

Seeding new SPACEs: Six principles to guide reflection as we embed Indigenous perspectives into engineering courses

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ABSTRACT

CONTEXT

Embedding Australian Indigenous perspectives into a course or program is as much about the ‘way’, as the ‘why’ and ‘what’. Course convenors have a wide range of levels of experience, familiarity and understanding of Indigenous perspectives. Colleagues whose cultural backgrounds and countries of origin vary, bring further diversity to the way embedding Indigenous perspectives may be approached or valued. The approach adopted to embed Indigenous perspectives into our large first year engineering course was adapted from “Embedding Indigenous Perspectives into Engineering Education” and related publications (Goldfinch et al., 2016; Kennedy et al., 2016).

PURPOSE OR GOAL

This practice-based paper distils the principles that worked well for us in embedding Indigenous perspectives into a large first year engineering design course, with an aim to offer these as points of reflection for colleagues seeking to embed Indigenous perspectives into their own courses.

APPROACH OR METHODOLOGY/METHODS

The authors used a process of yarning outside of course time to build a relationship of trust and a safe place to reflect. Through this dialogue, general principles emerged that related to the ‘way’ we were doing things that complemented the ‘why’ and ‘what’ we were doing. As we entered into new relationships with colleagues seeking to embed Indigenous perspectives into their courses, we found the principles useful to guide the creative implementation process.

ACTUAL OR ANTICIPATED OUTCOMES

Six principles are outlined in this paper as a starting point for colleagues seeking to embed Indigenous perspectives. These principles are about seeding the right SPACE for learning and engagement, underpinned by positive and trusting relationships.

- Principle 1: **Safe space** – for supportive and uncomfortable conversations.
- Principle 2: **Privileging Indigenous voices** – listening, not speaking on behalf of.
- Principle 3: **Authentic assessments and activities** – integrative not add-on.
- Principle 4: **Contemporary view of Indigenous engineering** – not only historical.
- Principle 5: **Engaging a spirit of curiosity** – we are all learning.
- Principle 6: **Relationships** nurtured over time – underpinning all principles.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

These six principles serve to provide those seeking to embed Indigenous perspectives into their courses or programs with a starting point and ‘way’ forward. The sixth principle of relationships supports the other five principles in a pervasive way. Relationships may include relationships with other educators who have experience embedding Indigenous perspectives, relationships with Indigenous engineers and networks within and external to the University, to be nurtured over time.

KEYWORDS: Indigenous engineering, community or practice, principles of practice

Introduction

Incorporation of Indigenous perspectives is one part of creating greater diversity and resilience with engineering with benefits for engineering as a whole. Indigenous knowing interacts with Engineering knowing to create engineering structures, processes and products that are quite unlike similar outcomes of Western thinking (Leigh et al., 2014). In Australia, we have a moral and ethical obligation to redress the underrepresentation of Indigenous perspectives within engineering as part of deepening reconciliation and relationships between Indigenous and non-Indigenous Australians. Indigenising the engineering curriculum benefits all students: Indigenous students, non-Indigenous students and the engineering discipline as a whole (Friesen & Herrman, 2018; Prpic & Bell, 2018; Campbell et al., 2020; 2022). Indigenous perspectives enrich engineering culture including: An Engineering Way of Thinking, An Engineering Way of Doing, Being an Engineer, Acceptance of Difference, Relationships, and Relationship to the Environment as defined by Godfrey and Parker (2010). Engineering is a “principled” discipline, with a code of ethics outlining a clear code of conduct where sustainability and the respect for the dignity of all persons is highlighted alongside technical ability and leadership (Engineers Australia, 2019). Indigenous engineering principles enable engineers to extend our code of ethics further to include practices of working with Country in a way that enacts our human custodial role of caring for Country (Leigh et al., 2014).

Engineers Australia, the peak body representing the engineering profession, has highlighted a need for greater Indigenous participation in engineering education and professional practice (Engineers Australia, 2011). There is often a general awareness amongst colleagues and Universities that there is value in incorporating Indigenous perspectives, but they may be unsure how to do it (Friesen & Herrman, 2018) or coming from a low base of knowledge and experience (Goldfinch et al., 2017). Several frameworks for embedding Indigenous perspectives into curricula have been created to guide academics to participate in enhancing Indigenous Cultural Competency and to consider appropriate participation and engagement with Indigenous communities (Kennedy et al., 2016, Universities Australia, 2011). Underpinning these frameworks are principles that guide implementation including a strengths-based not deficit view of Indigenous contributions, an emphasis on two-way knowledge sharing and engaging with Aboriginal communities in the ‘right’ way (Kennedy et al., 2016). It is also essential to adopt a reflective approach to embedding Indigenous perspectives that enables personal development through sharing (Kennedy et al., 2016; Campbell et al., 2022). This paper is our investment both in time and in the relationships with colleagues that we hope continues to inspire and nourish this process.

Purpose

This practice-based paper aims to distil the principles that we found worked well for us in embedding Indigenous perspectives into a large first year engineering course (Campbell et al., 2020; 2022), with an aim to offer these as points of reflection for colleagues who may be seeking to embed Indigenous perspectives into their own courses and programs. We present six principles for consideration and also provide questions that can be used to guide reflection and course evolution.

Approach

The teaching team met weekly both in developing the teaching resources one month before teaching started and over the 12-week teaching term to reflect on our experience of the course using a yarning methodology. As we developed and delivered the course and reflected on our experience, certain principles and intentions were implicit in our approach, and as the teaching term progressed these same principles were viewed from new angles and evolved further through our practice. Our weekly discussions were typically 2-3 hours long beginning with casual remarks, getting down to business and circling back and making new connections to our opening conversations. Many of these conversations were co-creative and generating of new knowledge and understanding that we acknowledged and took notes of as part of our journey.

Outcomes

Principle 1: Safe space (for supportive and uncomfortable conversations)

As we grapple with creating authentic curriculum, and what that means, and how best to take a contemporary view of Indigenous engineering, and how to position that appropriately, we will inevitably have questions and potentially move in and out of uncomfortable and comfortable conversations. It is important that academics are appropriately supported within safe spaces (physical and psychological) for dialogue, discussion and learning outside of the course learning environment. For example, we found forming a community of practice that met weekly during periods of active course development and delivery useful. Where possible this would include Indigenous mentor/s and other teaching team members with experience integrating Indigenous perspectives who could offer feedback and guidance. However, it is essential that excessive pressure is not placed on Indigenous colleagues or teaching members to participate or perform this role. Both a community of practice and a classroom can be a safe or an unsafe environment for anyone, but particular care needs to be taken towards the safety of Indigenous staff and students (Campbell 2022, Campbell & Chang 2021). It is worth checking-in with your teaching team about their experiences and reflecting on the experiences of students both Indigenous and non-Indigenous within the course, with a view to being adaptive to circumstances and the needs of individuals. There is a balance to maintain between creating a space where dialogue is free and open, and also ensuring that everyone is comfortable and safe within the space. Modelling of respectful, professional and open communication by the teaching team can elevate student conversation to a similar level and 'way' of being that assists the creation of a safe environment. Importantly, we also tailored the learning environment to provide resources and support for students to explore at their own pace outside of the classroom, allowing learning to evolve for the individual within a safe environment (Campbell et al., 2020; 2022; Michael et al., 2019).

Principle 2: Privileging Indigenous voices (listening, not speaking on behalf of)

A focus on the privileging of Indigenous voices is essential for the embedding of Indigenous perspectives and supports development of Principle 3 – Authentic assessment and activities. Through privileging Indigenous voices, we also provide opportunities for all staff and students to engage in listening, rather than speaking on behalf of, which sparks Principle 5 – Engaging a spirit of curiosity and further supports the creation of Principle 1 – Safe space. In doing so, we take a strengths-based not deficit view of Indigenous cultures and communities where the value of Indigenous knowledge and perspectives within engineering is emphasised (Goldfinch & Kennedy, 2013; Kennedy et al., 2016). We had an Indigenous staff member as part of the teaching team, who facilitated and lead our design discussion panels, design debriefing and was able to highlight for students, areas where they could improve their cultural competency and communication. In development of case study resources to support student design projects, this staff member highlighted the importance of acknowledging the diversity of Indigenous voices and perspectives across Aboriginal and Torres Strait Islander Nations and using content (videos, articles etc) that were authored or created by Indigenous people centring their voices and perspectives (Campbell et al., 2020; Campbell et al., 2022). Sensitively curating resources that have been approved by Indigenous people is essential, but further engagement with local communities is needed to ensure that the information presented is not unintentionally offensive due to factors we may not be aware (Kennedy et al., 2016). As we continue to evolve the course and these resources further, we will further seek peer-review of the resources curated from other Indigenous researchers and educators.

Principle 3: Authentic assessment and activities (integrative, not add-on)

We discussed within the safe space created (Principle 1) the need for Indigenous perspectives to be embedded authentically within the course, which aligns with the fourth element of Goldfinch et al. (2016) "understanding and articulating the relationship between Aboriginal world-views and the engineering method". Authentic learning is a means for students to develop robust knowledge that

can be transferred to the real-world (Herrington et al., 2014). This meant that the assessment could not be perceived by the students as separate from the course, rather as an integral part (Friesen and Herrmann, 2018). Using our design course as an example (Campbell et al., 2020; 2022), Aboriginal and Torres Strait Islander people were positioned as the users of the design and were therefore central to all considerations as 'users' and 'stakeholders'. Essentially, if students were to achieve excellence in their design outcome and process, they would have needed to invest time into exploring and understanding Aboriginal and Torres Strait Islander perspectives. Otherwise, their design would not be 'user-centred' or 'fit for purpose'. We found that authentic assessment needed to be supported by authentic modelling by course staff of an engineering 'way of being' that is inclusive of Aboriginal and Torres Strait Islander perspectives, otherwise, the authentic assessment can be eroded. The teaching team, for example, provided an Acknowledgement of Country in the first studio without referring to this as a teaching or learning activity and we found that 90% of students modelled this behaviour in their own presentations. The industry guest 'clients' who come into the course to provide feedback on the student designs and presentations have experience working with Aboriginal and Torres Strait Islander communities within a design context and can offer authentic guidance and suggestions to make the student presentations more user-centred (Michael, 2019). This demonstrates to students that the inclusion of Aboriginal and Torres Strait Islander perspectives is a way of being for a contemporary Australian engineer. It is essential that these experiences are closely linked to the outcomes of the course, and to assessment. If marks are attached to the assessment, the apportionment of marks needs to reflect the value of these perspectives as marks often represent for students the value currency. Authentic therefore means to us that Aboriginal and Torres Strait Islander perspectives are positioned centrally within the assessment activities that are integral to the course as well as within the 'way of being' modelled by engineering professionals within the course (Michael, 2019).

Principle 4: Contemporary view of Indigenous engineering (not only historical)

There can be a tendency for those with no exposure to Aboriginal and Torres Strait Islander peoples or worldviews to take a historical view. However, it is essential that in engaging with Indigenous perspectives that we recognise past contributions, the continuity of those contributions and the present value of these contributions in the current contemporary engineering context. This helps us collectively de-colonise engineering and create greater resiliency within the engineering profession through consideration of diverse perspectives. It also creates greater resiliency of our technical work through better positioning of the intention of that work within the continuity of knowledge and within the time and space it exists, particularly with regard to landscape. Using our design course as an example (Campbell et al., 2020; 2022), case study resources were created on a variety of topics where modern and historical examples of Aboriginal and Torres Strait Islander engineering, innovation and ingenuity were presented to demonstrate the continuity of contribution and value of Indigenous engineering across Australia. Importantly these case studies were authentic in that they related directly to the design challenges that the students had been given even if they did not relate to the specific location and context. For example, students designing a Keeping Place to store Aboriginal and Torres Strait Islander artefacts in Cape York could look at recent examples of similar Keeping Places created in other parts of the country. This promoted a contemporary perspective for our students of Aboriginal culture, although there were still one or two instances where students' early design presentations included historical pictures of Aboriginal people in Cape York that were inappropriate to the current context or users of their designs. This enabled some fruitful discussion and these historical representations were not repeated in the students' final designs.

Principle 5: Engaging a spirit of curiosity (we are all learning)

Approaching the work with a beginner approach, creates the potential to explore new perspectives with curiosity and supports development of Principle 1 – safe space and also provides a useful approach towards Principle 2 – Privileging Indigenous voices. We all come from different cultural backgrounds, with different levels of experience and exposure to Indigenous perspectives. We found it helpful to engage a spirit of curiosity within the classroom and an attitude that we are all

learning – unless in the case someone has authority or permission as a Traditional Knowledge custodian – as most often academic efforts to embed Indigenous perspectives are coming from a small base of knowledge and experience (Goldfinch et al., 2017). This principle assists academics to place themselves within the community of learners within the classroom rather than acting as the repository of wisdom, and similarly reduces any pressure on Indigenous students or teaching team members to play any special role. This is an easy relational way to setup within the studio or tutorial environment, where the relationship between the teaching team and students is less hierarchical and more collaborative, but the ‘spirit of curiosity - we are all learning’ can be applied in any setting. It is important to note that Aboriginal and Torres Strait Islander people are always stakeholders within the learning community whether or not there are Indigenous students or academics within the classroom. This vantage assures that the spirit of curiosity is applied in a way that is based on genuine engagement and respect for Indigenous perspectives and their application within engineering. Creating a space of learning, curiosity and exploration assists with creating a safe space for constructive dialogue and gentle correction if needed. Reflexive practice is an essential component of this. For example, in addition to in-class discussion, we provided students with a workbook they could complete in their own time which prompted a spirit of curiosity in the line of reflective questioning (Michael et al., 2019; Campbell et al., 2020; 2022).

Principle 6: Relationships nurtured over time (underpinning all principles)

All relationships are important in embedding Indigenous perspectives, none more so than relationships with Aboriginal and Torres Strait Islander peoples and communities. Relationships with communities need to be nurtured over time the ‘right’ way including with the right people, right space, right time, right place and using right language (Kennedy et al., 2016). It is important that relationships are continuous and not fly-in, fly-out with discontinuities in engagement (Goldfinch & Kennedy, 2013). In the case of our design course, the Aboriginal communities of Cape York who we were designing for had expressly requested not to be contacted, so our relationships were with Engineers Without Borders who were delivering the EWB Challenge to Universities around Australia, in partnership with Centre for Appropriate Technology (CfAT), who had been working with communities in Cape York for many years (Engineers Without Borders, 2020). Although we were not in direct contact with the Cape York communities we remained in relationship with them, firstly by respecting their wishes not to be contacted, secondly by engaging all the above-mentioned principles in delivering design solutions to meet their needs. However, in our first two iterations of our course, we did not engage the important relationships with our local Indigenous communities, which we acknowledge is fundamental and will work towards over time.

Relationships within our teaching team and amongst the teaching and learning community at our University, were important for providing essential support for embedding Indigenous perspectives both financial and social. We received internal funding from our University which enabled us to appropriately pay contributors to develop and deliver resources and activities, including guest Lectures. It was important to us that Indigenous participants were appropriately valued through remuneration as well as in co-creating the direction of resources. The conversations we had been having between ourselves over many years enabled us to easily initiate a safe place of reflection and yarning outside of course time from which the principles within this paper emerged and then to further mentor other colleagues about ways to approach embedding Indigenous perspectives. A course does not exist in a vacuum and all internal and external stakeholders are always in relationship to it whether they be students, staff, guests, industry or communities, both Indigenous and non-Indigenous. Acknowledging this, it is helpful to take a relationship-based approach to drive course evolution and improvement (Michael, 2019). This means considering the existence, participation and nurturing of all relationships during course development and planning, as well as delivery and beyond a single course offering. It is important to engage with a two-way process of learning (Goldfinch et al., 2017), to invite opportunities for listening, for co-creation of courses and to share the feedback and student response with all those participating (Campbell, 2022).

Discussion

This paper presents an early draft of six principles that we are actively working with as we embed Indigenous perspectives within our courses and programs. We don't expect this paper to be an end point, rather a launching off point for our own journey towards applying and evolving an approach to incorporating Indigenous perspectives into other courses and programs within engineering at our university. These principles emerged out of the reflections that occurred between teaching members of a large first year design course over two iterations (Campbell et al., 2020; 2022) and are informed by the work on embedding Indigenous perspectives into the engineering curriculum by many authors before us (Friesen & Herrmann, 2018; Jones et al., 2018; Kennedy et al., 2016; Leigh et al., 2014; Prpic & McCarthy, 2016; Universities Australia, 2011). We have been surprised at how frequently our conversations return to these principles as we mentor colleagues who are embarking on similar journeys to embed Indigenous perspectives into their courses. Therefore, the principles offered in this reflective paper may be useful to other colleagues more broadly to use as a launching off point for creating their own approach to embedding Indigenous perspectives.

We conceptualise the principles as a seed, that can provide the early nourishment for Indigenous perspectives to be embedded into a course (Figure 1). The first five principles are about creating the right SPACE for the embedding of Indigenous perspectives into a course, while the sixth principle, 'Relationships', acts as a crucible holding the other five principles, which acknowledges that course development and delivery must always be supported by right relationships. This aligns very much to the conclusions by Kennedy et al., 2016 that relationships and time are key underlying principles for inclusion of Indigenous perspectives in engineering curricula.

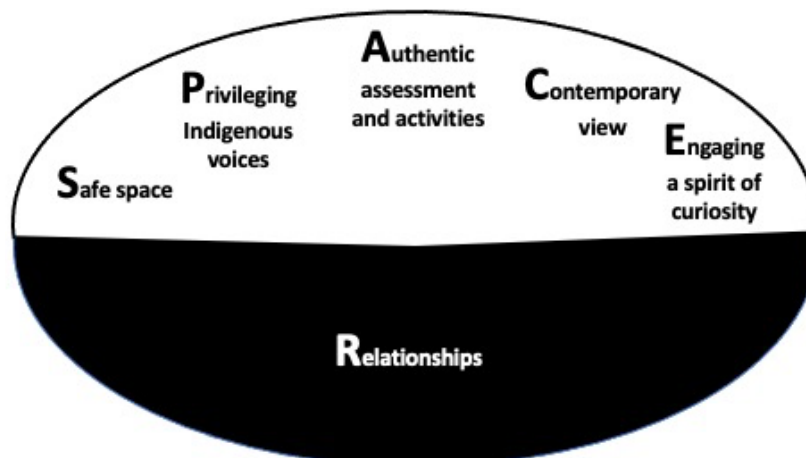


Figure 1: Schematic seed representation of the six principles. The first five principles providing the right SPACE for the embedding of Indigenous perspectives, underpinned by Relationships.

The next step will be for us to formally interview teaching teams who we are mentoring both during course development and at the end of course delivery, using the principles as a basis of discussion and for evolving the course. Below we have used the principles in this paper to guide the generation of reflective questions that could be used.

Reflective questions to guide application of the principles:

In addition to meeting regularly within teaching teams, it is valuable to formally reflect at the beginning and end of a course iteration to assist the on-going evolution of the course.

Principle 1 – **Safe space**. Have we created a safe space for learning and engagement with Indigenous perspectives within our course? Have we included all stakeholders engaged in the course in our conception of a safe space including any students, staff or guests? Have we maintained our awareness of the experience of Indigenous and non-Indigenous students, staff and guests as we have been delivering the course? Have we provided space for self-exploration of Indigenous perspectives outside of class time? Have we provided space within the classroom for

constructive dialogue and reflection? How do we feel each of these elements went, and were received? Did we meet outside of course time to reflect on our experiences? What could we do better to create a more safe and inclusive learning environment for the next iteration of the course?

Principle 2 –Privileging Indigenous perspectives and voices. In the resources and activities we created, were Indigenous voices privileged? Were the majority of our resources Aboriginal and Torres Strait Islander presenters and authors? Did we have input into the selection and appropriateness of those resources? Can we engage some peer-review, moderation and benchmarking processes that engage Indigenous voices in the process of course development, resource curation or delivery? What resources do we have within our University to support this, for example, Council of Elders, Indigenous research units, Indigenous staff members, Indigenous stakeholder reference groups? Would a community of practice support this? Do we have any internal learning and teaching grants? Could we engage Indigenous students in the process of developing resources and activities?

Principle 3 – Authentic. Have we created assessments and activities that incorporate Indigenous perspectives that align to the main narrative arc and learning objectives of the course? Have we integrated Indigenous perspectives in a way that is natural and relevant to engineering for students? Have we appropriately valued these perspectives by attributing marks to those assessments in a similar way to the rest of the course elements? How can we deepen the authenticity of our assessments in our next iteration of the course?

Principle 4 – Contemporary view. Have we taken a contemporary view of Indigenous perspectives in the activities and assessments we have created? How effectively do these experiences support the continuity of knowledge and contribution of Indigenous knowledge and experience to engineering? What changes could we make in the next iteration of our course to ensure that we are providing a contemporary view of Indigenous perspectives? As the course evolves, how can we ensure that contemporary Indigenous perspectives continue to be updated and included?

Principle 5 – Engaging a spirit of Curiosity. Did we successfully engage a spirit of curiosity and feeling that we are learning within the classroom and in the incorporation of Indigenous perspectives into our engineering activities? As a teaching team, were we personally engaged with the learning process within the community of learners? Did we feel that students were engaging with Indigenous perspectives with a spirit of curiosity? Was the content inspiring and interesting? Did we successfully model to students our own interest and engagement in incorporating Indigenous perspectives into our engineering work? Did we successfully model the importance of incorporating Indigenous perspectives into our engineering as part of being a culturally capable and inclusive engineer?

Principle 6. Relationships. What relationships with Indigenous students, staff, communities and engineers have been created over the course? What was the process of engagement in these relationships? Did any Indigenous Lecturers, research assistants or students contribute to the course? Were these relationships extractive and transactional, or were they co-creative and relational? Were they remunerated for their contributions? Were the relationships followed up with after the course activity or assessment was over? Were the outcomes of the course, and the student response shared? How will the relationships be maintained and nurtured over time?

Conclusion

Each course and program of study within engineering is unique, yet simple guiding principles can be developed by a teaching team or program director to assist the embedding of Indigenous perspectives that may be able to be applied more generally. Building on substantial work conducted by colleagues at other Universities regarding the incorporation of Indigenous perspectives into the engineering curriculum, this reflective practice paper provides an example of how this work may be applied at an individual course level. Six principles have been presented that may enable creation of an authentic, contemporary and safe learning environment for embedding Indigenous perspectives, where a spirit of curiosity is engaged, Indigenous voices are privileged, and relationships provide the foundation for any successes that are realised.

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