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# Designing the Olkola Cultural Knowledge Centre: A Traditional Owner-Led Integrated Research and Education Process

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**Abstract:** The purpose of this paper is to identify, track and discuss the pedagogical processes involved in an integrated teaching and research project to design and build a Cultural Knowledge Centre on Olkola Country in remote Cape York, Australia. The paper provides an empirical enquiry into the foundational principles and key design, theoretical and practical processes of the collaborative partnership between the Olkola Aboriginal Corporation (OAC), Monash University (and now The University of Melbourne) that has been operating since 2018. This paper focuses on a pedagogical stage in 2019 that saw 320 final year structural, mechanical, transport, environmental and water engineering students team up with 15 masters of architecture student mentors with input from Indigenous Olkola Traditional Owners (TOs) to progress the engineering design concepts and assist with development application preparations. The research provides significant contributions to practical and theoretical understandings of interdisciplinary design education and research that combine traditional cultural and scientific knowledge to support TO needs and aspirations. These lessons have implications for: 1) improved interdisciplinary communication and understanding; 2) the sharing and transfer of technical expertise with TOs; and 3) effective community engagement through architectural science education.

**Keywords:** integrated education; sustainability; remote building; Indigenous; participatory practices.

## 1. Project Need and Context

The most fundamental requirement of any Traditional Owner (TO) led research and teaching partnership is to respond to a community identified need in a contextually appropriate way. The Olkola Aboriginal Corporation (Olkola) are the TOs and custodians of Olkola Country in Cape York, which was handed back to the TOs in 2014 (Bush Heritage, 2016). At present there are 4 outstations on Olkola Country. These facilities support the TOs to maintain land management work. There is currently no built

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facility on Country to keep and promote cultural artefacts and knowledge. Olkola share a vision to extend their land management work and continue cultural practices by building a Cultural Knowledge Centre (CKC) on Olkola Country. As Olkola elder Uncle Mike Ross (2018) states '[We want to] use the centre for all projects-recording knowledge and collecting information of the country and our culture. [We want to] use all the knowledge we can get of our landscape to manage country. Putting together scientific information and cultural knowledge. We can do a lot in a centre based on Country, [because] you're not talking about your Country, you're on Country'.

The CKC Project has run over three teaching semesters (at the time of writing), from master plan through to detailed design and has involved a total of 350 students to support the Olkola People in achieving their vision for a Cultural Knowledge Centre. This paper focuses on the most recent stage in Semester 2 2019, when 320 engineering students joined 15 Master of Architecture students to work with Olkola. This unit improved upon the conceptual designs from the previous semester, to improve their practical viability and ready them for development and building permit approvals. As such, the objective of this stage was for the engineering students to produce engineering design proposals and for the architecture students to produce development application reports and construction drawing sets. It was a natural fit then for Civil and Environmental Engineering Practice, a compulsory capstone unit for all final year structural, mechanical, transport, environmental and water engineering specialisations, to partner with a Master of Architecture elective to see the project through to the next stage.

The problem-solving and design approach taught in the subject aims to equip students with new modes of critical thinking and decision-making processes that can be directly applied to the complex, systemic and interconnected nature of the real world. Student design responses are used by the OAC in decision making processes and funding applications. This paper tracks the Olkola led interdisciplinary education processes involved and shows that the project makes significant contributions to 1) students, 2) architectural science education, 3) the CKC Project and most importantly 4) the Olkola.

## 2. Theoretical Background

To situate this project in the field of architectural science education, we first need to identify how the field emerged, and how interdisciplinarity and TO Led engagement are approached within it. Architectural science emerged in the 1960s to distinguish scientific aspects of building from aesthetic or functional design considerations. At this time, Henry Cowan the University of Sydney's Head of Architectural Science (1963), attributed the need for architectural science to increasing labour costs, building complexity and the rapid emergence of new materials and technology. Consequently, specialised courses in architectural science, architectural engineering and building science emerged, which contributed to a splintering of building projects into separate specialised technical consultancies.

Since then, the scientific component of architecture curricula has tended to focus on fundamental theoretical principles, typically within the architecture student cohort only. In contrast to this approach, Cowan argues architecture science is most effectively learnt in studio-based projects that have an integrated and applied approach with senior year engineering, construction and architecture students working together. The value of integrating multiple disciplines is supported by other architectural science educators including Nur and Oya Demirbilek (2007) who state that 'the responsibility for achieving an optimum outcome for any project lies with each and every member of a design team'.

While integration is recognised as one element of effective architectural science education, active engagement is as another critical component. In their teaching, Nur and Oya Demirbilek (2007) aim to achieve active engagement through student centred learning, arguing it 'enhances student learning, helps them to apply the information gained to design, and gives them a better chance to remember'. In addition to student-centred learning, real project applications with active community engagement can also enhance learning by showing the value of applied technical skills. In Australia, architecture curricula have recently shown a specific interest in Indigenous community engagement to improve student awareness and understanding of Indigenous cultures. However, educators have a responsibility to ensure that this engagement is culturally appropriate and that it also benefits partner communities.

With this increased interest, several recent research publications and guidelines outline protocols for conducting culturally appropriate Indigenous research, design and most significantly built environment education, all of which tend to echo each other. Most recently in 2020, the Australian Institute of the Aboriginal and Torres Strait Islander Studies (AIATSIS) published a *Code of Ethics for Aboriginal and Torres Strait Islander Research (2020),* which outlines 4 principles for research with Indigenous peoples. The principles include Indigenous peoples' right to 'self-determination' of research aims and approaches, 'leadership' in research activities that provide 'sustainable and accountable' 'impact and value' (AIATSIS, 2020). These principles are echoed in Kennedy et al's (2018) *International Indigenous Design Charter*, which calls for 'self-determination', 'deep listening', 'shared knowledge' and 'shared benefits' that are 'community specific'. In *Indigenous Knowledge in the Built Environment: A Guide for Tertiary Educators* Jones et al (2018) further reinforce these principles and suggest practical tools such as memorandum of understandings and action plans. The guide emerged from an earlier report by the same authors that identified 'within the built environment, there is a clear lack of discourse about the nexus between built environment professionals and Indigenous protocols and knowledge' (Jones et al, 2016). Although the authors cited some exceptions (Pieris et al, 2014; McGaw and Pieris, 2015; McGaw et al, 2015), all tend to adopt art or design-based architectural lens, rather than a scientific one.

Due to a lack of Indigenous engagement in architectural science publications, it is relevant to turn to built environment teaching initiatives that work with Indigenous partners to identify how interdisciplinary skillsets and scientific principles are applied. Several built environment educators across Australia, including Jock Gilbert, Michael Mossman, David O'Brien, Gini Lee, David Morris, Grant Revell, Paul Memmott, Shaneen Fantin and the Engineers Without Borders (EWB) Challenge deliver teaching programs with Indigenous community partners. The educators and their respective programs aim to deliver meaningful outcomes for Indigenous communities; however, the studios typically cater to architecture, landscape or planning disciplines, or in the instance of the EWB engineering disciplines only. Although many maintain ongoing partnerships throughout the design and build process, which necessarily encompass a project's scientific aspects, few adopt an interdisciplinary teaching focus. There is thus a need for further Indigenous-led teaching and research offerings that bring together all disciplines involved in a building project to achieve an optimum outcome. This approach is a central aim of the CKC Project, which shows it complements emergent Indigenous led research and teaching approaches in Australian architectural science education.

## 3. Methodology

To analyse and evaluate the subject a qualitative methodology linked to the Teaching and Learning Activities (TLAs) is adopted. In turn, TLAs are aligned with the intended learning objectives (ILOs) to ensure students gain a grounded understanding of remote building and participatory design practices. To ensure the ILOs were reflected effectively in teaching, three core TLAs were recursively tested:

1. Proposition: gained through analysis of pre-reading, lecture materials and guest speakers;
2. Collaboration: through the active participatory co-design with Olkola and engineering and architecture students to connect abstract theories by generating practical design responses; and
3. Reflection: through personal self-assessment via informal weekly feedback and two rounds of formal feedback at the concept and detailed design stage.

The combined analytical and generative nature of engineering design and construction strategies supports a 'by design' or 'design projection' approach that combines multiple methods. According to Swaffield and Deming (2012) design projection/ design research shifts the focus away from buildings as physical artefacts to a process–driven approach. This is generally used in practice-based studies across art, architecture and design but also has value in engineering and scientific disciplines. Design projection aims to produce new theories through a process of 'shift[ing the] focus back and forth between theoretical propositions and the empirical evidence' (Swaffield and Deming). The aim is the pursuit of 'whole' knowledge that according to McDonagh (2015) combines the 'true' scientifically provable, with the 'real' or experiential. Real knowledge also aligns with bottom up community development approaches such as action research and participatory design (Jenkins and Forsyth, 2010). This approach supports the generation of 'real' outcomes and allows for integration of multiple disciplines.

Concurrent with this generative teaching methodology is the analysis of the research process. To this end, semi-structured interviews and questionnaires were used with students and Olkola in the form of written reflections in a Folio of Feedback (architecture students), survey results (engineering students) and the Student Experience Survey (SES) undertaken in all subjects at semester's end. To ensure free, prior and informed consent of all participants the ethics approval outlines an agreement process with Olkola and students in terms of inclusion, ownership and authorship of work. This includes a voluntary student consent process to opt in or out of work being used by Olkola or in the research project. Survey results are deidentified to ensure student privacy. Names and images are only used with prior consent.

# 4. Subject Structure

To track key stages and activities, it is necessary to outline the subject's structure. The key stages were: 1) team organisation, 2) pitch and ballot, 3) concept and detailed design and 4) presentation to Olkola. At the subject outset these stages and the CKC project brief were provided to each student.

## 4.1 Team Organisation

The engineering students were organised into Engineering Teams (ET) of 4 or 5 students each with a member from a geotechnical, structural, transport, water, environmental or mechanical engineering stream. Each ET was assigned an Architecture Student Mentor (ASM) in the role of practicing architect to uphold the architectural concept in negotiation with the ET. The goal was to mimic a real construction project with a multi-disciplinary professional team. 8 architecture students had also undertaken the previous semester where they had spent time co-designing with Olkola on Country, so they further supported the new students to understand the CKC Project. The students from the previous studio continued to work up their designs to the next stage, while those joining chose a previous student's design to become the custodian of and make changes to. For the new students this emulated professional practice where project team members may change, but there is a shared conceptual vision.

## 4.2 The Pitch and the Ballot

Given there were only 15 architecture students for 65 ET, each ASM was assigned three or four ET. To allocate the ASMs to ET, the ASMs were asked to prepare a three-minute pitch presentation in the second week. After the ASMs pitched their designs, a ballot of preferences was conducted, and each ET was allocated an ASM to assist with developing the design and contextual knowledge of the project.

## 4.3 Concept and Detailed Design and Feedback

From Weeks 2-6 the ET worked up the conceptual engineering design strategies for the structure, water flows and treatment, transport, mechanical and environmental services with their ASM. With over 300 students enrolled in the course, two co-supervisory academic staff and a dozen voluntary professional mentors, organisation and oversight of the students was managed each week with a group lecture followed by workshop sessions in which the ET met with professional and architecture student mentors. In Week 7 the ET presented and received verbal feedback on concept design schemes from a panel of professionals and their ASM. As part of the folio of feedback task the ASM also provided both written and drawn feedback to their ET. The feedback aimed to identify conceptual strengths, changes needed for architectural concept alignment and construction detail sketches to assist in resolving details.

From weeks 7-12, the ET continued to work up their design schemes into detailed reports. Concurrently, the ASM worked with the ET to finalise a construction drawing set and development application report. Critically, in Week 7 Olkola chose a conceptual design and provided further written feedback about what they liked about the chosen proposal as well as aspects of other schemes they wanted to see incorporated into the design. Weekly informal feedback sessions continued during this time. In week 10, the ET submitted draft engineering proposals and reports to their ASM who prepared another round of written and drawn feedback, similar to that of the conceptual stage.

## 4.4 Presentation to and Exhibition with Olkola Traditional Owners

In week 12, the Civil Engineering Department invited Olkola to attend the final presentations and an exhibition of work. 5 ET were chosen to present their design to Olkola, based on the quality of their design report. The ET presentations also covered several different architectural designs and approaches to geotechnics, structures, water, mechanical services, transport and environmental engineering. This highlighted the diversity of ways the CKC Project was tackled and in turn provided TOs with rich data and design options to assist in their decision-making processes. The opportunity to present to Olkola also aimed to enrich ET understandings of the project and how it supports Olkola to connect with and live on Country. Following the presentations, an exhibition was held to showcase the collaboration to date, and the latest addition, the ASM development application reports and construction drawing sets. The exhibition also provided a more informal setting for the students and Olkola to exchange project experiences, which reaffirmed the collaborative ethos of the project.

# 5. Results

In this paper, the results are assessed through the lens of student feedback. For the ET this was provided individually in CATME and SES surveys at the end of the semester, whereas the ASM provided feedback throughout the semester in a Folio of Feedback. Although many common themes emerged in both student groups, it is worth discussing the engineering and architecture students separately to highlight their different experiences and how these relate to disciplinary background and/or the unit structure.

## 5.1 Engineering Student Feedback

Overall a consistent theme in engineering student feedback was that the unit was 'tough' and 'challenging', but despite the difficulty it was a 'rewarding', 'fun experience' that provided 'real life experience' and 'lasting memories and impact'. Three common themes emerged, namely the students: 1) valued the ASM collaboration despite different approaches, 2) found student-centred learning new but useful for applying theoretical knowledge and 3) valued the project and Olkola collaboration.

Engineering student feedback showed emphatic support for the ASM collaboration, because they 'loved the interaction' and were a 'most helpful' resource. Many explained specific benefits, such as '[the ASM] meets us every single week with feedback and suggestions constantly in all disciplines' and 'talk[ing] to our architect mentor face-to-face and their enthusiasm and willingness to achieve the same goal was invaluable'. From this, it is evident that communication and a shared vision benefitted the ET however, the ASM collaboration was not always easy. A common complaint was 'the architect made last minute changes…which required us to also make changes, creating delays'. While some suggested remedying the problem by finalising the architectural designs 'well before the detailed design phase', many acknowledged, 'I also believe this accurately emulates the workplace'. Overall the experience was seen as valuable, such as 'working on a real project with architects allowed me to gain an appreciation for projects in the real world…and where engineers fit in the project lifecycle'.

The feedback also showed that student-centred learning was new for the engineering students who remarked that significant 'self-learning' and 'motivation' was needed in the subject. To this effect, a key theme observed was exposure to a professional 'way' of working. One student suggested this was achieved by 'this unit pushes to summarise the knowledge I have learnt for the last three years and connects it into a system…[as] a kick start or warm up for my career by creating a real project working system'. This systemic view is reinforced by another who states, 'moving away from the theory and closed-ended solutions of previous courses into applying those in design solutions for open-ended problems' showed 'the multi-disciplinary nature of a project and how everything is linked'. While many viewed this as good preparation for their professional working life, some found the approach 'stressful', 'a lot of work' and 'anxiety' inducing. This is perhaps reflective that the unit, unlike other engineering subjects, was less focused on delivering technical knowledge, instead consolidating understandings through application, which suggests students lack exposure to this higher order thinking in earlier years.

Engineering student feedback showed support for the CKC Project, with many drawn to working with Olkola and the project's real-world relevance. While many students explained the value of working with Olkola, such as 'we got the opportunity to present to Olkola, which I think was really really important and nice to have their feedback, because at the end of the day they've been kept in our minds throughout this whole process and that is who this work is for so [it] was definitely a highlight'. It was more common for engineering students to value the project's practical significance, such as 'it was really cool to be working on a real–world project with actual consequences.' Others struggled to identify the relevance of a remote project focused on local renewable construction materials like timber and earth to corporate work, such as 'applying the unit to a more realistic project would be ideal. Using real industry materials such as concrete or steel would have been really beneficial'. This difference could be attributed to the core requirement for all final year engineering students to take the subject.

## 5.2 Architecture Student Feedback

In contrast to the engineering students, ASM Folios of Feedback documented experiences throughout the semester. The ASM feedback provides a counterpoint to engineering student experiences and highlights differences in communication styles, learning approaches and design iteration. Key overall themes were: 1) varied experiences of working with ET depending on the collaborative approach, 2) frustration at ET lack of drawings, 3) the importance of negotiation, 4) the value of engineering in design resolution, 5) comfort with self-directed learning and 6) resonance with the project purpose.

The ASMs tended to establish rapport with the ET because their scheme was chosen in the ballot. The ASM who received the most ET first preferences tended to share: 1) structurally straight-forward designs, 2) friendly pitch presentations that invited collaboration and 3) clarity on work needed. For ASM who received few or no first preferences there were two discernible albeit often separate trends, either: 1) the design seemed highly complex and difficult to resolve, or 2) the student made a 'sales pitch' as if to a client rather than seeking to mutually engage. This difference in approach of director versus co-collaborator continued to influence ASM and ET dynamics throughout the semester, with those who took on board the latter approach generally reporting greater satisfaction than the former.

Although the management/collaboration style influenced ASM experiences differently, other experiences were universally shared. Most ASM relayed feeling 'frustrated', 'annoyed' and 'disappointed' at the lack of ET drawings. One student stated 'it became apparent from early days that engineers work very differently to architecture students…they don't produce drawings frequently which made it hard to review their work/design changes'. Some identified alternative ways to progress the collaboration. For instance, one student trialed using an ipad to collaboratively work up sketches, explaining 'I realised the ipad would be good to use so we could draw over any work I'd done'. Another moved away from drawings to other 'methods to help generate ideas such as asking teams to mind map how to achieve their project objective'. Many expressed a renewed appreciation for drawings, such as 'it really highlighted to me the power and importance of drawings [as] an effective communication tool'.

The collaboration also highlighted the importance of regular communication and negotiation. One student stated, 'an integral part of working well as a team is continual communication', this was reinforced by another who stated 'the communication methods were the more challenging and interesting aspect…I learnt that the way you have to explain projects to people outside of the architecture industry/education, is fundamentally different…there is a tendency to pitch a project as if addressing a client. I found this methodology does not work effectively when trying to collaborate'.

The ASM expressed appreciation for exposure to different engineering disciplines citing it also improved their designs. Structural engineering was commonly cited as the most valuable discipline, with one student explaining 'due to me learning how lateral loads, wind loads and connections, work within a structural system'. Another elaborated 'working with the engineers helped me resolve a lot of the connection details…The engineers were able to explain a lot to me about how these work…this has definitely had significant [design] implications.' Many also cited being 'surprised' to learn about the potential of other engineering disciplines. One student remarked, 'the most surprising and now my favourite is water engineering. These engineers think about structure too but also rainwater collection, storage, pumping, sterilization and irrigation.' Another found mechanical engineering of greatest benefit, explaining '[they] have opened my eyes to services design and really how fundamental this is to allow a building to actually be built and functional.'

In comparison to the engineering students, ASM emphasised the CKC Project's importance, citing their involvement as a 'custodian[ship]', 'investment' and/or a 'responsibility'. One student explained 'I responded to the unit as a student, a representative of an idea/ongoing project, and as a friend to those involved in the project Olkola'. Another echoed this interest stating, 'learn[ing] about Aboriginal Land Rights and tenure structure helped me understand more about the Olkola people gaining back their Country'. The ASM who joined the unit also expressed strong connections with the conceptual vision of the designs they became custodians of and how they could contribute to refining them. One student stated, 'I am thankful to become custodian of a project rich in values which will generate a sustainable future on Country, and grateful for [the former student]'s initial guidance on what she wanted to see retained.' This feedback highlights the importance of student choice in establishing connections with a project. The incoming ASM chose the scheme they wanted to carry forth, and the ET chose an ASM in the ballot. As a group, the ASM perhaps resonated more with the project due to it being an elective, as opposed to the engineering students for whom it was a core requirement.

Finally, in contrast to engineering, the ASM seemed more comfortable with self-directed learning, perhaps due to the more open nature of the course. Overall, the feedback showed the relationships formed were the most valued outcome. A student who undertook the CKC Project across three consecutive semesters articulated the impact '[The CKC Project has] helped me consider how I think about those who are actually using the environments we are dealing with and gaining a better understanding of the people involved. It's honestly as simple as that. Understanding that communication more so and developing the relationships with people involved'.

# 6. Contribution

Student feedback results help to identify how the unit's interdisciplinary TO led approach contributes benefit to 1) students, 2) architectural science education, 3) Olkola TOs and 4) the CKC project.

The collaboration exposed students to different ways of thinking, the need for compromise and it highlighted that the best results come from intractable problems, which no discipline can solve on their own. Student solutions were challenged by other disciplines and hence needed to be well justified, showing the importance of making mistakes in order to learn. While ASM were frustrated by ET wanting to finish the project early and ET were similarly frustrated by ASM changing their mind frequently until the last minute, both groups shared education outcomes in better understanding how elements come together to form a whole project with a client group, conceptual vision and design resolution. For ASM this clarified the reality of what is possible, and it pushed ET to think beyond risk adverse designs.

Further to the professional outcomes, the students were also exposed to Indigenous cultures and the challenges of living on Country in remote Australia. For many the unit was their first exposure to working with an Indigenous group. This got students thinking about how they could apply their professional skills beyond economically commercial projects to also value social and cultural dimensions, and in doing so contribute to what civics educator Krinks (1999) calls 'active citizenship'.

Building an active citizenry of technical practice in students translates directly into lessons for architectural science education. The collaboration highlighted the advantages of working on a real-life applied project over multiple semesters with assessments tailored to community needs and the project stage. In line with Cowan's (1963) assertion, it also showed the advantages of bringing students nearing graduation together to draw on their existing and different technical disciplinary knowledges in preparation for practice. These findings also align with Demirbilek and Demirbilek (2015) student centred learning advantages of deep learning, high levels of engagement and independent enquiry.

The unit shows that a TO led approach contributes to a truly reciprocal exchange by creating opportunities for learning about Indigenous culture and engaging students through the application of their technical skills and expertise that also deliver practical project outcomes that benefit Olkola TOs. This showed that several factors need to be aligned to establish a TO led integrated subject, namely:

- The will of the faculty Head of Departments involved;
- An established and ongoing relationship between the university and a community;
- Flexibility to make contingencies (such as if delays occur in the feedback loops);
- Responsive assessments to TO identified needs, the project stage and with relevant disciplines;
- Adaptive engagement processes in line with the changing demands of a project.

The unit has made practical contributions to the CKC project, which has been passed on to Olkola. ET work presented multiple options of structural, water, services, environmental and transport proposals that combined with accompanying visualisations, aided design resolution discussions. ASM construction sets furthered CKC concepts and helped Olkola choose a scheme. These contributions informed the preparation for construction, by assisting with: 1) finalising and certifying the design and engineering drawings, 2) funding applications and 2) the staging and construction methodology. The development application has since been submitted (2020) with minor amendments to the ASM reports and construction sets. Although student work does needs further resolution, which highlights the limited contribution it can make to a real project, the breadth of research, visualisation and presentation options has significantly enriched the quality of the Olkola collaboration and project outcomes.

At the end of the semester, the OAC best summarised the benefits of the collaboration stating: 'Olkola are proud to be undertaking the [CKC] Project in partnership with Hannah [, Pippa] and Monash University. Having only been back on our traditional lands for 5 years after being displaced, this building project means our research, cultural knowledge and people have a home On Country where we can share our story if we choose. We hope that by undertaking this project, we can show other Traditional Owner groups that building strong relationships with positive outcomes is a possibility for our people and hopefully others can follow in Olkola's footsteps and undertake a [CKC] Project too' (OAC, 2019).

# 7. Conclusion

The collaboration drew upon all architecture and engineering skills students had acquired during their university careers to undertake a complex integrated, open ended design project as part of a multidisciplinary team. This real-world project closely modelled the type of work expected of a professional architect and/or engineer working in a project team. The problem-solving and design approach taught in the subject equipped students with new modes of critical thinking and decision-making that can be directly applied to the complex, systemic and interconnected nature of the real world. While students perceived this approach and the follow through and inquiry that it required as tough and challenging, ultimately, this study shows that applying learnings to a real-world project with genuine TO leadership helped to engage students. The outcomes have helped Olkola to practically progress the CKC towards construction. The integration of the disciplines and active input of Olkola highlights the importance of communication in architectural science education, something Cowan (1963) asserts is 'clearly desirable if a proper understanding of the contribution which each can make to the work of the other is going to be achieved'.

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