WCTE 2014 Quebec City Canada August 10-14
World Conference on Timber Engineering

TIMBER AND ARCHITECTURAL EDUCATION – A CASE STUDY IN 'LEARN BY MAKING'

David Bylund[1]

ABSTRACT: Contemporary architectural education has become synonymous with the digital representation of design. This paper explores the emerging practice of incorporating a 'Learn by Making' approach to architectural education that can work in parallel with digital representation through the combination of design, fabrication and the installation of permanent and semi permanent timber structures.

KEYWORDS: Timber design, Learn by Making, architectural education

1 INTRODUCTION

Modern 'Learn by Making' (LbM) attempts to fuse traditional and contemporary timber construction methods with undergraduate architectural education. This approach is gaining popularity amongst architectural students, educators and the potential clients who stand to benefit.

Few undergraduate students of architecture have the opportunity to construct the product of their creative endeavours. At best, student projects are built as scale or virtual models. The prospect of realising their project through the LbM approach to architectural education is creating new educational opportunities.

The intent of the LbM method is to assist students to connect the abstracted representation of a building design or concept with reality of being required to build it. By creating an opportunity whereby students are required to interpret their design intent, as represented by their drawings, into reality fosters greater understanding of how design must understand construction methods, materiality and structures in direct and accountable ways.

Exposing architecture students, in a controlled environment, to a real client and brief culminating in a full scale permanent structure, can be an effective tool in preparing tomorrow's architects for the burgeoning renaissance of timber and the rigors of professional practise.

The author's interest in this approach to architectural education has resulted in the creation and successful completion of two LbM elective units at the University of Western Australia Faculty of Architecture, Landscape and Visual Arts in semester one, 2013 and semester one, 2014. The elective unit is entitled *Timber in Architecture – An Exercise in Learn by Making*.

2 METHODS

The subject of this paper and the creation of the ALVA LbM unit was been inspired by various iterations of the LbM approach undertaken at universities such as the Norwegian University of Science's Faculty of Architecture and Fine Art, the University of Tasmania's School of Architecture and Design timber based architectural program and the work of Emeritus Professor Naoto Ando at Tokyo Univeristy's Engineering and Construction Department.

According to the University of Tasmania, LbM projects '… allow students to experience design work in collaboration with consultants and local authorities…' [1] and they do this through '…

[1] David Bylund, Architect, Perth, Western Australia. Email:

the design and fabrication of small public buildings and structures.' [ibid] The LbM process attempts to replicate elements of the traditional tasks typically undertaken by an architect such as working with a client to design a scheme, liaising with other design and construction consultants and submitting formal documentation to local councils for approvals.

This combination of processes creates an opportunity for students to translate the drawn representations of their designs into full scale and often permanent structures. Timber's unique properties makes it the ideal material to consider when undertaking the LbM approach to architectural education. Its workability, strength to weight ratio, ready availability, open construction capacity and established place in society make it the ideal material from which to base a modern LbM architectural program.

2.1 Precedent 'Learn by Making' Experiences

In 2010, a test LbM exercise was jointly run by the author in conjunction with Dr Andreas Falk at *Kungliga Tekniska högskolan* (KTH) (Sweden's Royal Institute of Technology), School of Architecture and the Built Environment in Stockholm. This LbM exercise was incorporated into an Architectural Technology unit entitled *Translated Structures and Material Combinations*.

Figure 1: *KTH Students assembling box beam grillage*

The course focused on the use of timber as a structural material in architectural design and culminated in the students building a timber box beam grillage structure.

3 CASE STUDIES

Following on from the success of KTH experience, the author conducted two LbM electives for 4th and 5th year Master of Architecture students at the University of Western Australia's (UWA) Faculty of Architecture, Landscape and Visual Arts (ALVA) in the first semester of 2013 (ARCT5597) and in the first semester of 2014 (ARCT5590). These are detailed below.

3.1 Case Study One

Timber in Architecture – An exploration of timber design, construction and installation. Carey Baptist College

The aim of the 2013 elective was for the students to design and construct a permanent pavilion type structure for a primary school communal horticulture garden. The intent was to foster an appreciation for timber as a structural and aesthetic building material through design, fabrication and implementation via the hands-on LbM process and to provide a new element to the school garden as a gift to the community.

A primary school in the southern suburbs of Perth in Western Australia kindly provided the project from which the elective was based. A communal garden had recently been established at the school to allow the students an opportunity to experience fruit and vegetable gardening, poultry care and aquaponics. An outdoor cooking area had been previously established with a concrete slab, power, water and gas services connected. This location created an opportunity to incorporate a central open pavilion structure to provide much needed shade and to act as a focal point to the garden.

Figure 2: *Carey Baptist College communal garden site*

The class was divided into eight groups. Each group was required to develop a scheme, exploring their design concepts in preparation for presentation to the client. The various solutions explored timber construction through sketches, analogue and digital model making and scaled prototyping. This approach successfully culminated in one student project being selected from the group through a competitive design process.

The eight proposals were then assessed by a design review committee comprising the client, one of the industry sponsors, Associate Professor Patrick Beale and the author. Consideration was given to issues such as addressing the brief, build-ability, structural logic and the quality of detailing.

The winning solution was then to be built by the class at ALVA's workshops and installed on site at the school as a permanent structure. The eight designs developed by the students represented a broad range of solutions, many with commendable attributes.

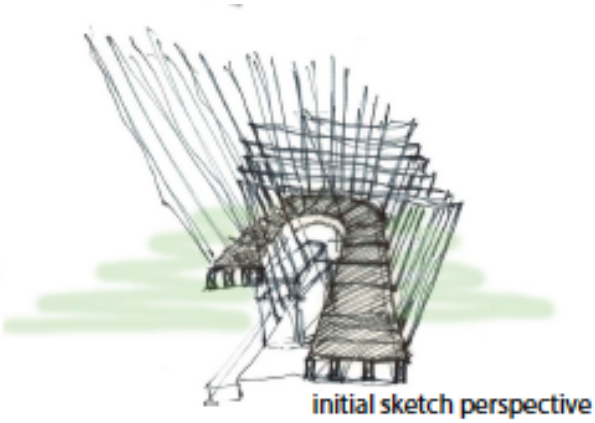

Figure 3: *Concept sketch by Sam Brown and Sam Thornton*

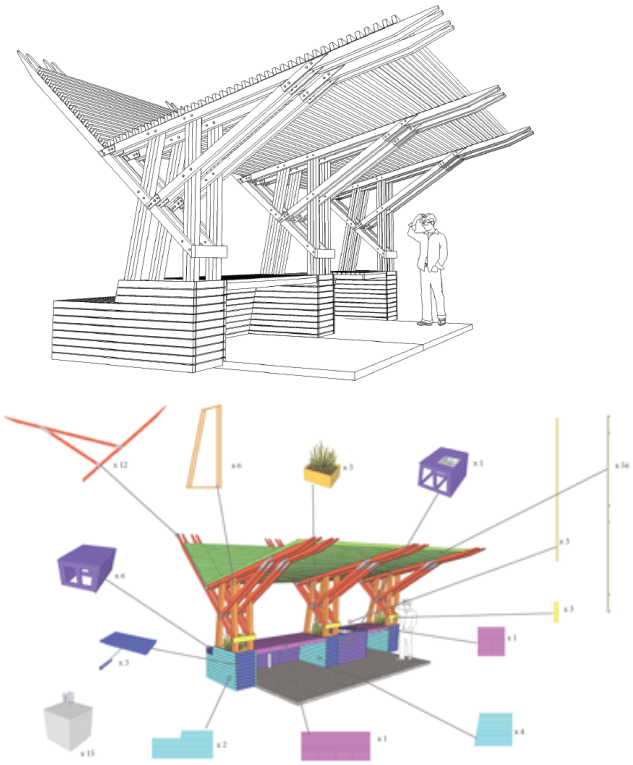

Figure 4: *Presentation drawings by Simon Perroni and Ryan Maddams*

Each group researched and investigated a number of timber based precedent projects. The winning scheme, designed by 5th year students, Sing Liang Chai and Dustin Diep, referenced the three dimensional timber grid structures of Keno Kuma's Wooden Bridge Museum and GC Prostho's Museum. Sing and Dustin's proposal was a creative response to the brief that represented both an innovative design solution and a good understanding of the potential of timber to create unique and responsive architecture.

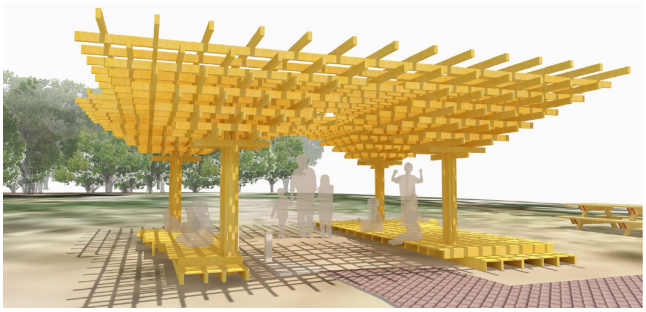

Figure 5: *Perspective view of the winning scheme by Sing Chai and Dustin Diep*

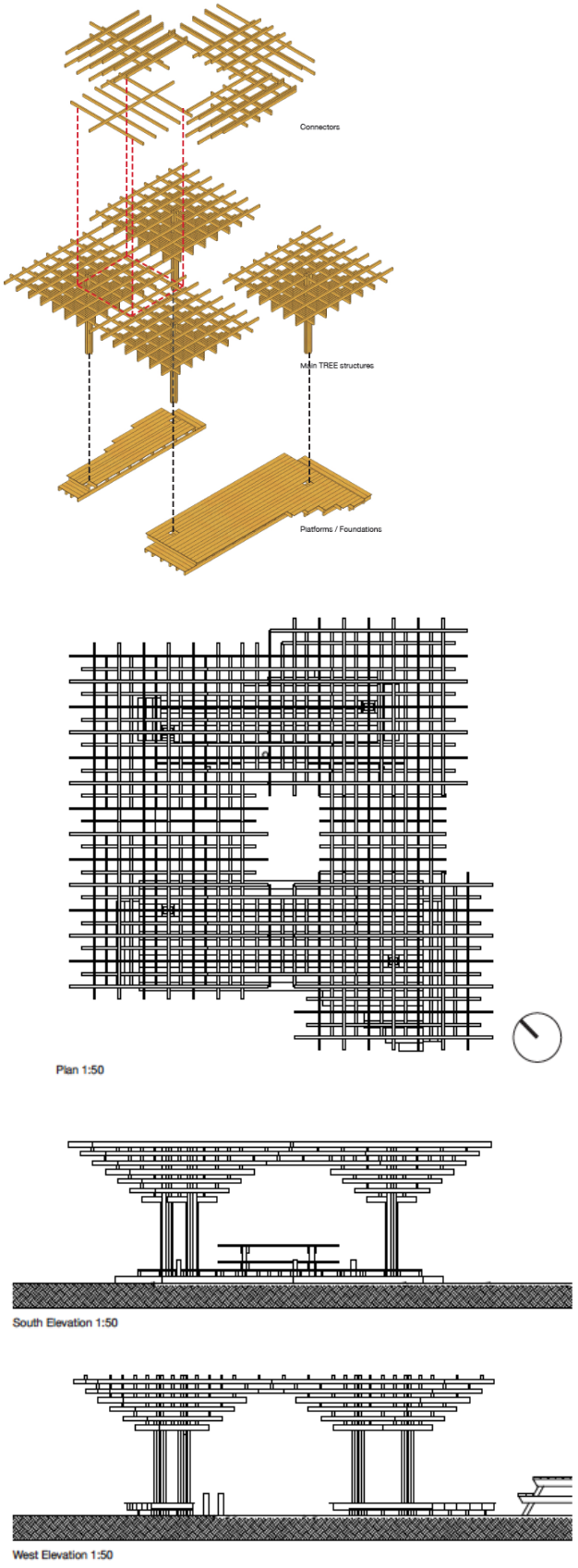

Figure 6: *Exploded axonometric, roof plan and elevations of the winning scheme*

The class first built a full-scale prototype and for many of the students, this was the first opportunity for them to use workshop equipment and experiment with various methods of wood working techniques.

The prototype structure provided a valuable test bed for the students to experiment with the process of converting their abstract drawn forms into a full scale, three dimensional object. This gave them valuable insights into the task builders face when given a set of plans to interpret. The students felt that the LbM experience will inform how they present and detail their work in the future.

Figure 7: *Prefabricating a prototype roof element in the ALVA workshop.*

The project was entered in the *2013 Australian Timber Design Awards*. The ATDA is Australia's premiere annual recognition of excellence in timber design and the Carey

Baptist pavilion structure was award first place in the Treated Pine Category.

Figure 8: *Students installing one of the roof elements on site*

Following the successful prefabrication of the primary structural elements and their installation at the site, the completed project sits aptly in its new surrounds and has become an integral part of the school's garden.

Figure 9: *The completed pavilion structure*

3.2 Case Study Two

City of Nedlands – Stirling Highway Bus Shelter

In semester One, 2014, the ALVA LbM unit was commissioned by the City of Nedlands Council to design and construct a new timber bus shelter on Stirling Highway, directly in front of UWA's ALVA faculty. This is one of the busiest university bus stops in the city and has over 100 buses stopping at it every day. This project represents a significant increase in difficulty from the previous project as it involved the students liaising with multiple government departments, a private building surveyor and a site that featured a high volume of traffic.

The city felt that an innovative new type of bus shelter was needed to help improve the amenity of the district and was very pleased to work with the architecture students to achieve an attractive and durable design solution.

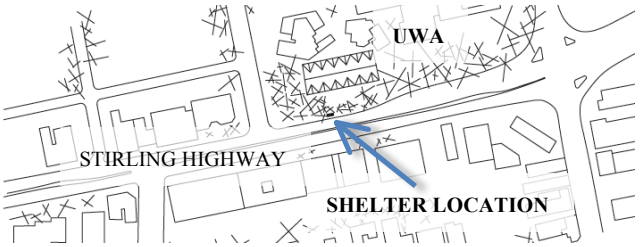

Figure 10: *The bus shelter site plan*

A design brief was developed following consultation with representatives from the City of Nedlands and a review of the Perth Transport Authority's Bus Shelter Guidelines documentation.

The students formed into eight groups of two and proceeded to undertake site investigations and design their bus shelters over a period of five weeks. As with the 2013 elective, the unit was run as a competitive design process. Structural engineer Mr William Smalley, of Scott Smalley Partnership, provided invaluable advice to assist the students in addressing the shelter's structural requirements.

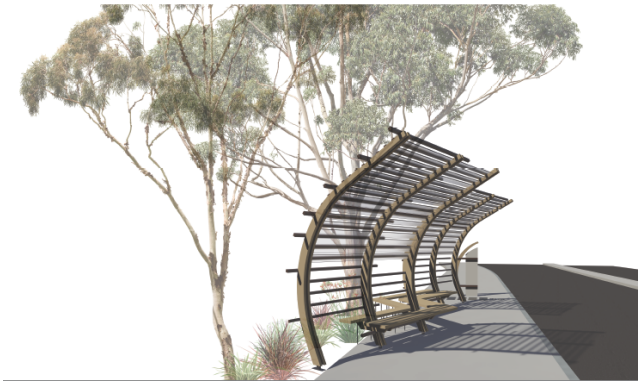

Figure 11: *Concept perspective by Michael Warr, Georgia Bowen and Chris Sullivan*

Figure 12: *Concept perspective by Fredrick Chan and Hugo Chung*

Figure 13: *Concept images of the winning scheme by Claire Holmes and Lan Nguyen*

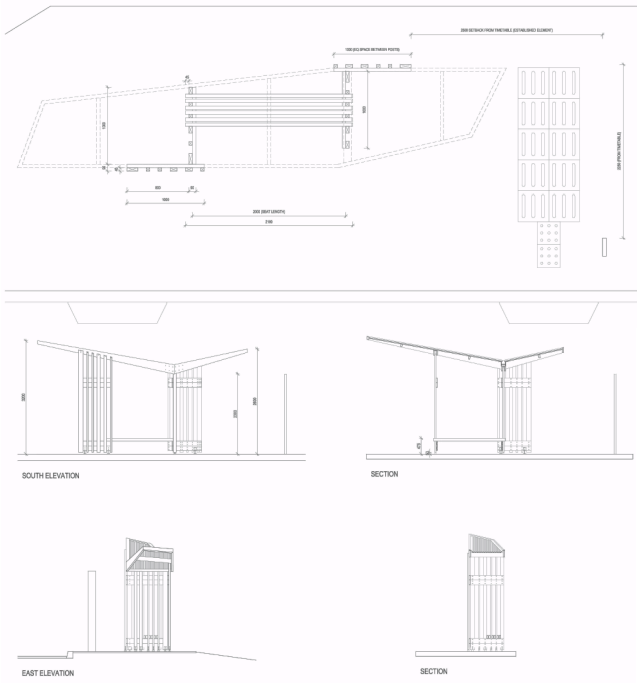

Figure 14: *Plan and elevations of the winning scheme*

Figure 15: *Bus shelter under construction in the ALVA workshop.*

The entire process become an invaluable industry and academia collaborative effort and provided the students with an opportunity to liaise with other design and industry based professions. Wespine, Western Australia's largest softwood sawmill, provided sponsorship with a generous supply of sawn lumber and Bunnings, a large Australian hardware chain, donated the fixtures and fittings. Both companies also supported the previous elective with generous donations of material and expertise.

Figure 16: *Bus shelter installation on site*

Figure 17: *The completed bus shelter*

4 CONCLUSIONS

Modern 'Learn by Making' is a valuable educational tool. LbM can provide architecture students with the opportunity to realise their designs and test architectural concepts. The process of converting their abstract two and three dimensional images into a built structure provides unique learning opportunities. The incorporation of relevant industry partnerships into the program can result in new experiences for architectural students by fostering university and industry collaboration. Timber is well suited to this teaching methodology and such projects can assist participants transition from architecture student to architect.

ACKNOWLEDGEMENTS

The author would like to acknowledge UWA and ALVA, Carey Baptist College in Harrisdale, Perth, Western Australia, the Perth local government authority, the City of Nedlands.
Thanks also to structural engineer Bill Smalley for his willingness to participate in the LbM process. The on going support of industry partners, Wespine and Bunnings, for their generous supply of timber and hardware is also acknowledged.
The students of semester one 2013 ARCT5597, and semester one 2014, ARCT5590 are also congratulated for their hard work and willingness to explore new ideas and concepts.

REFERENCES

[1] University of Tasmania, School of Architecture and Design, *Learn by Making*, 2014 http://www.utas.edu.au/architecture-design/learning-by-making