

A Way of Working with Wood

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Introduction

This paper asserts that wood possesses the unique ability to unify diverse design disciplines, bridging the gap between academia, practice, and industry. Being “the most humanly intimate of all materials”, the use of wood establishes a pedagogy that emphasizes the importance of hands-on learning, enabling students to cultivate their skills and creativity through the act of making.¹

The context for this work emerged from the inception of the University of Arkansas’ Fay Jones School of Architecture and Design’s Anthony Timberlands Center for Design and Material Innovation, constructed using mass timber. This building afforded an opportunity to engage students, through coursework, in the development of furniture for the design studio spaces. The research and design of studio furniture couched in the material knowledge of the building was structured through two courses – a seminar and design studio – and supported by industry partners – timber, land, and forest products company Weyerhaeuser – and through a consultancy with an award-winning industrial designer – Stephen Burks. Within this framework, both physical resources – engineered wood products – and material and design knowledge were shared across disciplines within the Fay Jones School and between academia, industry, and design practice. The material properties, techniques, applications, and crafting of wood created a common language for collaboration.

Wood as a Unifier

The value of wood has been much discussed and established. “For a large portion of the world’s population, wood has always played an integral role in everyday life.”² As a material, it is a critical source of fuel and is used for the creation of shelter and

tools. Its presence in contemporary life provides a link between humans and the natural environment – connecting us to the landscapes and ecosystems of which we are a part.

“Wood is universally beautiful to Man.”³ Its symbolic and aesthetic significance crosses cultural and temporal boundaries – from the Native American’s relationship with the forest and use of its products to Japanese craft and construction techniques to Scandinavian design. While the forest has different meanings – some spiritual, while others economic – for different cultures, all value it and benefit from use of its products. “The use of wood for construction offers numerous benefits that can positively affect the physical and mental wellness of a building’s occupant.”⁴ Studies have shown that the presence of wood in an interior environment “can lower the reactivity of the sympathetic nervous system” and reduce stress.⁵ Its visual presence, scent, and warmth to touch evoke our senses and tap into a subconscious connection to the natural environment.

With advancements in manufacturing technology and processes, the applications for and access to wood have increased. Regionally specific wood species and products have become globally available. The proliferation of wood products through big box retail stores and lumber supply outlets has decreased material costs and increased affordability and access. The accessibility of wood not only lies in its availability but ease of workability. Simple tools are needed to manipulate and shape wood. Techniques for processing and working with wood products are couched in traditions of hand craft and advance through innovations in technology. “Emerging digital technology and traditional craftsmanship do not

contradict, but rather complement each other.”⁶ As a material, wood unites hand craft and digital fabrication, tradition and advancement.

Despite its global economy, wood is a regional resource within the Southeast United States. It is significant to the physical, economic, social, and historic landscape of the place. Placing emphasis on wood products, the Fay Jones School, through this project and others, is drawing connections to the greater region, sharing and celebrating its resources.

Due its omnipresence, cultural value, health benefits, and accessibility, wood is simultaneously ubiquitous and significant. It connects us and establishes a common ground. Our familiarity with wood as a material across cultures, disciplines, and economies creates a shared language which we can use as a starting point for communication. Wood unifies diverse groups with differing approaches and agendas as was the case in this project.

The Scarcity of Craft and Value

Despite the ubiquity of wood, established applications based on use and type limit alternative ways of thinking about and working with the material. In practice, the use of grades, species, and types of wood products are determined based on performance and specification needs. Hardwoods, including both solid wood and veneered sheet goods, are reserved for finish-grade carpentry, millwork, and furniture. Softwoods, including dimensional lumber and engineered wood products, are used in structural applications. Whether framing, structural members, or underlayment, the value of softwoods stems from the development of processing and manufacturing techniques. Despite their practical application, softwoods have a low-aesthetic value, often covered with finish material. Due to limitations of cost or prescribed aesthetic-value, deviations from standard applications of hardwoods and softwoods are not commonly explored.



Fig. 1 Students in action making desk prototypes using engineered wood products.

In addition to limits in practiced-based applications, wood of any type can be difficult for students to access within educational settings. Hardwoods are expensive and reserved for high-value final work – limiting the ability to experiment with the material and make and learn from mistakes. Softwoods and engineered wood products are readily available but, because these products are sized for structural application, they can be difficult to transport, handle, and store. They are also not manufactured with consideration of achieving a finish quality expected for architectural models or furniture, typically having unwanted voids, discoloration, or rough surface textures. To combat this, this project capitalizes on the dearth of softwoods for finish quality work in educational settings, implementing techniques to achieve high-value results from low-value material.

While there is a known value in a pedagogy of learning through the act of making, shortages of time, physical spaces, and early hands-on experiences have impacted the prevalence of physical making in education. The fast pace of the academic timeline has created an increased dependency on technology. Digital fabrication processes are emphasized, especially in the application of full-scale materials. Engineered wood products, aesthetically expressive of and correlated with manufacturing technology, is often manipulated both in practice and academia using digital fabrication methods, specifically CNC-routing. While these methods increase time and material efficiencies and teach unique skills sets, they supplant time previously dedicated to building

skills such as tactile understanding, focus, and patience required of hand craft.

In addition to advances in digital technologies, the COVID-19 pandemic has limited physical interactions and increased digital output. For many students, including those involved in this project at the Fay Jones School, the early years of their design education were spent learning remotely, missing the opportunity to be in the wood shop. Now, these students are entering their final years in education with little to no experience in physical making or using the shop facilities. For these students, the processes and impact of making by hand are unfamiliar and there is a lack of material understanding and pursuits.

Thirdly, there has been a decline in hands-on education for students, particularly in grade schools. Focus has shifted towards college prep, theory, and STEM education, which includes programming, robotics, and digital manufacturing such as 3D printing.⁷ Consequently, traditional shop classes and art programs have been reduced or eliminated from school curriculums. As Mathew Crawford describes in his book, *Shop Class as Soul Craft: An Inquiry of the Value of Work*, “The disappearance of tools from our common education is the first step toward a wider ignorance of the world of artifacts we inhabit.”⁸ Although, there is evidence that shop class is coming back as a college alternative.⁹

In *The Thinking Hand*, Juhani Pallasmaa makes the case that making is a fundamental method of learning. “Most designers such as glass artists or furniture designers, not to mention architects - rarely make the objects they design themselves. Consequently, they need to understand the possibilities and limits of the materials and crafts and communicate their ideas and intentions to the specialist craftsman.”¹⁰ For many students, there is large disconnect between what is digitally drafted and how it is made. The act of making, learning the material, making mistakes, failing, and reworking the idea to fit within material limitations provides invaluable education.

Despite the Fay Jones School’s emphasis on making, the scarcity of time, physical spaces, and early hands-on education have impacted our students. During the past four years of the Fay Jones School’s furniture design studio, 95% of students in these courses lacked knowledge of using basic tools such as drills and screws. Through the development of the Anthony Timberland Center and this project, we acknowledge this issue and take the necessary steps to address it. Our approach aligns with that of Enzo Mari, an Italian designer, who dedicated his life to helping others understand objects through making. He believed that designing a quality product requires a better understanding of its conception. He writes: “This makes it particularly difficult to create projects of real worth. As a result, whenever I can, I seek to involve people not only with words but with ‘other’ actions too. In 1974, I thought that if people were encouraged to build a table, for example, with their own hands, they would be able to better understand the underlying thinking that had gone into it.”¹¹

Here, we bring this method to a contemporary context within the Fay Jones School.

Project Context and Description

The story begins with the desire to construct a new building for the Fay Jones School of Architecture and Design. The University of Arkansas organized a global design competition for the new building under the leadership of Dean Peter MacKeith. The Pritzker Prize-winning firm Grafton Architects won the competition, and together with local architects at Modus, have refined the design of the Anthony Timberland Center for Design and Material Innovation (ATC) and started the construction work due for completion in 2025.

With recent recognition and awards at the World Architecture Festival 2023 and in The Architectural Review, this mass timber building is putting Arkansas, its timber industries, and its future in wood product research and development on the map. The ATC is expected to become the central hub of the Fay Jones School's timber and wood

design courses and projects and will host the school's design-build program and fabrication technologies laboratories. With 62,000 cubic feet of timber used in the building, the ATC will demonstrate wood capabilities for students in the school's rapidly expanding graduate program in timber and wood design. The nearly 45,000-square-foot building will include a high-bay fabrication workshop – consisting of areas for wood, metal, and digital fabrication equipped with a 5-axis CNC router, a large format laser cutter, a large format water jet, and articulated robotic arms – in addition to seminar rooms, an exhibition gallery, outdoor terraces, and two large studios.

In the same spirit that inspired the construction of the ATC, which is based on collaboration, innovation, and the unification of wood, two faculty members, Alyssa Kuhns and Jake Tucci, along with the Dean's support, aimed to engage current students in the operation of the building's two design studio spaces. Through classes and student assistantships, they proposed engaging students in the design development and assembly of approximately 125 desk units for the new building.

The framing for this student design-build furniture project began with the support of Weyerhaeuser, a land, forest, and wood product company, through the Weyerhaeuser Giving Fund. With headquarters in Little Rock, AR and “almost 7 million acres of timberlands across 11 southern states from Virginia to Texas”, Weyerhaeuser has a strong state and regional presence.¹² Their support of this project stemmed from their focus on innovation and education and youth development.

With Weyerhaeuser's support, the structure of this student design-build furniture project integrated both industry and practice. Engaging with an industry partner, Weyerhaeuser, afforded the opportunity to share physical resources – wood products – as well as integral knowledge of the raw materials and manufacturing processes that inform their production. Through this partnership, wood innovation using regionally sourced construction-



Fig. 2 The Community Group's proposed desk design and studio layout for the Anthony Timberlands Center. Completed in the Design Studio.

grade wood products to conceive of finish-grade furniture became a focus.

Furthermore, a design consultant was hired to offer a practice-based perspective, increase project visibility, and challenge the ideas of the students, as well as the faculty and the school. Stephen Burks, a highly acclaimed product designer from Stephen Burks Man Made located in Brooklyn, NY, was invited to serve as the guest design consultant for this project. “Stephen Burks Man Made is a hands-on collaborative design studio deeply invested in the transformative power of craft techniques that challenge the limits of new technologies within industrial production.”¹³ Due to the studio's focus on hand craft, value of community-based practices, and experience with educational collaboration with Berea College and Herman Miller Knoll, Burks served as a resource for students.

To execute this project, industry and practice were integrated into a pedagogical approach sequenced over two courses, a research seminar and a design studio, and fostered through student

assistantships. The purpose of the research seminar was to develop a body of knowledge on material and human factors of wood furniture which were compiled into a sourcebook and used to inform the objectives for the design studio. In the research seminar, students investigated how designers work and implemented research strategies to study ergonomic, programmatic, and material considerations of design studio furniture.

Using the findings from the design research seminar, students in the design studio conceptualized, explored, and developed studio desk designs under the guidance of both the faculty and the guest design consultant Stephen Burks. Despite coming from different design disciplines within the school, the students had little experience in furniture making and engaged in the discipline through schematic design development, targeted material and assembly testing, and the production of working prototypes. Additionally, the students were tasked to challenge the idea of studio culture, drawing from their own experiences in academic studios.

To successfully execute this project, four key milestones were identified. Firstly, the creation of a research document. Secondly, the development and prototyping of desk designs through a design studio, with the guidance of a guest design consultant. Thirdly, the refinement of designs to ensure durability, repeatability, and approachability, with small-scale mass production in mind. Lastly, the production of the desks completed prior to the new building's occupation in 2025. Student assistantships along with school staff will help with the refinement and production of the final desk units. At the time of writing this paper, we have completed the second milestone and are in the process of recruiting student assistants.

Design Research

This project commenced with a design research seminar led by faculty member Alyssa Kuhns in the spring of 2023. The course, entitled A Way of

Working: Human and Material Factors of Wood Furniture, investigated the ways in which designers work, in terms of physical acts, processes employed, and the environments that foster both. In the course, students engaged with a specific way of working – implementing research strategies to study ergonomic, programmatic, and material considerations of design studio furniture. In addition to learning objectives grounded in human and material factors of wood furniture, a primary objective of the course was to engage in modes of collaborative practice. A total of 16 Fay Jones School Department of Architecture students worked in different group structures to produce a cohesive body of research for the course. These research strategies and topics were introduced through four distinct projects throughout the semester:

Case Studies. Students began the semester by studying well-known desk assemblies with intricate and innovative uses of wood and engineered wood products. The eight case studies were completed by pairs of students and included work from Alvar Aalto, Charles and Ray Eames, Hans Wegner, Finn Juhl, Ikea, and the University of Kentucky. The desks were studied through drawing and model-making exercises that highlighted design parameters such as dimensions, materials, joinery, finishes, and storage capabilities. For students, the Case Studies served as a reference for highly considered, well-executed wood furniture design.

Work Studies: User Testing and Surveys. After the Case Studies, students engaged in a study of ergonomic and programmatic considerations of the studio desk. The Work Studies project began with students studying their own work habits and environments. Students created time-lapse recordings and diagrams of their movement and posture while working in studio. These then informed points of focus for a school-wide study on working preferences. Students in the course solicited information from other Fay Jones School students regarding preferred desk dimensions, working posture, storage needs, and general

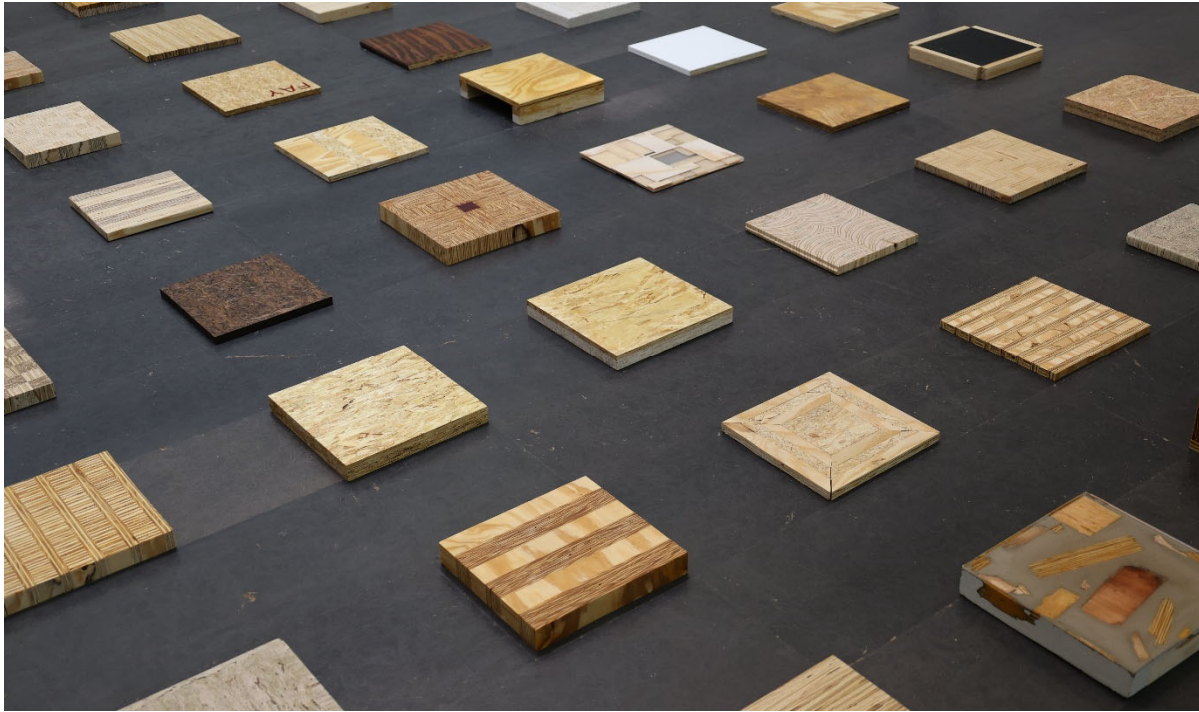


Fig. 3 Material assemblies exploring surface, edging, joining, and finishing of Weyerhaeuser wood products for use as tabletops.

working habits during a planned User Survey Event. The event was designed collaboratively by students in the course and included students from multiple disciplines and year levels within the school. The data collected from this User Survey Event was compiled to inform future desk design.

Material Studies. The second half of the course focused on projects geared towards material understanding and exploration. Students begin to consider material factors through an in-depth study of Weyerhaeuser wood products. In pairs, students researched manufacturing processes and taxonomies of LSL, PSL, LVL, TJI, MDF, OSB, plywood, and lumber. Products were studied through the production of diagrams and information was consistently cataloged to understand differences between material properties and dimensions.

50 Ways to Top a Table. In the final project, students engaged directly with Weyerhaeuser products to explore potential proposals for tabletop surfaces. A range of Weyerhaeuser's wood products was available for students to use for

material assembly explorations. In this exercise, each student produced a minimum of 3 – 12" x 12" material assemblies that were thought of as samples of desk surfaces. Each assembly considered the surface quality, edging, joinery or assembly, and finish of the desk surface. Through this exercise, students gained familiarity with the capabilities and limitations of each Weyerhaeuser product and explored techniques in transforming construction-grade material into finish-grade products.

The outcome of the Design Research Seminar was a research brief, or sourcebook, of findings to be used and implemented in the fall 2023 Design Development Studio. Research from the course was compiled by students throughout the semester and refined throughout summer 2023 by one student from the course who continued their involvement as a Research Assistant. Funds from Weyerhaeuser supported the procurement of materials and the hiring of the Research Assistant. The research from this course was compiled and formatted into a cohesive sourcebook document, which was

distributed to the fall 2023 Design Development Studio for their use in continuing the project.

Design Practice

After the fruitful research seminar held earlier in the spring, Jake Tucci led the Design Development Studio. At Fay Jones, advanced studios are allocated through a lottery system, ensuring that all students in the Fay Jones School have an equal opportunity to participate. As a result, the studio roster was filled with new students. While continuing with the earlier invested students would have its benefits, the inclusion of the new students allowed for a more diverse and impactful participation from the Fay Jones School.

Beyond the goals of the overall project, we wanted to run this design studio to encouraged students to gain insight on limitations of the practice of product design and mass-production of wood, for students to lead the evolution of the desk design, and ultimately learn through making.

On the first day, the 17 students were split into eight research groups. They were given the research brief from the research seminar and a simple project brief to investigate the range of considerations. Each team looked at a different research topic such as the Weyerhaeuser wood product offerings, desk design precedent, office layout precedent, academic examples, ergonomics, the current Fay Jones studio conditions and more. Though much of this research had been done in the previous seminar, the new set of students must understand them for themselves. All of the students in the studio have a visceral experience working in the studio environment, all eight teams crafted their ideal studio culture narrating its physical manifestation in the new Anthony Timberland Center. Reflection on the ideal studio culture and how touch, smell and look of wood can impact that ideal was a theme throughout the semester. Teams presented their findings and drafted a collaborative document to be referred to during the design generative phase.

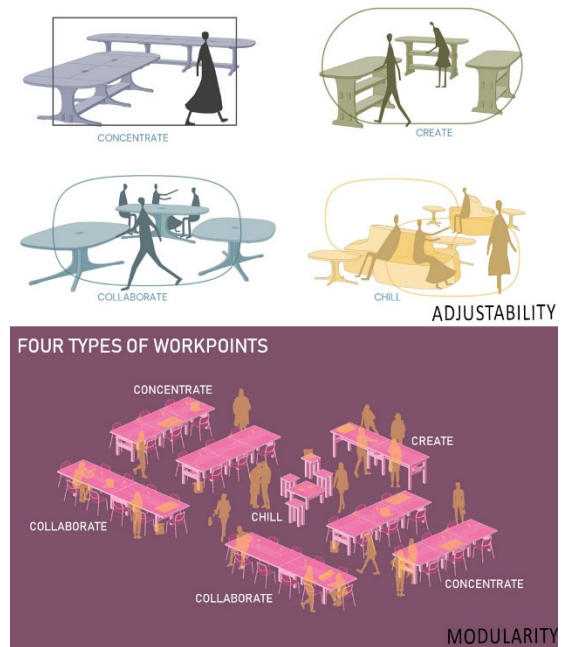


Fig. 4 Diagrammatic graphics describing different workpoints within the studio environment.

Following the investigation phase, each team created a conceptual framework that defined the ideal studio culture along with its spatial and behavioral goals to achieve that ideal. Design studios in the academic setting are generally equipped with basic amenities, such as industrial-style desks, pin-up spaces, and, perhaps, tables for group meetings. Teams explored the idea of individual desks, shared workstations, large community tables, storage, and places to decompress. They all concluded that a studio that creates well-being is one where one can focus, recalibrate, refresh, and socialize. To flesh out their conceptual ideal studio, they developed plans and 3D spatial layouts within the two large studio spaces in the Anthony Timberlands Center. In week two, Stephen Burks (design consultant) visited Arkansas to review the student's concepts and goals for the project. During these initial stages of the project, each of the eight teams created early desk designs. They used sketches, digital modeling, paper, and wood models to explore and refine their ideas. During this initial phase of the project, the charge to make a student workstation featuring a level worksurface and sturdy support structure, it

became evident that the reliability of the design hinged largely on the quality of the wood connections. Recognizing this challenge, Stephen Burks considered the possibilities and obstacles inherent in using construction-grade materials to fashion a desk christened the "Weyerhaeuser/Anthony Timberlands Center Furniture Studio – Between A Leg and A Surface".

In the fifth week of the semester, the students traveled to New York City for a four-day experience. One of the highlights of the trip was presenting their designs at Stephen Burks' studio, accompanied by several design jurors. After this session, the students were combined into four groups based on the conceptual alignment of their ideas. These four teams will go on to design and build a workstation prototype by December 4th, 2023, the final presentation date.

Students understood the opportunity to rethink studio and decided to take on the challenge of design all of the amenities in the space out of construction grade wood products. The workstations, storage, lockers, conference tables, end tables and even seating. Each team focused first on the desk, but later proposed a full furniture package that shared the DNA of their desk design.

Though the four teams worked independently, they merged their ideal studio narrative into one unifying statement.

"Studio Culture, whether in an academic or professional setting, is a coming together of different types of creatives in a collaborative environment to pursue a common goal in design.

Open conversation and constructive critique allow for creatives to test their ideas. Studio culture is cultivated within the studio space but by no means is it bound to it. However, the studio is the epicenter of creativity and inspiration that this group of people can draw from.

Encouraging areas for people to learn, inspire, and create with each other can help build a better community.

Studio culture is an environment that enables students to collaborate, engage, and inspire themselves and their peers to develop thought provoking designs. The intention is to have an accommodating space for all types of work modes by providing a variety of work environments that range from focused and more intimate spaces to more collaborative spaces that promote each student's ability to progress their ideas."

To implement the ideas of this narrative, students proposed hot desks instead of cold desks (assigned desks) and to divide the studio space into four conceptual zones: Concentrate would be for individually focused work at sitting height, Collaborate for group interactions, Create for model making and standing height and Chill for relaxed posture working on laptops and social breaks. Inspired by contemporary approaches to office design, the hot desk model, controversial to students and faculty alike whom are accustomed to assigned desks, encourages a variety of work points, work mobility, flexibility in studio formats, social interaction, a refreshing change of scenery, increased utilization of the space and accommodates future growth in student numbers. The combination of these "work points" can support a variety of studio types ranging from laptop only, to model making to design build where primary work would be done in the large Build Lab on the ground level, separate from the studio space. When the instructors reviewed the four teams early work, we identified four different approaches worth building upon. Each group approached the project through one of these lenses: Community, Modularity, Adaptability and Storability. This gave a way for each team to have their own conceptual trajectory to the project encouraging them to look beyond just the tectonics of the desk defining its form. Teams experimented with traditional wood joinery, CNC manufacturing methods, and ways of celebrating the texture and finish of the construction-grade wood

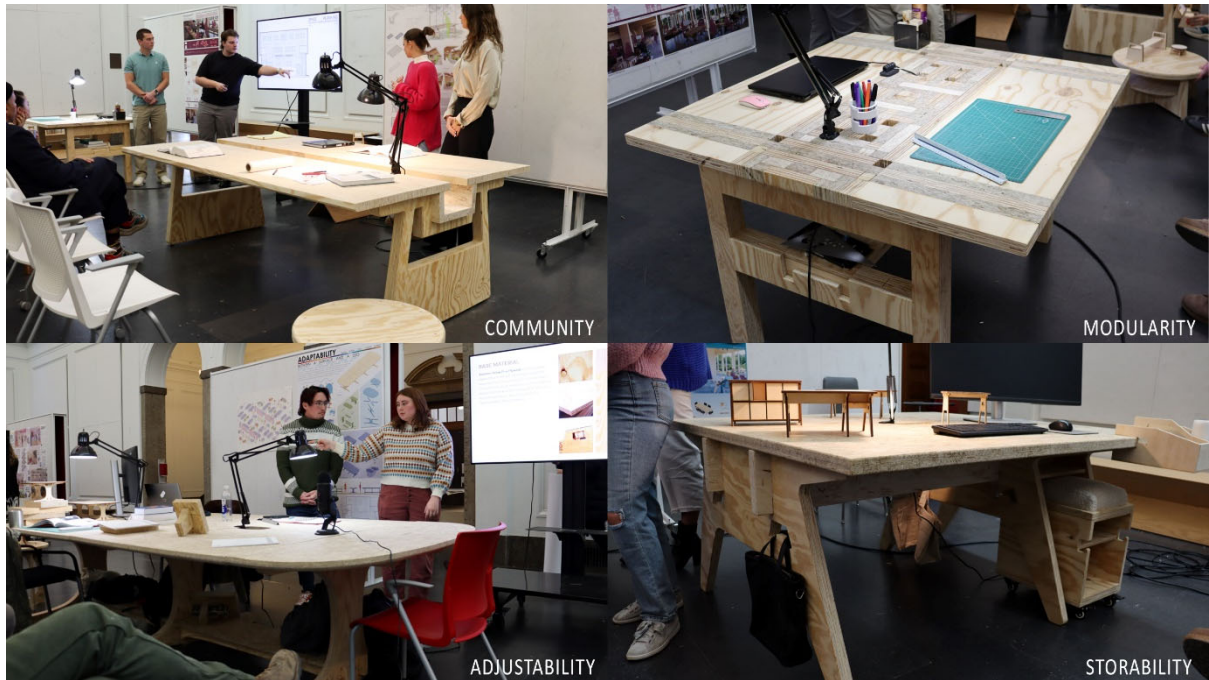


Fig. 5 Final full scale prototypes of desk designs presented at the final review, December 2023.

products. Teams sketched, work digital in Rhino3D, built scale models, tested full-scale joints and continually refined their proposed layouts of the studio spaces. Impressively, the diverse group of students had little experience in working with wood, outside of laser cutting, yet achieved a high level of craft in the final full-scale prototypes.

The result of this challenging and rewarding semester was four working prototypes, designed, crafted and assembled by students made from construction-grade wood products, as well as a full proposal for the studio layout and family of furniture that share the DNA of the desk. The prototypes all rely on the strength of connections between wooden materials, minimizing the use of fasteners.

The Community group designed a table that could be used by both low-density and high-density studios. The table is 8 feet by 5 feet in size and can seat four or six students respectively. It can also seat up to 8 people for a group meeting. The design of the desk was inspired by the large mass-timber gutter beam of the building. A trough runs through

the center of the table, which allows for attaching lighting, cable management, and the ability for students to make additional custom accessories. The prototype is constructed of $\frac{3}{4}$ yellow pine plywood and LSL beams, using a combination of hand-stacked wood lamination and CNC milling.

The Modularity group initially experimented with modular assemblies at the part and object scale. However, with guidance from Stephen Burks, they changed their approach and began looking at modularity as a unit of measure. They chose 1.5 inches as the unit based on standard lumber dimensions and set out to showcase the potential beauty of the seemingly mundane wood products. They created a mosaic pattern of wood products on the side and end grain, using yellow pine plywood, LSL, and PSL in various orientations. The workstation, measuring 5 feet by 5 feet, can accommodate two people and can be linked together to form long rows due to a module trestle leg that can be repositioned to connect the mosaic tops. Several "units" of wood are left open on the tabletop to allow for this connection or to be used for lighting or accessory attachments.

Throughout the semester, the Adaptability group worked on several ideas to reinterpret the concept of adaptability. They eventually decided to soften the desk's shape to facilitate smooth movement throughout the space and make it easy to adapt to different studio layouts. The desk was created using a modular design made from $\frac{3}{4}$ inch OSB subflooring. The design was 99% manufactured using CNC milling, with only final hand finishing and assembly required. The desk consists of a substructure of leg panels and cross beams that interlock together using lap joints and mortise/tenon joinery. Each 2.5-foot by 5-foot top can interlock with the substructure to create a double-wide desk. These double-wide desks can be linked together to create long desk units. The substructure allows for the addition of half-squoval shapes on each end to soften the form and provide a surface for an instructor in impromptu meetings. Additionally, the group proposed a series of small tables that would utilize the squoval-shaped offcuts as tops.

The Storability group had a specific focus on the items that needed to be stored at the workstation, while simultaneously designing hot desks. To meet this challenge, they developed a modular desk system with a sawhorse-like trestle leg. The students created a three-tiered storage system that featured integrated hooks for bags, a tool caddy that each student would own for the entire semester, a mobile storage bench with a cushioned seat, and a locker system that could act as an endcap for the desk units or be elevated by 6 inches to support standing height surface for model making. The mobile storage bench is garaged in the trestle leg, and the caddy can be attached to the desk surface, attached to the mobile storage bench, or stored in the locker. The desk system prototype was made from $\frac{3}{4}$ yellow pine, $\frac{3}{4}$ inch OSB subflooring, and LSL beams.

Our next steps involve completing the next two milestones. We plan to invite student assistants, funded by the Weyerhaeuser Giving Fund, to evaluate the four prototypes and develop a refined

version that will be ready for small-scale mass production by June 2024. Our industry partner, Weyerhaeuser, is planned to help assemble some of the first desks. The final step is to prepare the final desk for installation in the completed building by mid-2025. We still need to address the order of operations, material handling, temporary storage, and other logistics. To create the final desk units, we plan to use local wood-product suppliers and partner with local wood shops in the northwest Arkansas region to meet the subsidized CNC demands.

Outcomes

Throughout this student design-build furniture project, students acted both as designers and crafts people, learning through a tactile relationship with the material. Through the design-build approach, our primary objective was to impart knowledge to students regarding the design process, industrial procedures, manufacturing techniques, the utilization of wood, available resources and materials, as well as the methods and skills required to create their own projects. This approach seeks to elevate the quality of construction-grade products through the transfer of knowledge to the next generation of designers. The hands-on learning opportunities fostered skills of craft and making while also enabling the students to become thoughtful and involved designers of the built environment. Our intention was to provide a comprehensive understanding of the entire design and construction process, from start to finish, to foster innovation and excellence in the field.

By integrating academia, industry, and practice, united through a focus on wood, this project engaged multiple disciplines and sectors within design and construction. These efforts allowed for the sharing of physical resources and product and design knowledge between students, courses, faculty, industry experts, and design practitioners. Due to these collaborative efforts, we are able to push the limits of wood products and innovate on new approaches to furniture design.

End Notes

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