The Innovation Hub
for Affordable Heating and Cooling

Lesson Learnt Report

IDS-11 WCC Ribbonwood Community Center – Lessons Learned Report

Project - IDS11

19 November 2021

University of Wollongong

About i-Hub

The Innovation Hub for Affordable Heating and Cooling (i-Hub) is an initiative led by the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) in conjunction with CSIRO, Queensland University of Technology (QUT), the University of Melbourne and the University of Wollongong and supported by Australian Renewable Energy Agency (ARENA) to facilitate the heating, ventilation, air conditioning and refrigeration (HVAC&R) industry's transition to a low emissions future, stimulate jobs growth, and showcase HVAC&R innovation in buildings.

The objective of i-Hub is to support the broader HVAC&R industry with knowledge dissemination, skills-development and capacity-building. By facilitating a collaborative approach to innovation, i-Hub brings together leading universities, researchers, consultants, building owners and equipment manufacturers to create a connected research and development community in Australia.

Primary Project Partner

Lessons Learnt Report: IDS11 – WCC Ribbonwood Community Center

i-Hub Design Studio Lessons Learned Report

The IDS-11 Wollongong City Council Ribbonwood Community Centre Integrated Design Studio investigates design innovation to reduce net energy consumption of Wollongong City Council (WCC) soon to be renovated Ribbonwood Community Centre in Dapto. Over a 13-week period, a group of multidisciplinary students work collaboratively to respond to environmental challenges faced by WCC Ribbonwood Community Centre, with a particular focus on how WCC can achieve their organisational commitment of net zero emissions for its own operations by 2030.

This report explores the lessons learned from undertaking this Integrated Design Studio process, pulling relevant findings from the Studio Report (i-Hub IDS-11 Design Studio outcomes report_100%_v1). The lessons learned were developed through assessing the feedback provided by industry consultants, clients and studio tutors via one-on-one interviews, examining anonymous student survey responses, and through the observations of researchers made during the design studios.

Lead organisation	University of Wollongong		
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Important Note: The Integrated Design Studio (IDS11) ran in parallel with an additional studio (IDS10), with all studios occurring concurrently, utilising the same consultants, researchers and studio tutors, with differing clients. The lessons learned associated with IDS11 are similar to those associated with IDS10. To improve readability (for those reading multiple IDS reports), any information included within the report which is similar to information outlined within other IDS reports will be highlighted with a greyed-out background.

Lessons learnt

Lesson learnt #1	Existing structural form restricts integrated design opportunities

Category	Technical

Describe what you learnt about this aspect of the Project.

Architects and engineers are willing and very much capable of working collaboratively to produce integrated design solutions for clients who are cognisant of the benefits of efficient building design. This fact holds for both new and retrofitted structures. While both engineers and architects can work collaboratively to achieve this goal, the scope of possible opportunities is narrowed in existing structures due to the restrictions imposed by the prevailing structural form and can be further compounded by the client brief. This is especially true if the client is resistant to any structural alterations.

Having a predetermined structure limits to potential opportunities primarily for architects, who focus predominantly on form and function. While there is opportunity for examination of architectural improvement, this is governed by an underlying structural restraint. These same restrictions are relevant to engineers, who are unable to make significant changes to the pre-existing structural form, limiting potential strategic possibilities. These limitations placed on both specialisations, while not preventing integrated design completely, to impose restrictions that can be challenging to overcome, especially where overlapping opportunities are being sought where architects and engineers can work collaboratively.

Please describe what you would do differently next time and how this would help. What are the implications for future Projects?

The ideal solution would be to select a project requiring or allowing for structural changes to facilitate more holistic design opportunities to be explored by both architects and engineers. However, this is not always the case, with all retrofits typically being restricted due an existing structure. To facilitate more holistic practices, participants should be encouraged to consider structural changes to an existing envelope, to explore how differences impact energy efficiency. This also gives participants the opportunity to examine the trade off in embodied carbon when using the existing structure compared with potential improvements to envelope efficiency offered though structural alterations. These practices would be facilitated through placing greater emphasis on structural fluidity within the client brief and assessable items.

While a client may want to examine the possible retrofitted solutions for their existing structure, it may be beneficial to negotiate with the client, having one team examine improvements given a fixed structure, while another team is free to make structural alterations. While this may not necessarily be a desire of the client, it gives participants different opportunities to explore, and gives the client additional design ideas they may not have considered previously. This will also provide the client an energy efficiency comparison when structural alterations are allowable and indicate the potential benefits when structural changes are allowed.

If your Project learnings have identified any knowledge gaps that need to be filled, please state it below.

Structural form is key when engineers and architects work collaboratively on a holistic, integrated design. While it is not impossible to achieve successful integrated design given an existing structure, it does make the process more difficult. Further examination of retrofit projects would be useful, especially in better understanding the quantifiable limitations imposed when utilising an existing structural form.

Please include any other information you feel is relevant or helpful in sharing the knowledge you learnt through this stage of the Project. This may be qualitative or quantitative and may include a graph, chart, infographic or table as appropriate.

Refer to Studio Report (i-Hub IDS-11 Design Studio outcomes report_100%_v1) for further exploration of this lesson.

Lesson learnt #2	Importance of feedback mechanisms and student/consultant interactions

Category	Social

Describe what you learnt about this aspect of the Project.

Feedback in any regard was found to be of benefit to students at most stages of the design, providing either reassurance that the correct design procedures had been undertaken with the design progressing in a beneficial manner, or providing correction/advise as to what may need further consideration. Client specific feedback (in regard to the return brief) highlighted any aspects which required further/additional consideration, gave greater context to the desires of the client, and provided further information which was omitted or unconsidered. The inter-disciplinary background of the consultants also led to important discussions and feedback on the suitability of the design solutions, for example, whether the outlined solution was feasible in terms of building performance while also complying with structural requirements.

It was found that greater discussions were facilitated within larger working groups (~8 students, two consultants and one academic) rather than smaller, group-based discussions. When in larger groups the students become aware of what designs and methods the other smaller groups are considering, and allows them to discuss their issues with peers, with everyone involved in the working group able to provide suggestions about how to overcome the current issues being faced.

Please describe what you would do differently next time and how this would help. What are the implications for future Projects?

Using larger working groups from the start of the IDS will allow students to have more open discussions and share ideas more freely. This also facilitates more insightful discussions with consultants, who are able to provide more beneficial advice to all students.

Having more opportunities for potential feedback was considered to be of greater benefit for students, however this also required greater initiative from the students in a learning environment which was unique and unfamiliar. This likely resulted in students being unaware that they were able to reach out to clients/consultants directly for feedback/advise outside of class. It would be better to outline this in early weeks and reinforce this information each week to make students more aware of the resources available to them. Additionally, as students did not take advantage of the consultant's consultation times, it may be better to assign each group time with consultants (outside of class) each week (approximately 10-15 mins). This would allow students to have a conversation specific to their project, but also set periodic work deadlines so that they have work completed and ready to present to the consultants.

If your Project learnings have identified any knowledge gaps that need to be filled, please state it below.

Students respond positively to feedback, with greater outcomes being achieved when any type of feedback is provided. This feedback should be constructive, giving students direction on how to proceed. There are many options available for feedback to be provided, however it is unknown which method is best (e.g. in person, report comments, responses on forums). It could be beneficial for these (and other) feedback mechanisms to be explored to determine if students respond better to some specific forms of feedback.

Please include any other information you feel is relevant or helpful in sharing the knowledge you learnt through this stage of the Project. This may be qualitative or quantitative and may include a graph, chart, infographic or table as appropriate.

Lesson learnt #3	Evaluation matrices allow for simplified interdisciplinary design comparisons

Category	Technical

Describe what you learnt about this aspect of the Project.

Participants across multiple disciplines do not always completely understand the technical aspects associated with other disciplines, with them finding it difficult to compare design solutions. The difficulty associated with this is that architects or engineers understand design solutions relevant to their field and their associated positive and negative aspects. Through suggesting the use of an evaluation framework, participants in the studio were able to break their design solutions down into relatable statistics (e.g. cost, feasibility, certification scheme ratings, etc.) so that an associated metric may be assigned. The associated metric gives participants a manner in which to compare interdisciplinary design solutions. While further assessment (detailed calculations) is required following this process and as the design progresses, the proposed evaluation framework provides participants with a tool to provide quantifiable justification for design decisions, with reasoning as to why other alternatives were discarded. Methods like this provide architects or engineers with a method of communicating with other disciplines, which is not solely related to architecture and engineering.

Please describe what you would do differently next time and how this would help. What are the implications for future Projects?

The developed design evaluation methods should be used again in the future, as they are beneficial to participants' development and interdisciplinary communication. Other methods such as this which foster further interdisciplinary communication should be sought and implemented in the future, as they appear to be of great benefit to progressing a project and identifying the most beneficial design solutions.

If your Project learnings have identified any knowledge gaps that need to be filled, please state it below.

Additional methods which nurture interdisciplinary communication should be sought and implemented within the projects, for example a database that matches design solutions to specific climates and building typologies (as an option prior to detailed design analysis)

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Refer to Studio Report (i-Hub IDS-11 Design Studio outcomes report_100%_v1) for further exploration of this lesson.

Lesson learnt #4	Design frameworks provide beneficial milestones for project development

Category	Technical

Describe what you learnt about this aspect of the Project.

It was commonly identified by both consultants and studio tutors that students (no matter their level of education) lacked design experience, with students being largely reliant on the experiences of the consultants to assist in guiding them through the design process. A design framework was established which directs students from one objective to another, building on their knowledge of previous work before undertaking more detailed designs. This framework was presented to the students in the form of assessments, with each subsequent assessment built on the work completed previously. This progression assuaged the overwhelming nature that design can have, and reinforced the development of constructive design principals, with a design progressing step-by-step with changes being made based on feedback.

This design framework is loosely based on design procedures practiced in industry, with clients receiving a return brief, before more detailed designs are undertaken. These milestones are presented to the client for feedback and variations (as was also undertaken within the design studio) to ensure all parties are happy before a finalised design is submitted. These frameworks educate students on a method of undertaking design in a subtle indirect manner, preparing them for their future careers.

Please describe what you would do differently next time and how this would help. What are the implications for future Projects?

These frameworks are beneficial to student educational development, while also assisting them the progressively developing designs by offering milestones to focus on. This focuses attention on smaller achievable tasks, while stepping them towards the final goal of providing a finalised design. Without these frameworks, students may feel overwhelmed and miss critical steps in the design process.

It may be more beneficial to include more stages within the process. The shorter period associated with the IDS's limits the design process (from conception to delivery) to a 13-week period, with students having commitments other than this subject. More frequent smaller assessments may improve engagement, and impel students to consistently improve and develop designs. However, this may also result in fewer students enrolling due to the high number of assessable items. The commitments of the studio tutors would also be greater, to mark and provide feedback on regular assessment submissions.

If your Project learnings have identified any knowledge gaps that need to be filled, please state it below.

Establishing a very prescribed design process/methodology would be beneficial for IDS participants in the future.

Please include any other information you feel is relevant or helpful in sharing the knowledge you learnt through this stage of the Project. This may be qualitative or quantitative and may include a graph, chart, infographic or table as appropriate.

Refer to Studio Report (i-Hub IDS-11 Design Studio outcomes report_100%_v1) for further exploration of this lesson.