ACED AUSTRALIAN COUNCIL OF ENGINEERING DEANS

Position Statement **August 2017**

Embedding Aboriginal and Torres Strait Islander perspectives into the engineering curriculum

Increasing the participation of ATSI 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. This is important but 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*. Engineering is a holistic profession whereby engineers consider the community, the consumer/user and the environment before embarking on a technical design.

Traditional engineering education has been more about the technical side of the profession although professional skills such as communication, teamwork and ethical and sustainable design considerations have been introduced into all engineering programs.

It is increasingly acknowledged that Aboriginal and Torres Strait Islander (ATSI) people have worked with natural ecosystems for thousands of years in this country, in contrast to post-colonial exploitation of natural resources.

There is a huge opportunity for the profession to embrace ATSI knowledge, skills, philosophy and connectedness to country to achieve sustainable development on the Australian continent. One aspect of the vision is to have more ATSI people practicing in engineering.

Embracing these matters will diversify and strengthen current understanding of our wider environment as well as engage more effectively a significant part of our community in our profession.

Where are we now?

Some larger organisations have employed ATSI people and sought input from Traditional Custodians to assist them in better understanding social and environmental impacts of large projects such as mining[1].

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

Other broader projects, such as the CSIRO Indigenous STEM Education Project[2], have primarily focussed on ATSI 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 ATSI students commencing and completing a higher education qualification in Engineering and Related Technologies over the years from 2011 to 2015[3].

	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 ATSI people to consider engineering as a career.

As part of a consultative ACED study[4] funded by the Australian Office for Learning and Teaching (ALTC),

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[1] Langton, M (2015). *From Conflict to Cooperation: Transformations and challenges in the engagement between the Australian minerals industry and Australian Indigenous peoples*. Minerals Council of Australia. Forrest, ACT

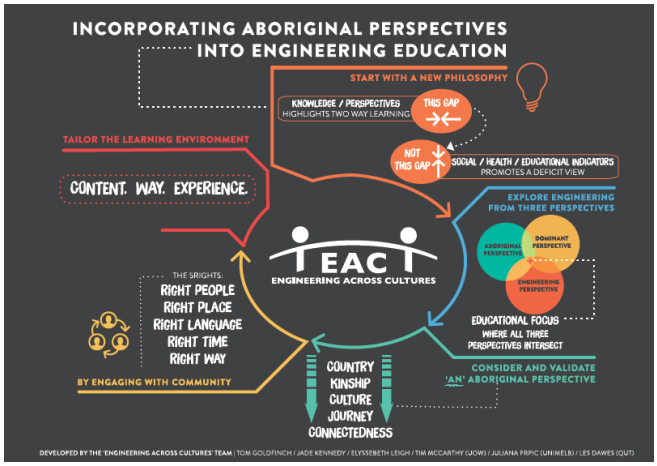
[2] CSIRO Indigenous STEM Education Project (2017): https://www.csiro.au/en/Education/Programs/Indigenous-STEM

[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

barriers to ATSI people participating in engineering, and proposals to increase their participation were explored. These are summarised updated and later in this paper.

A more recent ALTC-funded project[5] on embedding indigenous perspectives into engineering education has developed an infographic reproduced here. This diagram along with an introductory guide[6] published in 2016, provides an excellent background as well as a model for incorporating Aboriginal and Torres Strait Islander perspectives into engineering education. Other references are noted below.



Where to from here?

Connect with Industry to understand ATSI stakeholder engagement

Engineering education in Australia has involved partnerships between the universities and employer groups for more than a century. There are several larger engineering organisations that have already embraced the inclusion of ATSI perspectives in their projects. Engineering faculties can use these already existing partnerships to inform the inclusion of ATSI perspectives into the curriculum.

Develop and share emerging educational practices

Some engineering faculties are already on this journey of working with ATSI peoples to provide a more holistic consideration of all engineering designs. Using these experiences will also provide a good first step in the overall process of curriculum improvement. Once established, these should be shared with other institutions.

Develop capability

Staff members will need to be identified and trained in liaison/mentoring roles with ATSI students; ideally ATSI people will be appointed to teaching roles. In addition, non-engineering ATSI graduates may participate in team-teaching and educational support, and ATSI student buddy system (as a form of peer mentoring) may be valuable.

Understand local issues

Experience from industry and universities suggests that any successful effort should be based on positive, ongoing relationships with ATSI groups. Engineering faculties can begin by understanding their local context and identifying ATSI groups where both they and the faculty can benefit from an ongoing interaction.

Increase the number of ATSI students in Engineering

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

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

Suggested next steps

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

The working party (that reports back to the Executive Dean) could consider existing examples of sharing experiences, collaboration with industry organisations, and seek to build a knowledge base on ATSI 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 the Inc. (ACED) is a senior academic representative of each of the 35 Australian universities that provide 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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