



Mass Timber Education in U.S. Construction Programs: Current State and Future Needs

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This study explores the current state of Mass Timber education in U.S. construction programs, assessing the challenges, opportunities, and future needs for curriculum development. As Mass Timber gains traction as a sustainable building material, its integration into higher education remains limited, hindering the preparation of future professionals in construction. The research employs a mixed-methods approach, including surveys distributed to U.S. construction faculty to assess their familiarity with Mass Timber and the presence of related courses in their programs. Findings reveal that only 29% of the surveyed programs offer Mass Timber-related courses, with 49% of faculty having limited familiarity with the material. According to the survey responses, barriers to integration include curriculum constraints, a shortage of qualified instructors, and a lack of dedicated resources. Despite these challenges, there is a strong interest in expanding Mass Timber education, with 76% of faculty recognizing its value for sustainable construction practices. The study concludes that enhancing the Mass Timber curriculum and professional development for instructors is essential to meet the growing demand for expertise in this field. Recommendations include incorporating Mass Timber as an elective or specialized module, providing faculty training, and developing standardized educational resources to support its broader integration into construction programs.

Keywords: Mass Timber, Education, Construction, Mass Timber Construction, Sustainable Materials

Introduction

Mass Timber is emerging as a sustainable and innovative building material, recognized for its environmental advantages such as low embodied carbon and renewable sourcing, making it an attractive alternative to traditional construction materials like steel and concrete (Pittau, et al., 2019; Crawford & Cadorel, 2017). Despite its benefits, the adoption of Mass Timber in the U.S. construction industry faces significant barriers, including limited educational resources, a lack of standardized curricula in higher education, and knowledge gaps in areas such as material performance, safety, and regulatory requirements (Jafari & Collins, 2024).

Current construction education programs in the United States largely lack comprehensive Mass Timber education, leaving future professionals unprepared for this advancing field. To bridge this gap, universities and industry organizations are exploring the development of specialized curricula, micro-

credentials, and interdisciplinary programs that would equip students with the necessary skills and knowledge for Mass Timber applications. This study investigates the current state of Mass Timber education in U.S. university construction programs, assessing the challenges, opportunities, and future needs for curriculum development. In this study, the term ‘construction programs’ specifically refers to Construction Management and Construction Engineering programs. By addressing these gaps, this research aims to contribute to the establishment of a robust educational framework that supports the industry’s growing demand for sustainable construction practices and enhances the alignment between academia and industry standards.

Literature Review

Mass Timber refers to large engineered structural wooden panels, including Cross-Laminated Timber (CLT), Glue-Laminated Timber (Glulam), and Laminated Veneer Lumber (LVL). Recognized as a transformative sustainable building material, Mass Timber supports sustainable construction by addressing today’s needs while preserving resources for future generations (Dickie & Howard, 2000). Extensive research highlights the environmental advantages of timber construction, particularly its ability to sequester carbon dioxide and compatibility with sustainable building systems, establishing it as a viable, eco-friendly alternative to traditional materials such as masonry, steel, and concrete (Pittau, et al., 2019; Crawford & Cadorel, 2017; Liu, et al., 2016; Mirando, et al., 2024). The intrinsic properties of wood, along with comparatively streamlined manufacturing processes, contribute to Mass Timber’s reduced embodied energy and lower emissions throughout a building’s lifecycle (Vanova, et al., 2021; Abed, et al., 2022; Budig & Mlote, 2022).

Furthermore, the use of prefabricated Mass Timber components minimizes on-site waste generation (Brisland, et al., 2019) while promoting energy-efficient and low-emission building designs (Nuñez Avila & Blanca-Giménez, 2022). Beyond environmental benefits, Mass Timber supports biophilic design principles by introducing a natural aesthetic that enhances occupant well-being and productivity (Fell, 2013; Montjoy, 2022). In summary, Mass Timber offers a renewable, low-impact, and visually enriching option for sustainable building. Given these environmental and biophilic advantages, advancing education on Mass Timber within the built environment field is imperative. Educating future professionals on its applications and benefits will promote sustainable construction practices and foster broader adoption, ensuring a more sustainable future for the construction industry.

Mass Timber Education

Research in the U.S. and Canada shows that Mass Timber lags behind concrete and steel as the preferred structural material for high-rise and complex buildings (Lewis, 2020; Daneshvar, et al., 2021). However, with rising market demand for sustainable solutions and a gap in higher education regarding Mass Timber, there is a growing need for specialized courses in this area (Daneshvar, et al., 2021). Studies in North America indicate that many universities offer limited or no timber education at the undergraduate level (Lawson, et al., 2020; Daneshvar, et al., 2021).

According to a 2019 survey by the National Council of Structural Engineering Associations (NCSEA), Wood Design courses are offered in only 52% of architectural and civil engineering undergraduate programs in the U.S., compared to near-universal offerings for Steel Design (99%) and Concrete Design (100%) and just 33% for Masonry (Francis, 2021). These Wood Design courses are typically elective or cross-listed, infrequently offered every two to three years, and rarely focus on Mass Timber design and construction, highlighting a significant gap in integrating Mass Timber education into U.S. engineering curricula.

Similarly, a 2020 survey of Canadian universities revealed that undergraduate programs allocate only 14% of their curriculum to timber-related courses, compared to 34% for steel and 44% for concrete, while masonry and aluminum receive just 7% and 1%, respectively (Daneshvar, et al., 2021). Among 33 surveyed undergraduate design courses, only 11 focused exclusively on timber, 20 covered multiple materials, and 2 were joint undergraduate–graduate courses. This limited emphasis on timber education in Canadian programs parallels the challenges observed in the U.S., reflecting a broader gap in preparing students for sustainable construction practices involving timber and Mass Timber applications.

While surveys have shed light on the limited representation of timber-related education in architectural and civil engineering programs in the U.S. and Canada, no comprehensive study has been conducted to evaluate the integration of Mass Timber education specifically within U.S. construction programs. Given the underrepresentation of Mass Timber in these curricula, it is critical to investigate the current state and future requirements for Mass Timber education in construction programs. Addressing this gap is crucial, as education plays a central role in equipping professionals with the knowledge and skills necessary to apply emerging materials in real-world projects.

Methodology

Research Aim and Objectives

This research aims to address a significant gap in construction education by investigating how Mass Timber can be effectively integrated into U.S. academic programs, providing a foundation for preparing future professionals to meet the growing demands of sustainable construction practices. As an eco-friendly alternative to traditional building materials, Mass Timber has the potential to revolutionize construction practices; however, its integration into educational curricula remains limited. By exploring the current state of Mass Timber education, this study seeks to offer actionable insights that can guide the development of curricula, resources, and faculty training, ultimately helping academic institutions prepare their students for the evolving needs of the construction industry. The findings will contribute to the knowledge base on sustainable building materials and offer strategic recommendations for overcoming academic barriers that prevent the widespread adoption of Mass Timber education.

The primary objectives of this study are threefold. First, the research will assess faculty members' familiarity with Mass Timber and evaluate the extent to which Mass Timber-related content is currently included in U.S. construction programs (Objective 1). Understanding faculty familiarity with Mass Timber will provide a baseline for identifying knowledge gaps and areas where additional resources are needed. Second, the study will investigate the barriers hindering Mass Timber's integration into construction curricula (Objective 2). These barriers may include limited curriculum space, a lack of qualified instructors, or insufficient course materials, which can impede the inclusion of Mass Timber as a core topic in construction education. Lastly, the research will evaluate faculty perceptions of potential solutions for enhancing Mass Timber education, including the feasibility of introducing a Mass Timber micro-credential (Objective 3). The study aims to identify practical pathways for addressing the gaps in Mass Timber education by assessing faculty attitudes toward micro-credentials and other educational innovations.

Data Collection

To achieve the research aim and objectives, this study employs a mixed-methods approach, combining both qualitative and quantitative data collection techniques, to provide a comprehensive understanding of the current state of Mass Timber education within U.S. construction programs and to identify future needs for effectively integrating this material into academic curricula. Using a structured survey

developed on the Qualtrics platform, the research captures quantitative data through multiple-choice and multiple-answer questions, enabling statistical analysis, while open-ended questions facilitate the collection of qualitative insights into faculty perspectives and experiences. The survey questions were developed after a thorough review of relevant literature and a question refinement phase to ensure clarity and relevance. This approach ensured that the questions effectively addressed the key aspects of the research while remaining comprehensible to respondents.

The survey, consisting of 20 targeted questions, is designed to evaluate faculty familiarity with Mass Timber, assess its presence in U.S. construction programs as either elective or mandatory content, and identify the resources and support necessary for its integration into curricula. The questions are organized into five key sections:

1. **Mass Timber Courses:** This section evaluated faculty members' awareness of Mass Timber and determined whether they are currently teaching related content. A brief description of Mass Timber was provided for those unfamiliar with the material.
2. **Course Details:** Directed at faculty currently teaching Mass Timber, this section collected information on course structure, including whether the course is standalone, integrated into other courses, or offered as a micro-credential program.
3. **Program Needs:** This section, applicable to all faculty members, explored the challenges and future needs of incorporating Mass Timber into curricula. It also assessed faculty opinions on the value of integrating Mass Timber into their programs.
4. **Additional Comments:** This section allowed faculty to share any additional concerns or suggestions and express their willingness to collaborate in future research on Mass Timber curriculum development.
5. **Demographics:** Faculty members were asked to provide information about their academic rank, discipline, and the state in which they are located. This demographic data aimed to offer insight into regional trends in Mass Timber education across U.S. construction programs.

To ensure broad representation, the survey was distributed to civil engineering faculty and Associated Schools of Construction (ASC) members via ASC announcements, direct emails, and LinkedIn posts. Institutional Review Board (IRB) approval was obtained prior to distribution. This structured approach enables a thorough assessment of existing gaps and future opportunities for advancing Mass Timber education within U.S. construction programs.

Results and Discussion

Results

A total of 38 responses were collected from construction faculty members, of which 35 were considered complete. The majority of respondents were from Construction Management, 80% (28 respondents), followed by Construction Engineering, 17% (6 respondents), and Civil Engineering, 3% (1 respondent). In terms of academic rank, Associate Professors comprised the largest group, 40% (14 respondents), followed by Assistant Professors, 23% (8 respondents), Professors, 17% (6 respondents), Lecturers and Instructors, 11% (4 respondents), and School Heads or Department Chairs, 9% (3 respondents). This distribution reflects a broad spectrum of academic ranks, offering perspectives from both junior and senior faculty members, which enhances the survey's comprehensiveness.

The survey further assessed respondents' familiarity with Mass Timber, revealing notable variations in knowledge. As illustrated in Figure 1, a significant portion identified as "slightly familiar" (43%, 15 respondents), indicating a basic awareness with limited depth of understanding. Another 31% (11

respondents) were “moderately familiar,” suggesting foundational knowledge or some practical exposure. A noteworthy 14% (5 respondents) were “experts,” reflecting specialized knowledge or extensive experience. Conversely, 12% (4 respondents) had low familiarity, with 6% (2 respondents) “not familiar at all” and another 6% (2 respondents) “very familiar” but not at an expert level.

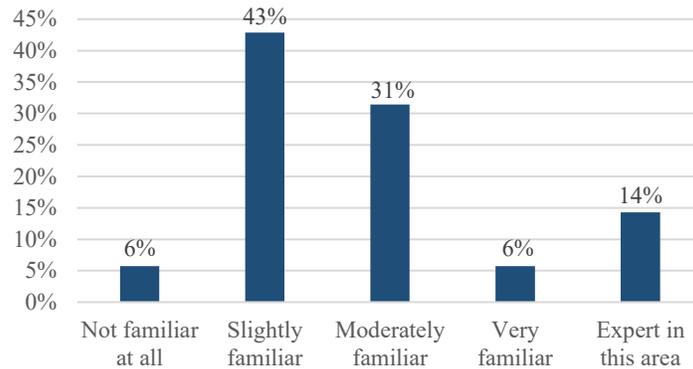


Figure 1. Familiarity of Construction Faculty Members with Mass Timber

Regarding course offerings, only 29% of programs currently include Mass Timber-related courses, leaving 71% without such curriculum components. Among the programs that offer Mass Timber-related courses, 60% are mandatory, while 40% are elective (Figure 2). All mandatory courses include Mass Timber as one of several topics, whereas elective courses focus exclusively on Mass Timber. This suggests that when Mass Timber is included, it is often treated as a core subject within the broader curriculum.

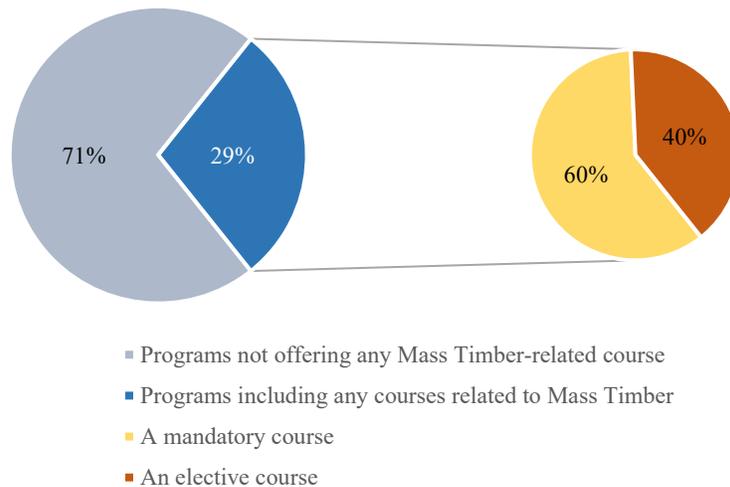


Figure 2. Percentage of Mass Timber-related Courses in Construction Programs and Their Type (Mandatory vs. Elective)

The survey also explored faculty-reported challenges in integrating Mass Timber into the curriculum. As indicated in Figure 3, 38% of respondents (20 respondents) noted the most frequently cited barrier

was the lack of room in existing curricula, suggesting that construction programs are densely packed, leaving minimal flexibility for new topics without significant restructuring. The second most common challenge, reported by 23% (12 respondents), was a shortage of qualified instructors knowledgeable about Mass Timber. Additionally, 21% (11 respondents) pointed to a lack of course materials and resources, highlighting a gap in accessible and standardized teaching tools specific to Mass Timber.

In terms of student interest, only 12% (6 respondents) identified it as a barrier, suggesting a potential opportunity to increase student engagement through industry speakers, guest lectures, or case-based learning. Furthermore, 6% (3 respondents) noted the need for institutional justification for incorporating Mass Timber, implying that awareness of industry demand could strengthen advocacy for its inclusion. These challenges indicate that the primary hurdles are curricular space, instructor availability, resource adequacy, and institutional support.

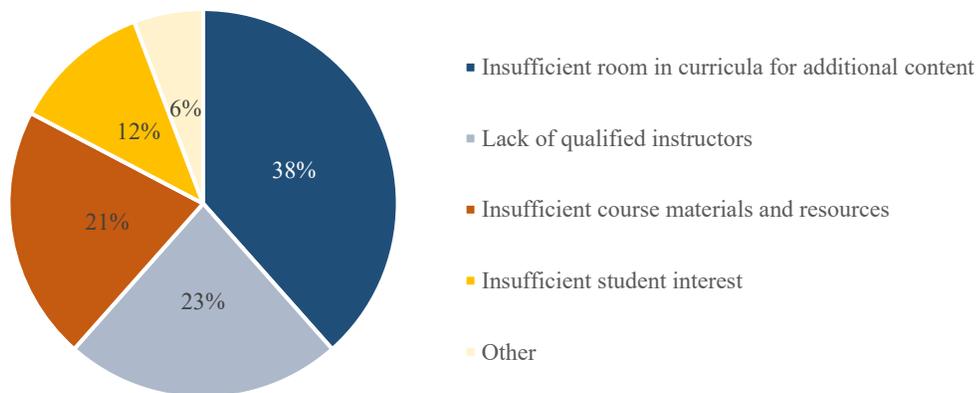


Figure 3. Challenges of Incorporating Mass Timber into Construction Programs' Curriculum

When asked about the potential impact of a Mass Timber micro-credential to address these challenges, responses were mixed. Among the 41% who responded negatively, key concerns included limited student demand, implementation difficulties, and the perception that a micro-credential, not being an accreditation requirement, might hold less priority within the curriculum. Construction faculty also noted challenges in finding advocates and resources to support such a credential, with local industry primarily valuing experience over credentials. Additionally, with heavy course loads, particularly for working students, adding a micro-credential could pose further burdens. These structural and logistical concerns reflect the practical challenges of introducing a Mass Timber micro-credential into current academic structures.

In contrast, 59% of respondents who supported a Mass Timber micro-credential emphasized its benefits, including accessible, flexible, web-based content that could enhance faculty knowledge and student learning without overburdening program resources. If delivered asynchronously with materials like workshops and assignments, a micro-credential could offer a cost-effective way to introduce Mass Timber education, especially if it were available to students at minimal cost.

Figure 4 shows that faculty identified the most valuable aspects of a Mass Timber course, with 35% of respondents favoring case studies to demonstrate best practices, challenges, and innovative applications in real-world projects. This was followed by 27% prioritizing broader sustainability considerations, reflecting the construction industry's growing focus on eco-friendly practices. Practical, hands-on

learning experiences were emphasized by 23% of respondents, highlighting the importance of understanding Mass Timber’s physical properties and construction techniques, even if it ranked slightly lower than case studies and sustainability. Collaboration with industry professionals was valued by 15% of respondents for providing current insights and networking opportunities. Interestingly, integration with relevant software tools did not receive any selections, potentially reflecting either a lack of awareness or a preference for other methods in introductory Mass Timber education.

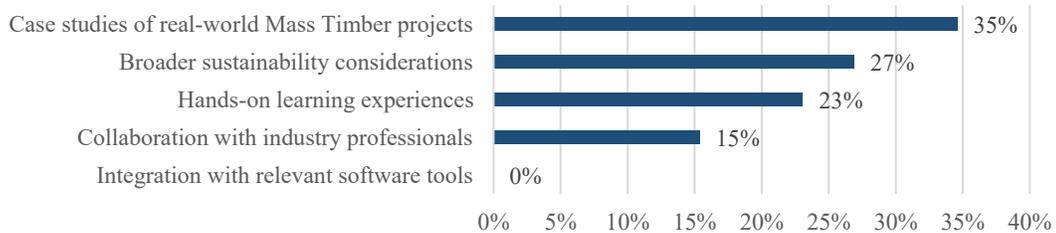


Figure 4. Percentage of Construction Faculty Responses on The Most Important Aspects to Include in A Mass Timber Course

Figure 5 highlights critical resources and support needs for expanding Mass Timber content in construction programs. The most requested resource, cited by 20% of respondents, was faculty development workshops on Mass Timber, underscoring the demand for training to equip educators with the necessary skills to teach this subject effectively. Comprehensive textbooks or course materials were the second most requested resource, with 18% of respondents highlighting the importance of structured educational materials. Additionally, 15% of respondents identified a need for access to industry experts, funding for guest lectures, professional development opportunities, and laboratory or workshop facilities, suggesting a balanced emphasis on practical learning and staying current with industry practices.

Moderate demand for research funding (11%) reflects a desire to enrich curricula with current findings and innovations. Collaboration with other universities or industry partners, although less frequently requested (7%), can provide valuable insights and shared learning. Faculty comments also noted that their universities already offer many of these resources, with the primary challenge being the integration of new content into established curricula. Thus, while faculty development and teaching materials are essential, the structural challenge of curriculum integration is a major hurdle in adopting Mass Timber education.

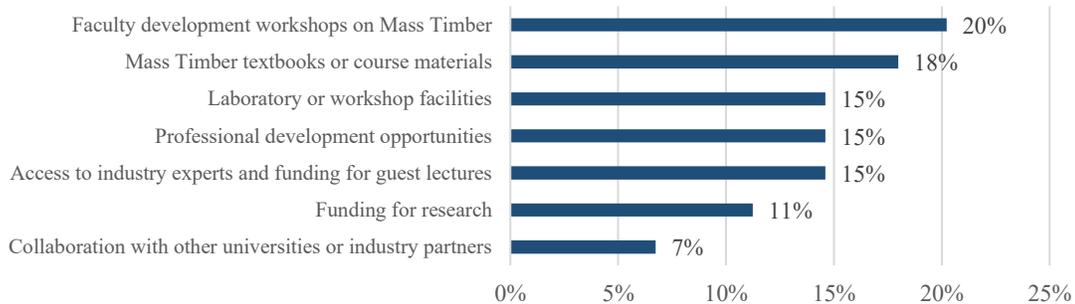


Figure 5. Resources and Support Needed to Incorporate More Mass Timber Content into Construction Programs

Discussion

The survey results suggest that while Mass Timber education is currently underrepresented in U.S. construction programs, there is significant interest in expanding its inclusion. The findings address the research objectives and can be interpreted as follows:

Objective 1: Faculty Familiarity with Mass Timber and Inclusion in U.S. Construction Programs

The results indicate that faculty members across U.S. construction programs exhibit a range of familiarity with Mass Timber, with many reporting only slight or moderate knowledge. This suggests there is a considerable opportunity to expand Mass Timber education and professional development within construction programs. Faculty members who are less familiar with Mass Timber may benefit from targeted educational resources such as workshops, training sessions, or online resources. These efforts would help fill existing knowledge gaps and prepare instructors to teach Mass Timber effectively. Enhancing faculty familiarity with Mass Timber is crucial for integrating it into the curriculum and ensuring that instructors are confident in delivering content on this important topic.

Objective 2: Barriers to Integration of Mass Timber into Construction Curricula

Despite growing interest in sustainable building materials like Mass Timber, the study identifies several key barriers to its integration into construction curricula. These include limited curriculum space, a shortage of qualified instructors, and the lack of appropriate course materials. Many programs struggle to incorporate Mass Timber due to time constraints within existing courses, particularly in already packed curricula. Additionally, the limited number of qualified instructors with expertise in Mass Timber further hampers its inclusion. These barriers highlight the need for dedicated resources to address the structural and staffing limitations faced by construction programs. Developing faculty development programs, establishing industry partnerships, and creating adaptable course materials could help overcome these obstacles and make Mass Timber education more accessible across programs.

Objective 3: Faculty Perceptions of Solutions for Enhancing Mass Timber Education

The study also sought faculty perceptions of potential solutions for enhancing Mass Timber education, particularly the idea of introducing a Mass Timber micro-credential. While there was a positive response to the concept, faculty also expressed concerns regarding the logistical and structural challenges of implementing such a credential. The perceived benefits of a micro-credential include its potential for providing flexible, targeted learning opportunities for both students and faculty, especially in an area as specialized as Mass Timber. However, challenges such as aligning the credential with industry needs, ensuring its relevance, and addressing its feasibility within academic structures were also highlighted. These concerns must be addressed through careful planning, ensuring the micro-credential is well-designed, relevant to current industry practices, and logistically feasible for institutions to implement.

In addition, faculty responses emphasized the importance of incorporating real-world applications, sustainability, and hands-on learning experiences into Mass Timber courses. Industry collaboration was also cited as a key component in creating effective educational content. By aligning Mass Timber education with current industry practices and needs, programs can ensure that students are well-prepared to contribute to the growing demand for sustainable building materials and construction methods.

Overall, the study underscores the need for increased faculty familiarity with Mass Timber, greater integration of Mass Timber content into construction curricula, and overcoming barriers related to curriculum space and faculty qualifications. Faculty development initiatives, the creation of specialized courses, and industry collaboration are essential to addressing these challenges. The idea of a Mass Timber micro-credential has promise but requires careful development to ensure its relevance and feasibility. Ultimately, by addressing these key areas, construction programs can better prepare students to meet the evolving demands of the construction industry and contribute to the growing field of sustainable building materials.

Conclusion and Recommendations

This study highlights a strong interest in expanding Mass Timber education within U.S. construction programs, particularly among Construction Management faculty. However, engagement with Construction Engineering and Civil Engineering disciplines remains limited, reflecting an opportunity for broader representation. Faculty familiarity with Mass Timber varies widely, underscoring the need for targeted professional development to address knowledge gaps and equip educators to teach this emerging field effectively.

Several barriers hinder the integration of Mass Timber into curricula, including limited space in crowded course schedules, a shortage of qualified instructors, and insufficient teaching resources. These challenges suggest that Mass Timber education may initially be best introduced as elective or specialized modules, complemented by faculty workshops and the development of standardized teaching materials, such as case studies, textbooks, and hands-on tools. Industry collaboration will also play a critical role in ensuring the relevance of educational content and providing resources like guest lectures and funding for curriculum development.

Although faculty opinions on the feasibility of a Mass Timber micro-credential were mixed, many recognized its potential to enhance learning through flexible, web-based delivery methods. Successful implementation will require alignment with industry needs and careful consideration of logistical challenges, such as balancing curriculum demands and addressing local industry preferences for experience over credentials.

Limitations and Future Research

This study's findings are based on a relatively small sample size (35 respondents), limiting generalizability. Additionally, reliance on self-reported data may introduce bias, and the geographic distribution of respondents might not fully capture regional variations in Mass Timber education and industry demand. Furthermore, this research focuses primarily on faculty perspectives, leaving student and employer viewpoints underexplored.

Future studies should address these limitations by expanding the sample size, incorporating diverse stakeholder perspectives, and conducting longitudinal analyses to evaluate the long-term impact of Mass Timber education initiatives such as micro-credentials. Exploring student interest, industry demand, and strategies for integrating Mass Timber content into existing curricula will be essential. Developing partnerships with industry professionals to create standardized teaching resources, such as textbooks and hands-on materials, will further bridge knowledge gaps and ensure alignment with evolving industry trends. Addressing these challenges equips academic institutions to prepare the next generation of construction professionals to meet the growing demand for sustainable building materials and ensure the sustained growth and relevance of Mass Timber education.

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