classroom interaction (Picciano et al., 2021).

Scholars have described BL along spectra of modality and interaction. Graham et al. (2019) categorize learner interactions as technology- or F2F–mediated between students, instructors, and content. These interactions can be combined in different proportions to meet instructional goals. Implementation can occur at multiple levels, from individual activities to full courses, programs, or institutions (Graham, 2009) and can take diverse forms such as rotation, flex, or enriched virtual models (Horn & Staker, 2015). Research across higher education identifies persistent challenges to faculty adoption of BL, including limited technological competence, time constraints, insufficient instructional design support, and skepticism about its value (Beggs, 2000; Rasheed et al., 2020; Porter et al., 2016). Faculty often balance enthusiasm for BL's potential with concerns over workload, assessment, and institutional incentives (Oh & Park, 2009). Despite these challenges, studies consistently demonstrate that the benefits of BL, such as improved engagement, access, and instructional flexibility, outweigh its barriers when supported by thoughtful design and institutional commitment (Graham et al., 2013).

Within construction education, which relies heavily on applied, hands-on learning, these issues are amplified. CM instructors must translate physical, experiential learning into partially digital formats while maintaining authenticity and collaboration. Yet the literature on BL in CM is fragmented and largely student-focused, with limited attention to how faculty experiences may vary by course type, academic level, or institutional setting and how these contextual factors shape instructional design and sustainability. Few studies have examined how CM faculty design blended courses, perceive their effectiveness, or navigate the challenges of adoption across these differing instructional contexts. To address this gap, this review synthesizes research on BL in CM education, emphasizing the faculty

perspective; that is, how instructors design and facilitate active learning, how they perceive BL, and what challenges they encounter in implementation.

Methods

Because research on BL in CM spans general, construction, and engineering education fields, a three-phase search strategy was used to capture an appropriate sample of CM-specific work. Studies from the learning sciences were included when they informed teaching theory, instructional design, or faculty pedagogical practice relevant to construction and engineering education, rather than other discipline-specific applications of BL. Searches were conducted across (1) Google Scholar using Harzing's Publish or Perish to identify highly cited and foundational BL literature, (2) education databases ERIC and Scopus, and (3) targeted sources within construction education, including the International Journal of Construction Education and Research (IJCER), the Journal of Engineering Education (JEE), and proceedings from the Associated Schools of Construction (ASC) and American Society for Engineering Education (ASEE) annual conferences. Search terms combined blended learning, hybrid learning, e-learning, and construction education (or construction management), limited to peer-reviewed publications in English starting in 2000. Because CM-specific results were limited, relevant studies from engineering education that addressed BL pedagogy were included to strengthen the dataset. Figure 1 shows the systematic literature review approach used in this research and a summary of the resulting manuscripts for further analysis. An initial yield of 114 papers was screened for relevance to CM or engineering education. Abstracts and full texts were reviewed to determine alignment with the study purpose: faculty design, perception, or implementation of BL in CM contexts. Studies focused exclusively on student outcomes or outside higher education were excluded. This process resulted in 35 unique articles that met all criteria.

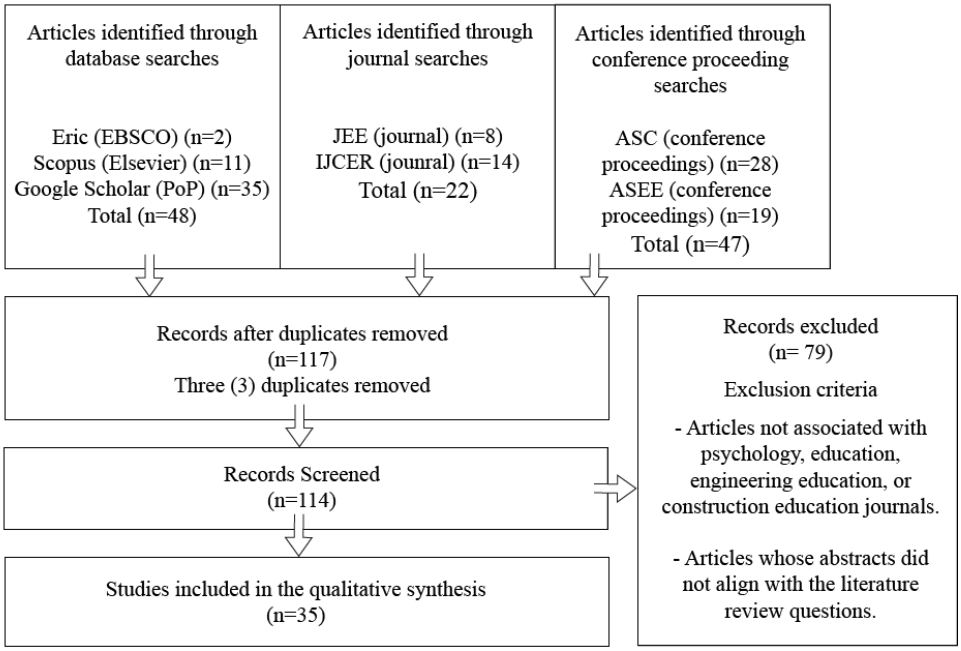

Figure 1. Systematic literature search flowchart

Results

How do CM faculty support hands-on, active learning through blended instruction?

Across the literature, active learning emerged as a defining element of effective blended instruction. Thirteen of the 35 reviewed studies described active or hands-on learning as central to their course design. In these studies, BL was not limited to moving lectures online but was instead used strategically to reallocate class time toward interactive, applied, and collaborative work, which is a key pedagogical priority in CM education. Faculty viewed BL as an opportunity to transform classroom dynamics from passive reception to active construction of knowledge. The most frequently cited strategies included structured group work, where students collaborated on problem-solving or design activities during F2F sessions. These group exercises often required shared decision-making, communication, and immediate presentation of deliverables, simulating professional teamwork environments common in the construction industry (Burgett, 2014; Kim & Lee, 2020; Rogers & Martin, 2019). Several studies also emphasized peer teaching and peer review as mechanisms for reinforcing understanding. In these cases, students were asked to prepare to explain concepts or critique peers' work, promoting metacognition and communication skills (Boghaert & Grove, 2018; Poon, 2013).

Laboratory sessions, workshops, and studios were another recurring feature. These F2F components provided essential tactile or spatial learning experiences that could not be replicated online but were strengthened by digital preparation or post-lab reflection. In some cases, online pre-class materials introduced theoretical foundations, allowing in-person time to focus on the physical or applied dimensions of construction problems (Hayden & Russell, 2018; Sul et al., 2020). Other activities, such as in-class homework, field or site visits, and discussion forums, offered additional ways to connect theory to practice. Despite these efforts, only one study explicitly discussed active learning in the online portion of the course. Dart et al. (2020) reported that engineering students voluntarily worked through mathematical problems while viewing instructional videos, finding that such engagement (though optional) enhanced learning. Overall, the literature consistently portrayed active learning as integral to BL in CM, though evidence suggests that most activity remains centered in the F2F component rather than being fully integrated across modalities.

What are CM faculty perceptions of blended learning (BL)?

Faculty perceptions of BL were overwhelmingly positive but unevenly documented. The majority of papers reported on faculty attitudes after they had adopted BL, often through case studies or reflective reports. Very few studies examined how faculty perceived BL before its introduction or what motivated them to adopt it initially. This gap leaves much of the faculty decision-making process unexplored. Among those who implemented BL, faculty typically expressed optimism about its pedagogical potential and satisfaction with student outcomes. They described BL as a way to make instruction more interactive, efficient, and aligned with modern learning preferences. Cleveland-Innes et al. (2015) found that instructors viewed BL as enabling new opportunities for leadership, peer learning, and active discussion. Similarly, Boghaert and Grove (2018) reported that, despite initial implementation difficulties, faculty believed that BL had the potential to transform the student experience when grounded in intentional design and continuous refinement. Several instructors noted that after the initial investment in development BL saved time in lecture delivery and grading while increasing flexibility for both students and instructors.

At the same time, the literature revealed pockets of skepticism and concern. A few studies recorded apprehension about losing control of classroom interaction or diminishing the immediacy of F2F

communication (Felder & Brent, 1996; Rogers & Tingerthal, 2013). Others suggested that some faculty doubted the applicability of BL to technical or highly specialized content areas (Steino & Davidsen, 2017). Concerns also persisted that reduced F2F time could lead to lower academic performance if students failed to engage with online materials (Hardie et al., 2013). Importantly, these negative perceptions were often mentioned only briefly, suggesting they were not the central focus of most studies. Overall, the reviewed literature portrays a faculty community that is largely favorable toward BL once experience is gained but still lacks empirical understanding of how perceptions evolve through adoption, experimentation, and sustained teaching. Few systematic investigations have captured these longitudinal or comparative perspectives, leaving a clear opening for future research.

What challenges do CM faculty encounter when implementing BL?

Challenges reported by CM and engineering faculty largely mirrored those observed across higher education, but their impact was often amplified by the applied and collaborative nature of CM courses. Two major categories of challenges emerged: design and implementation barriers and teaching and administrative burdens.

Design and implementation challenges centered on time, expertise, and institutional support. Faculty frequently cited the substantial time investment required to redesign courses for blended delivery, particularly in developing online materials and integrating them coherently with in-person sessions (Poon, 2013; Rogers, 2021). Many instructors lacked formal instructional design assistance and relied on trial-and-error approaches to course development. Others reported discomfort or lack of confidence with educational technologies, describing the learning curve as a significant barrier to effective integration (Heintz & Muhren, 2007; Hardie et al., 2013). Additionally, maintaining student engagement in the online components proved difficult; some faculty reverted to traditional lecturing when students arrived unprepared for in-person activities (Boghaert & Grove, 2018). Teaching and administrative challenges emerged after implementation. Faculty noted that while BL encouraged richer classroom interaction, it also increased demands for individualized feedback and continuous monitoring of student progress. Large class sizes exacerbated this problem, making “just-in-time” feedback logistically challenging (Marasco et al., 2018). Instructors also struggled when students were unprepared for peer-to-peer collaboration or when online activities created uneven workloads between digital and F2F components. Several authors mentioned increased grading time, new assessment complexities, and difficulties maintaining coherence across multiple platforms (Cleveland-Innes et al., 2015; Boghaert & Grove, 2018). In a few contexts, technological or financial constraints limited student access to necessary hardware or reliable internet connectivity (Hardie et al., 2013).

Despite these difficulties, most authors concluded that the benefits of BL outweighed the challenges, particularly when courses were iteratively improved and institutional support was provided. Faculty viewed the design and adaptation process as part of an evolving pedagogical practice rather than a one-time technical adjustment. Across the studies, the most successful implementations were those where instructors had both the autonomy and the resources to experiment, evaluate, and refine their blended approaches.

Discussion

This review sought to clarify how CM faculty use, perceive, and experience BL. The synthesis of 35 studies reveals that while BL is increasingly used to promote active, hands-on learning, the existing literature provides an emerging but fragmented understanding of its role in CM education. Most studies focus on student experiences and outcomes, with far less attention to faculty perspectives, design decisions, or long-term sustainability. Consequently, the scholarship on BL in CM remains

descriptive and localized, rather than systematic or comparative across programs and institutions. A consistent trend is that much of the BL research in CM arises from conference proceedings, particularly from the Associated Schools of Construction (ASC) and the American Society for Engineering Education (ASEE). These venues have been instrumental in documenting instructional innovation, yet their case-based format and limited indexing constrain the accumulation of generalizable evidence. Because most studies represent single-course implementations, their findings are difficult to replicate or synthesize, and they often lack methodological depth. This reflects a disciplinary reality: CM faculty tend to share pedagogical innovations informally or through practitioner-oriented platforms, creating enthusiasm for BL but limiting opportunities to build an evidence-based understanding of its effectiveness and scalability.

Taken together, the literature portrays faculty as central but underexamined agents in BL adoption. Instructors use BL primarily to facilitate active, hands-on learning that mirrors professional construction practice, leveraging the modality to make class time more interactive and applied. Faculty who have implemented BL generally report positive experiences, citing improved engagement, flexibility, and alignment with CM's project-based nature. However, adoption remains uneven, and many instructors face challenges related to course design, workload, and technological fluency. Few studies investigate how faculty develop these courses, what institutional supports they rely on, or how their perceptions evolve from initial adoption to sustained use. Another pattern in the literature is a positivity bias: most publications are authored by faculty who already hold favorable views of BL or who operate in environments that encourage its use. As a result, the literature underrepresents instructors who are skeptical, constrained by time or resources, or who have encountered negative outcomes. This skew limits the field's understanding of barriers to adoption and the conditions necessary for successful implementation. Without exploring both supportive and resistant faculty experiences, the CM discipline risks treating BL as a technological fix rather than a pedagogical transformation requiring cultural and institutional alignment.

The contextual nature of CM education further complicates adoption. CM courses often depend on tactile, collaborative, and site-based experiences that are difficult to reproduce digitally. Faculty must adapt these activities into blended environments without diluting their authenticity or learning impact. Yet, little research documents how these instructional translations occur in practice, what technologies best support them, or how programs evaluate their success. These gaps highlight a need for inquiry into design frameworks specifically suited to the applied, hands-on demands of CM education. Overall, this review suggests that BL in Construction Management education is in a formative stage: rich with innovation but lacking cohesive, faculty-centered research. Advancing the field will require studies that move beyond isolated case examples toward systematic investigations of faculty perceptions, design practices, and institutional supports. Longitudinal and comparative research could clarify how faculty sustain and refine BL over time, and cross-institutional studies could identify scalable strategies for integrating hands-on learning in blended formats.

It should be noted that the COVID-19 pandemic had a profound influence on the discussion of blended learning within construction management and engineering education. During the rapid shift to online instruction in 2020–2021, many programs adopted temporary digital solutions to maintain course delivery. However, these adaptations were largely forms of emergency remote teaching rather than intentional blended learning. They lacked the deliberate integration of online and F2F elements that defines BL and often omitted the active, hands-on learning central to CM pedagogy. While these emergency measures were not effective examples of true BL, they nonetheless expanded faculty awareness of digital tools and demonstrated the potential flexibility of hybrid formats. The experience exposed structural weaknesses in technology access, instructional design support, and faculty preparedness, but it also accelerated interest in purposeful, sustainable blended approaches. In this

way, the pandemic served as a catalyst, highlighting both the limitations of ad-hoc online teaching and the long-term opportunity for well-designed blended instruction in CM programs.

In summary, while some CM faculty are already using BL to strengthen active learning and professional engagement, the research base remains narrow and fragmented. Broader, faculty-focused inquiry is essential to transform these individual successes into a coherent understanding of how BL can sustainably enhance teaching and learning in construction education. Several limitations of this research should be acknowledged. Although a systematic, multi-phase search strategy was used, it is possible that relevant BL studies were not identified, especially those employing different terminology or published in practitioner-oriented or minimally indexed outlets. Because much of the CM-relevant BL literature is case-based and reported through conference proceedings, this limits the generalizability of the conclusions that can be drawn. The literature also reflects a tendency toward reporting positive faculty experiences, potentially underrepresenting barriers or unsuccessful implementations. Finally, because many studies inconsistently reported contextual details such as course level, program structure, and institutional supports, this review could not compare BL practices across instructional settings. These limitations reflect both the emerging nature of BL research in CM education and the current state of reporting practices in the field.

Conclusions

This review synthesized 35 publications examining blended learning (BL) in Construction Management (CM) and closely related engineering education contexts, with a specific focus on faculty design practices, perceptions, and implementation challenges. By centering the faculty perspective, this study contributes a distinct lens to a literature that has largely emphasized student outcomes and instructional technologies. The findings indicate that CM faculty most often employ BL as a means of reallocating face-to-face time toward applied, collaborative, and hands-on activities, while online components primarily serve preparatory or supportive roles. This pattern reflects the applied and project-based nature of CM education and highlights how disciplinary context shapes blended instructional design. Across the literature, faculty who adopt BL generally report positive perceptions related to student engagement, flexibility, and alignment with professional practice. At the same time, adoption remains uneven and frequently under-supported, with persistent challenges related to course redesign time, technological fluency, workload, and access to instructional design resources. Taken together, these findings suggest that BL in CM education functions less as a discrete instructional technique and more as an ongoing pedagogical change process shaped by faculty beliefs, institutional structures, and disciplinary norms.

This review is significant because it moves beyond isolated case studies to identify cross-cutting patterns in how CM faculty experience and enact BL. By revealing common design tendencies, reporting gaps, and structural barriers, the results provide a foundation for more systematic, faculty-centered inquiry into blended pedagogy in applied disciplines. Without such evidence, BL risks being adopted as a surface-level technological solution rather than as a pedagogically grounded approach requiring sustained support and cultural alignment. Future research should build on these insights through longitudinal and comparative studies that examine faculty experiences before, during, and after BL adoption, as well as mixed-method approaches that integrate faculty and student perspectives. Additional work is needed to develop discipline-specific design frameworks that address the unique demands of CM education, including laboratories, site-based learning, and collaborative project work. Although contextual characteristics such as program type, course level, and institutional setting are important for understanding BL implementation, these details were inconsistently reported across the studies analyzed, limiting systematic comparison. Therefore, future research should also prioritize the collection and reporting of such contextual information to enable more robust,

comparative analyses of BL in CM education. Advancing this research agenda will be essential for translating blended learning theory into sustainable, evidence-based practice in construction management education.

Acknowledgment

The authors used generative AI tools (ChatGPT 5.2) to assist with language editing and clarity improvements after the research and final draft of this manuscript was completed. All intellectual content, data interpretation, and conclusions are the authors' own.

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