



Embedding Aboriginal and Torres Strait Islander perspectives into the engineering curriculum

Increasing the participation of Indigenous people in engineering, and developing engineering graduates with greater understanding of Indigenous perspectives

The Vision

Engineering has been traditionally and stereotypically known as a very technical profession with practitioners being very skilled and knowledgeable in mathematics, sciences and use of the scientific method to undertake their work. While this is important it is secondary to the primary function of engineering. Engineers aim to design products, systems infrastructure and services that produce a safer, healthier and more sustainable world and hence improve the quality of life of everyone.

Engineering is social first and then technical.

Increasingly, engineering should be a holistic profession whereby engineers consider the community, the consumer/user and the environment before embarking on technical design.

Engineering education is responding to this by emphasising professional skills such as communication, teamwork and ethical and sustainable design, alongside the technical side of the profession.

What remains largely absent in the engineering curriculum and in engineering practice is recognition of the perspectives of Aboriginal and Torres Strait Islander people. They have worked with natural ecosystems for thousands of years, in contrast to post-colonial exploitation of natural resources.

There is a huge opportunity for engineering education to embrace Indigenous knowledge, skills, philosophy and connectedness to country. More Indigenous students will enrol in engineering. Over time, their engagement and changes to the curriculum will diversify and strengthen the engineering profession's understanding of our wider environment and contribute to sustainable development on the Australian continent.

Where are we now?

Some larger organisations have employed Indigenous people and sought input from Traditional Custodians to assist them in better understanding social and environmental impacts of large projects such as mining¹.

¹ Langton, M (2015). *From Conflict to Cooperation: Transformations and challenges in the engagement between the Australian minerals industry and Australian*

Some engineering faculties and schools have sought to engage with Indigenous stakeholders to introduce Indigenous knowledge and perspectives into their curricula. Overall, however, these initiatives are somewhat isolated within their institutions.

Other broader projects, such as the CSIRO Indigenous STEM Education Project², have primarily focussed on Indigenous school student participation in STEM (Science, Technology, Engineering and Mathematics) primary and secondary school subjects, or on promoting engineering education pathways in specific areas.

The following table shows the numbers of Aboriginal and Torres Strait Islander students commencing and completing a higher education qualification in Engineering and Related Technologies over the years from 2011 to 2015³.

	2011	2012	2013	2014	2015
Commencers	104	100	144	156	145
Completions	28	31	35	52	49

For each entry, female participation is in the range 12-16%

There is clearly enormous scope for more Indigenous people to consider engineering as a career.

Part of a consultative ACED study⁴ funded by the (then) Australian Office for Learning and Teaching (ALTC), explored factors limiting participation of Indigenous people in engineering programs, and offered proposals to increase their participation were explored. These are summarised and updated later in this paper.

Indigenous peoples. Minerals Council of Australia. Forrest, ACT

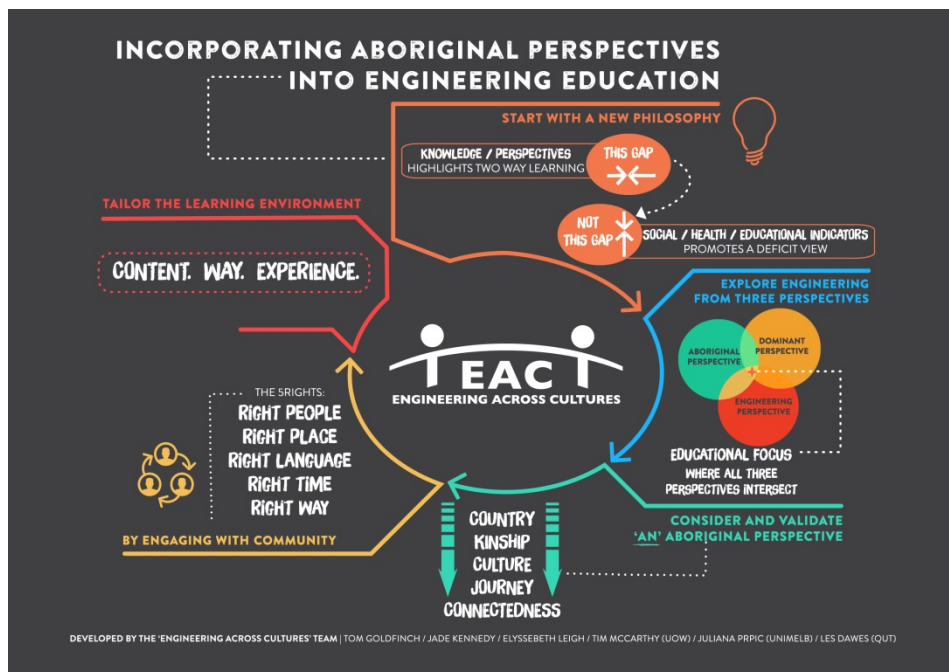
² CSIRO Indigenous STEM Education Project (2017): <https://www.csiro.au/en/Education/Programs/Indigenous-STEM>

³ Data provided to ACED by the Australian Government Higher Education Statistics Unit.

⁴ E Godfrey & R King (2011) *Curriculum specification and support for engineering education: understanding attrition, academic support, revised competencies, pathways and access*. <http://www.olt.gov.au/project-curriculum-specification-support-uts-2008>

A more recent Office of Learning and Teaching (OLT) funded project⁵ focussed on embedding Indigenous perspectives into engineering education. Outputs included this infographic and an introductory guide⁶.

students and graduates may participate in team-teaching and educational support to engineering students, such as peer mentoring.



Understand local issues

Experience from industry and university partnering suggests that efforts should be based on positive, ongoing relationships with Indigenous groups. Engineering faculties can begin by exploring their local contexts and identifying groups (e.g. Land Councils and Traditional Owner Groups) that can deliver mutual benefits from ongoing interactions.

Increase Indigenous engineering student numbers

ACED members should work within their institutions (in collaboration with Indigenous Support Units) and others, on initiatives that may include:

- reviewing the effectiveness of access and enabling pathways for Indigenous engineering students;
- involving engineering students and staff in targeted outreach and mentoring activities to primary and secondary schools, and in regional and rural areas, to increase the awareness of Indigenous students and their families to engineering opportunities;
- encouraging formation of *Neighbourhood Engineer* relationships with schools with high numbers of Indigenous students.

Where to from here?

Connect with Industry to understand Indigenous stakeholder engagement

Engineering education in Australia has a long tradition of partnership between the universities and employer groups. Several larger engineering organisations have already embraced the inclusion of Indigenous perspectives in their projects. Engineering faculties can use these with their existing partnerships to inform the inclusion of Indigenous perspectives into the curriculum.

Develop and share emerging educational practices

Some engineering faculties are already working with Aboriginal and Torre Strait Islander peoples to provide more inclusive engineering designs. These experiences will also provide a good first step in the overall process of curriculum improvement. Once established, these should be shared with other education providers.

Develop academic staff and support capability

Staff members will need to be identified and trained in liaison/mentoring roles with Indigenous students. Over time, more of these staff will be from Indigenous communities. In addition, non-engineering Indigenous

Next steps

ACED members (Executive Deans and others) are encouraged to set up a working party in their Faculty or School to consider the information and ideas expressed in this paper, and develop action plans.

The outcomes of these working parties should be shared with ACED with a view to identifying and sharing successful actions and experiences, fostering collaboration with industry organisations, and building a knowledge base on Indigenous perspectives in engineering education and engineering practice.

⁵ Goldfinch T, Kennedy J, Leigh E, Dawes L, Prpic J and McCarthy T (2016): *Embedding Indigenous Perspectives into Engineering Education*. Final report for Office for Learning and Teaching, awaiting review

⁶ Kennedy J, Goldfinch T, Leigh E, McCarthy T, Prpic, J and Dawes L (2016): *A beginner's guide to incorporating aboriginal perspectives into engineering curricula*. ISBN: 978-1-74128-257-3.

<https://indigenousengineering.wordpress.com/>

Australian Council of Engineering Deans Inc.

The membership of ACED is a senior academic representative of each of the 35 Australian universities that provides professional engineering degrees accredited by Engineers Australia. ACED's mission is to promote and advance engineering education, research and scholarship on behalf of the Australian higher education system.

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