MASS TIMBER CURRICULUM IN THE U.S. IN ENGINEERING, ARCHITECTURE, AND CONSTRUCTION DISCIPLINES: CURRENT STATE OF ADOPTION, GAPS, AND NEEDS ANALYSIS

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ABSTRACT

Mass timber is a sustainable construction material that is increasing in demand throughout the engineering, architecture, and construction (AEC) fields in the United States. While it is gaining popularity, there are several barriers that still exist in the adoption of mass timber in the AEC industry. One of these barriers is the lack of mass timber curricula and educational resources in accredited programs across undergraduate and graduate institutions in the U.S. By analyzing information gathered from syllabi and interviews of instructors teaching classes with timber and mass timber components in accredited programs, this study aims to establish the current state of integration of timber and mass timber related content in engineering, architecture, and construction curricula and how they compare to one another. Results suggest that there is currently a relatively low number of timber and mass timber courses available in accredited higher educational institutions across the AEC fields, with architecture having the largest number and construction having the smallest. Engineering offers the largest number of mass timber-specific courses, while construction has the least. Within AEC classes, the curriculum content also predominantly focuses on the structural and design applications of mass timber. This highlights the opportunity for more comprehensive coverage of technology, construction, and materials concepts across all three disciplines. A lack of available instructional tools was also prominently discussed, with many instructors citing a lack of formal instructional materials, real-world examples, and case studies. It was also found that instructors with industry experience had an easier time creating and/or identifying these materials, suggesting that courses with industry experience-led instructors tend to currently provide a greater amount of mass timber educational content in comparison to courses without. Lastly, the instructor-suggested resources and solutions identified that could most help further support the increased adoption of mass timber curriculum included case studies and design projects, and instructional materials that include problem sets and lecture notes.

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Thank you to the professors for their participation in this study and willingness to improve mass timber education. I'd like to thank MassTimber@MSU for their collaboration and Cade Person, Olivia Pauls, and Christiana Kiesling for their valuable contributions to the project. I'd also like to thank Dr. Cetin and Dr. Berghorn for their guidance and support throughout this process. Finally, thank you to my family and friends for pushing me to work hard and accomplish my goals.

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INTRODUCTION

Driven by population growth, technological advancements, economic factors, sustainability needs, and social expectations, vertical infrastructure across the world is constantly evolving. Historically most buildings in the U.S. have been built with steel or concrete structural components (Slaton, 2001). However, mass timber has emerged in recent years as an alternative product that can be used as a sustainable option for structural components of a building. The use of wood has been found to contribute to reducing carbon emissions through both storing carbon and reducing emissions during the construction phase in comparison to steel or concrete (Dennehy, 2020; USDA Forest Service, 2023).

The use of mass timber materials in construction has also become more widely used and accepted in the AEC (Architecture, Engineering, and Construction Services) community in the United States in recent years. The transition from traditional light-frame timber design to also include modern engineered mass timber enables this material to compete with conventional construction methods that primarily rely on steel and concrete (Kuzmanovska et al., 2018). Furthermore, the versatility of mass timber allows it to be manufactured in different ways, featuring large solid timber sections that are typically cross-laminated (CLT), dowel-laminated (DLT), glulam (GLT), nail-laminated (NLT), mass plywood panels (MPP), or structural composite lumber (SCL) (Woodworks, 2023).

An increase in awareness and a growing number of projects have allowed mass timber to grow in the U.S. building construction market (Ahmed & Arocho, 2021). According to a report on the mass timber construction market, mass timber construction is predicted to grow at a compound annual growth rate of six percent from 2022 to 2031 (Allied Market Research, 2023). From 2020-2023 alone, the number of mass timber buildings grew 114%, with over 2000 construction projects occurring during this period (Ross, 2024). There are various reasons suggested as to why mass timber has seen such a growth in the U.S. Studies have shown that mass timber used in construction can reduce project costs and in turn benefits the clients, contractors, and developers (HKS, 2022). The seismic performance of mass timber buildings is another factor, specifically studies have found that mass timber structural components are resilient under seismic conditions, acting as rigid bodies with ductile properties provided by the connections (Izzi et al., 2018). Mass timber also has been found to perform well structurally when exposed to fire, producing a protective layer of char that slows the burning process in members (Muszyński et al., 2019). In addition, these properties have improved as the design of fire and seismic resisting connections for mass timber materials has also been developed (Muszyński et al., 2019). As more projects adopt mass timber as a construction material, the barriers continue to decrease, making it increasingly accessible and utilized in the building industry.

Because mass timber is relatively new to the U.S. construction industry in comparison to the well-established concrete and steel industries, less industry professionals are familiar with the use of this material in the construction, architecture, and engineering professions (Woodworks, 2023; Riddle, 2023). Similarly, there are also less instructors that have the background knowledge to teach courses that cover the design and use of mass timber to the future industry professionals currently completing their education. This suggests the need for better mass timber education in educational institutions across the three AEC disciplines to better prepare the future workforce for interfacing with this structural material. Previous studies have suggested that the availability of a well-structured curriculum that can be incorporated into higher educational institutions across the United States can help to reduce barriers to instruction and thus increase adoption of curriculum content (VanWyngaarden, 2024). For example, a study on the adoption of high-impact education (learning practices to promote deep learning and student engagement) in undergraduate STEM (science, technology, engineering, and mathematics) courses revealed better outcomes among students and faculty with organized curriculum (VanWyngaarden, 2024). Instructors in the AEC fields interested in teaching mass timber focused courses would thus also strongly benefit from educational resources on mass timber design and construction.

Components of educational curriculum include clear learning objectives and outcomes, interdisciplinary integration, industry relevance, feedback mechanisms, assessments, and flexibility (UNESCO, 2023). Curriculum intended to cover a particular topic should cover a broad range of topics that relate to the core focus and provide students with a well-rounded education (UNESCO, 2023). The AEC industry relies on this type of curricula to deliver the knowledge and skills of a professional acting in the field (Sheine, 2019). Preparing students for the workforce is critical in the AEC industry and will continue to shape the future generation's performance. A combination of design, construction, technical, structural, and materials courses are important to include for students to receive a holistic educational experience (Alakavuk, 2016).

Integrating mass timber education into existing coursework has been a challenge due to barriers including limited funding to support new course development, and restrictions on course and program requirements limiting the flexibility to support additional electives (Lehmann, 2023; Beck, 2022). Steel and concrete are much more prevalent in curricula across the AEC industry; there is less of a focus on timber and masonry structures (Dong, 2015). Recent research revealed that because of this knowledge gap in the AEC industry, this has led to various challenges in mass timber adoption, such as misrepresentation of mass timber cost estimates (Woodworks, 2023). Without sufficient education, students are not adequately prepared to perform the responsibilities of a professional in the mass timber industry, even at an introductory level. Furthermore, the American Wood Council noted that mass timber design projects, problem sets, and real-world examples available for use in mass timber construction are deficient in today's higher educational curriculum. Since mass timber is comparatively new, it also creates challenges for instructors in finding suitable industry-focused resources (American Wood Council, 2023). This highlights the importance of creating widely available mass timber educational resources that are easily accessible to students and educators.

A recent study found a significant lack of engineering courses that teach the fundamentals of mass timber. Specifically, a survey on undergraduate and graduate engineering curriculum revealed that only 55% of engineering institutions offered courses on timber design, only some of which regularly teach this class listed in the curriculum, and very few of which integrate mass timber components into timber design (Okoye, 2019; Person, 2024). Additionally, most of these programs did not require their students to take a timber course to graduate (Okoye, 2019). No known studies have been completed to assess the current state of mass timber curriculum in the architecture and construction areas.

In summary there is a lack of research on the level of integration of mass timber curriculum throughout engineering, architecture, and construction higher educational programs throughout the U.S. There is also little research done evaluating the similarities and differences in the current state of mass timber education across these disciplines, as well as how effectively these fields are interconnected in their approach to teaching mass timber. Furthermore, there is an absence of research on instructor-identified gaps, that, if filled, would provide the most effective resources for improving mass timber curriculum development and ease of adoption. Examining the existing curriculum and what is missing in accredited higher educational institutions throughout the United States across all three disciplines is crucial to gain a better understanding and improving the state of mass timber education. An understanding of mass timber across all three disciplines is needed in industry to support mass timber adoption.

This study seeks to characterize the current level of mass timber integration in engineering, architecture, and construction programs, as well as identify the gaps in current curricula and the instructor-suggested resources that are needed for the expansion and improvement of mass timber education. It also seeks to draw comparisons across the three disciplines to help determine what kinds of resources would be universally helpful across AEC, and other specific topics that would be field specific. Insights on these objectives are obtained through syllabus analysis and structured interviews conducted with instructors teaching courses across AEC that include some (often small amount) content on mass timber in their coursework. The remainder of this study is organized as follows. First the methods section reviews how timber-related AEC coursework was searched for and identified across the AEC disciplines in U.S. institutions. The results and discussion section discusses findings from these interviews and analysis, including prevalence of mass-timber curriculum, components of mass timber instruction currently discussed in curriculum, instructor-identified needs for curriculum resources, and preferred structure of these resources. It also discusses differences across the AEC areas in terms of findings. The conclusions section summarizes results, studies limitations, and suggests future work.

METHODS

A search for mass timber courses offered by 4-year higher educational institutions across the United States was performed to determine how many of these courses existed. A list of colleges and universities with accredited undergraduate and graduate programs in engineering (civil engineering specifically), architecture, and construction was compiled first to facilitate this process. To maintain accreditation, these programs follow the standards of the Accreditation Board for Engineering and Technology (ABET), the National Architecture Accrediting Board (NAAB), and the American Council for Construction Education (ACCE), respectively. In total 702, 135 and 92 institutions in the United States were found to have accredited programs in civil engineering, architecture, and construction, respectively, under these accreditation boards. This list of institutions was used to facilitate the mass timber related curriculum search process. Due to the large number of accredited civil engineering programs, the course search was further simplified for this set of programs by focusing on the two largest civil engineering accredited public institutions in each state (i.e. 100 civil engineering institutions total). This is closer in number to the 135 and 92 institutions with architecture and construction programs.

The course search process began by reviewing the specified institutions' websites to determine whether they offered accredited programs in engineering, architecture, and/or construction. The course catalogs were then thoroughly examined for institutions with accredited programs and any courses in these programs with titles related to timber or mass timber were noted. Course descriptions were then reviewed for these courses to identify keywords related to *mass timber*, including *timber, mass timber*, *wood, lumber, hardwood, sustainable building, CLT*, and *GLT*. Courses that included any of these words were catalogued, along with a brief description of the course and how it is related to timber. Additionally, the type of degree program under which these were offering the course was documented (i.e. associates, bachelor's, master's, doctoral), along with the instructors listed as teaching the course(s), and their contact information, if available.

Once the relevant courses were identified and analyzed, instructors were contacted via email to request the course syllabi. The main goal of this step was to use the syllabi to understand how much mass timber related content was listed in the syllabus as being integrated into the course curriculum. Key information was then documented, including course title, institution, course description, objectives, textbooks and required materials (e.g. codes, etc..), and presence of mass timber-specific topics and/or assignments. The estimated percentage of the course content devoted to mass timber was also determined from the syllabi where possible.

Instructors of these classes were then contacted via email and requested to participate in an interview via video conference call. In total 154 instructors were contacted via email between June 2023 and February 2024. After two rounds of follow-up emails and no response from the targeted instructors, no further contact was made. Video conference calls followed a structured interview, where the instructors were asked a series of specific pre-determined questions. Some of the questions included the type of course taught, the instructor's experience/background, the mass timber concepts taught, and reference materials used/desired (see Appendix Table A7 for the questions). These questions were designed to assess what is currently being taught in the identified courses, and to obtain their opinion on what additional resources are needed to further improve the inclusion of mass timber related curriculum across the AEC courses currently offered. Interviews were audio recorded then transcribed for analysis of responses. Analysis of responses included a mixed methods approach of quantitative and qualitative analysis. Responses provide insights and supplemental information to the syllabi on course focus, percentage of mass timber covered, the instructors' background in mass timber, the specific concepts covered, and reference materials employed in the courses.

Another part of the analysis involved identifying the gaps in mass timber resources. The interviewed instructors provided feedback on the adequacy of publicly available teaching materials and references, and what topic they would like to cover but do not have time or resources to cover currently. They also provided insight into what materials they felt would be the most helpful for content development. The types of mass timber resources used and desired by participants were then analyzed and separated into categories such as design standards, academic materials, and industry resources. This information was key to identifying the barriers in the adoption of mass timber into engineering, architecture, and construction curriculum.

Tables 1, 2 and 3 show detailed information on the instructor participants across engineering, architecture, and construction, respectively. These tables include professional and academic titles, types of experience, and high-level information about the institutions in which they worked. The names of both the participants and their institutions are not included to maintain anonymity. The participants originate from institutions across multiple regions in the U.S., ranging in level of experience in both mass timber and academia (both teaching and research). This speaks to the diverse perspectives on mass timber education included in this study. Almost all instructors had experience teaching timber or mass timber. However, even though they were teaching these topics a much smaller number had industry (65.2% general timber and 30.4% mass timber), research (4.3% general timber and 13.0% mass timber), design (26.1% general timber and 8.7% mass timber), or graduate school (17.4% general timber and 0.0% mass timber) experience.

Table 1: Engineering Instructor Participant Information

Participant	Title	General Timber Experience					Mass Timber Experience						
		Design	Industry	Grad School	Research	Teaching	Design	Industry	Grad School	Research	Teaching	U.S. Region	Institution Fall 2023 Enrollment †
A	Professor of Practice	X	X	-	-	X	-	-	-	-	X	South east	19,500
B	Lecturer	X	-	X	-	X	-	-	-	X	X	North east	11,300
C	Associate Professor	-	X	-	-	X	-	X	-	-	X	South east	9,000
D	Assistant Professor	-	X	-	-	X	-	-	-	-	X	Mid west	56,400
E	Assistant Professor	-	-	-	-	-	-	-	-	-	-	Mid west	60,000
F	Associate Professor	-	-	X	-	X	-	-	-	X	X	Southwest	69,600
G	Adjunct Professor	-	X		-	X	-	X	-	-	X	South east	32,100
H	Associate Professor	-	-	X	-	X	-	-	-	X	X	South east	33,000
I	Assistant Professor	X	-	X	X	X	-	-	-	-	X	Southwest	32,700
J	Associate Professor	-	-	-	-	X	-	X	-	-	-	West	36,800
K	Instructor	-	X	-	-	X	-	X	-	-	X	Canada	50,000

Note: Participant E was developing but had not yet taught a timber course: No interviewed participants had mass timber experience in grad school or in design thus columns are not shown for these types of experience

† Enrollment numbers taken from institution websites.

Table 2: Architecture Instructor Participant Information

Participant	Title	General Timber Experience					Mass Timber Experience						
		Design	Industry	Grad School	Research	Teaching	Design	Industry	Grad School	Research	Teaching	U.S. Region	Institution Fall 2023 Enrollment †
A	Assistant Professor	X	X	-	-	X	X	-	-	-	X	South east	9,100
B	Associate Professor	-	X	-	-	X	-	-	-	-	X	North east	6,900
C	-	X	-	-	-	X	-	X	-	-	X	Mid west	25,200
D	Associate Professor	-	-	-	-	-	-	-	-	-	-	North east	5,900
E	Assistant Professor	-	X	-	-	X	-	-	-	-	-	Mid west	3,100
F	Assistant Professor	-	X	-	-	X	-	-	-	-	X	North east	30,300
G	Practicing Professor	-	X	-	-	X	-	X	-	-	X	South Central	69,000

† Enrollment numbers taken from institution websites.

Table 3: Construction Instructor Participant Information

Participant	Title	General Timber Experience					Mass Timber Experience						
		Design	Industry	Grad School	Research	Teaching	Design	Industry	Grad School	Research	Teaching	U.S. Region	Institution Fall 2023 Enrollment†
A	Associate Professor	-	X	-	-	X	-	-	-	-	X	North east	3,700
B	Lecturer	-	X	-	-	X	-	-	-	-	X	South Central	154,000
C	Assistant Professor	-	X	-	-	X	-	-	-	-	X	North west	21,000
D	Professor	-	X	-	-	X	-	-	-	-	X	South west	28,100
E	Visiting Professor	X	X	-	-	X	X	X	-	-	X	South east	12,000

† Enrollment numbers taken from institution websites.

In total, there were 11 engineering, 7 architecture, and 5 construction instructor participants. Participants were AEC instructors who volunteered for interviews following initial invitations and two subsequent follow-up requests. The participants interviewed included various ranks of professors and lecturers, from regions all over the United States, with general timber and mass timber experience ranging from industry involvement to teaching. Several participants have substantial experience in multiple areas, indicating a strong academic background on general timber and mass timber. This data represents a diverse sample of perspectives on mass timber education.

RESULTS AND DISCUSSION

The results are organized into several sections, beginning with the analysis of the frequency of timber and mass timber course offerings in AEC accredited programs in the U.S. The proportion of mass timber content within courses is also examined, along with the types of resources used and desired for teaching mass timber. The varying levels of experience among instructors and how it impacts the ability to find teaching resources is also identified. Lastly, insights from instructor interviews highlight the potential of mass timber as a sustainable building material and reveal challenges in curriculum integration.

Frequency of Timber/Mass Timber Course Offerings

The total number of courses with timber-related content identified in 100 civil engineering, 135 architecture, and 92 construction U.S. institutions evaluated across the three disciplines varies significantly. For engineering, the number of courses with timber content was 78, architecture 118, and construction 37. The total number of courses focused specifically on mass timber was found to be 15 for engineering, 2 for architecture, and 0 for construction. The data on the number of courses, syllabi received, and interviews conducted are shown in Table 4.

Table 4: Overview of Timber/Mass Timber Curriculum Integration Across Engineering, Architecture, and Construction Disciplines

	Engineering	Architecture	Construction
# of accredited programs in each discipline considered	100	135	92
Accredited programs that offered courses with timber/mass timber curriculum	59 (59%)	79 (59%)	36 (39%)
Accredited programs that offer courses specifically on mass timber only	9 (9%)	2 (<1%)	0 (0%)
Courses with timber/mass timber curriculum included	78	118	37
Courses with mass timber curriculum only	15	2	0
Syllabi received	17	18	14
% syllabi received out of total courses	21.8%	15.3%	37.8%
Interviews conducted	11	7	5
% interviews conducted out of total courses	14.1%	5.9%	13.5%

† Timber/Mass Timber courses are identified from accredited 4-year institutions offering curriculum featuring topics such as 'timber', 'mass timber', 'sustainable building', 'lumber', 'wood', 'hardwood', 'CLT', or 'GLT'. Institutions offering more than three courses with such content were evaluated, and only the top three courses were selected.

These results suggest that timber/mass timber classes and mass timber only classes are more prevalent in engineering and architecture than in construction, with engineering having the most mass timber-only classes. This may be due to where mass timber is in the adoption lifecycle, which leads with design prior to construction, thus there is more focus on engineers and architects who are designing mass timber systems, versus construction. A varying percentage of syllabi was received out of the total accredited courses. Engineering had a return rate of 21.8%, architecture 15.3%, and construction 37.8%. The variation in response rates may suggest various levels of engagement or resource availability among disciplines. Construction received the highest return rate of the three disciplines, which may reflect a higher engagement or interest in timber/mass timber concepts for those already focused on them. The number of interviews conducted was highest in engineering (11), followed by architecture (7), and construction (5). When compared to the total number of courses, the percentage of interviews was 14.1% for engineering, 5.9 % for architecture, and 13.5% for construction.

The availability of the number of courses with timber/mass timber content across engineering, architecture, and construction disciplines is displayed in Table 5. This shows the relative number of courses at accredited institutions, demonstrating a varying degree of emphasis on timber/mass timber education across the three disciplines. The data shows that architecture programs are more commonly offering more and offering multiple courses related to timber, while construction programs provide the least; engineering falls in between but offers the most mass timber specific courses.

Specifically in engineering, out of 100 accredited schools, 41% of institutions offer no timber courses and 55% provide only one. Only 4% of the schools offer two timber courses, and no engineering programs offer three or more. This suggests that while timber content is present, it remains limited to a single course at most schools. However, engineering has the highest percentage of accredited programs with mass timber-specific courses (9%). In architecture there are slightly higher numbers. Out of the 135 accredited programs, 42% offer no timber courses, mirroring the data for engineering. However, 39% of schools have one course, and a higher percentage (13%) provide two courses. Furthermore, 6% of architecture programs have three or more courses that have timber content. This suggests a greater integration of timber concepts in architectural education compared to engineering, across multiple courses. Construction falls behind both fields in timber integration. Out of the 92 accredited schools, 61% offer no timber courses, the highest percentage among the three disciplines. Approximately 36% of programs have one course, but only 2% have two courses, and only 1% offer three or more. This suggests that construction programs are less advanced in adopting timber and mass timber education compared to engineering and architecture. In addition, while 2% of accredited programs in architecture offered mass timber courses, no mass timber courses were found in construction programs. This shows how mass timber content currently remains a unique subject with limited course offerings across accredited programs.

Table 5: Timber/Mass Timber Curriculum Availability in Accredited Engineering, Architecture, and Construction Programs

	Engineering	Architecture	Construction
# of accredited programs in each discipline considered	100	135	92
1+ courses with mass timber-specific content	9%	2%	0%
0 courses with timber content	*41%*	*42%*	*61%*
1+ courses with timber (including mass timber)	59%	58%	39%
1 course	55%	39%	36%
2 courses	4%	13%	2%
3+ courses	0%	6%	1%

† Timber/Mass Timber courses are identified from accredited 4-year institutions offering curriculum featuring topics such as 'timber', 'mass timber', 'sustainable building', 'lumber', 'wood', 'hardwood', 'CLT', or 'GLT'. Institutions offering more than three courses with such content were evaluated, and only the top three courses were selected.

Proportion of Mass Timber Coverage in Courses

The percentage of mass timber content covered in each course taught by the surveyed participants was relatively small. Out of the 23 instructors' courses, only one course contained over 50% of mass timber content. The various mass timber content proportions in each participants' courses in engineering, architecture, and construction can be seen in Table 6, Table 7, and Table 8, respectively. These percentages were approximations made by the instructors when prompted. This shows that although some courses contained mass timber focused content, it was often a small portion of the overall curriculum. Many of these courses contained a larger percentage of content on timber or other structural materials such as masonry.

Table 6: Percentage of Mass Timber Content in Each Engineering Survey Participant's Course

Engineering Survey Course Information	
Survey Participant Course	**% Mass Timber Content**
1	<2%
2	33%
3	40%
4	20%
5	**50%**
6	40%
7	<2%
8	10%
9	30%
10	30%
11	**>98%**

Table 7: Percentage of Mass Timber Content in Each Architecture Survey Participant's Course

Architecture Survey Course Information	
Survey Participant Course	**% Mass Timber Content**
1	30%
2	15%
3	15%
4	0%
5	15%
6	10%
7	20%

Table 8: Percentage of Mass Timber Content in Each Construction Survey Participant's Course

Construction Survey Course Information	
Survey Participant Course	**% Mass Timber Content**
1	20%
2	<2%
3	<2%
4	<2%
5	<2%

Mass Timber Topics Covered in Courses

To provide an overview of the types of timber/mass timber courses being offered in engineering, architecture, and construction programs, Figure 1 summarizes data derived from syllabi received. These charts visually represent how different disciplines within these fields incorporate timber/mass timber content into their curricula. Each chart displays the distribution of course types offered in each discipline including structural design, construction, building technology, and materials courses. To clarify, the structural design courses focused on building systems and their design. The technology courses were mainly focused on how buildings perform as integrated and efficient systems using advanced technologies (i.e. "Building Technology Systems: Structures and Envelopes") and materials courses highlight the properties and applications of building materials. By examining these breakdowns, this effort identifies the common methods and areas in which timber/mass timber is currently being taught, highlighting which aspects of the material receive the most academic focus.

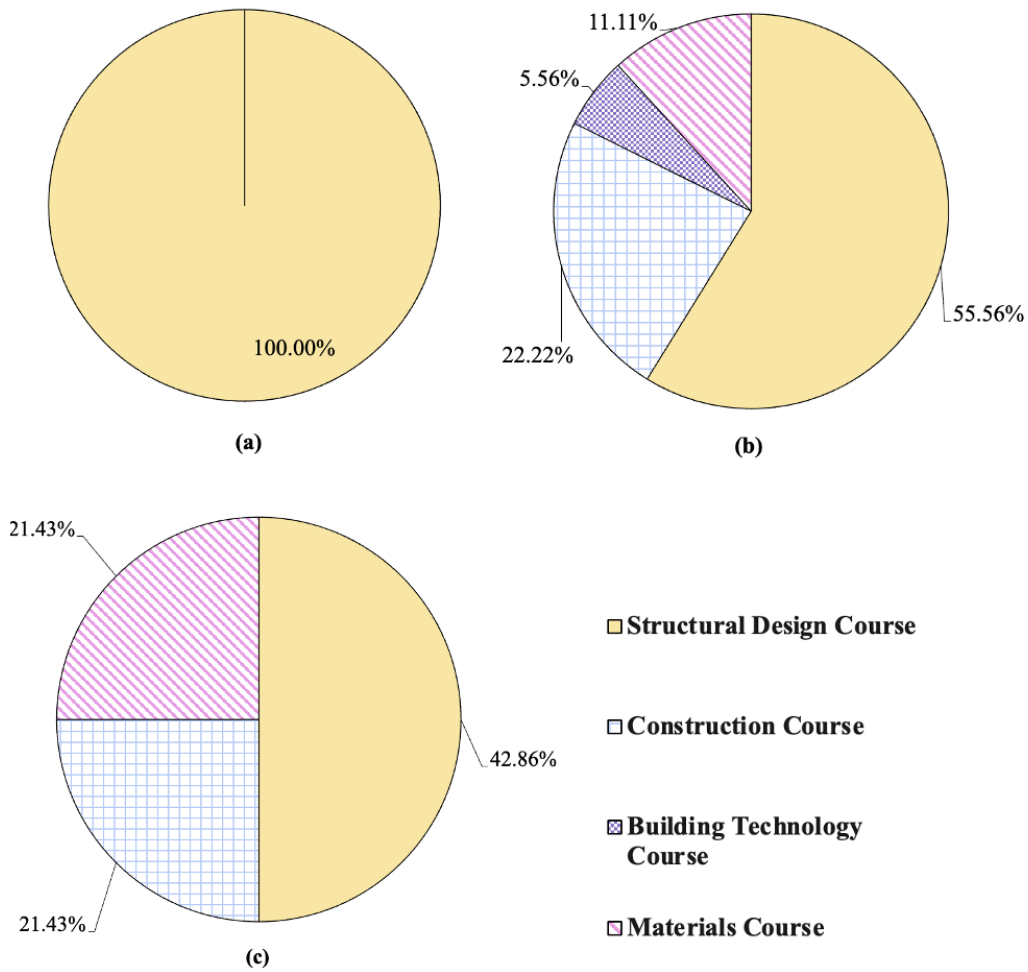


Figure 1: Distribution of (a) Civil Engineering, (b) Architecture, and (c) Construction Course Types from Syllabi Received

It can be observed from Figure 1 that out of the syllabi received from civil engineering courses, 100% represent structural design courses. This aligns with the importance of safety, load-bearing capacities, and the mechanical performance of mass timber in real-world applications that civil engineering designers would be responsible for calculating. The architectural programs displayed show a more diverse course focus. 55.56% of the courses received were structural design courses, followed by 22.22% for construction. Materials and building technology courses made up a small proportion, at 11.11% and 5.56% respectively. This spread suggests that architecture, as a discipline, explores multiple aspects of timber and mass timber rather than concentrating on a single area. Construction courses also have more variation than engineering courses but still seem to focus more on structural design. 42.86% of the courses are structural design related, with materials and construction courses being relatively evenly distributed, comprising 21.43% of the syllabi each. This variety reflects the broad scope of construction education, where students learn how to manage design and/or construction processes of mass timber, alongside material procurement and structural considerations.

The specific mass timber-related content also varied across all three disciplines. Engineering courses with mass timber content covered topics such as structural analysis of mass timber beams, columns, beam-columns, and connections. Some also touched on adherence to building codes, evaluation of design loads, and material characteristics (CLT and GLT). Mass timber architecture content focused on design concepts, geometric properties (CLT and GLT), building modeling, construction systems, and assembly methods. Construction courses also covered topics such as construction systems and assembly methods, along with design and analysis of structures, project delivery processes, material testing, and quality control and assurance.

These results show that engineering, architecture, and construction disciplines focus on different mass timber topics. Engineering courses appear to emphasize the structural design of mass timber materials, while architecture integrates structural design, technology, and material aspects. Construction also provides a more balanced curriculum than engineering but still highlights structural design concepts. The distribution of course types from the syllabi received can help designate where future education efforts should be focused. By incorporating a larger variety of course types, engineering programs could help engineers learn to use mass timber in more innovative and creative designs, beyond just its structural applications. On the other hand, architecture programs could expand materials and technical courses, given that understanding the behaviors and properties of mass timber is crucial in structural applications.

Resources Used and Desired for Mass Timber Instruction

To assess the specific types of mass timber resources being used and those desired by instructors, a count of resources used and desired by the participants interviewed was completed. A list of various mass timber resources used by instructors were categorized into groups. This included, first, *design standards*, including main and supplemental National Design Specification for Wood Construction (NDS) codes (American Wood Council, 2020), the CLT Handbook (FPInnovations, 2019), the American Wood Council (AWC) Special Design Provisions for Wood and Seismic (SDPWS) (American Wood Council, 2020), the Forest Products Laboratory (FPL) Wood Handbook (Forest Products Laboratory, 2010), and the Timber Construction Manual

(American Institute of Timber Construction (AITC), 2012)). Second was *academic resources*, including timber textbooks, online videos, teaching seminars, lecture materials and tools, example syllabi, problem sets, assessment materials and design projects, and third, *industry resources* such as manufacturer product catalogs, publications, real life projects, and site tours. The final type of resources was *industry-developed technical resources*, including websites, videos, and representatives (See Appendix Table A4, Table A5, and Table A6 for a full list of the resources). The visual distribution of the utilized and desired resource counts across engineering, architecture, and construction can be seen in Figure 2 and Figure 3. The breakdown of these resources by category can be seen in Figure 4.

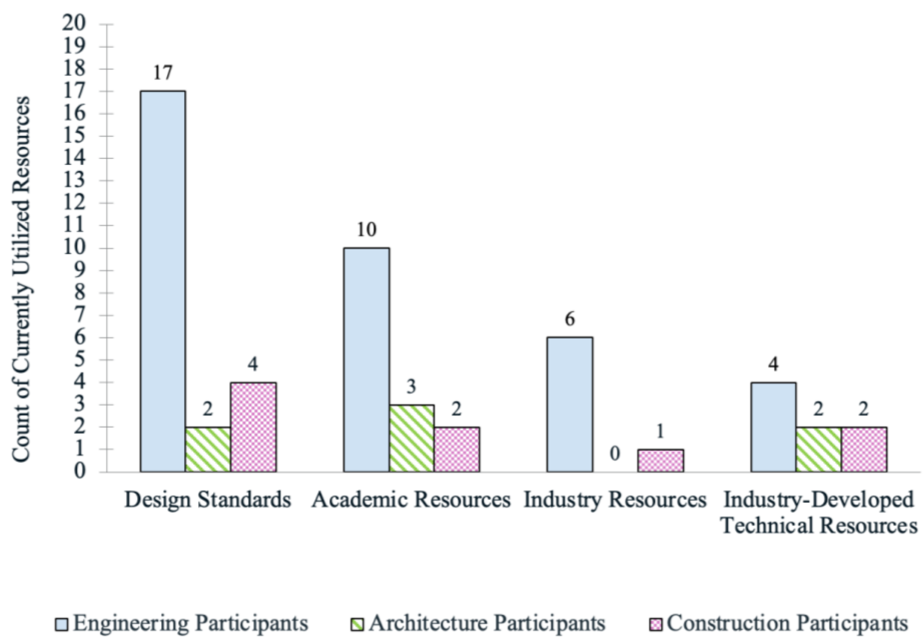


Figure 2: Types of <u>Currently Utilized</u> Resources by Engineering, Architecture, and Construction Interviewed Instructors in Timber/Mass Timber Courses

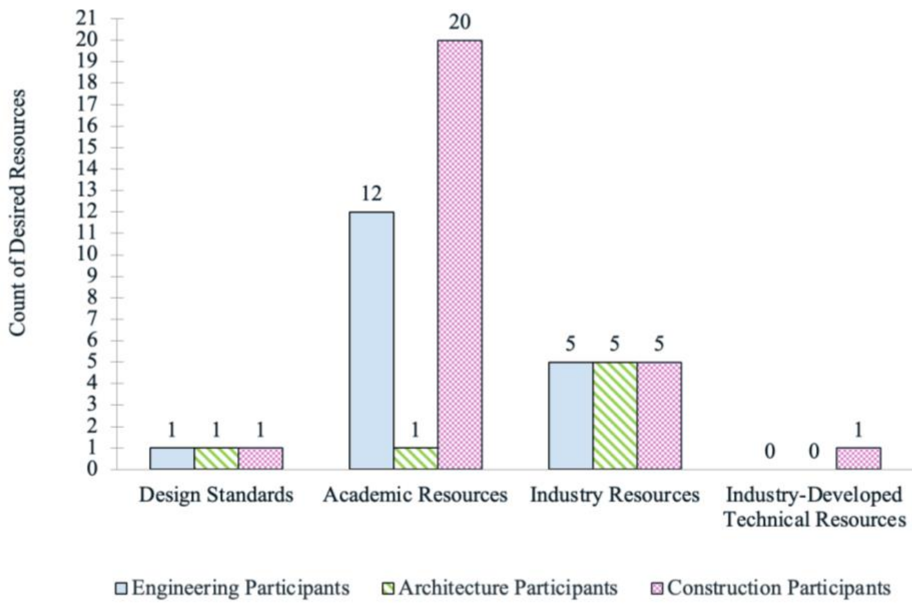
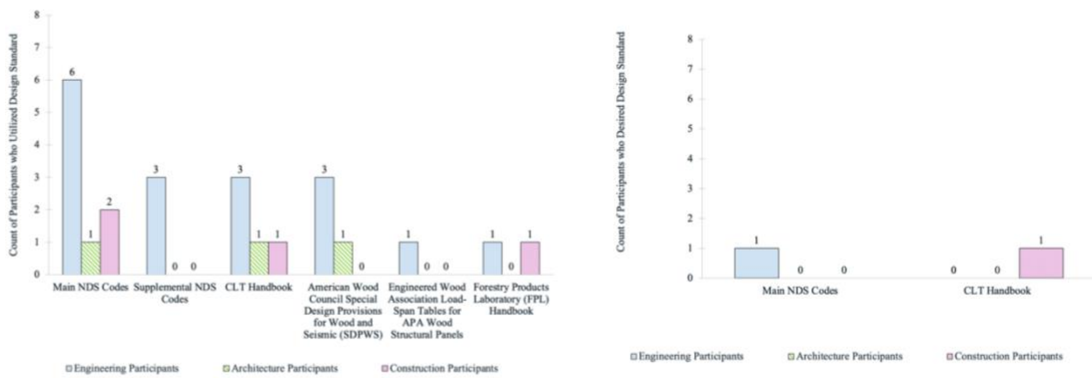
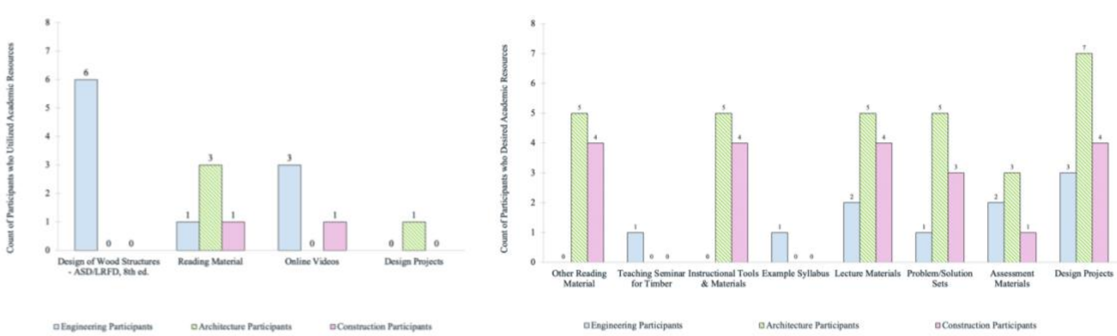


Figure 3: Types of Resources Desired by Engineering, Architecture, and Construction Interviewed Instructors for use in Timber/Mass Timber Courses



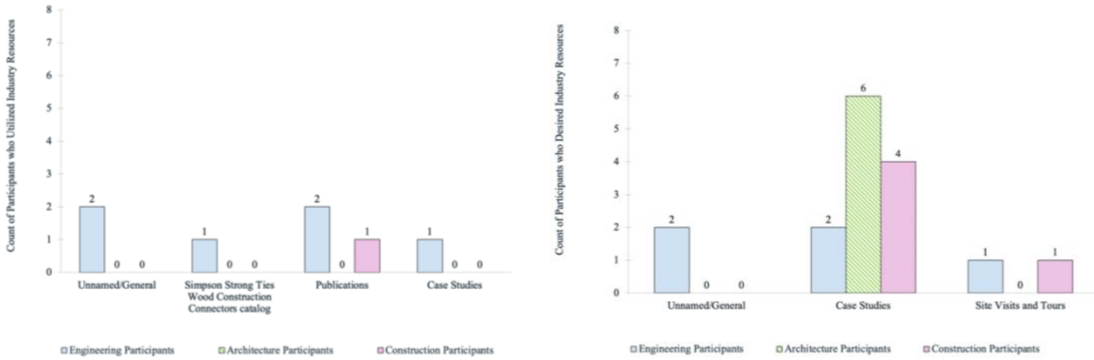
(a)



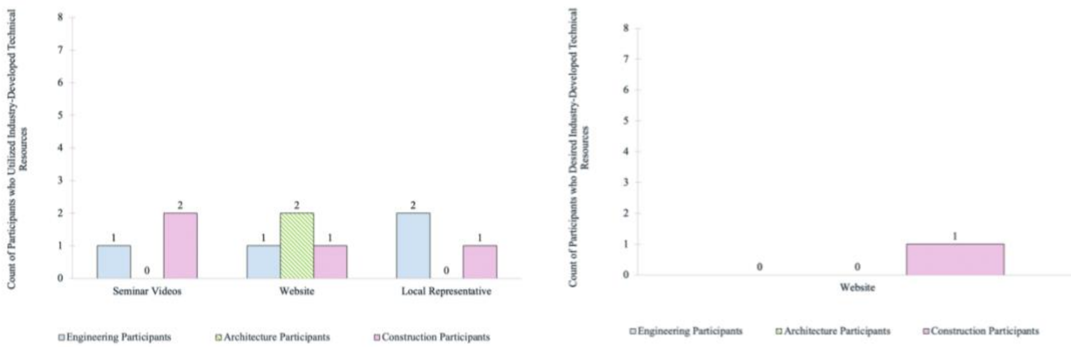
(b)

Figure 4: Types of (a) Design Standard, (b) Academic, (c) Industry, and (d) Industry-Developed Technical Resources Currently Utilized (left) and Desired (right) by Engineering, Architecture, and Construction Interviewed Instructors for use in Timber/Mass Timber Courses

Figure 4 (Cont'd)



(c)



(d)

Both architecture and construction disciplines showed minimal engagement with industry resources, such as industry publications and catalogs which were more frequently cited in engineering education. Design standards and academic resources were most frequently utilized by interviewed participants, specifically the main NDS codes and timber textbooks, and reading materials. On the other hand, academic and industry resources were also the most desired by the participants. Design projects, reading materials, instructional tools, lecture materials, problem sets, and assessment materials were the most desired academic resources and case studies were the most desired industry resources.

Also of importance to note were several comments from engineering instructors in particular, on how it would be helpful to have mass timber design instructional resources similar to what other structural engineering-focused industry organizations have developed for concrete and steel (e.g., PCI [Precast/Prestressed Concrete Institute, 2025]). Specifically, one of the engineering instructors emphasized the desire for a mass timber tool kit, stating, "*...a wood products tool kit that had mini examples of all different types of mass timber and connections...being able to bring it into the classroom is really handy as a kit*." This highlights the importance of hands-on learning tools in creating a more engaging and interactive learning experience, and to help support the instructors and their ability to effectively teach materials. Another instructor emphasized the value of "*practical design examples, things that are more realistic for design (not just simple things you see in a textbook)*". This feedback shows the need for materials beyond well-structured textbook problems to provide students with scenarios containing complexities and challenges that are faced in the real world. Participants across all three disciplines also expressed a preference for shorter reading materials. Some instructors explained how concise and targeted resources are seen as more effective for helping students retain complex topics. These insights highlight the importance of practical, diverse, and accessible resources to support student learning in mass timber curriculum.

Impact of Industry Timber and Mass Timber Instructor Experience

A common theme that occurred during the interviews was the differences in the perspectives of those instructors that had mass timber related experience, particularly in industry, and those who did not. To focus on this further, the distribution of general timber and mass timber experience among interviewed instructors is presented in Figure 5 and Figure 6, respectively. These figures visually break down the percentage of instructor experience into categories including design, graduate school, industry, research, and teaching. An instructor with design experience is defined as one that is/was directly involved in the development and design of mass timber building. It can be observed from the graphs that the highest area of experience was teaching for all three disciplines, which is to be expected as nearly all instructors interviewed had taught or were teaching a course that included mass timber content. The second most common was industry experience (45% of engineering, 71% of architecture, and 100% of construction instructors), but still represented only about one in every 4 to 5 instructors. Very few instructors had design, graduate school, or research experience.

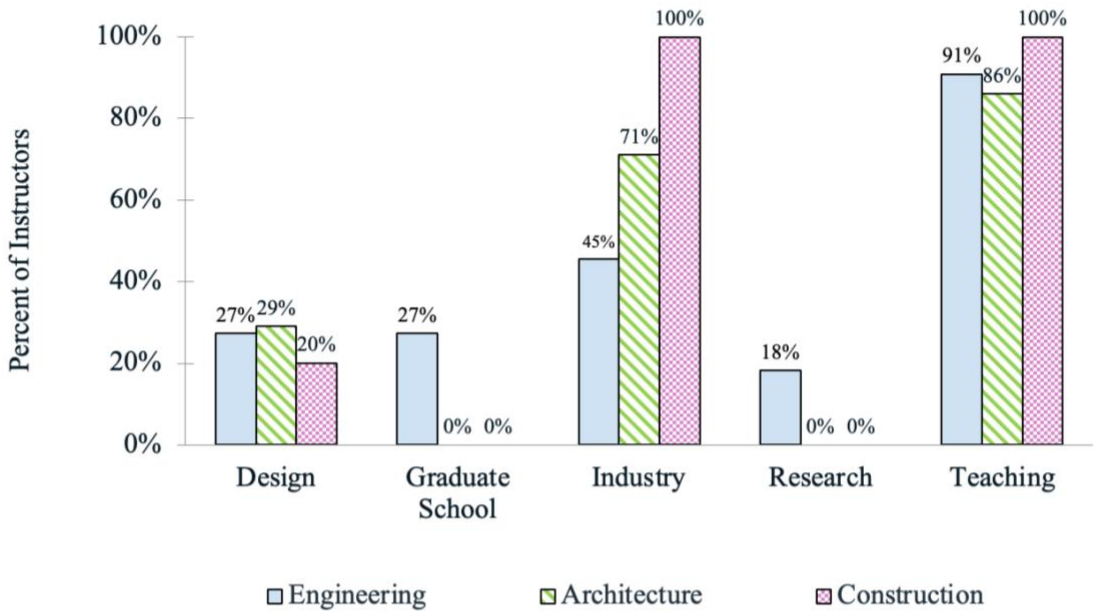


Figure 5: General Timber Experience Across Engineering, Architecture, and Construction Interviewed Participants

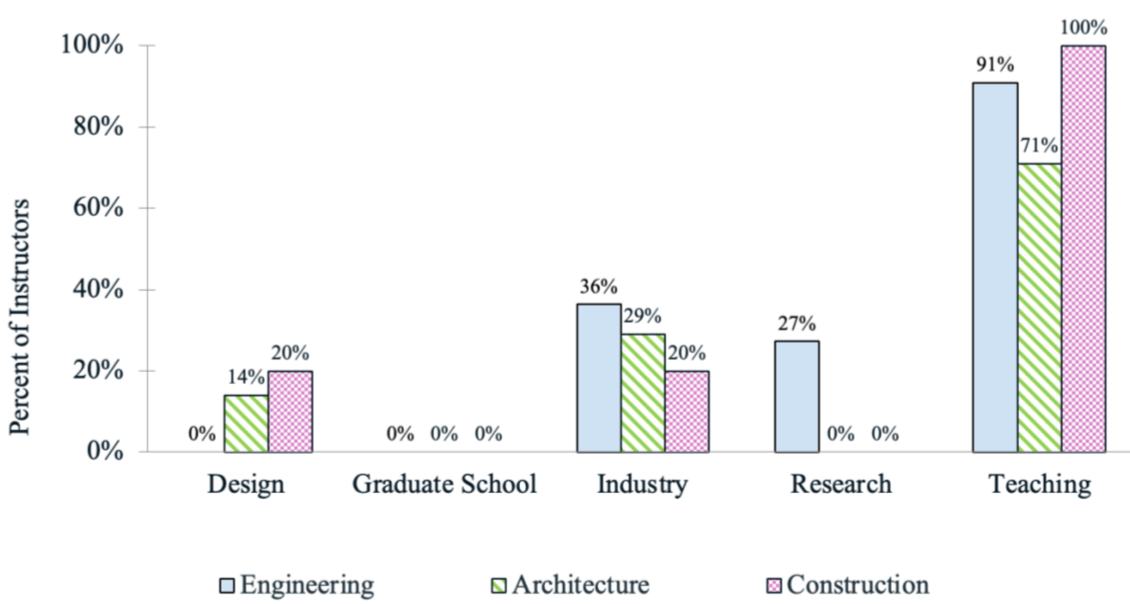


Figure 6: Mass Timber Experience Across Engineering, Architecture, and Construction Interviewed Participants

It was also noted from the interviews that many participants who struggled to find adequate mass timber teaching materials were also those who did not have industry experience. One instructor who lacked industry experience stated, "*I would love to see some more CLT resources out there, but I also haven't been great at looking for or finding these resources either*". This suggests that there are likely more resources available than are widely known by instructors, particularly those that are not regularly using such resources for work in industry. Many of the interviewed instructors also indicated they lacked the time and desire to look for existing mass timber materials. One instructor of a wood and steel analysis construction course noted, "*I only have five weeks to teach timber design, so I can only provide an introduction to mass timber*".

Potential and Challenges of Integrating Mass Timber

Another common theme from the interviews was that mass timber was often recognized as a promising and desirable material, and thus of interest to integrate into classes. For example, one architecture instructor noted the importance of mass timber, stating, "*There is wood to be had and could be used productively if we developed the infrastructure and the knowledge base*". This highlights the potential of mass timber as a sustainable building material and the need for structured curriculum to use it efficiently. Another architecture instructor noted, "*It has unique properties in terms of fire resistance while still having other structural properties that steel can't offer*". However, despite this indicated excitement, many instructors also indicated they lacked the time in their schedule and/or funding from their educational institution to go through with it. An architecture instructor explained, "*I did not have adequate time to cover all of the materials in wood design*". This also points to the importance of the development and sharing of educational resources on mass timber to ease the burden on instructors interested in the integration of mass timber into their curriculum.

CONCLUSIONS

This research focused on assessing the level of integration of mass timber related content into engineering, architecture, and construction curriculums and coursework in 4-year undergraduate and graduate programs in the United States. Mass timber as a construction material is relatively new in the U.S. as compared to steel and concrete, and thus the teaching of content in mass timber is also relatively small as compared to the well-established curriculum related to steel and concrete in higher educational institutions. Improving mass timber education in higher educational institutions is necessary to keep up with the growing popularity of mass timber as a sustainable construction material.

This study revealed a relatively low amount of mass timber-specific courses available in accredited universities, but a relatively higher number that have at least one course that covers topics related to timber/mass timber in smaller amount of detail. Across all courses with timber/mass timber content, architecture had the highest number of timber/mass timber courses; both architecture and engineering had similar percentages of programs with courses that included this content. Engineering had the highest number of mass timber-specific courses and construction had the least. Across these courses the main area of focus was on structural design related topics across all three disciplines, however, architecture and construction covered a broader range of mass timber course topics overall as compared to engineering which focused mainly on the structural and design aspects.

The instructor-identified gaps in curriculum content and references preventing further integration of mass timber curriculum were also identified, along with how the level of industry experience affected the instructors' ability to find and use sufficient resources. Instructional tools such as lecture notes, reading materials, case studies, project descriptions, example calculation problems, homework questions, and assessment questions are the main gaps identified in all three disciplines, with mass timber curricula lacking sufficient instructional materials and real-world examples to be used as problems in the classroom. Those that struggled less with such resources included instructors with real-world experience in timber and mass timber. The instructor-suggested solutions to help further support the increased adoption of mass timber curriculum across the AEC industry were recognized as industry resources, specifically design project examples and case studies, and instructional materials such as lecture notes and problem sets.

There are several limitations in this study. The interview analysis relied on the select group of participants who were willing and able to be interviewed, representing only a sample of the academic community. By interviewing a broader range of instructors this would enable the ability to compare the results of this study with a larger sample to determine if other common themes and trends are occurring. The specific regions and institutions in which the interviewed participants were from may also limit the applicability of the findings to other areas. Furthermore, limiting the course inventory to the two largest institutions in each state for civil engineering excludes smaller institutions in that discipline from review.

This study serves as a valuable resource to help guide future mass timber curricula in higher educational institutions. The recommendations made by instructors currently active in teaching relevant content are crucial in determining what will be most useful to educational programs. As mass timber becomes more popular, it is important that institutions equip students with the knowledge and skills necessary to work with this material in the field. Improving mass timber curriculum would help address the current market demands and support the push towards sustainable construction. Future work to build off these findings should focus on creating a more comprehensive curriculum by collaborating with industry professionals to gather real world project examples and standardized instructional tools. Implementing professional development programs could also help educators without industry experience to find and use relevant mass timber resources in their curriculum. A comprehensive and interdisciplinary mass timber education that emphasizes the collaboration between industry and the classroom will lead to better practices in the evolving construction industry and initiate more emphasis on sustainable construction.

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APPENDIX

Table A1: Timber/Mass Timber Courses Available in Accredited Engineering Programs

State	Largest 2 ABET Accredited University Programs - Engineering	Course Code	Courses
Alabama	University of Alabama	CE 436	WOOD STRUCTURAL DESIGN
	Auburn University	FOEN 5230/6230	FOEN 5230/6230 - ENGINEERED WOOD STRUCTURE DESIGN
		CIVL 5690	TIMBER DESIGN
Alaska	University of Alaska - Anchorage	CE A454	TIMBER DESIGN
	University of Alaska Southeast	-	-
Arizona	Arizona State University	CEE 353	CIVIL ENGINEERING MATERIALS
	University of Arizona	CE 434	DESIGN OF WOOD AND MASONRY STRUCTURES
Arkansas	University of Arkansas	CVEG 4353	TIMBER DESIGN
	Arkansas State University	-	-
California	University of California Los Angeles	C&EE 148	WOOD AND TIMBER DESIGN
	University of California Berkeley	CIVE 124	STRUCTURAL DESIGN IN TIMBER
Colorado	University of Colorado Boulder	CVEN 4565	DESIGN OF WOOD STRUCTURES
		CVEN 5835	SPECIAL TOPIC: DESIGN OF WOOD STRUCTURES
	Colorado State University Fort Collins	CIVE 568	DESIGN OF WOOD AND MASONRY STRUCTURES
Connecticut	University of Connecticut	CE 3520	CIVIL ENGINEERING MATERIALS LABORATORY
	Central Connecticut State University	CE 472	TIMBER STRUCTURES
Delaware	University of Delaware	CIEG 213	CIVIL ENGINEERING MATERIALS LABORATORY
	Delaware State University	-	-
Florida	University of Central Florida	CES 5821	MASONRY AND TIMBER DESIGN
	Florida International University	-	-
Georgia	Georgia Institute of Technology	CEE 4530	TIMBER AND MASONRY DESIGN
	University of Georgia	CVLE 4810	DESIGN OF WOOD STRUCTURES
Hawaii	University of Hawaii at Manoa	-	-
	University of Hawaii at Hilo	-	-
Idaho	Boise State University	CE 454	TIMBER DESIGN
	Idaho State University	CE 4466	DESIGN OF WOOD STRUCTURES
Illinois	University of Illinois Urbana-Champaign	CEE 469	WOOD STRUCTURES
	University of Illinois Chicago	CME 413	DESIGN OF WOOD STRUCTURES

Table A1 (Cont'd)

Indiana	Purdue University	CE 479	DESIGN OF BUILDING COMPONENTS AND SYSTEMS (ARCHITECTURAL ENGINEERING)
	Indiana University Bloomington	-	-
Iowa	Iowa State University	-	-
	University of Iowa	CEE 4164	DESIGN OF WOOD STRUCTURES
Kansas	University of Kansas	CE 768	DESIGN OF TIMBER STRUCTURES
	Kansas State University	ARE 723	TIMBER STRUCTURES
Kentucky	University of Kentucky	-	-
	University of Louisville	CEE 523	TIMBER DESIGN
Louisiana	Louisiana State University	-	-
	University of Louisiana at Lafayette	CIVE 472G	WOOD ENGINEERING DESIGN
Maine	University of Maine	CIE 544	DESIGN OF WOOD AND MASONRY STRUCTURES
	University of Southern Maine	-	-
Maryland	University of Maryland Global Campus	-	-
	University of Maryland College Park	ENCE 688W	ADVANCED TOPICS IN CIVIL ENGINEERING; DESIGN OF TIMBER STRUCTURES
Massachusetts	University of Massachusetts Amherst	BCT 540	DESIGN OF WOOD STRUCTURES
	University of Massachusetts Lowell	CIVE 5530	WOOD STRUCTURES
Michigan	University of Michigan	ARCH 509	MASS TIMBER
	Michigan State University	-	-
Minnesota	University of Minnesota Twin Cities	CEGE 4417/5417	STRUCTURAL ENGINEERING DESIGN OF WOOD BUILDINGS
	Minnesota State University Mankato	-	-
Mississippi	Mississippi State University	CE 6983	ENGINEERING OF WOOD STRUCTURES
	University of Mississippi	-	-
Missouri	University of Missouri Columbia	-	-
	Missouri State University Springfield	CE 5260	ANALYSIS AND DESIGN OF WOOD STRUCTURES
Montana	Montana State University	ECIV 416	DESIGN OF WOOD AND TIMBER STRUCTURES
	University of Montana	-	-
Nebraska	University of Nebraska Lincoln	CONE 416	WOOD AND/OR CONTEMPORARY MATERIALS DESIGN
	University of Nebraska at Omaha	CONE 416	WOOD AND/OR CONTEMPORARY MATERIALS DESIGN
Nevada	University of Nevada Las Vegas	CEE 748	ADVANCED DESIGN OF TIMBER STRUCTURES
	College of Southern Nevada	-	-

Table A1 (Cont'd)

New Hampshire	University of New Hampshire	CEE 789	CEE 789 TIMBER DESIGN
	Plymouth State University	-	-
New Jersey	Rutgers University New Brunswick	14:180:417	MASONRY & WOOD DESIGN
	Montclair State University	-	-
New Mexico	University of New Mexico	CE 413	TIMBER AND MASONRY DESIGN
	New Mexico State University	CE 454/545	WOOD DESIGN
New York	University at Buffalo	CIE 430LR	DESIGN OF WOOD STRUCTURES
	Stony Brook University	-	-
North Carolina	North Carolina State University at Raleigh	CE 528	STRUCTURAL DESIGN IN WOOD
	University of North Carolina Chapel Hill	-	-
North Dakota	University of North Dakota	-	-
	North Dakota State University	CE 430	TIMBER AND FORM DESIGN
Ohio	Ohio State University	FABENG 5810	DESIGN OF TIMBER AND WOOD-FRAMED BUILDING SYSTEMS
	University of Cincinnati	-	-
Oklahoma	University of Oklahoma Norman	CEES 4753	STRUCTURAL DESIGN IN WOOD
	Oklahoma State University	CIVE 4573	TIMBER DESIGN
Oregon	Oregon State University	WSE 210	RENEWABLE MATERIALS TECHNOLOGY AND UTILIZATION
		WSE 225	BUILDING DESIGN INNOVATION WITH WOOD
	Portland State University	CE 417	TIMBER DESIGN
Pennsylvania	Penn State University	BE 462	DESIGN OF WOOD STRUCTURES
	Temple University	-	-
Rhode Island	University of Rhode Island	CVE 552	STRUCTURAL TIMBER DESIGN
	Rhode Island College	-	-
South Carolina	University of South Carolina Columbia	ECIV 526	TIMBER AND MASONRY DESIGN
	Clemson University	CE 4070	WOOD DESIGN
South Dakota	South Dakota State University	CEE 458	DESIGN OF TIMBER STRUCTURES
	University of South Dakota	-	-
Tennessee	University of Tennessee	-	-
	University of Memphis	-	-
Texas	Texas A & M University College Station	-	-
	University of Texas Austin	ARE 362L	STRUCTURAL DESIGN IN WOOD
Utah	Utah Valley University	-	-
	University of Utah	CVEEN 524	MASONRY/TIMBER DESIGN
Vermont	University of Vermont	CEE 5730	STRUCTURAL DESIGN - WOOD
	Castleton State College	-	-

Table A1 (Cont'd)

Virginia	Virginia Tech	-	-
	George Mason University	-	-
Washington	University of Washington Seattle	CEE 454	DESIGN OF TIMBER STRUCTURES
	Washington State University	CE 436	DESIGN OF TIMBER STRUCTURES
		CE 539	ADVANCED DESIGN OF TIMBER STRUCTURES
West Virginia	West Virginia University	CE 464	TIMBER DESIGN
	Marshall University	-	-
Wisconsin	University of Wisconsin Madison	-	-
	University of Wisconsin Milwaukee	CIV ENG 573	DESIGN OF MASONRY AND WOOD STRUCTURES
Wyoming	University of Wyoming	CE 4295	STRUCTURAL TIMBER DESIGN
	Sheridan College	-	-

Table A2: Timber/Mass Timber Courses Available in Accredited Architecture Programs

State	NAAB - Accredited Architecture Programs	Course Code	Course Title
Alabama	University of Alabama	-	-
	Auburn University	ARCH 3320	MATERIALS AND METHODS OF CONSTRUCTION I
		ARCH 3030	MASS TIMBER AND THE SOUTH
Arizona	Arizona State University	ARCH 2113	ARCHITECTURAL STRUCTURES
		CVEG 4353	TIMBER DESIGN
	University of Arizona	-	-
Arkansas	University of Arkansas	-	-
California	University of California Los Angeles	ARCH&UD 433	STRUCTURES III
	University of California Berkeley	ARCH 160	INTRODUCTION TO CONSTRUCTION
	Academy of Art University	ARH 320	STRUCTURES: WOOD AND STEEL
	California Baptist University	ARC 493	STRUCTURAL SYSTEMS II
	California College of the Arts	ARCHT 5400	MASS TIMBER SYSTEMS AND PRODUCTS AS COMMUNITY OPPORTUNITIES
		MARCH 640	
	California Polytechnic University - San Luis Obispo	-	-
	California Polytechnic University - Pomona	-	-
	New school of Architecture and Design	AR322	STRUCTURAL SYSTEMS II
		AR721	MATERIALS AND METHODS I
		AR725	STRUCTURES II
	University of Southern California	ARCH 313	DESIGN OF BUILDING STRUCTURES
	Woodbury University	ARCH 546	ADVANCED STRUCTURES
		ARCH 321	INTRODUCTION TO STRUCTURES
		ARCH 122	INTRO TO MATERIALS AND METHODS
Colorado	University of Colorado - Denver	ARCH 4340	THEORY OF STRUCTURES II
Connecticut	University of Harford	ADT 474	DESIGN OF STEEL AND WOOD STRUCTURES FOR TECHNOLOGY
	Yale University	ARCH 2011	STRUCTURES I
Florida	University of Central Florida	-	-
	Florida A&M	-	-
	Florida Atlantic University	ARC 3503	ARCHITECTURAL STRUCTURES 2
	Florida International University	ARC 4553L	STRUCTURAL DESIGN 1 LAB
		ARC 5554	STRUCTURES 2
	University of Florida	-	-
	University of Miami	ARC 230 / ARC 630 / ARC 661	MATERIALS AND METHODS

Table A2 (Cont'd)

District of Colombia	The Catholic University of America	-	-
	University of the District of Columbia	ARCP 115	MATERIALS AND METHODS OF CONSTRUCTION
Georgia	Howard University	ARCH 502	STRUCTURES II (STRENGTH)
		ARCH 401	MATERIALS AND METHODS I
	Georgia Institute of Technology	ARCH 4015	STRUCTURES 1
		ARCH 6251	BUILDING STRUCTURES I
	Savannah College of Arts & Design	ARCH 241	CONSTRUCTION TECHNOLOGY I: BUILDING MATERIALS AND ASSEMBLIES
		ARCH 319	STRUCTURES: GENERAL STRUCTURE
Hawaii	Kennesaw State University	ARCH 3211	ARCHITECTURE STRUCTURES II: STEEL AND WOOD
	University of Hawaii at Manoa	ARCH 724	ARCHITECTURE SYSTEMS III: QUANTITATIVE STRUCTURAL ANALYSIS AND DESIGN
Idaho	University of Idaho	-	-
Illinois	Illinois Institute of Technology	ARCH 480	MATERIALS AND CONSTRUCTION
		ARCH 482	MATERIAL: FIBROUS
	University of Illinois Urbana-Champaign	-	-
	University of Illinois Chicago	-	-
	Judson University	ARC 441	ADVANCED ARCHITECTURAL STRUCTURES
	The School of the Art Institute Chicago	ARCH 2251	ARCHITECTURE: STRUCTURES 1
	Southern Illinois University - Carbondale	ARC242	BUILDING TECHNOLOGY I: WOOD
		ARC362	STRUCTURES II: WOOD AND CONCRETE
Indiana	University of Notre Dame	ARCH 40511	STRUCTURAL DESIGN FOR ARCHITECTS
	Indiana University	-	-
	Ball State University	ARCH 418	STRUCTURAL SYSTEMS 3
Iowa	Iowa State University	-	-
Kansas	University of Kansas	ARCH 624	STRUCTURES II
	Kansas State University	ARCH 347	STRUCTURAL SYSTEMS IN ARCHITECTURE I
Kentucky	University of Kentucky	ARC 553	STRUCTURAL DESIGN AND ANALYSIS II
		ARC 584	DESIGN OF TIMBER AND MASONRY STRUCTURES
		ARC 599	TOPICS IN ARCHITECTURE - DES. OF LIGHT FRAME STRUC SYS
Louisiana	Louisiana State University	ARC 3004	ARCHITECTURAL STRUCTURES II
	University of Louisiana at Lafayette	-	-
	Louisiana Tech University	ARCH 343	STRUCTURAL SYSTEMS II
	Tulane University	-	-

Table A2 (Cont'd)

Maine	University of Maine at Augusta	ARC 322	STRUCTURES II
Maryland	Morgan State University	ARCH 312	BUILDING STRUCTURAL SYSTEMS
	University of Maryland College Park	ARCH 465	ARCHITECTURAL STRUCTURES II
Massachusetts	University of Massachusetts Amherst	-	-
	Northeastern University	ARCH 2240	ARCHITECTONIC SYSTEMS
	Boston Architectural College	-	-
	Wentworth Institute of Technology	ARCH 2200, ARCH 7300	BUILDING MATTERS: MATERIALS & ELEMENTS OF CONSTRUCTION
		ARCH 3900, ARCH 8800	STRUCTURES 02
	Harvard University	SCI 6229	STRUCTURAL DESIGN II
		SCI 6230	CASES IN CONTEMPORARY CONSTRUCTION
	Massachusetts College of Art and Design	EDAD 202	METHODS & MATERIALS
		EDAD 227	ARCHITECTURAL STRUCTURES I
		EDAD 302	SUSTAINABLE ARCHITECTURE III
		EDAD 317	ARCHITECTURAL STRUCTURES II
		EDAD 327	ARCHITECTURAL STRUCTURES III
		EDAD 427	STRUCTURES OVERVIEW
	Massachusetts Institute of Technology	4.440/4.462	INTRODUCTION TO STRUCTURAL DESIGN
		4.463	BUILDING TECHNOLOGY SYSTEMS: STRUCTURES AND ENVELOPES
Michigan	University of Michigan	-	-
	Lawrence Technological University	ARC 3513/5523	INTERMEDIATE STRUCTURES
	Andrews University	ARCH 201	CONSTRUCTION I
		ARCH 205	STRUCTURES I
	University of Detroit Mercy	ARCH 2330	STRUCTURES I
		ARCH 2640	BUILDING STRUCTURES I
	Kendall College of Art and Design at Ferris State	-	-
Minnesota	University of Minnesota at Minneapolis	ARCH 4571	ARCHITECTURAL STRUCTURES I
Mississippi	Dunwoody College of Technology	-	-
	Mississippi State University	-	-
Missouri	Drury College	-	-
	Washington University at St. Louis	ARCH 448A	STRUCTURES II
Montana	Montana State University	ARCH 344	ARCHITECTURAL STRUCTURES II
Nebraska	University of Nebraska Lincoln	-	-
Nevada	University of Nevada Las Vegas	-	-

Table A2 (Cont'd)

New Jersey	New Jersey Institute of Technology	ARCH 223	CONSTRUCTION I
		ARCH 282	STRUCTURAL PRINCIPLES
		ARCH 541G	CONSTRUCTION I
	Princeton University	-	-
New Mexico	Kean University	-	-
	University of New Mexico	-	-
New York	City College of The City University of New York	ARCH 24501	CONSTRUCTION TECHNOLOGY I
		ARCH 35402	STRUCTURES II - DESIGN OF STRUCTURAL ELEMENTS
	Columbia University	-	-
	The Cooper Union	ARCH 132	STRUCTURES II
	Cornell University	ARCH 5615	BUILDING TECHNOLOGY II: CONSTRUCTION ELEMENTS
		ARCH 2615	BUILDING TECHNOLOGY II: STRUCTURAL ELEMENTS
	New York Institute of Technology	ARCH 221	BUILDING CONSTRUCTION I
		ARCH 313	STRUCTURAL TIMBER DESIGN
	Parsons School of Design	-	-
	Pratt University	ARCH 762	TECHNOLOGY 2: MATERIALS & ASSEMBLIES
		ARCH 632	MATERIALITIES & QUALITIE QUALITIES
		ARCH 565A	MATERIALS & METHODS
		ARCH 261	ARCHITECTURE MATERIALS
	Rensselaer Polytechnic Institute	ARCH 2330	STRUCTURES I
	Rochester Institute of Technology	ARCH 451/641	FUNDAMENTALS OF BUILDING SYSTEM
	State University of New York at Buffalo	ARC 455LAB	STRUCTURES 3 LAB
	SUNY College of Technology at Alfred State	-	-
	Syracuse University	-	-
	New York City College of Technology	ARCH 2481	STRUCTURE II
North Carolina	North Carolina State University at Raleigh	-	-
	University of North Carolina Charlotte	ARCH 4301	MATERIAL & ASSEMBLY PRINCIPLES
		ARCH 4304	STRUCTURAL SYSTEMS
North Dakota	North Dakota State University	ARCH 450	ARCHITECTURAL DETAILING

Table A2 (Cont'd)

Ohio	Ohio State University	-	-
	University of Cincinnati	-	-
	Kent State University	ARCH 40401/50401	METHODS & MATERIALS I
		ARCH 40301/50301	STRUCTURAL SYSTEMS I
	Miami University	-	-
	Bowling Green State University	-	-
Oklahoma	University of Oklahoma Norman	ARCH 4233/5233	ARCHITECTURAL STRUCTURES II
	Oklahoma State University	ARCH 4233	ARCHITECTURAL STRUCTURES II
		ARCH 5233	ARCHITECTURAL STRUCTURES II
		ARCH 5023	TIMBER & MASONRY DESIGN & ANALYSIS
		ARCH 3223	STRUCTURES: TIMBERS
Oregon	University of Oregon	ARCH 562	STRUCTURAL DESIGN
		ARCH 471	BUILDING ENCLOSURE
		ARCH 462	STRUCTURAL DESIGN
		ARCH 571	BUILDING ENCLOSURE
	Portland State University	-	-
Pennsylvania	Penn State University	ARCH 203	MATERIALS & BUILDING CONSTRUCTION I
	Temple University	ARCH 3152	MATERIALS & METHODS
	Marywood University	ARCH 547	BUILDING TECHNOLOGIES IV
	Drexel University	-	-
	Philadelphia University + Thomas Jefferson	ARCH 304	STRUCTURES II
	University of Pennsylvania	ARCH 4310/5310	CONSTRUCTION I
	Carnegie Mellon University		
Rhode Island	Roger Williams University	ARCH 231	CONSTRUCTION MATERIALS & ASSEMBLIES I
	Rhode Island School of Design	-	-
South Carolina	Clemson University	-	-
South Dakota	South Dakota State University	-	-
Tennessee	University of Tennessee - Knoxville	ARCH 263	DESIGN IMPLEMENTATION I: BUILDING IN WOOD
	University of Memphis	-	-
	Belmont University	ARCH 3041	STRUCTURES I

Table A2 (Cont'd)

Texas	Texas A & M University College Station	ARCH 431	INTEGRATED STRUCTURES
	University of Texas Austin	ARC 327R	TOPICS IN ARCHITECTURAL THEORY
	University of Texas San Antonio	-	-
	University of Texas Arlington	ARCH 3323/5323	CONSTRUCTION MATERIALS & METHODS
	Rice University	-	-
	Texas Tech University	-	-
	University of Houston	-	-
	Prairie View A&M University	ARCH 4343	STRUCTURAL SYSTEMS II
Utah	Utah Valley University	-	-
	University of Utah	-	-
Vermont	Norwich University	ARCH 4075	BUILDING STRUCTURES
Virginia	Virginia Tech	-	-
	Hampton University	-	-
	University of Virginia	-	-
Washington	University of Washington Seattle	ARCH 351	ARCHITECTURAL STRUCTURES I
	Washington State University	-	-
West Virginia	Fairmont State University	-	-
Wisconsin	University of Wisconsin Milwaukee	ARCH 410	ARCHITECTURAL DESIGN I

Table A3: Timber/ Mass Timber Courses Available in Accredited Construction Programs

State	ACCE - Accredited Construction Programs	Course Code	Course Title
Alabama	Auburn University	-	-
	University of Alabama	-	-
	Tuskegee University	CSMT 350	GREEN BUILDING DESIGN AND CONSTRUCTION
Alaska	University of Alaska, Anchorage	-	-
Arizona	Arizona State University	CON 424	STRUCTURAL DESIGN
	John Brown University		
	Northern Arizona University	CM 123	CONSTRUCTION METHODS I
Arkansas	University of Arkansas at Little Rock		
California	California Baptist University	CON 340	BUILDING STRUCTURES
	California Polytechnic State University, San Luis Obispo	CM 214	RESIDENTIAL CONSTRUCTION MANAGEMENT
	San Diego State University	-	-
	California State University	CEM 437	STRUCTURAL BUILDING SYSTEMS
Colorado	Colorado State University	CON 458	STRUCTURAL SYSTEMS FOR CONSTRUCTION II
Connecticut	Central Connecticut State University	CM 520	CONSTRUCTION MATERIALS AND METHODS
Delaware	University of Delaware	-	-
Florida	Florida Gulf Coast University	-	-
	Florida Institute of Technology	CON 2000	STATICS AND MECHANICS FOR CONSTRUCTION
	Florida International University	-	-
	University of Central Florida	-	-
	Seminole State College of Florida	-	-
	University of Florida	-	-
	University of North Florida	BCN: 3224	CONSTRUCTION TECHNIQUES
Georgia	Georgia Southern University	-	-
	Kennesaw State University	CM 3110	RESIDENTIAL AND LIGHT CONSTRUCTION
Hawaii	University of Hawaii at Manoa	CEE 471	CONSTRUCTION METHODS
Idaho	Boise State University		
Illinois	Bradley University	CON 470	DESIGN OF STEEL AND WOOD STRUCTURES
	Illinois State University	TEC 327	DESIGN OF BUILDING STRUCTURES
	Southern Illinois University, Edwardsville	-	-
Indiana	Ball State University	-	-
	Indiana State University	-	-
	Indiana University Purdue University Indianapolis	CMGT 45000	STRUCTURAL SYSTEMS AND ANALYSIS
	Purdue University	-	-
Iowa	Iowa State University	-	-

Table A3 (Cont'd)

Kansas	Kansas State University	CNS 523	TIMBER CONSTRUCTION
Kentucky	Eastern Kentucky University	CON 322	CONSTRUCTION STRUCTURAL DESIGN
	Northern Kentucky University	CMGT 121	CONSTRUCTION MATERIALS AND METHODS II
Louisiana	Louisiana State University	-	-
	University of Louisiana, Monroe	CONS 2010	CONSTRUCTION MATERIALS
Maine		-	-
Maryland	University of Maryland, Eastern Shore	CMTE 350	GREEN BUILDING FUNDAMENTALS
Massachusetts	Wentworth Institute of Technology	CONM 1200	BUILDING CONSTRUCTION
		CONM 2600	WOOD & STEEL ANALYSIS & DESIGN
Michigan	Eastern Michigan University	CNST 412	STRUCTURAL SYSTEMS
	Western Michigan University	-	-
	Ferris State University	-	-
	Michigan State University	-	-
	Michigan Technological University	-	-
Minnesota	Dunwoody College of Technology	-	-
	Minnesota State University	CM 220	CONSTRUCTION MATERIALS AND METHODS II
Mississippi	Mississippi State University	-	-
	University of Southern Mississippi	-	-
Missouri	Missouri State University	-	-
Montana		-	-
Nebraska	University of Nebraska - Lincoln	CNST 242	VERTICAL CONSTRUCTION
Nevada	University of Nevada, Las Vegas	CEM 370	STEEL AND WOOD DESIGN IN CONSTRUCTION
New Hampshire		-	-
New Jersey		-	-
New Mexico	University of New Mexico	-	-
New York	Alfred State College	-	-
	State University of New York, ESF	-	-
	Utica University	CMG 436	TEMPORARY STRUCTURES
North Carolina	East Carolina University	-	-
	North Carolina A&T State University	-	-
North Dakota	North Dakota State University	-	-
Ohio	Bowling Green State University	-	-
	Kent State University	-	-
	Ohio State University	CONSYSM 3545	STRUCTURES FOR CONSTRUCTION MGRS I
Oklahoma	University of Oklahoma	-	-
Oregon	Oregon State University	CEM 383	STRUCTURES II
Pennsylvania	Drexel University	-	-
	Pennsylvania College of Technology	-	-

Table A3 (Cont'd)

Rhode Island	Roger Williams University	CNST 465	SUSTAINABLE CONSTRUCTION
South Carolina	Clemson University	-	-
South Dakota		-	-
Tennessee		-	-
Texas	Lamar University	-	-
	Prairie View A&M University	-	-
	Texas A&M University	COSC 253	CONSTRUCTION MATERIALS AND METHODS I
	Texas Tech University	-	-
	Texas State University	-	-
	University of Houston	CNST 3155	CONSTRUCTION MATERIALS AND TESTING
		CNST 4311	STRUCTURAL STEEL AND TIMBER CONSTRUCTION
	University of Texas at San Antonio	CSM 2143	CONSTRUCTION MATERIALS AND TESTING
		CSM 3143	STRUCTURES I
Utah	The University of Utah	CVEEN 5500	SUSTAINABLE MATERIALS
Vermont		-	-
Virginia	Virginia Polytechnic Institute and State University	CEM 4314	DESIGN OF WOOD STRUCTURES
Washington	Central Washington University		
	University of Washington	CM 313	CONSTRUCTION METHODS AND MATERIALS I
	Washington State University	-	-
West Virginia		-	-
Wisconsin	University of Wisconsin, Stout	-	-
	Marquette University	-	-
Wyoming	University of Wyoming	CM3200	STATICS AND STRUCTURAL SYSTEMS

Table A4: Currently Utilized and Suggested Mass Timber Resources in Engineering

Category	Currently Utilized		Suggested	
No. of Responses	**Responses**	**Response Rate**	**Responses**	**Response Rate**
Design Standards	**NDS Codes**			
Main	6	55%	1	9%
Main and Supplemental	3	27%	0	0%
CLT Handbook	3	27%	0	0%
American Wood Council Special Design Provisions for Wood and Seismic (SDPWS)	3	27%	0	0%
Engineered Wood Association Load-Span Tables for APA Wood Structural Panels	1	9%	0	0%
Forestry Products Laboratory (FPL) Handbook	1	9%	0	0%
Academic	**Textbooks**			
Design of Wood Structures - ASD/LRFD, 8th ed.	6	55%	0	0%
Other Reading Material	1	9%	0	0%
Online Videos	3	27%	0	0%
Teaching Seminar for Timber	0	0%	1	9%
Instructional Tools & Materials	0	0%	0	0%
Example Syllabus	0	0%	1	9%
Lecture Materials	0	0%	2	18%
Problem/Solution Sets	0	0%	1	9%
Assessment Materials	0	0%	2	18%
Design Projects	0	0%	3	27%
Industry	**Vendor Products Specifications**			
Unnamed/General	2	18%	2	18%
Simpson Strong Ties Wood Construction Connectors catalog	1	9%	0	0%
Publications	2	18%	0	0%
Case Studies	1	9%	2	18%
Site Visits and Tours	0	0%	1	9%
Industry-Developed Technical Resources				
Seminar Videos	1	9%	0	0%
Website	1	9%	0	0%
Local Representative	2	18%	0	0%

† Percentages taken out of the total number of participants interviewed for each discipline (Structural Engineering = 11, Architecture = 7, Construction = 5)

Table A5: Currently Utilized and Suggested Mass Timber Resources in Architecture

Category	Currently Utilized		Suggested	
No. of Responses	**Responses**	**Response Rate**	**Responses**	**Response Rate**
Design Standards	**NDS Codes**			
Main	1	14%	0	0%
Main and Supplemental	0	0%	0	0%
CLT Handbook	1	14%	0	0%
American Wood Council Special Design Provisions for Wood and Seismic (SDPWS)	1	14%	0	0%
Engineered Wood Association Load-Span Tables for APA Wood Structural Panels	0	0%	0	0%
Forestry Products Laboratory (FPL) Handbook	0	0%	0	0%
Academic	**Textbooks**			
Design of Wood Structures - ASD/LRFD, 8th ed.	0	0%	0	0%
Other Reading Material	3	43%	5	71%
Online Videos	0	0%	0	0%
Teaching Seminar for Timber	0	0%	0	0%
Instructional Tools & Materials	0	0%	5	71%
Example Syllabus	0	0%	0	0%
Lecture Materials	0	0%	5	71%
Problem/Solution Sets	0	0%	5	71%
Assessment Materials	0	0%	3	43%
Design Projects	1	14%	7	100%
Industry	**Vendor Products Specifications**			
Unnamed/General	0	0%	0	0%
Simpson Strong Ties Wood Construction Connectors catalog	0	0%	0	0%
Publications	0	0%	0	0%
Case Studies	0	0%	6	86%
Site Visits and Tours	0	0%	0	0%
Industry-Developed Technical Resources				
Seminar Videos	0	0%	0	0%
Website	2	0%	0	0%
Local Representative	0	29%	0	0%
† Percentages taken out of the total number of participants interviewed for each discipline (Structural Engineering = 11, Architecture = 7, Construction = 5)				

Table A6: Currently Utilized and Suggested Mass Timber Resources in Construction

Category	Currently Utilized		Suggested	
No. of Responses	**Responses**	**Response Rate**	**Responses**	**Response Rate**
Design Standards	**NDS Codes**			
Main	2	40%	0	0%
Main and Supplemental	0	0%	0	0%
CLT Handbook	1	20%	1	20%
American Wood Council Special Design Provisions for Wood and Seismic (SDPWS)	0	0%	0	0%
Engineered Wood Association Load-Span Tables for APA Wood Structural Panels	0	0%	0	0%
Forestry Products Laboratory (FPL) Handbook	1	20%	0	0%
Academic	**Textbooks**			
Design of Wood Structures - ASD/LRFD, 8th ed.	0	0%	0	0%
Other Reading Material	1	20%	4	80%
Online Videos	1	20%	0	0%
Teaching Seminar for Timber	0	0%	0	0%
Instructional Tools & Materials	0	0%	4	80%
Example Syllabus	0	0%	0	0%
Lecture Materials	0	0%	4	80%
Problem/Solution Sets	0	0%	3	60%
Assessment Materials	0	0%	1	20%
Design Projects	0	0%	4	80%
Industry	**Vendor Products Specifications**			
Unnamed/General	0	0%	0	0%
Simpson Strong Ties Wood Construction Connectors catalog	0	0%	0	0%
Publications	1	20%	0	0%
Case Studies	0	0%	4	80%
Site Visits and Tours	0	0%	1	20%
Industry-Developed Technical Resources				
Seminar Videos	2	0%	0	0%
Website	1	20%	1	20%
Local Representative	1	20%	0	0%
† Percentages taken out of the total number of participants interviewed for each discipline (Structural Engineering = 11, Architecture = 7, Construction = 5)				

Table A7: Interview Questions

Interview Questions
1. Course Taught:
2. Is this course designed to be focused on timber, mass timber, something more general?
3. What % of the course includes concepts of mass timber?
4. How did you come to teach this course? (self-developed, inherited from someone else?)
5. Do you have experience working with timber (general)? In what capacity? (Research, design, teaching, industry, etc.)
6. Do you have experience working with mass timber? In what capacity?
7. Did you add the mass timber component yourself? [if yes why?] Why do you think including this is important?
8. Do you cover concepts related to mass timber (CLT, glulam, etc.) in your course? If so, which topics do you discuss and to what extent?
9. What kinds of reference materials do you currently use to guide/develop your instructional materials (related to mass timber)?
10. Are you able to find adequate materials to support teaching mass timber?
11. Are there any gaps in current resources available to you that prevent you from adequately teaching certain concepts related to mass timber? Which concepts in particular?
12. What concepts would you potentially like to cover in the future (that you don't currently, or are working on developing)
13. What type(s) of materials would you find most helpful if developing content? a. Lecture notes b. Reading material c. Case studies and related activities d. Project descriptions e. Assessment questions f. Homework questions g. Example calculation problems h. Others?