AAEE Award for Engineering Education Engagement

A Journey in First Nations Engagement:
A Decade of Transformation in Engineering Education

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At Budj Bim

Introduction

My name is Juliana Kaya Prpic, and I am honoured to nominate myself for the AAEE Award for Engineering Education Engagement. As an Associate Professor at the University of Melbourne (Education Specialist—Indigenous Engagement and Education), I have been at the forefront of First Nations engagement in engineering education for the past decade. My ongoing commitment and leadership have driven initiatives aimed at achieving parity, integrating First Nations perspectives into engineering curricula, co-developing research projects, engaging engineering educators and transforming engineering education.

The Australian Context

Aboriginal and Torres Strait Islander peoples have long endured the consequences of European colonisation, including conflict, dispossession of lands, and cultural oppression—persistent and often under-recognised aspects of Australian history that continue today. In the engineering profession, Indigenous representation remains alarmingly low, with First Nations engineering graduates comprising less than 0.01% of the cohort compared to approximately 3% of the general population (ACED, 2020).

This disparity highlights the critical need for addressing two significant challenges expressed in the Federal Government's Indigenous Higher Education Review: achieving parity for First Nations students in engineering education and embedding Indigenous knowledge systems across the curriculum to develop respect for Indigenous knowledge, cultures, and values (Behrendt et al, 2012, Universities Australia, 2022). Since I began this work, there has been a growing shift from perceiving First Nations people as 'lacking' in engineering knowledge to recognising their culture as an enduring and knowledgeable civilization (Kutay et al, 2023, Stephensen and Cunningham, 2023). However, integrating Indigenous perspectives in engineering education remains challenging. Key obstacles include acknowledging the relevance of Indigenous knowledges, understanding Indigenous community needs and priorities, and building sustainable relationships with communities (Goldfinch et al., 2017; Hollis & Goldfinch, 2017).

My work since 2013 has been instrumental in addressing these challenges and creating lasting change in engineering education. This document outlines my journey from 2013 to the present, highlighting key initiatives that showcase a comprehensive approach to inspiring First Nations students to undertake study in engineering, engaging First Nations people and engineering educators in integrating Indigenous perspectives, knowledge, and practices into engineering education and research with the aim of decolonising and Indigenising the engineering curriculum.


On-Country at Ankerre Ankerre with Peter Renehan, CEO Centre for Appropriate Technology

Approach and Chronology of Engagement Initiatives

Embedding Indigenous perspectives—Research project (2013)

My work began with an invitation by A/Professor Tom Goldfinch to join a team on a project entitled Embedding Indigenous perspectives into Engineering Education (Goldfinch et al, 2016). The key outcome of this project is a model for incorporating First Nations perspectives into engineering education (Kennedy et al, 2016, see: https://ro.uow.edu.au/asshpapers/122/). This model addresses several important aspects:

1. ***Start with a new philosophy:*** The model recognizes the need to shift from a deficit-based approach to one that highlights two-way learning and knowledge exchange.
2. ***Explore multiple perspectives:*** It emphasises the importance of considering the intersection of dominant, disciplinary (engineering), and Aboriginal perspectives.
3. ***Consider and validate Aboriginal perspectives:*** The model outlines key concepts in First Nations worldviews - Country, Kinship, Culture, Journey, and Connectedness.
4. ***Engage with community:*** It provides a guide for engagement through the "5 Rights" - Right People, Right Place, Right Language, Right Time, and Right Way.
5. ***Tailor the learning environment:*** The model suggests focusing on Content, Way, and Experience to create an effective learning environment.

This project led to significant engagement with engineering educators through a workshop series presented at the AAEE Annual Conferences (see Attachment). It also earned the 2016 Best Paper Award at the prestigious SEFI Conference, the leading European engineering education event, held in Finland https://www.sefi.be/2017/07/09/sefi-2016-annual-conference-best-papers/.

National Indigenous Engineering Summit (2015)

The National Indigenous Engineering Summit , held in 2015, and in which I played a major role, laid the foundation for my subsequent initiatives. This landmark event:

1. Brought together diverse stakeholders including academic engineering teaching staff, other educational providers, representatives of the engineering industry, engineering professional bodies, not-for-profit organizations, and policy leaders.
2. Aimed to develop strategies for creating and supporting pathways to assist Indigenous Australians into the engineering profession.
3. Resulted in 21 recommendations across four key areas: a) Pathways and Accreditation b) Student Support c) Adaptations for Schools of Engineering d) STEM Education
4. Set a long-term vision of achieving parity in engineering graduations by 2030.

The Final Report is available at: https://shorturl.at/Haunm

The key outcomes of the Summit included the establishment of the Victorian Indigenous Engineering Winter School (VIEWS); formation of an Indigenous Engineering Special Interest Group with Engineers Australia; identification of critical research areas in Indigenous engineering education, and (after 10 years) the bringing together of engineering educators and First Nations engineers for an Indigenous Engineering Symposium(2023). This will now become an annual event with another National Indigenous Engineering Summit planned for November 2025.

Victorian Indigenous Engineering Winter School (VIEWS)

Building on the recommendations from the 2015 Summit, I secured funding to establish VIEWS in 2016 as a collaborative venture between the University of Melbourne, RMIT University, Swinburne University, and Monash University aimed at providing a holistic approach to introducing engineering to Years 10-12 First Nations students. See: https://eng.unimelb.edu.au/engage-with-us/indigenous/views

The philosophy underpinning the program addresses five key areas:

1. *Explore four universities* to experience different university options available.
2. *Meet First Nations engineers* and speak with First Nations engineering students.
3. *Discover pathways to engineering* to align with individual needs.
4. *Experience the work of engineers* through hands-on workshops aimed to develop the problem solving and design skills used every day by engineers and industry site visits such as BARPA, ARUP, Melbourne Water, Melbourne Star and Metro Trains Melbourne providing insights into the global challenges that engineering can address,
5. *Engage in cultural activities*, led by Indigenous Support Units and Indigenous Elders.


Students at VIEWS

Over 250 Indigenous students from across Australia have participated in VIEWS, many of whom have gone on to study engineering.

VIEWS was nominated as a Finalist in the 2022 Eureka Prize for STEM inclusion (see: https://shorturl.at/tZoSI), and received the 2021University of Melbourne Award for Excellence in a Priority Area (see: https://shorturl.at/bnwiG).

Budj Bim on-Country Learning and Research

This project marks a significant milestone in my engagement with First Nations people, culture, knowledge, and practices. Since 2017, I have built a strong relationship with the Gunditjmara community to establish a collaborative partnership that is grounded in Country and weaves together together western 'engineering' and Indigenous 'ingenuity' to co-design, co-develop and co-deliver a multi-faceted, multi-dimensional and multi-relational learning experience in engineering education.

Our story began with a meeting on-Country at the Budj Bim National and UNESCO World Heritage Cultural Landscape, where we could share an idea and an ideal, an imagining of a shared learning, and circumambulate the question: "What learning, for whom, and why is it important?".

Working in an emergent and iterative way that involved deep listening, discussion, reflection, researching, experiencing, learning, and trusting that all will come together in a meaningful way, and building on the model developed in the *Embedding Indigenous Perspectives Research Project* (see above), we evolved a framework to guide our engagement process. Our framework embraces five key principle—philosophy, place, people, projects, and practice—each of which informs and influences the other four (Prpic & Bell, 2022—https://figshare.com/s/70741c6ac689fca1b632):

1. ***Philosophy***, which:
   - Emphasises the importance of understanding different worldviews and develops a clear understanding of who we are and what we bring to the relationship.
   - Highlights the contrast between western engineering approaches and Indigenous ingenuity
   - Encourages us to question, explore and reflect on individual and collective philosophies, values, attitudes, culture, knowledge systems and unconscious biases and how these shape ontology, epistemology, axiology, praxeology and pedagogy.
2. ***Place***, which:
   - Creates time and space to "listen to the land" (Uncle John Lovett) and invites us to engage with 'local and cultural phenomena as a focus of learning' (Smith, 2002).

- Experience that "Indigenous knowledge practices are ecological encounters of profound ethical relationality that acknowledge the act of living in place as a site of learning how to be in place" (Kelly, 2020, p. 186).
- Emphasises the importance of Country for First Nations people—Engagement on Country is essential for any attempt to decolonise the curriculum.
- Provides opportunities to learn about the oldest and most extensive engineered aquaculture system in the world, the impact of colonisation, traditional and contemporary practices of sustainability and land and resources management, Gunditjmara knowledge of aquaculture systems, climate change, hydrology and ecology and current cultural renewal practices where traditional, new and emerging technologies contribute to the healing of Country.

3. ***People***, which:
    - Embraces attitudes of respect, relevance, reciprocity, responsibility, and relationality.
    - Embodies our commitment to openness and inclusion that is at the heart of our philosophy
    - Brings together two communities. Gunditjmara Elders, Rangers and community members and The University community which now includes four cohorts of students—foundation year Indigenous students enrolled in Bachelor of Science Extended program, third year students enrolled in the subject Indigenous Engineering and Design, final year Master of Engineering students.


Students at Budj Bim with Tyson Lovett-Murray

4. ***Projects,*** which*:*
    - Are community-led and form the cornerstone of our partnership.
    - Are co-designed to meet learning outcomes and contribute to ongoing cultural heritage learning.
    - Include water quality monitoring, plant regeneration programs, and geospatial landscape mapping.
    - Have led to major collaborative research projects funded by both the ARC and the University (see the list of grants in the Attachment).

5. ***Practice,*** which:
    - Is an interplay of philosophy, place, people, projects and embodies the emergent, relational and collaborative learning experience.
    - Involves several critical aspects that take the learning experience beyond the usual university educational structures and embody the emergent, relational and collaborative learning. These include orientation, taking time to relate, cultural heritage awareness, and reflective practice.

Our partnership was awarded The University of Melbourne 2022 Excellence Award for Place-based Initiative (see: https://shorturl.at/9gD9t) and the 2023 Engagement Australia Award for Excellence in Indigenous Engagement (see: https://shorturl.at/5luYL and for a short video see: https://shorturl.at/Nd7h2)

Listening to the Desert Program

This initiative represents a comprehensive and evolving approach to First Nations engagement, extending across diverse contexts and communities. The Program engaged engineering educators and the Faculty executive in a 4-day immersive on-Country experience in Central Australia. The intention was to foster relationships with the Mparntwe peoples and Desert Knowledge Australia and deepen commitment to, and understanding of, the complexity of First Nations culture and the engagement required.

This approach also completes a critical cycle—from inspiring students through programs like VIEWS, to community learning and research collaborations at Budj Bim, and now integrating First Nations perspectives at the highest levels of engineering education and practice.

Structured with daily themes, the Program immersed participants in core concepts essential for engaging with First Nations peoples and their knowledge in an engineering context. Themes included *What is Indigenous Engineering?*, *Connection to Country*, *Relationship to the Sacred*, and *Implications for Engineering Education* (See: https://shorturl.at/oUfos).

> *"I was sceptical and now relieved and pleasantly surprised at everyone's commitment. I feel more connected to the Faculty's mission."*
>
> ~ Listening to the Desert participant

This thematic approach enhanced focus and reflection, encouraging a deeper understanding of and engagement with First Nations worldviews and their relevance to engineering. Through our shared experience in the *Listening to the Desert* Program, we have strengthened our collective faculty narrative and begun to mirror Indigenous values of relationship and mutual support. This alignment allows us to commit to a shared responsibility and work collaboratively toward reconciliation and the decolonisation of the engineering curriculum. Our partnership with the Mparntwe peoples of Desert Country is particularly significant, as it offers profound opportunities to engage with the diversity of both Aboriginal peoples and place, fostering deeper connections and insights that shape our teaching and practice.

This initiative has led to a university funded project entitled: *Healing Country, Healing People: Restoration of Ankerre Ankerre (Coolabah Swamp)* which has engaged capstone students. Inspired by the success of this Program, I am also working with Peter Renehan and other First Nations engineers to design and develop an on-Country learning experience for engineering educators, engineering practitioners and Engineers Australia. By involving Indigenous engineers like Grant Maher and Josh Loyd, we are moving beyond outreach and community collaboration to include Indigenous voices in leadership and decision-making roles within the engineering profession.

Conclusion: A Comprehensive and Evolving Approach

Over the past decade, my journey in First Nations engagement within engineering education has evolved from initial awareness-raising efforts to comprehensive curriculum changes. This sustained commitment since 2013 has involved diverse stakeholders, including First Nations communities, students, engineering educators, engineers, and industry partners.

My approach integrates First Nations perspectives across multiple aspects of engineering education, prioritising both immediate changes and long-term transformation. It is grounded in reciprocal relationships with First Nations communities and knowledge holders, focusing on two-way learning and meaningful knowledge exchange.

Moving forward, I remain committed to deepening engagement with First Nations communities, further integrating Indigenous knowledges into our curriculum and research, and contributing to a more inclusive and culturally responsive engineering profession. This ongoing work requires constant reflection, adaptation, and growth.

While challenges in embedding First Nations perspectives in engineering education are significant, so are the opportunities. By fostering inclusivity, challenging traditional worldviews, and meaningfully embedding First Nations knowledge systems, I can contribute to creating a more equitable and innovative field that better serves all communities.

This transformative journey is complex and iterative, requiring patience, humility, and a willingness to learn. I remain committed to this vital work, recognizsing its importance for First Nations students, communities, and the future of engineering as a whole.

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Committed to First Nations engagement —at Standley Chasm, Mparntwe, Central Australia