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# Developing Entrepreneurial Mindsets in Construction Management through Experiential Projects

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# Developing Entrepreneurial Mindsets in Construction Management through Experiential Projects

Entrepreneurial Minded Learning (EML), a framework supported by the Kern Entrepreneurial Engineering Network (KEEN), promotes critical thinking and innovation by encouraging students to explore real-world problems through the 3Cs: Curiosity, Creating Value, and Connections. In construction management education, the focus often remains on technical skills and project execution, neglecting the development of entrepreneurial skills like adaptability, value creation, and stakeholder engagement, leaving a gap in preparing students for the challenges of the industry. To bridge this gap, micro-moment activities were introduced prior to the main project to prime students for EML-based thinking. These short, focused exercises encouraged students to solve small-scale problems through critical decision-making and innovation aligned with the 3Cs. Following these activities, students were introduced to a hands-on Design-Build project within a Construction Project Management course, where they assumed the role of a contractor responsible for both designing and constructing a residential building. The project engages students with the 3Cs by challenging them to explore location selection and environmental factors (Curiosity), create functional and aesthetically valuable designs for clients (Creating Value), and assess how their design decisions might impact stakeholders (Connections). To evaluate the project's effectiveness, students completed an open-ended survey designed to reflect on their learning outcomes and their experiences with EML principles. The survey responses were analyzed using thematic coding to identify patterns and insights related to entrepreneurial learning. Preliminary results indicate that students developed increased adaptability, innovative problem-solving abilities, and a deeper understanding of value creation in construction, validating the integration of EML as an approach to enhance practical skills for real-world industry challenges.

**Keywords:** Entrepreneurial Minded Learning (EML), Construction Project Management, Experiential Learning, Engineering Technology

## 1. Introduction

The entrepreneurial mindset is increasingly critical in modern engineering education, as it prepares students to think innovatively, solve complex problems, and navigate real-world challenges effectively (Hassan et al., 2013; Santiago & Guo, 2020). The KEEN network promotes the EML framework, which emphasizes the 3Cs, Curiosity, Creating Value, and Connections, as foundational elements of learning in engineering education. By fostering these competencies, educators aim to develop engineers who are not only technically proficient but also capable of addressing broader societal, environmental, and economic issues (Harichandran et al., 2020). The integration of entrepreneurial principles through frameworks like KEEN is essential for equipping students to succeed in dynamic and interdisciplinary fields.

Despite the growing recognition of the entrepreneurial mindset as a critical component of engineering education, traditional construction management programs often focus predominantly on technical and procedural skills, such as scheduling and cost estimation (Sababha et al., 2020; Shekhar et al., 2018). While these skills are essential, they frequently underemphasize the innovative problem-solving and environmental considerations that are vital for addressing the complexities of real-world projects (Santiago & Guo, 2020). This gap in training leaves graduates underprepared to navigate the interdisciplinary and multifaceted challenges of modern construction management. To address this gap, this study designed an experiential project that integrates the 3Cs from the EML framework into construction management education. The project aims to help students develop an entrepreneurial mindset by requiring them to engage with real-world construction challenges, project needs, and environmental considerations. This hands-on approach simulates professional decision-making by incorporating design innovation, sustainability, and stakeholder engagement into project management tasks (Ismael, 2023).

This study adopts the Design-Build methodology, a professional practice that combines design and construction under a unified management approach. By reflecting real-world industry practices, it enhances efficiency while fostering holistic and innovative thinking. Through this approach, students engage with complex decision-making, considering project requirements, environmental sustainability, and long-term value creation (Bosman et al., 2018). The Design-Build framework serves as a practical foundation for developing an entrepreneurial mindset, encouraging adaptability and problem-solving in construction management. In this project, students were tasked with designing and constructing a residential building for a family relocating to Virginia Beach, addressing challenges such as coastal flooding risks (Chathuranika & Ismael, 2025), location analysis, and project requirements (Ismael, et al., 2024). This hands-on approach encouraged students to move beyond technical execution, integrating creative problem-solving and client-centered design to align with the principles of the 3Cs. By incorporating the 3Cs, the study aimed to develop entrepreneurial skills through hands-on, problem-based learning in construction management.

This paper analyzes student reflections to evaluate how effectively the project fostered the 3Cs, contributing to the growing body of literature on entrepreneurial education in engineering. Previous research has demonstrated the effectiveness of the EML framework promoted by KEEN in enhancing student engagement and innovative thinking (Zhu et al., 2024; Sababha et al., 2020). Building on these findings, this study demonstrates how the KEEN principles can be applied specifically in construction management, a discipline that requires both technical and entrepreneurial competencies.

The remainder of this paper is structured as follows: Section 2 provides background on entrepreneurial learning and its application to construction management education. Section 3 describes the study's methodology, including participant details, project implementation, and assessment methods. Section 4 presents the results of the analysis, highlighting key student learning outcomes. Section 5 discusses the broader implications of the findings, limitations, and recommendations for future research. Finally, Section 6 concludes the study by summarizing key insights and potential enhancements for integrating entrepreneurial thinking into construction management education.

## 2. Background

The evolution of engineering education has increasingly emphasized the need for interdisciplinary approaches that go beyond technical expertise to incorporate skills like creativity, adaptability, and stakeholder engagement. As global challenges grow more complex, educators are incorporating entrepreneurial thinking into engineering education to prepare students for roles that require adaptability, problem-solving, and innovation. This is especially relevant in construction management, where engineers must balance environmental sustainability, client needs, and regulatory compliance under tight time and budget constraints. (Harichandran et al., 2020).

A key component of entrepreneurial education is its ability to integrate problem-solving and value creation into existing technical curricula. While traditional engineering education often separates theoretical and practical learning, the EML framework emphasizes the importance of connecting classroom knowledge with real-world applications. Studies on learning science have demonstrated that experiential learning enhances understanding and long-term knowledge retention by engaging students in problem-solving and critical thinking (Donovan & Bransford, 2000, 2005). Studies have demonstrated that experiential learning activities, such as design challenges and project-based coursework, are effective in fostering the 3Cs: Curiosity, Creating Value, and Connections (Bosman et al., 2018). These elements help students transition from solving abstract problems to addressing multifaceted challenges that require innovative thinking and collaboration. Despite its importance, entrepreneurial thinking remains underrepresented in traditional engineering and construction management education, where the emphasis is often placed on technical proficiency and procedural knowledge (Sababha et al., 2020). However, recent research has begun exploring strategies for integrating entrepreneurship into engineering education, including multi-tool approaches to enhance learning outcomes (Ismael, 2024). This gap is particularly evident in construction management courses, which rarely incorporate holistic, client-centered, and adaptive approaches essential for real-world project success.

The Design-Build methodology adopted in this study is particularly well-suited to implementing the KEEN framework. Widely used in the construction industry, Design-Build integrates the design and construction processes under a single management structure, enabling seamless communication and decision-making (Shealy, et al., 2017). This approach reflects real-world practices, where engineers must balance efficiency with creativity while aligning their designs with client and environmental needs (Gerhart et al., 2020). Additionally, Design-Build projects inherently encourage holistic thinking, as they require consideration of both technical and non-technical aspects, such as cost estimation, stakeholder management, and long-term sustainability (Ismael & Shealy, 2024). Such an experiential model promotes real-world application and value creation, helping students develop practical problem-solving skills.

Construction management education, however, has historically lagged in adopting methodologies that incorporate entrepreneurial thinking. Research indicates that students in this discipline often lack opportunities to engage with hands-on projects that reflect real-world complexity (Shekhar et al., 2018). Furthermore, the focus on procedural knowledge, such as scheduling and cost estimation, often limits the development of higher-order skills like adaptability, creativity, and problem-solving (Sababha et al., 2020). By integrating entrepreneurial principles into construction management courses, educators can address these gaps and better prepare students for the evolving demands of the industry.

This study builds on prior research by applying the EML framework within an online Construction Project Management course to evaluate how experiential learning can foster the entrepreneurial mindset. The project required students to engage with real-world constraints, such as environmental factors and client-specific requirements, while incorporating innovative design and construction practices. By leveraging the Design-Build methodology, the study examines how experiential learning can enhance student problem-solving and prepare them for the multifaceted challenges of modern construction management.

## 3. Methodology

This study integrated the 3Cs into a 7-week experiential learning project within an online Construction Project Management course. The course is part of the Civil Engineering Technology program in the Engineering Technology Department and aimed to prepare students to address real-world challenges by enhancing critical thinking, problem-solving, and innovative design skills.

### *3.1 Participants*

The study involved a total of 24 students (n = 24), with 19 males and 5 females, enrolled in the course. The students represented diverse academic and professional backgrounds but were all part of the Engineering Technology Department. The course emphasized practical applications of project management principles within the context of residential new construction.

### *3.2 Project Implementation: Virginia Beach Haven – A Design-Build Project*

To integrate entrepreneurial thinking into construction education, students participated in the Virginia Beach Haven: A Design-Build Project. This project simulated a professional construction scenario where students assumed the role of contractors using the Design-Build approach, managing both the design and construction of a residential home for a relocating family of four. In this context, the "client" refers to a hypothetical homeowner rather than a real stakeholder. The scenario was designed to mirror real-world construction challenges by requiring students to interpret and address client preferences based on provided specifications. The project required students to consider several key factors, including site selection (coastal vs. inland), environmental sustainability, flood risk mitigation, functionality, and aesthetic appeal. The final deliverables consisted of two primary components:

1. A comprehensive report, covering location analysis, stakeholder identification, design documentation, cost estimation, project management planning, and reflections.
2. A physical prototype constructed using accessible materials such as cardboard, aluminum foil, and plastic wrap, representing structural and aesthetic elements of their proposed design.

The project was implemented in three structured phases, with instructor guidance at each stage to facilitate student learning and problem-solving:

#### *Phase 1: Research & Exploration (Weeks 1-2)*

During this phase, students were introduced to the project scenario and provided with detailed client specifications, including family needs, environmental concerns, and preferences for a coastal or inland location. To support their decision-making, students conducted independent research on coastal resilience, zoning regulations, and community infrastructure, helping them evaluate the advantages and challenges associated with different site options. Based on their findings, they drafted a Location Analysis Report, where they justified their site selection by considering environmental risks, property value, and lifestyle factors. Throughout this phase, weekly discussions facilitated by the instructor encouraged students to critically assess how environmental constraints and stakeholder priorities influence construction design choices. This initial stage laid the foundation for students to approach the project with an entrepreneurial mindset, emphasizing curiosity in problem-solving, value creation, and connections to real-world challenges.

*Phase 2: Design & Development (Weeks 3-5)*

During this phase, students created initial schematic drawings and presented design justifications emphasizing exploration, value creation, and real-world applications. Curiosity encouraged students to challenge conventional home design assumptions and integrate innovative solutions. Creating value focused on aligning home features with the client's lifestyle, incorporating elements such as energy efficiency, outdoor living, and family-friendly layouts. Connections required students to analyze regulatory factors, cost implications, and long-term sustainability. As part of the project deliverables, students developed a Cost Estimation Report that detailed material and labor costs, along with potential contingencies. Additionally, they created a Project Management Plan using the Critical Path Method (CPM) to ensure a structured and realistic timeline for project execution. Throughout this phase, students received peer feedback and instructor reviews to refine their designs, with an emphasis on feasibility and market value. This iterative process helped them strengthen their problem-solving abilities while balancing creativity with practical constraints.

*Phase 3: Prototyping & Reflection (Weeks 6-7)*

In the final phase, students built a physical prototype using readily available materials such as cardboard, plastic wrap, and aluminum foil. They documented how these materials represented real-world construction elements, with toothpicks symbolizing structural columns and plastic wrap serving as windows. This hands-on approach reinforced the connection between design concepts and tangible construction elements, encouraging students to think critically about material selection and structural integrity. The final deliverables included a comprehensive report and a prototype table. The report covered key project components, including location analysis, stakeholder identification, design documentation, cost estimation, project management plan, and images of the prototype. The prototype table provided top, right, left, and bottom view images to help visualize the proposed design. As part of the final reflection, students responded to four open-ended questions that linked their learning experiences to real-world construction challenges:

1. *How did this project encourage you to explore new ideas or challenge existing assumptions about construction design and management?* **(Curiosity)**
2. *How did your design decisions focus on creating value for the client? What specific aspects of your design enhanced its value to the client?* **(Creating Value)**
3. *In what ways did you connect your design and construction process with real-world needs and challenges (e.g., client expectations, environmental factors)?* **(Connections)**
4. *Reflect on what you learned throughout this project. What skills or knowledge did you find most valuable?* **(General Reflection)**

*3.3 Evaluation*

To evaluate student performance, the project was assessed using the rubric shown in Table 1. The rubric measured how well students incorporated entrepreneurial thinking into their designs by considering curiosity (exploring creative and innovative solutions), creating value (ensuring functional and aesthetic value for clients), and connections (linking classroom concepts to real-world challenges).

Table 1. Assessment Rubric for the Design-Build Project

| Criteria | Exemplary (4) | Proficient (3) | Developing (2) | Needs Improvement (1) |
|---|---|---|---|---|
| Curiosity (Exploration of new ideas, innovation in design)<br>**ABET 1** | Demonstrates strong creativity and explores innovative construction solutions. | Shows some creativity, but design remains conventional. | Limited creativity, mostly follows given templates. | Lacks innovation or exploration of alternative solutions. |
| Creating Value (Client-centered design, sustainability, functionality)<br>**ABET 2** | Design aligns well with client needs, enhances usability and sustainability. | Mostly considers client needs but lacks depth in value creation. | Some value considerations but lacks strategic alignment. | Minimal consideration of client needs or sustainability. |
| Connections (Real-world application, stakeholder impact)<br>**ABET 4** | Demonstrates strong awareness of regulatory, environmental, and economic constraints. | Addresses some real-world constraints but lacks depth in stakeholder impact. | Limited connection to real-world applications. | Design does not reflect consideration of real-world constraints. |

*3.4 Analysis*

The qualitative data were analyzed using thematic coding to identify recurring patterns and align them with the 3Cs. Themes under Curiosity included exploring new ideas, challenging assumptions, and engaging in creative problem-solving. For Creating Value, the focus was on client-centered design, functionality, and long-term sustainability. Themes related to Connections emphasized addressing real-world constraints, environmental risks, and stakeholder alignment. A single word cloud was used as a visual tool to summarize responses to the general reflection question, highlighting recurring keywords and providing a high-level overview of student learning outcomes.

## 4. Results

*Question 1 (Curiosity): How did this project encourage you to explore new ideas or challenge existing assumptions about construction design and management?*

Theme 1: Bridging theory with practice**.**

The project encouraged students to explore new ideas and challenge their existing assumptions about construction design and management, enhancing curiosity in meaningful ways. Many students emphasized how the hands-on experience bridged the gap between theoretical knowledge and practical application. By applying concepts learned throughout the semester, they gained valuable insights into the complexities of initiating and managing construction projects. As one student noted, "The project sheds practical light on what it takes to begin and lead a construction project, at least in the initial stages." This integration of knowledge reinforced their understanding and prepared them for real-world challenges, highlighting the theme of bridging theory with practice**.**

Theme 2: Creativity and design innovation

Another significant outcome was the emphasis on creativity and design innovation. The project gave students the freedom to move beyond rigid, predefined tasks and embrace client-focused and novel design approaches. Several students expressed how they found the design process engaging and liberating. For instance, one student shared, "This project allowed me to have some fun with the design process and make something I wanted to, rather than just what I was told to." This creative exploration helped students realize the feasibility of innovative ideas in construction design.

Theme 3: Real-world challenges and constraints

Additionally, the project exposed students to real-world challenges and constraints, such as cost estimation, regulatory compliance, and environmental factors. These challenges prompted critical thinking and adaptability. For example, a student remarked, "When researching the price of materials, I didn't realize how expensive building materials are," underscoring the eye-opening nature of these considerations. Another student reflected, "Issues around project insurance and regulatory compliance were of top priority this time around," demonstrating how the project broadened their understanding of construction management's complexities.

*Sample of student work*

The use of innovative tools like Virtual Reality (VR) demonstrates students' ability to explore new approaches and challenge traditional design methods (Ismael, 2024). While most students utilized AutoCAD for their designs, one student created an immersive 3D model in VR, as shown in Figure 1. The front view highlights large windows to maximize natural lighting, while the side view emphasizes thoughtful spatial planning, aligning with the client's needs. This application of VR reflects the "Curiosity" element of the 3Cs, showcasing creative problem-solving and enhanced communication of design intent.

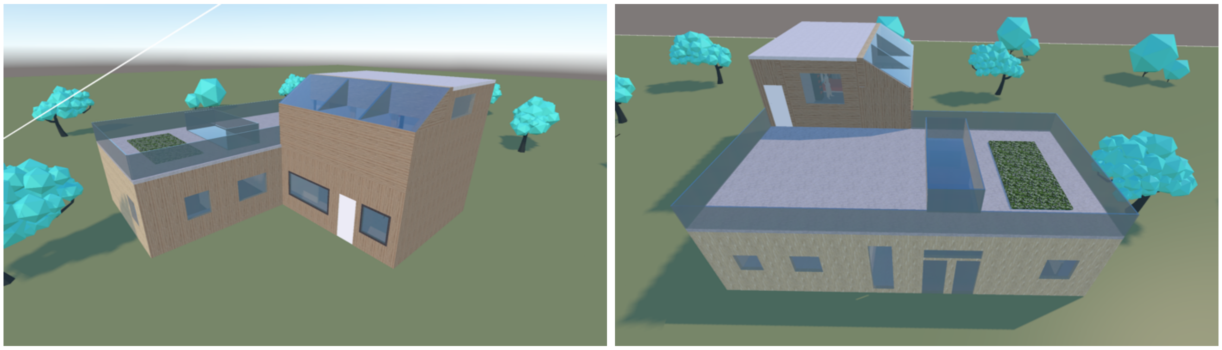

Figure 1: Front view (right) and side view (left) of a student-designed 3D model represented in Virtual Reality (VR).

*Question 2 (Creating Value): How did your design decisions focus on creating value for the client? What specific aspects of your design enhanced its value to the client?*

Theme 1: Prioritizing client needs

Students' design decisions reflected a strong emphasis on prioritizing client needs, ensuring that the home aligned with the family's specific requirements and aspirations. Many students highlighted their efforts to incorporate the client's preferences into the design, such as large living spaces, natural lighting, and family-friendly layouts. For instance, one student noted, "The size of the master bedroom, the family gathering room, and the multiple windows in the family room were an important request of theirs and should bring value to the client." Another emphasized how their open floor plan and use of natural light created a welcoming and functional space, stating, "With the open layout and natural light from windows, I believe it enhanced the home's usability and appeal, making it both enjoyable and low maintenance for long-term living."

Theme 2: Enhancing functionality and outdoor living

Another theme that emerged was enhancing functionality and outdoor living to meet the client's desires for family and recreational spaces. Students often incorporated features such as patios, landscaped backyards, and indoor-outdoor spaces to create additional value. One student reflected, "I decided to go one step further by breaking the patio into an indoor and outdoor section. Now, even when the weather isn't at its best, the family can still relax in the screened-in portion." Others prioritized spaciousness and flexibility, designing layouts that accommodated personal space for family members while fostering interaction and entertainment.

Theme 3: Addressing real-world challenges

Many students also focused on addressing real-world challenges such as safety, sustainability, and cost efficiency. For example, in disaster-prone areas, students incorporated structural features to withstand environmental risks, with one stating, "Optimizing flood water drainage is of utmost importance for ensuring the safety of the occupants." Another highlighted the incorporation of energy-efficient features, noting, "This passive house design will save the client money faster than you think, with triple-paned windows and advanced thermal sealing." These decisions aimed to provide not only immediate benefits but also long-term value through durability and energy savings.

Theme 4: Community and location

Finally, students demonstrated an understanding of the importance of community and location in creating value. Many chose locations with strong school districts and recreational amenities, tailored to the family's priorities. As one student explained, "The project is located in a neighborhood with growing families, good schools, and community activities, providing a sense of connection for the client."

*Sample of student work*

Students focused on "Creating Value" by designing homes that aligned closely with client needs, emphasizing features that enhanced functionality, sustainability, and family comfort. As seen in the Revit design (Figure 2), the student incorporated features such as a landscaped backyard with ample outdoor living space and large windows to maximize natural light. The corresponding 3D-printed model (Figure 3) demonstrates how these ideas were translated into a physical representation, allowing for better visualization of the home's usability and aesthetic appeal.

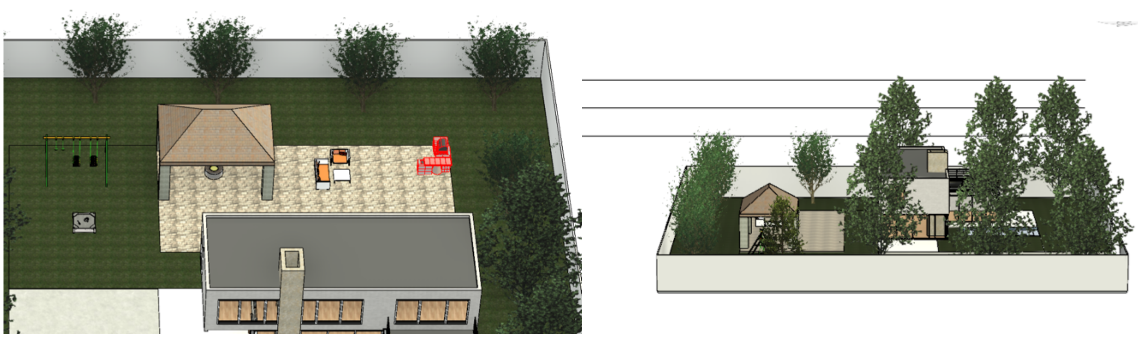

Figure 2. Revit design created by a student to demonstrate alignment with client-centered, value-driven residential layouts, emphasizing outdoor functionality and family-friendly features.

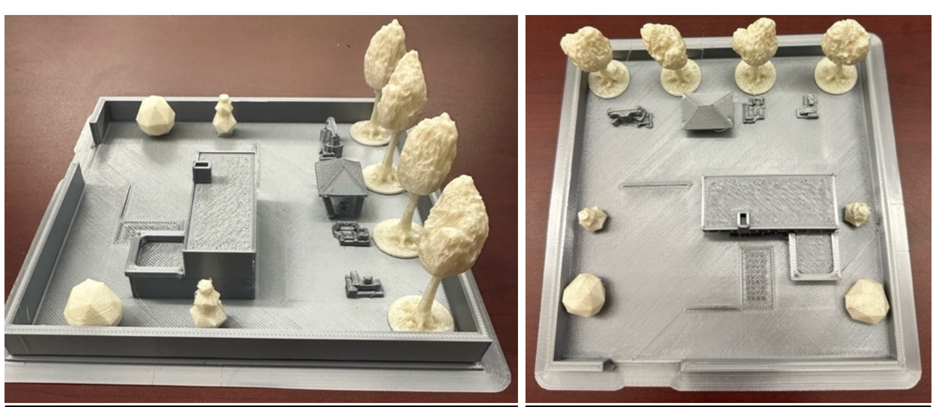

Figure 3. 3D-printed model translating the Revit design into a physical representation, showcasing a focus on creating value through client-centric design elements.

*Question 3 (Connections): In what ways did you connect your design and construction process with real- world needs and challenges (e.g., client expectations, environmental factors)?*

Theme 1: Real-world client expectations

Students demonstrated a strong ability to connect their design and construction processes to real-world client expectations and environmental challenges. Many students emphasized how their designs prioritized family needs, including functional layouts, proximity to community amenities, and sustainable construction practices. For instance, one student explained, "The suggested location of the home took into consideration the lifestyle of a young family with its proximity to amenities, parks, and the highway for commuting." Another reflected, "I focused on integrating client needs by ensuring functional layout choices that improve daily living, like a spacious kitchen and family room."

Theme 2: Environmental considerations and sustainability

A recurring focus was on environmental considerations and sustainability, as students addressed challenges such as coastal flooding, energy efficiency, and durability. Several designs included elevated foundations and drainage solutions to mitigate flood risks, particularly in coastal areas. One student noted, "I raised the foundation of the home above ground level to future-proof the home, considering global warming and rising sea levels." Others incorporated energy-efficient materials and natural lighting to reduce environmental impact and long-term costs. For example, one reflection highlighted, "Large windows provide natural lighting and heating, decreasing the need for AC and lighting."

Theme 3: Balancing practical challenges with client desires

Balancing practical challenges with client desires was another common theme. Students tailored their designs to meet the client's expectations while navigating constraints such as budget, material availability, and environmental regulations. One student shared, "Understanding the importance of regulatory agencies, I selected a parcel out of a flood zone while still providing plenty of greenery and a family-friendly layout." Another described the importance of considering real-world scenarios like supply chain delays and how those informed their material choices.

Theme 4: Enhance community and lifestyle connections

Finally, students aimed to enhance community and lifestyle connections for their clients, often by selecting locations that matched family needs. Many designs featured outdoor spaces, large windows, and natural aesthetics to create a sense of harmony with the environment. As one student explained, "The property balances proximity to nature with urban amenities, offering both a peaceful retreat and access to community development opportunities."

*Sample of student work*

To connect their designs with real-world challenges, students employed practical materials and techniques. The concrete prototype shown in Figure 4 reflects a focus on vertical structural elements, addressing material durability and environmental constraints. This approach highlights how students connected theoretical knowledge with practical, real-world applications.

Figure 4. Concrete prototype (in-progress) simulating vertical structural elements, addressing real-world construction challenges and material considerations.

*<u>Question 4 (General): Reflect on what you learned throughout this project. What skills or knowledge did you find most valuable?</u>*

The student responses to the question, were represented visually in a word cloud, shown in Figure 5. This visualization highlights the most frequently mentioned skills and knowledge areas that students identified as valuable. Central terms such as “design,” “skills,” and “time” underscore the importance of practical and technical expertise gained through experiential learning. Students frequently emphasized the value of "management" and "client" focus, indicating the project's success in fostering critical construction management competencies. The prominence of words like “valuable,” “knowledge,” and “work” reflects the significant personal and professional growth students experienced. Additionally, the focus on "building," "construction," and "process" demonstrates the hands-on learning and understanding of real-world challenges that the project provided. The word cloud visually reinforces the impact of the project in preparing students for industry-relevant problem-solving and decision-making skills.


Figure 5. Word cloud representation of student responses to question 4

## 5. Discussion

The results of this study highlight the effectiveness of integrating experiential learning into construction management education, particularly through a hands-on Design-Build project. Similar studies have demonstrated that project-based learning enhances student engagement and higher-order thinking skills by bridging theory with real-world applications (Bosman et al., 2018; Shekhar et al., 2018). While past research has explored the impact of design-simulation projects in engineering education (Santiago & Guo, 2020), fewer studies have examined their direct application in construction management.

### *5.1 Enhancing Curiosity through Real-World Challenges*

The findings suggest that the project successfully improved curiosity by encouraging students to explore new ideas, challenge conventional design assumptions, and engage in creative problem-solving. This aligns with prior research indicating that problem-based learning improves students' ability to analyze and respond to complex, real-world challenges (Sababha et al., 2020). Notably, students in this study highlighted how exposure to regulatory constraints and environmental considerations expanded their understanding of construction design. Similar results were observed in Shekhar et al.,'s (2018) study, where experiential learning improved students' ability to integrate technical knowledge with industry requirements.

### *5.2 Creating Value through Client-Centered Design*

Students demonstrated creating value by designing homes that aligned with client needs, emphasizing factors such as family-friendly layouts, sustainability, and cost efficiency. These findings support previous research on project-based learning, where students exhibited a greater ability to align engineering solutions with end-user priorities (Bosman et al., 2018). While Santiago & Guo (2020) reported that engineering students often struggle with considering long-term user needs, this study suggests that incorporating a defined client scenario helps students make more informed design decisions. Additionally, student reflections emphasized the importance of balancing functionality with environmental constraints, reinforcing findings from Harichandran et al. (2020), who argue that inquiry-based learning improves students' ability to integrate sustainability into engineering solutions.

### 5.3 *Strengthening Connections between Theory and Practice*

The results demonstrate that students were able to establish connections between classroom concepts and real-world constraints, particularly in areas such as environmental risk mitigation, regulatory compliance, and cost estimation. These findings align with studies emphasizing the role of experiential learning in bridging academic knowledge with industry expectations (Sababha et al., 2020; Zhu et al., 2024). However, while students successfully engaged with practical constraints, some struggled with managing conflicting priorities, such as balancing budget limitations with sustainability goals. This supports prior research indicating that while project-based learning improves problem-solving skills, additional instructor guidance may be necessary to help students navigate trade-offs in decision-making (Gerhart et al., 2020).

Despite the study's positive outcomes, several limitations should be acknowledged. The small sample size limits the generalizability of the findings, a challenge also noted in previous studies on experiential learning in engineering (Harichandran et al., 2020). Additionally, the online format may have constrained collaboration opportunities, reducing the depth of peer-to-peer learning compared to in-person project-based courses (Shekhar et al., 2018). Future studies could explore hybrid or fully in-person implementations to assess whether increased collaboration enhances learning outcomes. To address these limitations, future iterations of this project could incorporate several enhancements. Introducing team-based collaboration would simulate real-world teamwork dynamics, enriching the learning experience by incorporating diverse perspectives in problem-solving. Extending the project timeframe would allow students to engage more deeply in the design and prototyping phases. Finally, cross-disciplinary integration, involving students from related fields such as architecture or environmental engineering, could encourage interdisciplinary collaboration and broaden the scope of problem-solving approaches.

## 6. Conclusion

This study demonstrated the value of integrating entrepreneurial thinking into construction management education through a hands-on Design-Build project. By applying the 3Cs, students engaged with real-world challenges, client needs, and environmental constraints. The findings highlight how experiential learning supports creativity, critical thinking, and problem-solving, preparing students with essential skills for navigating complex professional scenarios.

The project effectively bridged theoretical knowledge with practical application, encouraging students to innovate and consider long-term value in their designs. By focusing on sustainability, client-centered solutions, and adaptability to environmental and regulatory challenges, students developed a better understanding of how entrepreneurial principles apply to construction project management. Despite limitations in sample size and the online format, the study demonstrated the effective integration of entrepreneurial learning in engineering education. Future enhancements, such as team-based collaboration and interdisciplinary approaches, could further strengthen the project's impact. Ultimately, this work highlights the importance of embedding entrepreneurial thinking into engineering curricula to better prepare students for the evolving demands of the industry. This approach contributes to broader efforts to redefine construction management education to meet 21st-century industry demands.

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