Artificial Intelligence in Construction Education: Perspectives from Practitioners, Faculty and Students

Ms. Binita Acharya, Colorado State University

Binita is a student at Colorado State University pursuing her master's degree in Construction Management.

Dr. Mehmet Egemen Ozbek

Dr. Mehmet E. Ozbek is a professor and the holder of the Joseph Phelps Endowed Chair in the Department of Construction Management at Colorado State University (CSU). He also has a courtesy appointment in the Civil and Environmental Engineering Department. He is an affiliated faculty of the Center for Sustainable and Intelligent Transportation Systems as well as the School of Global Environmental Sustainability at CSU. He holds a Ph.D. in Civil Engineering with a focus on Construction Engineering and Management. Dr. Ozbek's research areas include infrastructure asset management, multi-criteria decision-making, sustainable infrastructure, and construction contracts. He has received grant funding from Federal, state, and private entities; and he has published extensively to disseminate his research in peer-reviewed publications as well as delivering presentations and keynote addresses at international conferences. He received multiple teaching awards at the university and national level, including an award voted by the students in his department. In addition to serving on national committees and boards related to construction and infrastructure, he serves as the Editor-in-Chief of the Associated Schools of Construction (ASC) International Journal of Construction Education & Research, an associate editor for Transportation Research Record, and a specialty editor for the American Society of Civil Engineers (ASCE) Journal of Construction Engineering and Management. Dr. Ozbek also serves as a reviewer for numerous journals and conference proceedings. Dr. Ozbek has taught courses at the undergraduate and graduate programs, including a service-learning course, a study-abroad course, and a Collaborative Online International Learning (COIL) course at CSU. He also taught construction engineering and management courses as a visiting faculty for the summer sessions within the Civil, Environmental, and Architectural Engineering Department in the University of Colorado at Boulder. At the international level, he served as the overseas external adviser for the Construction Program at the University of Technology, Jamaica. Dr. Ozbek is the faculty advisor for the Construction Management Association of America Student Chapter at Colorado State University and served as the faculty coach for the ASC Competition Commercial Team and the Integrated Project Team. He also held an administrative position as the Acting and Interim Head of the Department of Construction Management at CSU from 2018 to 2020.

Dr. Rebecca A Atadero P.E., Colorado State University

Rebecca Atadero is a professor in the Department of Civil and Environmental Engineering at Colorado State University, specializing in structural engineering. She conducts research on the inspection, management and renewal of existing structures, social equity in civil engineering work, and diversity, equity and inclusion in engineering education.

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Abstract

The construction industry is undergoing a significant transformation driven by advancements in technology, particularly artificial intelligence (AI). AI has emerged as a transformative force that enhances efficiency, safety, productivity, and sustainability while reshaping traditional practices across various phases of construction, including project planning, design, site management, and safety. Despite this potential, the construction sector has historically lagged in technological adoption, making the development of AI literacy among future professionals increasingly vital. The purpose of this study is to identify current uses of AI in the construction industry and determine industry expectations for AI competencies among entry-level professionals with the intent of using this knowledge to develop improved training. This paper will describe findings from two types of data collection. First, we surveyed undergraduate construction management students to understand their perspectives on the use of AI in construction education. Second, we conducted interviews with educators and industry professionals focusing on current AI applications, perceived skills gaps, and recommendations for AI literacy in construction education. The study analyzes interviews and surveys with thematic qualitative analysis and descriptive statistics to identify common themes and connect them to approaches, misunderstandings, and difficulties in incorporating AI into construction education. The analysis shows that, on average, students rated their understanding of general concepts of AI, AI tools, and their application in construction management at 2.5 out of 5, and 70% of the students believed that they would continue making use of AI tools after their studies. Educators highlighted that incorporating problem-based learning with generative AI tools is highly important for strengthening students' critical thinking skills and helping them adapt to the rapidly evolving AI landscape. Additionally, industry professionals emphasized the need for students to have a clear understanding of AI capabilities, apply AI appropriately within context, and remain aware of the ethical considerations associated with its use. This study can help establish a foundational framework to explore further how artificial intelligence is understood and integrated into construction education. It also provides insights for developing more adaptive teaching strategies that prepare future construction professionals for technology-driven industry demands.

1. Introduction and Purpose:

The Architecture, Engineering, and Construction (AEC) industry is currently undergoing a significant digital transformation driven by the integration of Artificial Intelligence (AI) often referred to as the Fourth Industrial Revolution or "Construction 4.0" [1]. While the construction sector has historically lagged in productivity growth and digitization compared to other industries, recent advancements have positioned AI as a critical tool for enhancing efficiency, safety, and decision-making [2]. Industry operations are being fundamentally transformed through the application of machine learning for project scheduling, computer vision for real-time safety monitoring, generative design for structural optimization, and predictive analytics for complex risk management [3], [4], [5]. Financial projections suggest that AI integration could add $0.5 trillion to the industry's gross value by 2035, while the global construction market is expected to grow to $15.5 trillion by 2030 [2], [6]. While a recent survey indicates that approximately 37% of AEC professionals are already utilizing AI, major firms such as Skanska and Procore have moved ahead by implementing internal AI chatbots and automated progress tracking systems [3], [7]. This digital transformation is reshaping skill requirements, mandating that the future workforce possesses robust AI literacy to maintain competitive standards in a technology-driven market [5].

Construction education programs face significant pressure to prepare AI-literate graduates who can ethically and efficiently navigate this rapidly shifting professional landscape [8]. Educational institutions encounter complex hurdles in this endeavor, including the unprecedented pace of technological evolution, curriculum inertia within already dense technical programs, and notable gaps in faculty expertise regarding AI applications [9], [10]. Traditional construction management education has historically focused on core technical and managerial skills, but it must now pivot to incorporate data science and AI competencies as foundational requirements [11]. Research indicates that successful technology integration requires a comprehensive understanding of which industry-specific skills are required and how to deliver them through innovative pedagogical models. This necessitates understanding the perspectives of those involved in both the educational and professional sectors to ensure academic relevance [5].

While prior research has examined technology adoption in AEC education [7], limited work has explored how practitioners, faculty, and students collectively perceive AI integration within construction programs [12]. The absence of multi-stakeholder perspectives may result in curricular decisions that do not fully reflect industry expectations, instructional constraints, or student readiness [7]. It is essential to include input from various stakeholder groups, as each offers unique and vital insights: practitioners identify immediate industry needs, faculty evaluate pedagogical feasibility, and students highlight learning preferences and career readiness goals. Understanding areas of alignment and divergence among these groups is therefore essential to informing AI-related curricular decisions in construction education.

The purpose of this study is to examine the perspectives of construction management students, educators, and industry practitioners regarding current AI use in the construction industry. The findings provide evidence-based insights to support AI-related curricular decisions in undergraduate construction programs.

2. Research Questions

This study aims to gain an understanding of how AI is currently being used and integrated in the construction industry to ultimately help improve the seamless integration of AI into construction education. This study is driven by the following research questions:

- How is artificial intelligence currently being used and integrated in the construction industry?
- How can these practices inform the effective integration of AI into construction education?

3. Background:

The construction industry is currently undergoing a transformative shift known as Construction 4.0, which integrates advanced digital technologies to overcome chronic issues such as stagnant productivity, low-profit margins, and safety hazards [2], [7]. While there is broad agreement that AI enhances data-driven decision-making, scholars differ in how they position its role within this transformation. Some emphasize Building Information Modeling (BIM) as the foundational infrastructure enabling AI-driven insights and real-time coordination [1], whereas others highlight AI's analytical capacity to extract value from data generated through IoT sensors, drones, and historical project records [4]. This distinction suggests differing views of AI as either an extension of existing digital systems or a more transformative force within construction workflows.

Additionally, there are varying perspectives regarding the impact of specific AI applications currently reshaping the construction sector including predictive analytics, robotics, and generative design. Predictive analytics is commonly framed as an optimization tool that is utilized in project management to forecast delays, material shortages, and cost overruns by analyzing historical data and environmental variables [10], [13]. In contrast, robotics and automated systems such as AI-powered machines are described as a replacement for repetitive or hazardous tasks such as bricklaying, welding, and 3D printing, to address labor shortages and mitigate on-site risks [1], [14]. Generative design further illustrates this spectrum: while frequently associated with enhanced efficiency and sustainability through rapid generation of design alternatives [2], [15], it also reflects a broader shift toward algorithm-assisted decision-making in design processes. Collectively, the literature reflects both confidence in AI-enabled performance gains and recognition that automation may alter traditional professional roles

This rapid adoption necessitates a workforce proficient in AI literacy, defined as the set of competencies required to critically evaluate, collaborate with, and purposefully utilize AI technologies [8], [16]. There is an urgent industry demand for professionals who can bridge the gap between traditional engineering expertise and data-centric assessment [14]. While approximately 37% of AEC professionals are already using AI, a profound talent gap remains, as many firms lack internal experts capable of leading large-scale digital implementations [6]. This industry transformation raises important questions for education, as academic institutions must pivot themselves from teaching purely manual skills towards preparing graduates for highly automated, data-intensive professional environments.

3.1 AI in construction Education:

The integration of AI into construction management curriculum is transitioning from theoretical exposure to applied, hands-on learning [11]. While some programs incorporate AI through Problem-Based Learning (PBL) and flipped classroom models, delivering lecture content through pre-recorded materials and reserving class time for activities such as Monte Carlo simulation scheduling or robotic arm optimization [11], others introduce specialized undergraduate modules, including computer vision applications for Personal Protective Equipment (PPE) inspection using non-programming platforms like Roboflow [8]. These approaches reflect differing strategies: embedding AI within existing pedagogical structures versus developing targeted technical modules.

Large Language Models (LLMs), particularly ChatGPT, further illustrate this divergence. They are described as “translation tools” that enable students without computer science backgrounds to generate code for tasks such as BIM information retrieval [14], [17]. However, their integration process faces several implementation challenges, including curriculum inertia and the density of existing technical requirements which leave little room for interdisciplinary topics [18]. Faculty expertise presents an additional tension; while AI offers instructional possibilities, many instructors report feeling underprepared to teach its technical dimensions or ethical implications [9].

Resource constraints also hinder adoption, with high costs for high-performance computing, data security concerns, and inherent “black box” nature of AI complicating instructional transparency [12], [19]. There is also a pedagogical risk of over-reliance on automation, which may lead to “intellectual atrophy” if students skip the manual verification necessary for deep learning [11]. Given these developments, understanding stakeholders’ perspective becomes critical to ensure that AI integration does not merely replace foundational thinking but enhances it through responsible and transparent governance.

3.2 Stakeholder Perspectives in Educational Innovation:

Successful curriculum design for AI integration requires multi-stakeholder input, as practitioners, faculty, and students often have diverging expectations regarding the value and risks of these technologies [6]. From the practitioners’ perspective, the focus is on efficiency, productivity, and ROI; they demand graduates who possess “job-ready” skills to implement AI-driven resource optimization and automated compliance tracking [7], [20], [21]. Industry leaders emphasize that the lack of AI-trained professionals is a primary barrier to technology adoption in construction.

In contrast, the faculty perspective is often characterized by hesitancy and role identity concerns [21]. While some faculty see AI as a way to “humanize” education by freeing up time for higher-order mentoring, others view it as a threat to academic integrity and are concerned about the burden of revising outmoded assessment strategies [9], [19]. Faculty often prioritize the need for students to understand the “why” behind first principles before resorting to automation [17]. Meanwhile, students’ perspectives are generally optimistic regarding AI’s ability to improve efficiency and reduce studying time, yet they express significant fears about job displacement and the potential erosion of their own critical thinking skills [20], [22], [23]. Students have indicated a strong interest in structured, discipline-specific guidance on AI ethics rather than broad institutional policies [19].

The literature reveals a growing body of work on individual stakeholder views; however, a gap exists in comprehensive research [20]. While some studies explore student perceptions of ChatGPT in civil engineering [14] or faculty attitudes toward GenAI [9], no studies have comprehensively examined all three perspectives simultaneously regarding AI within the construction sector. This piecemeal view may lead to misaligned curricula where academic content does not reflect the practical constraints or ethical realities of the professional site [7], [24], [25].

There is a lack of alignment between what is taught in the classroom and what is required by a sector facing significant AI-literacy deficit. This study is an initial effort in addressing these gaps by conducting simultaneous multi-perspective investigation into the needs and perceptions of students, faculty, and industry practitioners. This work will contribute actionable insights for designing curriculum that balance technical proficiency with the human-centric judgement required for the future of construction industry.

4. Methodology

This exploratory investigation was conducted in two distinct phases.

a. Survey

First, we administered a questionnaire to construction management students to gather their opinions on incorporating AI into construction education. The instrument was designed to capture self-reported perception and attitudes toward AI use in the construction industry rather than objectively measured competencies or technical proficiency. The questionnaire included multiple-choice questions, open-ended questions, and ranking questions to capture both qualitative and quantitative data relevant to the research objectives. Survey items were informed by themes identified in the literature review, including AI use, efficiency of AI tools used and their perceptions on ethical use of AI.

For example, students were asked about their exposure to AI tools ("Have you ever used any Artificial Intelligence tools or Generative AI applications like ChatGPT?"), their perceived knowledge ("On a scale of 1–5, how knowledgeable do you consider yourself in AI applications in construction management?"), and the perceived importance of AI skills ("How important do you think it is for future Construction Management professionals to have skills in AI?"). To assess perceptions of practical application, students were asked to identify areas where AI could have the greatest project impact, such as project scheduling, cost estimation, safety monitoring, and risk management. Open-ended questions explored students' concerns about learning AI and tasks they were most curious about using AI for in their future careers. Qualtrics was used for survey development and response collection.

The target population consisted of undergraduate construction management students at Colorado State University. The survey was distributed through the department's Canvas page and reinforced through in-class announcements in required courses. Participation was voluntary and no incentives were offered. A total of 126 valid responses were collected.

Survey data were analyzed using descriptive statistics. Frequencies and percentages were calculated for categorical variables, and means were computed for Likert-scale items to summarize patterns in reported AI knowledge, usage, attitudes, and confidence.

b. Semi-structured Interviews

In the second phase, we conducted semi-structured interviews with six construction professionals involved in AI integration initiatives, as well as five faculty members who incorporated AI topics into their construction curriculum. Table 1 shows the details of the participants interviewed. These interviews were facilitated through video conferences using Microsoft Teams and were audio-recorded and transcribed. To protect participant anonymity, all identifying information related to the individuals and the affiliated organizations was removed from the transcripts prior to the analysis.

Table 1: Details of Participants Interviewed

Group	Designation	Years of Experience
Industry	Director of Innovation	19 years
Industry	Senior Innovation Manager	13 years
Industry	Cofounder/COO- AI startup	8 years
Industry	Project Manager	10 years
Industry	VDC Manager	11 years
Industry	Continuous Improvement Manager	12 years
Educator	Junior Professor	12 years
Educator	Post doctoral researcher	4 years
Educator	Assistant Professor	4 years
Educator	Associate Professor	11 years
Educator	Professor	15 years

The data from the interviews and surveys were analyzed following Braun and Clarke's six-phase thematic analysis framework, which is a recognized method for identifying, examining, structuring, interpreting, and documenting recurring patterns in qualitative materials [26], including interview transcripts and survey narratives. We employed an inductive approach to identify naturally occurring themes with the dataset. Coding and theme development were reviewed iteratively by the research team to ensure consistency and alignment with the data.

A primarily data-driven approach was adopted to identify patterns emerging from participant responses. Phase one involved researcher immersion through repeated reading of transcripts and survey narratives to develop familiarity with the data. In phase two, initial codes were generated systematically to capture meaningful segments relevant to AI use, and perceptions. A hybrid coding strategy was applied, combining inductive theme development with deductive sensitivity to the research questions. Phase three involved organizing related codes into candidate themes by clustering conceptually similar patterns. In phase four, themes were reviewed and refined to ensure coherence within themes and distinction between themes, while confirming alignment with the broader dataset. Phase five focused on clearly defining and naming themes to capture their underlying meaning and contribution to the research questions. In the final phase, themes were synthesized into a coherent analytical narrative, supported by representative participant quotations. The findings section will provide a detailed discussion of the themes derived from this analytical process.

5. Findings

5.1 Survey Findings

The survey examined students' exposure to artificial intelligence. A total of **126 undergraduate students** participated, representing a range of academic levels, with juniors (39%) and seniors (45%) comprising the majority of respondents. Participants were enrolled in and/or taking classes in Construction Management.

Survey results indicate that student exposure to AI tools is already widespread. Nearly 96% of respondents reported having used AI or generative AI tools. The most commonly used tools were conversational AI platforms, such as ChatGPT, followed by AI writing assistants and grammar-checking tools. In contrast, substantially fewer students reported using AI image generation tools or coding assistants. This pattern suggests that students' engagement with AI is currently centered on general-purpose productivity tools, rather than construction-specific applications. When asked how they use AI in their studies, the majority of students reported using AI to save time, better understand course material, and obtain quick information. Over 50% of respondents indicated using AI for proofreading, idea generation, and research support. These responses suggest that students primarily view AI as a supportive learning aid, rather than as a substitute for disciplinary knowledge or technical expertise. Students generally recognized the importance of AI skills for their future careers. On average, respondents rated the importance of AI for future construction management professionals at 3.39 out of 5, indicating moderate to high perceived value. In addition, 77% of students reported that they expect to continue using AI tools after graduation, suggesting that AI is viewed as a long-term professional resource rather than temporary academic aid.

Despite frequent AI use, students rated their self-perceived understanding of AI as moderate. While students expressed relatively high familiarity with general AI concepts and generative tools, their confidence was notably lower when asked about AI applications specific to construction management. This reveals a gap between widespread AI usage and limited understanding of how AI translates into construction practice.

5.2 Interview Findings

The qualitative analysis of the interview data identified three major preliminary themes that explain how artificial intelligence is currently understood, adopted, and anticipated within construction practice. These themes reflect participants' experiences with existing AI applications. Participants consistently emphasized the importance of using AI to make maximum use of construction data and the proactive control AI can provide. The three themes are presented below to provide a structured account of how practitioners and educators perceive AI's role in construction and how these perspectives can inform construction education.

5.2.1 AI as data-to-decision layer built on existing construction data:

All participants consistently described AI as being used primarily to transform existing construction data into actionable project intelligence, rather than as an autonomous decision-making system. AI was framed as a layer applied on top of established construction practices, particularly data collection activities that are already embedded in day-to-day project workflows. Participants emphasized that construction sites generate large volumes of data but historically lacked effective mechanisms to interpret and operationalize that information.

Several participants also highlighted that AI enables teams to aggregate and interrogate construction data in ways that were previously impractical. One participant explained this shift, stating that *"AI is actually allowing that data to be interrogated in a way that we have not in the past."* This capability was closely linked to the construction activities, where AI breaks work into discrete components and translates physical installation into measurable indicators. Through this process, progress can be compared directly against the project schedule, enabling clearer visibility into project status.

Additionally, reality capture technologies such as drones, laser scanning, site photos, videos, and 360-degree cameras were consistently identified as the primary data sources feeding AI systems. Importantly, participants emphasized that AI does not require high-end or specialized equipment to be effective. As one interviewee noted, *"A $400 camera is a $400 camera, but you push that video walk through machine learning, slap some AI on top of it, and now you can actually get analytics from that low-grade video capture."* This illustrates how AI elevates routine site documentation into a source of meaningful project metrics, such as percentage completion and schedule deviation.

5.2.2 AI as a mechanism for proactive control and risk mitigation:

A second dominant theme across participant responses was the use of AI to enable proactive control of schedule, cost, and safety outcomes. Participants consistently described AI as a tool that improves early visibility into project conditions, allowing teams to intervene before issues escalate. Maintaining the schedule emerged as a central concern, with participants repeatedly linking schedule stability to both cost performance and safety outcomes. AI tools were described as validating schedules and flagging deviations early in the construction process. One participant explained that *"it helps us validate and make sure that we are on schedule…it is really to facilitate workflow,"* highlighting how AI supports day-to-day management rather than replacing it. It was emphasized that when schedules are maintained, downstream impacts such as cost overruns and compressed work conditions can be avoided.

Additionally, safety outcomes were also closely tied to proactive visibility. Participants noted that falling behind on schedule often leads to crowded workspaces and uncoordinated activities, increasing the likelihood of incidents. One interviewee explained, "*when you get behind schedule, you are crowding work into certain spaces…having that proactive visibility before you become reactionary really allows you to plan the work.*" In addition, some participants described the use of predictive analytics to identify potential safety risks before they occur, further reinforcing AI's role in risk prevention rather than incident response.

Furthermore, document-intensive workflows such as submittal reviews, constructability checks, and contract analysis were identified as particularly mature applications of AI for risk mitigation. One participant noted that a review process that would typically take *"about 120 hours*" was reduced to *"about 10 hours,"* while simultaneously identifying more issues that could lead to change orders or litigation. This demonstrates that AI can contribute to both efficiency and risk reduction in high-stakes project activities.

5.2.3 AI as workforce augmentation with uneven adoption across roles and organizations:

The third major finding reveals that AI is currently positioned as a workforce augmentation tool rather than a replacement for professional expertise. Multiple participants consistently emphasized that AI supports human decision-making by automating repetitive and low-value tasks, allowing professionals to focus on higher-value tasks such as coordination, judgement, and problem-solving. However, participants explicitly rejected the notion of AI as a substitute for professional accountability. This perspective was captured by one interviewee who mentioned, *"the creative part of AI is it will get you a portion of the way, but then you still have to finish the race yourself and QC it."* This highlights the continued importance of human oversight, particularly in complex and high-risk construction environments.

AI was also described as enabling broader participation in technical workflows, such as allowing non-coders to generate scripts or accelerate tasks like RFI generation and document review. However, participants also noted that adoption remains uneven. Digitally mature roles, particularly VDC professionals and corporate office teams, were often early adopters, while traditional project management and field roles tend to use AI more cautiously due to concerns about incomplete information and project risk. One participant summarized this approach by stating, *"we like not to be on the bleeding edge. We like to be on the leading edge."*

Furthermore, differences in organizational capacity further contribute to uneven adoption of AI, with larger firms developing custom solutions and smaller firms relying on general-purpose AI tools. Despite this variability, participants acknowledged increasing competitive pressure to adopt AI capabilities, noting that individuals lacking AI skills may be disadvantaged in the evolving workforce. Table 2 summarizes the stakeholder's perspective in AI in Construction Education.

Table 2: Comparison of Stakeholder Perspective on AI in Construction Education

Dimension	Practitioners	Faculty	Students
Primary View of AI	Data-to-decision support layer embedded in workflows	Emerging instructional tools requiring structured integration	General-purpose productivity and academic support tool
Perceived Value	Proactive control of schedule, cost, and safety	Enhances higher-order learning when used responsibly	Timesaving, idea generation, improved understanding
Key Applications	Predictive analytics, document review, risk mitigation, workflow validation	AI-supported exercises embedded in core courses	Conversational AI, writing assistance, research support
Main Concerns	Uneven adoption, quality control, overreliance without validation	Academic integrity, intellectual atrophy, curriculum overload	Job displacement, superficial understanding of AI

Adoption Pattern	Role- and organization-dependent	Cautious, constrained by curriculum density	Nearly universal exposure, mostly non-technical use
Educational Implication	Graduates must validate AI outputs and exercise professional judgment	AI should be embedded in core subjects emphasizing reasoning	Need structured, domain-specific AI integration

6. Discussion

The findings of this study indicate that artificial intelligence is currently used in construction practice in a pragmatic and incremental manner. Rather than replacing professional expertise, AI is applied as a supportive layer that enhances data interpretation, project control, and workforce efficiency. This characterization aligns with prior study that frames AI in construction as an augmentation tool embedded within existing digital workflows rather than as a fully disruptive replacement of professional roles [1], [2], [14].These patterns provide important insight into how AI should be integrated into construction education and highlight a clear need to rethink existing pedagogical approaches.

One of the most important insights from the findings is that AI is primarily used to transform existing construction data into actionable project intelligence. Construction sites already generate large volumes of data through routine documentation and reporting activities, yet this data has historically been underutilized. AI adds value by helping practitioners interpret this information and connect it to project decisions. This finding reinforces literature emphasizing AI's role as a data interpretation layer built upon BIM and digital infrastructure, where value is derived from improved analytics rather than autonomous control [1], [4]. This suggests that construction education should place greater emphasis on helping students understand how data informs decisions, rather than focusing only on producing outputs such as schedules or reports. Coursework could be designed to help students trace how raw site data translate into progress metrics, schedule implications, and management actions. This would help students develop stronger analytical thinking skills and prepare them to adapt to evolving AI platforms.

The findings also show that AI is valued for enabling proactive project control and early risk identification. In practice, AI supports early visibility into schedule, cost, and safety conditions, allowing teams to intervene before issues escalate. This highlights a shift from reactive to proactive management. This emphasis on predictive visibility converges with prior research on predictive analytics and risk forecasting in construction project management [10], [13]Construction education could respond by placing greater emphasis on forward-looking decision-making. Rather than relying only on retrospective case studies, courses could incorporate exercises where students use AI-supported information to anticipate problems and plan interventions. This approach would help students understand the interconnected nature of schedule stability, cost performance, and safety outcomes.

Document-heavy workflows such as submittal reviews and constructability checks further illustrate how AI is being used to improve efficiency while reducing risk. These applications demonstrate that AI can support consistency and thoroughness in high stakes of tasks but still require human oversight. This balance between efficiency gains and the need for professional validation reflects concerns in the literature regarding overreliance on automated systems and the importance of maintaining human judgment [11], [19]. From an educational perspective, this suggests opportunities to integrate AI into assignments that involve document review and quality control. Students could use AI to support these tasks while being required to verify findings and justify decisions. Such an approach would reinforce professional accountability and prevent overreliance on automated outputs.

The findings also indicate that AI is currently positioned as a workforce augmentation tool rather than a replacement for professional roles. AI is used to automate repetitive and low-value tasks, allowing professionals to focus on judgment, coordination, and problem-solving. However, adoption remains uneven across roles and organizations. This uneven adoption across organizational roles reflects earlier observations in the literature regarding differential technological maturity and institutional readiness in AI implementation [6], [7].This unevenness suggests that construction education should not assume uniform AI use in practice. Instead, programs should prepare students to work effectively in AI-augmented environments while understanding when caution is required. Educational activities could emphasize evaluating the appropriateness of AI use in different contexts, helping students develop confidence in deciding when AI should and should not be applied.

Furthermore, the survey results suggest that the main challenge in construction education is no longer student exposure to AI, but the nature of that exposure. Although nearly all students report using AI, their engagement is dominated by conversational and writing-based tools which position AI primarily as a convenience or academic support technology. This pattern, however, risks creating an illusion of readiness, where frequent use might substitute for construction specific competence. This divergence between superficial tool familiarity and deeper domain integration echoes concerns raised in educational research regarding intellectual atrophy and uncritical AI reliance [11], [17].In contrast, practitioners and educators conceptualize AI as a data-to-decision layer embedded within project workflows, supporting proactive control of schedule, cost, and safety through data interrogation and risk mitigation. This misalignment reveals a structural gap between tool-centered student use and workflow-centered industry practices, where AI value depends on problem framing, data quality, validation, and professional judgement.

Taken together, these findings suggest that AI integration in construction education should not be treated as a separate technical topic. Instead, AI should be embedded within core construction subjects such as estimating, scheduling, safety, and project controls. This recommendation supports prior calls in the literature for integrated rather than isolated technology instruction within construction curricula [3], [11].The integration should move beyond tool familiarity toward data-driven learning experiences that focus on interpretation, validation, and accountability. This would allow students to experience AI as part of everyday construction workflows rather than as an abstract technology. Assignments could be structured to require students to interpret AI-supported insights, assess limitations, and make informed decisions. In doing so, education would shift from teaching students how to operate tools toward teaching them how to think critically in AI-enabled project environments.

Overall, the findings highlight that the primary educational challenge is not access to AI tools but ensuring that students develop the ability to interpret information, plan proactively, and exercise professional judgment. By embedding AI into construction curricula in a way that emphasizes reasoning, accountability, and decision-making, construction education could better align with current industry practice and prepare graduates to engage effectively with AI in their professional roles.

7. Conclusion

This study examined the current use of artificial intelligence in construction practice and its implications for construction education. The findings indicate that AI is primarily used as a supportive layer that transforms existing project data into actionable insight, enables proactive project control and risk mitigation, and augments the construction workforce rather than replacing professional expertise. While AI adoption is increasing across the industry, its use remains pragmatic, incremental, and closely tied to established workflows and professional judgment. The findings also reveal a clear gap between how AI is applied in practice and how it is currently addressed in construction education. Although AI tools are increasingly embedded in project delivery, educational approaches have yet to fully reflect the skills required to interpret AI-supported information, manage risk proactively, and exercise professional accountability. This highlights the need for construction education to move beyond tool-based instruction and toward integrating AI within core subjects in a manner that emphasizes data interpretation, decision-making, and critical evaluation.

Integrating AI into construction education has implications that extend beyond technical proficiency. By embedding AI within estimating, scheduling, safety, and project control curricula, educational programs can better align learning outcomes with industry expectations and prepare graduates for AI-augmented practice. Such integration supports the development of adaptable professionals who can engage effectively with evolving technologies while maintaining responsibility for project outcomes.

While this study provides important insights, the findings suggest three immediate priorities for curricular implementation. First, AI should be embedded within core construction subjects such as estimating, scheduling, safety, and project controls through assignments that require students to interpret and validate AI-supported outputs. Second, programs should emphasize data-to-decision reasoning by designing coursework that connects raw construction data to project management actions, reinforcing analytical thinking rather than tool operation. Third, AI instruction should incorporate explicit evaluation of limitations and risks to strengthen professional accountability and prevent overreliance on automated systems.

Additionally, further research is needed to explore how AI-integrated curricula can be implemented and assessed in construction education. Future work should examine the impact of AI-supported learning activities on student learning, decision-making, and professional readiness. Longitudinal studies could also investigate how AI competencies developed during education translate into practice over time. Additionally, collaboration with industry practitioners will be essential for developing curriculum frameworks that remain responsive to technological change and aligned with professional standards. These efforts will support the preparation of future construction professionals who can apply AI responsibly and effectively within complex project environments.

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