

# National Indigenous Engineering Summit

## Final Report

October 2015

Edited by Juliana Kaya Prpic



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ISBN 978-0-734-05172-1

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We acknowledge the Traditional Owners of the land in which the **National Indigenous Engineering Summit** took place, the land of the Wurundjeri, and pay respect to their Elders and families.

We would like to acknowledge and thank all those who have contributed their time and resources to this project, in particular the Department of Education and Training for funding the *Indigenous Engineers: Partners for Pathways* project.

The material contained in this document has been developed for the **National Indigenous Engineering Summit** with funding from the Australian Government Department of Education and Training (DET), through the Higher Education Participation and Partnerships Programme (HEPPP). The views and opinions expressed do not necessarily reflect the views of, or have the endorsement of, DET, HEPPP, or of any Minister, or indicate DET's or HEPPP's commitment to a particular course of action.

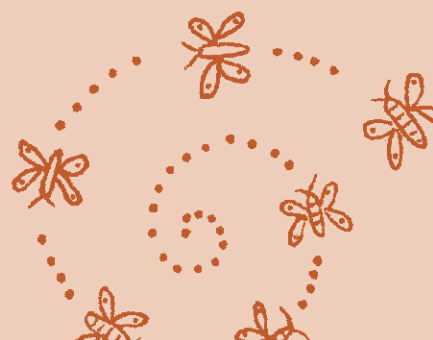
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Edited by Dr. Juliana Kaya Prpic, Melbourne School of Engineering, The University of Melbourne.

# Contents

<b>Executive Summary</b>	<b>2</b>
<b>Summit Recommendations</b>	<b>4</b>
Group A: Pathways and Accreditation	4
Group B: Student Support	4
Group C: Adaptations for Schools of Engineering	5
Group D: STEM Education	5
<b>Origins and History of the Summit</b>	<b>6</b>
Steering Committee	8
Stakeholder Forum	8
Not-for-Profit organisations	8
University and TAFE sector participant	8
National Indigenous Engineering Summit	9
<b>Steps Forward</b>	<b>10</b>
<b>Appendices</b>	<b>11</b>
Appendix 1: The Forum	12
Appendix 1A: Forum Program	13
Appendix 1B: Forum Participants	15
Appendix 1C: Responses from participants at the Forum	16
Appendix 1D: Visual Analysis of Forum Output	25
Appendix 2: Working party membership	26
Appendix 3: Working party documents	27
Appendix 3A: Engineering pathways and accreditation paper	28
Appendix 3B: Engineering pathways diagram	30
Appendix 3C: Student Support paper	32
Appendix 3D: Adaptations – best practice resources	41
Appendix 4: National Indigenous Engineering Summit	43
Appendix 4A: Summit program	44
Appendix 4B: National Indigenous Engineering Summit Participants	52
Appendix 4C: Final Communique	56



# Executive Summary

This Report documents the first **National Indigenous Engineering Summit**, which was held at the University of Melbourne on 18 and 19 June, 2015.

The Summit represents a progress milestone in the **Indigenous Engineers: Partners for Pathways** program, a Federally-funded initiative led by the University of Melbourne. The program aims to help Indigenous to enter engineering, by creating scholarships, devising strategies that promote other pathways into the discipline and by removing barriers to entry.

The Summit's purpose was to bring together academic engineering teaching staff, other educational providers, representatives of the engineering industry, engineering professional bodies, not-for-profit organisations and policy leaders to exchange ideas and develop strategies for creating and supporting pathways that will assist Indigenous Australians into the engineering profession.

With a particular focus on facilitating the entry of Indigenous students into tertiary engineering study, the Summit addressed the key issues raised by an Indigenous Engineers Stakeholder Consultation Forum held at the University of Melbourne in 2014. This Forum made recommendations around four fundamental themes, and further recommended that a working group for each theme be set up to develop the recommendations further.



Left to right: Jennifer-Leigh Campbell (Engineer), Professor Ian Anderson (Pro-Vice Chancellor Engagement, The University of Melbourne), Ross Peek (Engineer, Rio Tinto), The Honourable Natalie Hutchins Minister (MLA Victorian Minister for Aboriginal Affairs), Sam Thorne (Jacobs), Professor Iven Mareels (Dean, Melbourne School of Engineering, The University of Melbourne) and Mr Paul Douglas (Chair, Indigenous Engineering Steering Committee).

The four key themes were:

- **Pathways and Accreditation**

This group explored existing and possible future pathways by which indigenous students could enter tertiary engineering study, as well as what might be required to ensure each pathway met the accreditation needs of its target students.

- **Student support**

Acknowledging that a key success factor for indigenous students in achievement in tertiary engineering study was appropriate support beyond simply scholarships, this group examined what support would actually be required.

- **Adaptations for Schools of Engineering**

This group explored how academic engineering teaching institutions could change to promote greater engagement with indigenous students, including ways to support both non-indigenous and indigenous teaching staff and mentors in this endeavour.

- **STEM education**

This group addressed ways of engaging indigenous students with Science, Technology, Engineering and Mathematics (STEM) disciplines and encouraging them to realise that such studies are accessible and relevant to them.

The four working groups presented their findings for consideration and open discussion at the National Indigenous Engineering Summit. Based on the framework provided by the working groups, the Summit made 21 recommendations, which are set out in detail in the next Section.

Arising from these recommendations are a number of future actions. For immediate action, the three principal activities are:

- **A Victorian Indigenous Engineering Winter School (VIEWS).**

This will be a collaborative venture between The University of Melbourne, RMIT University, Swinburne University and Monash University. VIEWS will provide Year 11 and 12 Indigenous students in Victoria with an immersive experience of engineering and the offerings of the four universities.

- **An Indigenous Engineering Education Hub**

This Hub will be established as a collaborative venture between Aboriginal and Torres Strait Islander communities and a number of stakeholders including educators and careers advisors, Engineers Australia, Not-for-Profit Organisations, Engineers and Industry. It will nationwide and serve as a resource repository.

- **Research into aspects of Indigenous engagement within engineering.**



*Professor Iven Mareels Dean, Melbourne School of Engineering, The University of Melbourne and Chair of the G08 Deans of Engineering.*



# Summit Recommendations

## Group A: Pathways and Accreditation

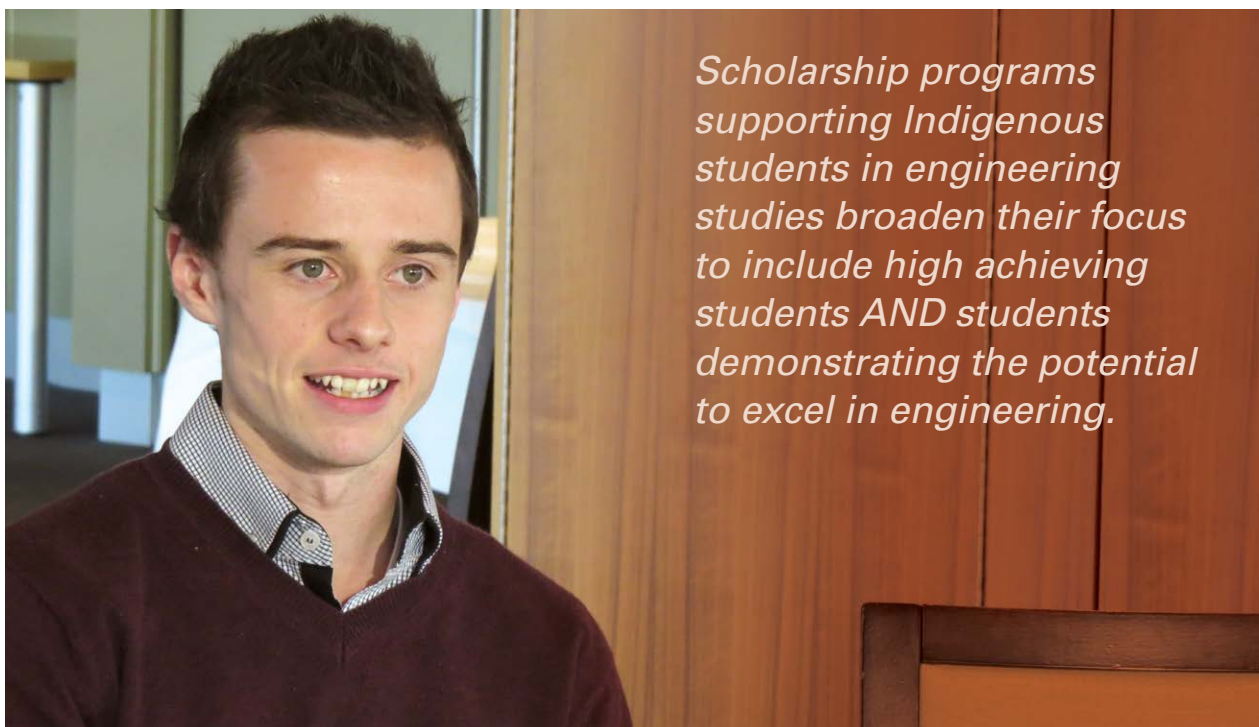
The recommendations proposed by the Pathways and Accreditation working party are:

- A new professional narrative is required to promote engineering as a socially-engaged and socially-rewarding profession, expanding/balancing the current technical narrative.
- The education and employment pathways framework should be inclusive of alternative pathways, such as project-based routes.

## Group B: Student Support

The recommendations proposed by the Student Support working party are:

- Scholarship programs supporting Indigenous students in engineering studies broaden their focus to include high achieving students AND students demonstrating the potential to excel in engineering.
- Align scholarship opportunities to other support mechanisms in the formal learning environment.
- Ensure support programs are created in collaboration with Indigenous stakeholders.
- Partnerships between educational stakeholders (students, educators, family, community, industry, government) are established with structural flexibility to enable responsive student support.
- Tertiary engineering education providers revise current curricula in partnership with Indigenous Stakeholders to embed Indigenous perspectives.
- Embed Indigenous support staff within engineering schools and departments to drive responsive and proactive support.



Engineering pathway student Adam Pyke – the inaugural recipient of the Indigenous Engineers: Engineering Pathway Scholarship at The University of Melbourne.

## Group C: Adaptations for Schools of Engineering

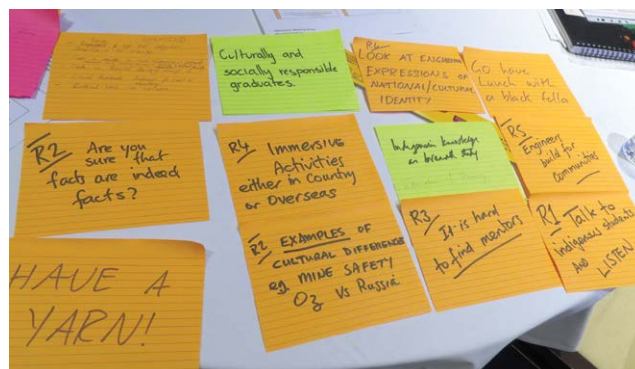
The recommendations proposed by the Adaptations for Schools of Engineering working party are:

- Establish partnerships with Indigenous communities that are respectful in the two-way exchange of knowledge, ideas, culture and values and ultimately lead to transformational change in engineering education.
- Establish an Indigenous Engineering Education HUB to share resources and best practice case studies.
- Develop an Engineering School policy that embeds an overarching commitment to providing a sense of belongingness for Indigenous students.
- Augment the curriculum with an understanding of the Aboriginal students' journeys to create an integrated learning experience that privileges Aboriginal learning and integrates cultural competency as a graduate attribute for all graduates
- Employ and actively involve Indigenous teaching and learning staff in a range of positions including lecturers, tutors, mentors, role models, guest speakers, and support for both staff and students.
- Provide cultural training for non-Indigenous teaching staff and develop support structures for both Indigenous and non-Indigenous teaching staff.

## Group D: STEM Education

The recommendations proposed by the STEM Education working party are:

- Promote Aboriginal and Torres Strait Islander input and leadership in STEM education as core business.
- Through continuing measurement of success by monitoring, evaluation and reporting of STEM education programs on offer to ATSI students, promote;
  - Principles of successful STEM educational programs known to have worked
  - Development of responsive ways of teaching mathematics and of appropriate resources to support teachers/educators in all STEM areas.
- Find and match eligible Aboriginal and Torres Strait Islander students with available financial support and research barriers to engagement and Indigenous perception in STEM education.
- Promote both University and TAFE based studies as complementary and sustainable career pathways into Engineering incorporating two-way articulation.
- Create a collaborative community of practice amongst Providers and Organisations to work together to produce a sustainable flow of mathematics competent Indigenous students from F-12 to achieve demographic parity.
- Promote professional development for all teachers of ATSI students in cultural responsiveness and in mathematics education.
- Promote the general STEM agenda in schools through the Australian Curriculum.



# Origins and History of the Summit

The **National Indigenous Engineering Summit** had its origins in the Indigenous Engineers: Partners for Pathways project, which was the University of Melbourne's response to the Federal Government's Indigenous Higher Education Review (IHER, Behrendt et al, 2012). This review examined "...how improving higher education outcomes among Aboriginal and Torres Strait Islander people will contribute to nation building and reduce Indigenous disadvantage" (p. ix).

The IHER found that, although Indigenous Support Program (ISP) funding has been successful in providing an incentive for universities to enrol Aboriginal and Torres Strait Islander students, there have not been the same incentives concerning retention and completion (p. 75). The IHER made 35 recommendations to the Federal Minister for Tertiary Education, Skills, Science and Research in relation to the following six main themes:

1. Achieving parity for Aboriginal and Torres Strait Islander students and staff members in the higher education sector.
2. Unlocking capacity and empowering choices (for example the role of schools and university-school outreach; other pathways; enabling programs; and access to information).
3. Aboriginal and Torres Strait Islander student success (provision of support through to completion by Indigenous Education Units and the faculties; and building professional pathways and responding to community need).
4. Provision of Aboriginal and Torres Strait Islander-specific support to universities (the ITAS; support for Aboriginal and Torres Strait Islander students from regional and remote areas; financial support for Aboriginal and Torres Strait Islander students); Aboriginal and Torres Strait Islander Knowledges and support (Aboriginal and Torres Strait Islander perspectives; higher degrees by research and research training; Aboriginal and Torres Strait Islander research capability).
5. Supporting Aboriginal and Torres Strait Islander staff members.
6. Issues of university culture and governance.

The Federal Government's response to the recommendations of the IHER included \$18.1 million of Higher Education Participation and Partnerships Program (HEPPP) allocated to nine priority projects

of national significance. (These can be viewed online at <http://www.education.gov.au/nationally-significant-projects-addressing-behrendt-review>). One of these nine priority projects is the **Indigenous Engineers: Partners for Pathways** project at the University of Melbourne.

The **Indigenous Engineers: Partners for Pathways** for Pathways project seeks to address the gross under-representation of Indigenous Australians in engineering studies and consequently in the profession. This project aims to create scholarships and devise strategies to promote pathways into engineering and remove barriers to entry for Indigenous and other students who do not have the STEM pre-requisites. The **Indigenous Engineers: Partners for Pathways** initiative will help to provide secondary school and university students with scholarships, residential camps and career development.

The overall aims of the **Indigenous Engineers: Partners for Pathways** project include:

- Fostering an interest and supporting capabilities and competencies among Indigenous secondary school students in mathematics and the sciences;
- Encouraging Indigenous secondary school students to undertake a TAFE of university qualification in a relevant field;
- Identifying role of TAFEs, universities, government, industry and professional bodies in developing the settings to support the policy reform;
- Promoting linkages between TAFE institutions, universities, government, industry partners and professional bodies to secure the increased participation of Indigenous Australians in the profession; and
- Developing a national approach or commitment from the engineering profession to support relevant initiatives



One step in implementing the aims of the **Indigenous Engineers: Partners for Pathways** project was the **National Indigenous Engineering Summit**.

The purpose of the **National Indigenous Engineering Summit** was to bring together a broad range of stakeholders including universities and other tertiary institutions, industry representatives and not-for-profit organisations (see Figure 1) working in 'the indigenous space' to:

- identify opportunities for collaboration;
- build on and harmonise existing activities that are already proving successful at raising Indigenous participation;
- identify principles and strategies that, if adopted by all the Stakeholders, will lead to parity in engineering graduations by 2030, and
- begin the process of achieving parity participation by Indigenous people in all aspects of the engineering profession, and in particular as tertiary-trained engineers.

At the University of Melbourne the process leading up to the **National Indigenous Engineering Summit** was led by the Murrup Barak Melbourne Institute for Indigenous Development and the Melbourne School of Engineering. It began in 2011 and involved several stages. These were:

- Establishment of a Steering Committee
- Partner engagement, Engineering industry, professional bodies, Not-for- Profit organisations, universities, and TAFE institutions
- Indigenous Engineers Stakeholder Consultation Forum  
Held at the University Woodward Law Centre on the 19th of September 2014.
- National Indigenous Engineering Summit  
Held at the University Woodward Law Centre on the 18th and 19th of June 2015.

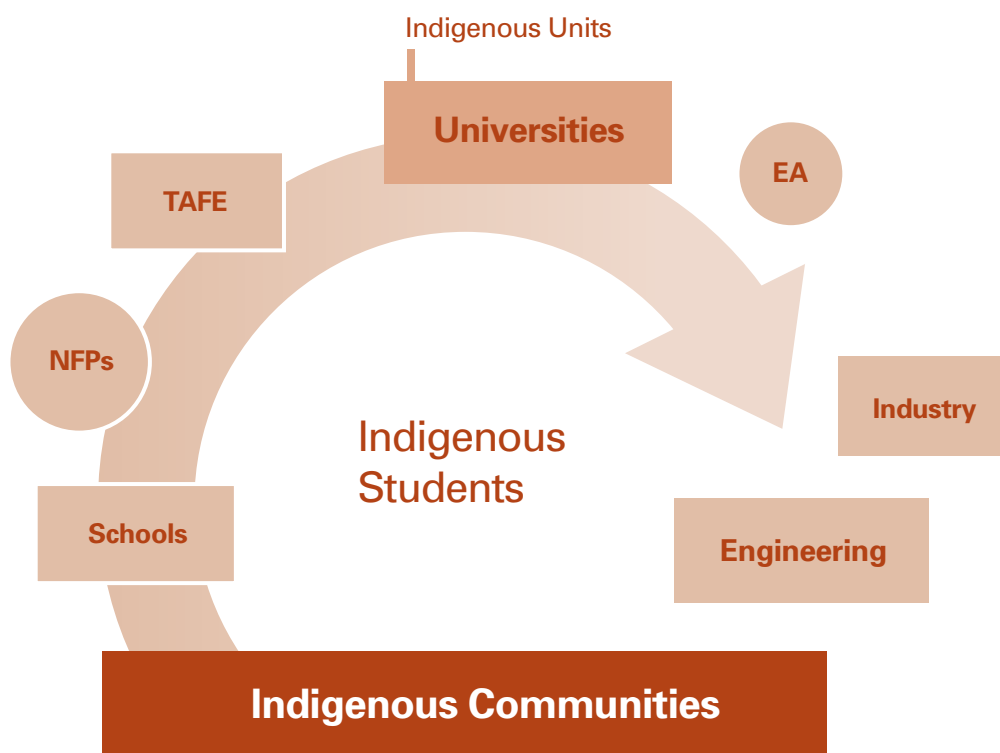


Figure 1: Stakeholders in Indigenous engineering education

## Steering Committee

Chair: Paul Douglas

Ian Anderson, Assistant Vice Chancellor, Indigenous Higher Education & Director, Murrup Barak

Iven Mareels, Dean Engineering

Geoff Stevens, Associate Dean Engagement

Peter Scales, Deputy Dean Engineering

Hope Perkins, Indigenous Engagement Coordinator

Ellen Day, Manager Partnerships & Development, Murrup Barak

Bill Lawson

James Rafferty, SKM – Structural Engineer

Peter Hoffman, Engineers Australia

Shanika Karunasekera, Melbourne School of Engineering

Justin Zobel, Head, Computing & Information Systems, MSE

Michael Milesi, SKM – Engineer

Juliana Kaya Prpic, Melbourne School of Engineering

## Stakeholder Forum

An Indigenous Engineers Stakeholder Consultation Forum was held at the University Woodward Law Centre on the 19th of September 2014 (see Appendix 2A for Forum program).

The Forum successfully brought together leaders from Industry, Not-for-Profit organisations, Universities and other organisations known to be active in encouraging and assisting Aboriginal and Torres Strait Islander secondary students to consider Engineering as a career. A total of 41 participants (see Appendix 2B for Forum participant list) explored the issues in a World Café style activity.

Participants were asked to respond to a number of questions from two perspectives, Not-for-Profit organisations and the University and TAFE sector. The questions for each group were:

### Not-for-Profit organisations

- What are the 'show stoppers' for Aboriginal and Torres Strait Islander secondary students entering tertiary STEM studies? How might they be overcome?
- How can Aboriginal and Torres Strait Islander secondary students with tertiary STEM studies potential be identified? How can such students be better prepared for tertiary studies?

- What role can tertiary institutions play at the secondary school level?
- What cultural, home and/or community obstacles are there for Aboriginal and Torres Strait Islander secondary students to overcome to be able to advance to tertiary STEM studies?
- How can prospective employers assist beyond offering study support (scholarships) and graduate employment? eg internships? Part-time work during study?

### University and TAFE sector participant

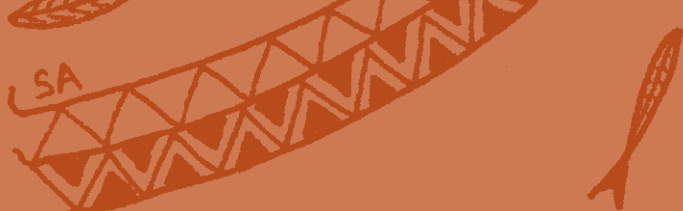
- What and where is the interface between Faculties and 'Indigenous Studies Support Units'? How well does it work? How can it be strengthened and improved?
- How to identify and help overcome home or community sickness and loneliness?
- What and where is the interface between employers, industry associations, peak bodies and tertiary institutions? How can it be better leveraged to assist Aboriginal and Torres Strait Islander tertiary students?
- How might articulation and recognition of prior knowledge be better leveraged to benefit Aboriginal and Torres Strait Islander students?
- How can we design integrated engineering pathways from TAFE into University?

Both groups were also asked to consider the next steps and preparation for the National Indigenous Engineers Summit. Questions included:

- What are the 6 most important topics we should explore in 2015 that would facilitate a quantum change to the current state?
- What areas of research, data or other stakeholder engagements are required before the Summit in 2015 to ensure you and other participants will be comfortable in providing informed sector-wide input?
- What is your gut saying should be the 6 key actions resulting from the 2015 **National Indigenous Engineering Summit** that would show to all stakeholders that the event was a success?

Participant responses to the questions can be found in Appendix 2C. The information was collated and organised into thematic and structured key areas of focus for the National Summit (see Appendix 2D). The Forum was beneficial in assisting in the planning and preparation for the Summit in June 2015.

Arising from the Forum, four working groups were established to prepare for the **National Indigenous Engineering Summit** (see Appendix 3 for Working



Group membership). Attendees at the Forum were invited to participate in these working groups according to their expertise and experience. The Working groups were led by Chairs and covered four overarching key themes identified from the Forum:

#### **Group A: Pathways and Accreditation**

This group worked toward defining education pathways for students in technical and engineering streams without unnecessary accreditation constraints that could inhibit their progress. The end goal was for individuals to be able to achieve meaningful employment at their chosen levels in technical and engineering streams, with real opportunities to further develop their careers through continued progress on the education pathway.

#### **Group B: Student Support**

This working group has explored successful existing approaches to supporting Indigenous students through their education to develop recommendations for effectively supporting students towards a career in engineering. The group aims to promote awareness, understanding and uptake of proven strategies.

#### **Group C: Adaptions**

The intention of the Adaptions working group has been to identify key changes to ensure that Indigenous students are successful in their engineering studies. The changes will involve not only adaptations in curriculum, student support and teaching approaches, but also in the ways in which institutions engage with each other, the engineering profession, Indigenous communities, industry and not-for-profit organisations.

#### **Group D: STEM Education**

This group has focussed its attention on the teaching of maths to Indigenous primary and secondary students as well as on maths teachers themselves, drawing on current best practice. The group has also sought to devise a strategy for connecting senior Indigenous scholars with adequate maths levels to the many unfilled scholarship and cadetship opportunities currently on offer.

Finally, the group aimed to find ways to complement the current \$28.8M BHP Billiton/ CSIRO STEM education project for Indigenous students.

### **National Indigenous Engineering Summit**

The National Indigenous Engineering Summit, proudly hosted by the Melbourne School of Engineering at the University of Melbourne, was held on the 18th and 19th June 2015. The full Summit program is provided in Appendix 5A.

The Summit was opened by Professor Ian Anderson and Professor Iven Mareels, with an Opening Address by the Honourable Natalie Hutchins, MLA, Victorian Minister for Aboriginal Affairs.

The Summit's purpose was to

- bring together academic engineering teaching staff, other educational providers, representatives of the engineering industry, engineering professional bodies, not-for-profit organisations and policy leaders to exchange ideas and develop strategies for creating and supporting pathways that will assist Indigenous Australians into the engineering profession, and
- endorse the recommendations made by the working parties.

The Summit was attended by seventy-five delegates (see Appendix 5B).

The working parties presented their recommendations and delegates had an opportunity to explore these at workshop sessions, where they were developed further.

Consistent themes were identified during the workshop sessions. These themes are:

1. There are many existing flexible pathways and diverse support systems that are poorly articulated, not well understood, and not effectively utilised. The challenge is to coordinate these efficiently and effectively so they can be utilised as intended.
2. It is essential to support Indigenous people to develop, control, and deliver STEM teaching and support services, using respectful cultural partnerships as the vehicle.
3. Indigenous families, communities, and role models are central to the delivery of any successful support strategy for all current and future Indigenous students on a STEM journey.
4. Tertiary STEM education in particular, but STEM education in general, needs to incorporate an Indigenous perspective in the curricula.
5. Policy and program development should be based on trials, evidence and data.
6. All stakeholders, including employers, need to take a collaborative approach to improve the success of these initiatives.

A video that captures the spirit of the Summit can be seen at: <https://www.youtube.com/watch?v=n1hnjoIWHck&feature=youtu.be>

At the conclusion of the Summit a Final Communique, signed by all the delegates, and summerising the outcomes was issued (see Appendix 5C).

# Steps Forward

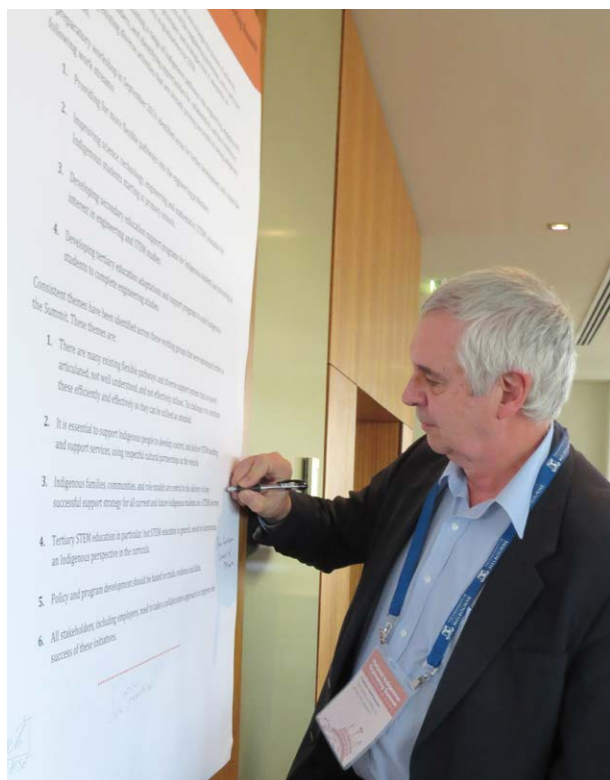
In addition to the recommendations above the Summit endorsed a number of future activities. These include:

- **A Victorian Indigenous Engineering Winter School (VIEWS).**

This will be a collaborative venture between The University of Melbourne, RMIT University, Swinburne University and Monash University. VIEWS will provide Year 11 and 12 Indigenous students in Victoria with immersive experience of engineering and the offerings of the four universities.

- **An Indigenous Engineering Education Hub**

This Hub will be established as a collaborative venture between Aboriginal and Torres Strait Islander communities and a number of stakeholders including educators and careers advisors, Engineers Australia, Not-for-Profit Organisations, Engineers and Industry. It will nationwide and serve as a resource repository.



*Professor Geoff Stevens, Melbourne Laureate Professor (Chemical and Bio-molecular Engineering – The University of Melbourne; Indigenous Engineering Steering Committee member)*

- **Establishment of an Indigenous Engineering Special Interest Group with Engineers Australia.**

The purpose of this special interest group is to ensure that Indigenous engineers are part of the ongoing conversation about the engineering profession. Indigenous engineers can provide input into the building of pathways into engineering, and in particular can serve as mentors to current students by providing advice and sharing their experiences.

- **Research collaboration**

The Summit highlighted a number of important areas for further research.

- What are Indigenous understandings and perceptions of engineering?
- What are Indigenous values and knowledge that might inform engineering, and contribute to a two-way knowledge exchange?
- What capabilities need to be developed in Indigenous students if they are to undertake tertiary study in engineering?
- What support mechanisms do Indigenous students need once at university to ensure that they complete an engineering degree?
- How can engineering Schools deepen their relationship with Indigenous communities so that authentic two-way knowledge exchange can occur?
- How do engineering teaching staff members perceive working with Indigenous communities, Indigenous knowledge, and Indigenous students?

Collectively these questions will support a better understanding of the ways in which university engineering Schools may need to adapt in order for parity and equity to be achieved.

Future projects on the theme of Indigenous Engineering Education will seek to expand and validate the approaches, participatory research methods and outcomes of the Summit.



# Appendices

Appendix 1: Forum	12
Appendix 2: Working party membership	26
Appendix 3: Working party documents	27
Appendix 4: National Indigenous Engineering Summit	43



## Appendix 1: The Forum

<b>Appendix 1A: Forum program</b>	<b>13</b>
<b>Appendix 1B: Forum participants</b>	<b>15</b>
<b>Appendix 1C: Responses from participants at the Forum</b>	<b>16</b>
<b>Appendix 1D: Visual analysis</b>	<b>25</b>



## Appendix 1A: Forum program

### Stakeholder Consultation Forum Program

<b>DATE:</b>	Friday September 19, 2014
<b>TIME:</b>	7:30am – 9:00pm
<b>VENUE:</b>	West Function Room, Woodward Centre Level 10, Melbourne Law School 185 Pelham Street, Carlton
<b>0730 – 0830</b>	<b>Opening Breakfast</b> Opening comments and acknowledgement of country Prof Ian Anderson
<b>0845 – 0900</b>	<b>Overview of June 2015 Summit</b> Welcome and introduction – Paul Douglas Overview of the day's proceedings and format – Michael Milesi
<b>0900 – 0930</b>	<b>Not-For-Profit (NFP) Overviews</b> Australian Indigenous Engineering Summer School – Peter Berry Australian Indigenous Mentoring Experience – Adam Linforth Australian Indigenous Education Foundation – Gillian Odbert Polly Farmer Foundation – Neil Jarvis Aurora Project – Richard Potok Beacon Foundation – Scott Harris
An overview of each NFP's objectives, operations and activities will be distributed prior to the Forum. It will be assumed that these documents have been read and these presentations will be snapshots only. Clarifications and questions can be dealt with in the following discussion.	
<b>0930 – 1030</b>	<b>World Café NFP</b> Table discussion and workshop around 4 key topics relevant to the NFP area
<b>1030 – 1100</b>	<b>Morning Tea</b>
<b>1100 – 1200</b>	<b>World Café NFP Plenary Session</b>
<b>1200 – 1230</b>	<b>Mathematics NFP Organisations Overview</b> Australian Association of Mathematics Teachers – Will Morony Aboriginal Torres Strait Islander Mathematics Alliance – Dr Chris Mathews
<b>1230 – 1330</b>	<b>Lunch</b>

## Appendix 1A: Forum program (continued)

### Stakeholder Consultation Forum Program (continued)

1330 – 1430	<b>Universities &amp; TAFE's Overviews</b> University of Melbourne – Prof Iven Mareels University of Sydney – Shane Houston, Keiran Passmore, Debra Reid University of Queensland – Shane Drahm University of New South Wales – Prof Martin Nakata University of Tasmania – Prof Stewart Franks University of Adelaide – Dr Claudia Szabo Curtin University – Prof Moses Tade, Tim Keely NMIT – Robert Presutti Ultimo TAFE – Trevor Schokman
1430 – 1600	<b>World Café Universities &amp; TAFE's including Plenary Session</b> Table discussion and workshop around 4 key topics relevant to the NFP area
1600 – 1630	<b>Afternoon Tea</b>
1630 – 1700	<b>Response from Industry</b> Engineers Australia – Stephen Durkin Business Council of Australia Business Indigenous Network – Jessica Jeeves Minerals Council Australia Indigenous Relations Working Group – Therese Postma Reconciliation Australia – Leah Armstrong Engineers Without Borders – Lizzie Brown
1700 – 1730	<b>Summary &amp; Forum Close</b> Forum Summary – Michael Milesi Outcomes and next steps – Paul Douglas, Ian Anderson
1730 – 1830	<b>Post Forum Drinks, Informal Discussion &amp; Networking</b>
1830 – 2030	<b>Forum Dinner</b> Guest Speaker – Prof Marcia Langton 'My Story' Vignettes – James Rafferty, Sam Thorne, Bonnie Joachim



Left to right: Professor Iven Mareels (Dean, Melbourne School of Engineering), Ellen Day (Murrup Barak, The University of Melbourne), Professor Marcia Langton (The University of Melbourne), Wayne Denning (Managing Director, Carbon Media), Hope Perkins (Indigenous Engagement Coordinator, Melbourne School of Engineering, The University of Melbourne) and Professor Ian Anderson (Pro-Vice Chancellor Engagement The University of Melbourne).



## Appendix 1B: Forum participants

Participants attending the Indigenous Engineering: Partners for Pathways Forum, which was held on 19th September 2014.

Name	Organisation
Professor Ian Anderson	The University of Melbourne
Mr Peter Berry	Engineering Aid Australia
Ms Lilly Brown	Aurora Project
Dr David Cruickshanks-Boyd	Parsons Brinckerhoff
Ms Ellen Day	Murrup Barak, Melbourne Institute for Indigenous Development
Professor John Dell	University of Western Australia
Professor Paul Douglas	Indigenous Engineering Steering Committee
Mr Shane Drahm	The University of Queensland
Mr Stephen Durkin	Engineers Australia
Ms Glenda Graham	Engineers Australia
Mr Adam Hansen	Australian Indigenous Mentoring Experience
Mr Scott Harris	Beacon Foundation
Professor Marjorie Horne	Australian Catholic University
Mr Neil Jarvis	Graham (Polly) Farmer Foundation
Ms Jessica Jeeves	Business Council of Australia
Mr Tim Keely	Curtin University
Professor Marcia Langton	The University of Melbourne
Mr Bill Lawson	
Mr Gavin Lind	Minerals Council of Australia
Mr Adam Linforth	Australian Indigenous Mentoring Experience
Professor Iven Mareels	The University of Melbourne
Dr Christopher Matthews	Aboriginal & Torres Strait Islander Mathematics Alliance
Ms Debra McDonald	Melbourne Careers Centre, University of Melbourne
Professor Michael Edward McManus	The University of Queensland
Mr Michael Milesi	
Ms Rasika Mohan	Engineers Without Borders
Mr Will Morony	Australian Association of Mathematics Teachers
Ms Caty Morris	Aboriginal & Torres Strait Islander Mathematics Alliance
Professor Martin Nakata	University of New South Wales
Ms Gillian Odbert	Australian Indigenous Education Foundation
Mr Kieran Passmore	University of Sydney
Ms Hope Perkins	The University of Melbourne
Mr Richard Potok	Aurora Project
Mr James Rafferty	Jacobs
Mr Trevor Schokman	Ultimo TAFE
Ms Lizzy Skinner	Engineers Without Borders
Professor Geoff Stevens	The University of Melbourne
Dr Claudia Szabo	The University of Adelaide
Mr Sam Thorne Jacobs	
Miss Sarah Zappia	The University of Melbourne
Professor Justin Zobel	The University of Melbourne

## Appendix 1C: Responses from participants at the Forum

### Not-For-Profit participant responses

#### Q1. What are the 'show stoppers' for Aboriginal and Torres Strait Islander secondary students entering tertiary STEM studies? How might they be overcome?

Maths at all levels

2 year gap' with numeracy

No integration (hard data) across all education sectors

More encouragement and support from teachers – better continuity (better teacher quality)

People's perceptions of maths

Bringing relevance to maths

Teacher quality

Bad pedagogy disadvantages Indigenous students more

Leadership – Dean's to take a stand

Lack of role models

Value proposition for communities and themselves

Move to university

Lack of leadership

Lack of motivation and encouragement

Lack of pathways

Maths vs science vs arts

Fear of teaching maths

Family and community do not necessarily support engineering / STEM

perception of maths as elitist

VC / Dean accountability and leadership

Piecemeal approaches

Continuity

Bush vs city complexity

Careers teachers are not confident with engineering

Limited buy in from industry?

Programs not fit for purpose – prerequisites

#### Q2. How can Aboriginal and Torres Strait Islander secondary students with tertiary STEM studies potential be identified? How can such students be better prepared for tertiary studies?

Via school – teachers

NAPLAN competency, not curriculum based

Good teaching and good curriculum

Events – students and challenges > emergent stars > this has surprised teachers and parents

Cognate skills, TAFE etc, hidden skills

Build long term relationships with schools and 'champion teachers'

To better prepare and identify what they need to 'learn' before uni

Organisations have many models – which work?

Participation – alertness to signals

Handle students as groups

#### Q3. What role can tertiary institutions play at the secondary school level?

**\*\*MATHS\*\***

Help teachers, host, nurture

Maths in context (eg business blackboard), meaning & benefits

Engineering – understanding it's not magic

Engineering – impact, relevance

Social media

Mentorship

Improving life in communities

Inspire students to be engineers

Helping teachers

School holiday programs – engaging programs with intensive numeracy / literacy (12 weeks)

Continuity is important (holiday programs)

Time on task

Universities to evaluate alternate entries program for engineering – how do they go once they're in

Teacher training

Indigenous perspective in engineering curriculum – beneficial for ALL students

Exposure to role models

Linking with culture (eg Aqua culture)

Exception becomes the norm (eg, 'business blackboards') engaging corporate skills/ perspective

Put maths in context

Support maths teachers

Explain what engineering is so schools can then clarify with students and families

Encourage mentoring of secondary students by undergraduate students

Involve undergraduate students in summer schools and programs

Access to 'Blackboard' type examples / resources for teachers

Branding issue – there's no soapies on engineers, the connection with the community is more obvious in 'competing' industries (eg, health care / teaching)

Educate families

**Q4. What cultural, home and/or community obstacles are there for Aboriginal and Torres Strait Islander secondary students to overcome to be able to advance to tertiary STEM studies?**

Awareness of opportunities

Struggling environment

Anti-university attitudes (you think you're better than them)

Cultural practices – particularly in traditional community

Value of education

Teacher / school expectations of students

Continuity of education

Geographic distance

Where can engineering be studied?

Perceived value of engineering – what is it?

Early cash

Access to study space

Access to technology (eg lack of internet at home)

Access to specialist teachers

Lack of understanding of engineering

Perceptions of (evil) mining industry

Home sickness

New culture and environment

Racism / lateral violence

Lack of support at university

Industry interaction with community

Financial support during degree

Cultural awareness

Lack of family support and encouragement / lack of understanding of benefits

Disconnect between community and career

Awareness of STEM careers / pathways

Maths teaching

Indigenous Faculty staff

Indigenous industry representation

Science vs traditional knowledge

Science maturing to including traditional knowledge

**Q5. How can prospective employers assist beyond offering study support (scholarships) and graduate employment? eg internships? Part-time work during study?**

Provide role models / mentoring (ie another young person students can relate to)

Employer connection with curriculum – collaboration / industry case studies at a local level

Making engineering real – relevance to community, how it can impact

Formalised “internships” for secondary school students – shadowing, observing, direct current work experience programs into engineering

Responsibility for ‘work-readiness’ pushed back to unis

Involve industry in academic accreditation and work placements

Make work placements real, practical, authentic learning

Cultural competence in organisations to aid retention, positive workplace experiences

Cultural responsiveness – embedding cultural competence in organisations in a sustainable way, beyond the individual > community

Engineering organisations need to demonstrate best practice – engineering in communities, role

models for community, tangible evidence, positive response

Arrange for engineers to visit schools and talk about their careers

Real experiences during work experience and summer vacation work – accredit these programs

Educate about diversity – it's benefits and impact

Cadetships being dropped because companies are seeing them as an expense rather than an investment / benefit

Gap between CBD and local communities

Industry experience programs to include ‘immersion’ programs in remote / rural communities ie vacation work / immersion

Group mentoring

Connections between community, school and industry

Early interventions, flexible pathways

School-based apprenticeships

Ongoing support by workplaces to support ‘whole’ student / graduate (all areas of wellbeing)

Scholarships >> access to support >> success

Industry / school collaboration for work experience opportunities – ie role models, practical / real examples, flexible pathways, impart of engineering on local communities

Highlight social and business benefits for industry

## Appendix 1C: Responses from participants at the Forum (continued)

### University and TAFE sector participant responses

#### Q1. What and where is the interface between Faculties and 'Indigenous Studies Support Units'? How well does it work? How can it be strengthened and improved?

Indigenous support unit aims need to be clarified

They're different depending on particular uni's

Pastoral care is a low priority

Depending on funding as to what aspect receives most focus

Need exemplars to share their experience

Need to establish a benchmark and best practice approach

Relationships between engineering academics and the support units are not formalised

What other organisations / faculties could we use as role models?

Relationships between engineering academics and support units are variable – how

Medicine and law work well due to relationships with industry – ie community legal clinics and number of students / role models

#### Q2. How to identify and help overcome home or community sickness and loneliness?

Very similar to NFP Q4

Look at prevention first

Communication to home – ie services in home community

Provide appropriate communication so families are reachable

Good models do exist

Intentionally created communities purposefully

Active network building

Case handlers

BUT sensitive to the individual

Right service, not a service designed to promote institution

#### Q3. What and where is the interface between employers, industry associations, peak bodies and tertiary institutions? How can it be better leveraged to assist Aboriginal and Torres Strait Islander tertiary students?

Part time study with part time work

Provide online data for access by all interested parties

Scholarship / cadetships / trainee ships – more flexible

Work integrated learning

Vocation work opportunities

Assisted study

Summer / winter / follow-up schools

"career trackers"

NFP support – aime / clontarf / pff etc

"outsourced" indigenous strategies

Technology

Reports / forums

"...data...knowledge..."

Target indigenous s+c

le yokai

South australia industry clusters

Feedstock / pipeline

Media presence – engineering soap opera / advertising campaign

#### Q4. How might articulation and recognition of prior knowledge be better leveraged to benefit Aboriginal and Torres Strait Islander students?

Some universities don't even acknowledge prior learning – how do we introduce common standards?

Also benefits institutions

Have a process for this

Market the process – at secondary and TAFE level – linkages

Streamline the process

Transparent criteria

TAFE and Universities to work together

Identification of students?

Distribute the information to organisations like aime and to schools

#### Q5. How can we design integrated engineering pathways from TAFE into University?

Untapped resource

Opportunity for TAFEs to build maths into their programs to facilitate transition (idealistic)

Issues of quality of maths at TAFE

TAFE is hands-on learning (not conceptual) need a shift in approach

Clustering of indigenous students in programs where literacy / numeracy skills loss is critical

TAFEs build maths into their courses – hands on vs conceptual

Get all the TAFEs (approx 61) and all the unis (approx 39) together to set a common vision and ground rules



## Next Steps and Summit Preparation

ATAR should be only one indicator for uni entry eligibility – references, aptitude tests, interviews

Engineering technologist is an option – need to educate community on what this means

Second chance education examples – eg mature students

Literacy / numeracy is a huge barrier in TAFE

Getting TAFEs and unis to work together = opportunities

Tertiary preparation – year 11 and 12 is 28 weeks

High proportion of indigenous students in TAFE – it is a pathway for some students

Sector spanning university & TAFE (eg Curtin)

Student motivation

Role of ATAR – to keep students out rather than bring students in

Tyranny of single indicators

Other factors – interviews, referees, letter applications, aptitude testing

Diversified entry = investment upfront > reduce cost of student attrition

Business case – use on indigenous students to test feasibility of diversified entry approach

Social valuation of teaching

Data collection – student numbers in engineering at tafe

Collective impact

Multiple organisations to bring in data

Only one pipeline – eg community college model – second chance education

Recognition and valuation of tafe learning in university programs

Capacity driven approach

### **Q1. What are the 6 most important topics we should explore in 2015 that would facilitate a quantum change to the current state?**

Frameworks for sector collaboration

How to engage women

How to leverage existing structures and networks (eg aime / clontarf)

What's the goal – eg parity by 2025

How to brand engineering (eg the "i frigging love science" fb page has 18m followers)

Raising profile of engineering in schools / community

Maths teaching

Early identification and support

Student support

Accreditation

Alternative pathways developed

Maths – participation and teacher competency

Clear plans to address maths in schools

Clear documented pathways

The big issue is not indigenous young people not having aspirations they do (and role models and exposure can reinforce these) but that education provision enables them to achieve to realise these aspirations

Reconciliation statement

Coalition of the willing

Strong strategy and business plan

Serious investment in maths and science camps

Alternate pathways ie associate engineers 2 years, TAFE > university, entry away from ATAR only to interview etc

United engineering dean's approach – commitment to consider change to increase participation

How to increase profile (and attractiveness) of stem careers

Support to existing engineers and scientists

Support for teachers in indigenous space

How can TAFEs and universities better communicate?

Is maths taught right?

What should entry requirements be for engineering?

Most cost effective way to invest in the pipeline (primary and secondary)

More effective way to engage and access alternate pathways eg TAFE / mature age

Develop a strategy to target and support high potential students in low SES schools

Inter-university cooperation on projects – ie forget the competition for students

Effective marketing of pathways into engineering (and stem more generally) to the important audiences – young people, families and communities

Changing perception of engineering

A comprehensive data set from k-12, university and employment needs to be developed

A strategy to keep it alive must also be developed

A 20/20 vision needs to be developed; within this real targets need to be set.

Making engineering relevant to indigenous students

Educating engineers / academics the relevance / importance of indigenous engineers

Advertising campaign – vignettes / role models, putting Indigenous success stories out there

## Appendix 1C: Responses from participants at the Forum (continued)

### Next Steps and Summit Preparation (continued)

Identification of good students and getting them to tertiary education

How to get industry bodies, corporations and government to invest in changing perceptions

Role models

Flexible course entry requirements

Making maths and science education more relevant

VET higher education

Identifying formal pathways between TAFE and higher education (ie UNSW model)

Industry engagement in all levels of education

Somehow tap into the TAFE resource of potential engineering students

A structured agreement and collaborative approach across all unis in regards to pathways

How to change perceptions of maths

Exemplary practice showcased (eg in attracting students in teaching)

Mentoring programs in schools by  
1) engineering university students  
2) other young engineers

The full education pathway and its link to a career

More pathways / bridging courses in maths and physics to ensure high school students can qualify for engineering (or science)

Increase feedstock of young Indigenous students

Adopting a different approach to entry into university

A structured agreement and collaborative approach across all unis in regards to pathways

Recognise the need for engineers and drafters

Help AAMT and ATISMA achieve their objectives

Help PFF, Aurora, AIESS, AIME and other NFPs with their objectives

Increasing the profile and benefits of a career in engineering – so kids know it's an option

More engagement across education sector encouraging maths

Establishing an Indigenous Engineers Association

Formal partnerships between schools, unis and industry

Structure and organisation of pipelines

**Q2. What areas of research, data or other stakeholder engagements are required before the Summit in 2015 to ensure you and other participants will be comfortable in providing informed sector-wide input?**

How many students are potentially available for programs?

What are the models for intervention at secondary level?

Data on outcomes

Number of indigenous enrolments across Australia into engineering

Dropout rate for indigenous students broken down into year levels and demographic interests

What is best practice in support of indigenous students?

Outcome data on alternative entry pathways –

Essential to have evaluation of impact of those programs that are designed to improve the pipeline >> from school to engineering courses >> from enrolment to graduation

Data on successful programs (eg Rio Tinto employment)

Mapping and data input for pipeline opportunities

Data on students in schools – particularly high achievers

Research current cohort of indigenous engineers to identify common success factors in their path to careers

Enunciate the challenge and develop targets for graduate indigenous students

Alignment between tertiary education and professional accreditation

What are the raps for tertiary institutions and how effective are they?

What lies behind the success in law and medicine and how can that be translated into engineering?

Snapshot of the range and type of indigenous student centres roles and contributions and outcomes

Clear metrics for success

Must engage Deans of science as they are a critical part of stem

Must bring more fully the heads of Aboriginal and Torres Strait Islander units of university's into the discussion

Data re: student's participation at each stage of the pipeline – both indigenous and non-indigenous

Indigenous organisation and community representation

NAPLAN data

Schools and industry must be at the table

Research enabling factors for success in indigenous students

Overview of sector-wide stakeholders: NFPs, keen industry partners, government initiatives

Research data on numbers in courses over the last 6 years comparing indigenous and non-indigenous students and also completion of courses

Other stakeholders: acara, all university indigenous support units, school representatives (careers counsellors), employers in this space (ie BHP Billiton)

Engineering companies engaged in this space

Ken Wiltshire and Kevin Donnelly should be invited to address the summit (have been appointed to head a review into the national school curriculum)

Whole of life data source

Working group to include tare/uni re: integrated pathways

Must engage the K12 teachers

Must engage university schools of education

All discussions must be driven by the "stored data" ??

Numbers around pipeline leak – across Australia and sector-wide

Data on numbers in various sectors correlated with economic / education background

A new policy for recruiting indigenous students that does not rely on ATAR – this should be backed by a sustainable funding policy

More schools and TAFE involved in the project – ie another version of the steering committee?

Number of indigenous students doing maths and their results

Engineering industry practitioner backgrounds – their university qualifications, TAFE qualifications, work experience

Data – what is the baseline? Distribution and progression of students and attainment

Alternate pathways: which / where / how

Teacher data – what resources are available (ie moocs, online, traditional)

### **Q3. What is your gut saying should be the 6 key actions resulting from the 2015 Summit that would show to all stakeholders that the event was a success?**

Making maths meaningful in schools so kids can see it's usefulness in life / careers

Develop pipeline

Improve maths teaching

More flexible pathways

Improved mentoring and support

Broader agreement (ie accreditation)

Success stories as role models

Agreement on how to proceed towards meeting targets and kpis

Regular meetings and updates

A clear pathway for more indigenous students to become eligible for engineering courses

Easier pathways for students to navigate

Adopt a collaborative paradigm – not competitive as it so often is)

Commitment to parity in tertiary admissions, graduations and eventually across industry

An action plan complete with KPIs which are communally agreed

Make connections between players and programs real and productive

Integrate actions and advocacy re maths issues with the overall effort in stem

Development of better support for maths-like teaching

The pathway kids tread between community, school, tertiary and career and what and how connections can/should be made between them

Developing a network of highly competent maths teachers of indigenous kids with a stem focus

Sharing in full of working models, co-funding of these models (no institutional parochialism)

Clear goals and KPIs

Building and creating collaborations between community, education and industry

Pipeline template (and commitment to pipeline) between key stakeholders

Targets for 10 years, 20 years

More support for existing NFPs working in the field

More funding for maths teaching

Link employment opportunities for universities and TAFEs

Identification of easy wins – getting some students quickly into the pipeline

School >> TAFE >> university pathway

Engineering profession to emulate what medical profession has achieved

Identify talent groups in primary school

Establish programs at TAFE to lift levels of mathematics

Extend trainee and cadetship programs with employer groups across Australia

Clear implementation plans

Set clear medium and long-term goals

Clear goals

Clear roadmap

Long-term goals backed by industry

Pipeline approach

Build national curriculum support for the engineering subjects

Long-term funding commitment from industry

Clear go-forward plan for more graduates

Shared view of further actions

## Appendix 1C: Responses from participants at the Forum (continued)

### Next Steps and Summit Preparation (continued)

Understanding of best practice	Big-picture engineering contexts built into maths education in schools	Success = a formal strategy with clear KPIs
National commitment	Science as human endeavour in schools incorporating / integrating engineering	Co-ordinate all the various disparate actions – to leverage impact, to multiply, to get best practice everywhere
Agreement on what success looks like and key industry/sector initiatives	Endorsement from key, high-profile, indigenous leaders	Funding? Business plan?
A roadmap that links supply (eg scholarships) to demand	Forum stakeholder meetings and reports circulated on a regular basis	Agreement on intervention points in pipeline and identifying who can assist
Media coverage of any success(es)		

### General notes from participants

Part of Program	Comment By / Comment On	Comment
NFP Overview	EAA	Summer Schools \$350K pa, \$300 scholarships for secondary school students, \$3000 for undergrad uni students.
NFP Overview	AIME	Support 300 year 11 kids in particular now. By 2018 aim for 3000. Developing an app as a lot don't have ready access to internet but do have mobiles.
NFP Overview	AIEF	Work with 35 boarding schools and 210 communities. Pathways year 10 and transition year 11.
NFP Overview	Polly Farmer	27 locations mostly WA 1000 Secondary and 150 Primary. Due to streaming of Maths in schools in WA from age 13 many students drop out.
NFP Overview	Aurora	Lots of scholarships not taken up because many don't know they exist and "admin" associated with applying. They are developing a single form for disadvantaged applicants to be able to apply for all relevant scholarships. Do 20 days of Camps per annum.
NFP Overview	Beacon	Focus on all students in disadvantaged locations not just indigenous. Thus they do not feel like they are being singled out. Get industry into schools to participate in practical "business blackboards" in english, maths, etc.
Maths Overviews	AAMT	4000 members, 2009 -13 "make it Count" program mainly primary schools. In general the teachers teaching maths today will also be doing it in 10 years' time therefore how to change their focus. Cultural and social inclusion and maths learning inclusion. Need local ownership of pushing maths, 1/3 of unis involved in some ways with Schools. New project – excellence & equity in Maths – via uni of SA.
Maths Overviews	ATISMA	Chris first chair, maths = life opportunities, need strong support from schools and local communities to support STEM and maths. A good outcome – would be recreate the inventions of David Unaipon and take out patents.
Maths Overviews	General	Need to work out way of getting to the mid-range students as a rich pool for potential engineers (ie in between low achievers and high achievers). Need look broader at overall education/work pipeline and not just our own individual bits.
Stakeholder Response	EA & EWB	Drop out ratio from engineering courses in Australia is twice that of Europe. In Australia 2 science grads for 1 engineer, in OECD 1 science for 2 engineers.



Stakeholder Response	EA & EWB	Effective examples of “selling the dream” Indigenous Lawyers Association and Australia Indigenous Doctors – need to find out more from them.
Stakeholder Response	EA & EWB	Revising EA RAP in partnership with EWB: building effective tech career pathways; industry best practice initiatives; cultural awareness; national approach to pro bono works. Lots of sector initiatives but disconnected. EWB stakeholder mapping – can make available to all. Accreditation blockers between EA and unis, 33 unis with engineering degrees. Per capita 195 should be grads only 16 now.
Uni & TAFE Overview	UoM	No mechanism from moving from TAFE to Uni ( last one in 1996). No intention of dropping entry reqs, need to prepare them better at school.
Uni & TAFE Overview	UoS	Won't lower entry reqs, working on “growing our own” ie try and keep the better indigenous undergrads when they graduate to become tutors etc as role models. Run winter schools for year 12s and spring schools for yr11s. Have a relationship with tafe regarding a 2 year “renewable energy” course.
Uni & TAFE Overview	UQ	Community misunderstanding on what an engineer does. Linked up with se qld health services group to indigenous – “deadly choices” as part of a pilot in pushing education. Deadly choices have good credibility in local communities. Use sport as a way of getting indigenous involved. Integrate fun with engineering eg take them to dreamworld to see how engineers involved in that facility.
Uni & TAFE Overview	UNSW	NAPLAN predictors, use retired teachers to help mentor secondary students, diagnostic tools developed. Made his power point presentation/stats available to all.
Uni & TAFE Overview	UA	Tutoring assistance, Massive Online Open Courses (MOOCS) for teachers initiative, struggle with communities in recognising what engineering does/is.
Uni & TAFE Overview	Curtin	: use AIME for local cohort, Smith Family to link to lower socio economic communities, Summer school – 1 week live in and on sites with industry, course includes cultural aspects and how school/ family can get involved – run by/ mentoring done by engineering students and also bring back attendees from previous year to “role model” and raise the bar. If done well at TAFE (particularly maths) they can miss year 1 of degree course.
Uni & TAFE Overview	Ultimo	Have been delivering courses with less maths and have available special maths subject for those wanting to go to uni. Feedback from indigenous student that “too many people looking after him” – need to get balance of support right. Growing middle class of indigenous – how to tap into?
Stakeholder Response	BCA	BCA = ceos of 120 companies 2008 identified indigenous issues/engagement. 28 companies in 2008 by 2013 88 companies regarding indigenous employment and reconciliation, more people into companies and retention. Recent RAP Westpac. Barriers in companies are HR “diversity” reqs and resource mgt. Have partnerships with AIME,AIEF and Clontarf. Possible expansion via 2 way development eg staff from companies into local indigenous communities and businesses engaging with schools.
Stakeholder Response	MCA	Uninterrupted training pathways into year2 of a 3 year para professional mineral engineers course establishment particularly looking at mature age students and those in work force but other positions – piloting with Uni South Qld and Uni Central Qld.

## Appendix 1C: Responses from participants at the Forum (continued)

### General notes from participants

General Notes / Overview	General	1. Rigidity
General Notes / Overview	General	2. Role models / industry/relevance
General Notes / Overview	General	3. Maths teaching, program, progression, cultural awareness
General Notes / Overview	General	4. Teacher quality, seeking resources, help, flexibility
General Notes / Overview	General	Lack of Relevance of STEM
General Notes / Overview	General	Lack of Pathways – STEM education, Maths education not culturally framed, teacher quality community based, support structures, family, society, industry.
General Notes / Overview	General	Lack of Leadership: Rigidity, one size fits all, industry, ambiguity with their position.
General Notes / Overview	General	Lack of motivation: lack of role models, relevance and understanding, importance of a career in Engineering and IT.
General Notes / Overview	General	It starts at Primary school with Aunties and Mums.
NFP Overview	EAA	Peter Berry spoke about the Australian Indigenous Engineering Summer School program. Aim is to raise the aspirations of high school students. 1 week of living on campus with site visits, lab classes. The uni's host the summer school. 460 students go through with 29 students at Uni. \$250k annual budget. The students know little about Engineering and not really knowing what they want to do career wise.
NFP Overview	AIME	AIME – Adam Lind forth presented on AIME. Kids in high school are typically disengaged. AIME attempts to make maths and science 'cool'. They are developing an Application for the kids to link into which is maths related.
NFP Overview	Polly Farmer	Polly Farmer Foundation – Primary school maths stream starts at 13 years of age. Need to start at primary school.
NFP Overview	Beacon	Beacon Foundation – Get to young people earlier. Bring the curriculum to life, provide real jobs.
Uni & TAFE Overview	UoM	University of Melbourne – 1. Leadership 2. Role models and lack of understanding, 3. Lack of pathways into maths 4. Lack of Community based support. Cultural issues plus system issues of Engineering. STEM Pathways are a deep concern. Dean committed to Parity and highlighted the success of the Medical Faculty as an example.
Maths Overviews	General	Ian Anderson – Bell Curve. Aboriginal kids not getting the attention in classrooms. Kids invisible in schools. Attention paid to the very best or the very worst. The kids then don't see the point.
General Notes / Overview	General	Idea that for 12 weeks kids aren't at school (holidays) and that Universities can design programs to engage kids at that time. Continuity of pathways.
General Notes / Overview	General	Collaboration is needed across all sectors, primary, senior and tertiary education.

## Appendix 1D: Visual Analysis of Forum Output



## Appendix 2: Working party membership

### Group A: Pathways and Accreditation

**Chair:** Lincoln Wood, Engineers Australia  
Chrissy Berryman, Skills Tasmania  
Claudia Szabo, The University of Adelaide

### Group B: Student Support

**Chair:** Tom Goldfinch, University of Wollongong  
Lilly Brown, The Aurora Project  
Beth Crowley, The Graham (Polly) Farmer Foundation  
Rhondda Davis, Murrup Barak  
Marj Horne, Australian Catholic University  
Jade Kennedy, University of Wollongong  
Bill Lawson

### Group C: Adaptions

**Chair:** Juliana Prpic, The University of Melbourne  
Rhondda Davis, Murrup Barak  
Barbara Kameniar, Murrup Barak  
Llew Mann, Swinburne University  
Chris Matthews, Aboriginal and Torres Strait Islander Mathematics Alliance  
Colin Scholes, The University of Melbourne

### Group D: STEM Education

**Chair:** Bill Lawson  
Tom Cooper, Queensland University of Technology  
Rhondda Davis, Murrup Barak  
Marj Horne, Australian Catholic University  
Caty Morris, Aboriginal and Torres Strait Islander Mathematics Alliance  
Lizzy Skinner, Engineers Without Borders  
Mark Symes, Australian Maritime College



*Left to right: Professor Tom Cooper (Director YuMi Deadly Centre), Caty Morris (Aboriginal and Torres Strait Islander Mathematics Alliance), Bill Lawson (AO Engineer), Lizzy Skinner (Engineers Without Borders), Mark Symes (Australian Maritime College) and Dr Chris Matthews (Aboriginal and Torres Strait Islander Mathematics Alliance).*

## Appendix 3: Working party documents

<u>Appendix 3A: Engineering pathways and accreditation paper</u>	<u>28</u>
<u>Appendix 3B: Engineering pathways diagram</u>	<u>30</u>
<u>Appendix 3C: Student Support paper</u>	<u>32</u>
<u>Appendix 3D: Adaptations – best practice resources</u>	<u>41</u>





## Appendix 3A: Engineering pathways and accreditation paper

Prepared by the Pathways and Accreditation Working Group

### Purpose of the Pathways and Accreditation Working Group

The purpose of the Pathways and Accreditation Working Group was to define education pathways for students in technical and engineering fields to develop their careers, supported by the removal of all unnecessary constraints that could inhibit their progress on that pathway. The goal is to enable individuals to achieve meaningful employment at their chosen levels, with the real opportunity to resume their career development through further education if they choose to do so.

### Background

The Pathways and Accreditation Working Group is one of four working groups at the National Indigenous Engineering Summit addressing the under-representation of indigenous students in engineering-related careers.

Building engineering pathways for Indigenous Australians requires support across all levels of engineering education. Industry, professional bodies, governments, VET sector and higher education providers, all have a role to play in supporting the transition of Indigenous students from secondary education to trades, to paraprofessional programs, and potentially to professionally-accredited engineering programs. Central to this is the definition of those pathways across different levels of awards that can form the basis for on-going consultation and decision making by all stakeholders.

### Pathways

In a recent study for the Australian National Engineering Taskforce (Reference 1), a generic engineering pathway was developed from engineering trades to professional engineering. This generic pathway provided a starting point for the development of a more comprehensive representation that was developed by the Working Group as its key output. This output (Reference 2) is too detailed to be depicted in this brief overview (it is available from the Summit website), but the fundamental features of the generic pathway are preserved. That is, it depicts the articulation pathways from completed awards to the next education level.

Especially for progression from trade level programs to the paraprofessional and professional program levels, there may be 'bridges' from one level to the next. 'Bridges' are additional studies required for articulating students to move to the next award level with academic credit (meaning that they do not need to undertake all units of the higher award). As noted by King et al, bridges are required 'because the lower level qualification cannot be a simple subset of the higher level qualification if it is intended to meet Engineers Australia's accreditation requirements for entry to the relevant occupation'. It is immediately apparent that the accreditation criteria that are applied to these bridging programs need to be exercised in a manner that removes unnecessary constraints on progression from one level to the next.



Left to right: Nicola Frewan (Bachelor of Science student, The University of Melbourne) and Sam Thorne (Jacobs).

Currently, about six percent of all commencing students in engineering degrees are admitted on the basis of a VET award, compared with ten percent across all higher education programs. Of these, approximately only 20 percent complete their degree, so the prospect of completion for Indigenous students is not encouraging. Clearly, not only is great effort required to attract students to the engineering pathway, similar effort is required to support them on their journey on that education pathway. When Indigenous graduates present for membership of Engineers Australia, there is also a need to recognise the nature and extent of their exposure to professional practice that has been achieved during their extended journey.

From this information it is apparent that the definition of a generic education pathway to a professional engineering degree, whilst important, is not the fundamental challenge. Many education providers already have defined pathways that are tailored to the specific programs that they offer; not all providers offer programs at all levels, and there is enormous variety in the manner by which a student can articulate between different providers, as well as between programs. The value of the comprehensive pathway developed by this Working Group is that it provides a reference point for each provider to define pathways specific to its programs. Likewise, employers who sponsor indigenous students will find it helpful when assisting and advising them about potential options for further education, as will Engineers Australia when considering matters of accreditation, membership and registration.

## The Journey

With a generic engineering education pathway available to all stakeholders, the major task in relation to pathways becomes that of attracting students to commence their journeys on the pathway, and motivating and empowering them to continue on a journey that is beset with many challenges. The origins of these challenges may be based in education, employment, society or community, as well as personal circumstances. Not the least of these challenges is the alienating language that is often employed by engineering professionals and the associated assumptions that discourage Indigenous students (and others) from their engineering journey.

The Summit Strategy Workshop A – Pathways and Accreditation – will explore the challenges associated with making the journey on the education pathway, primarily (but not only) from the perspectives of industry and the profession. In particular, the proposition that “a new professional narrative is required to mitigate the professional alienation resulting from deeply embedded and unhelpful assumptions” will be considered.

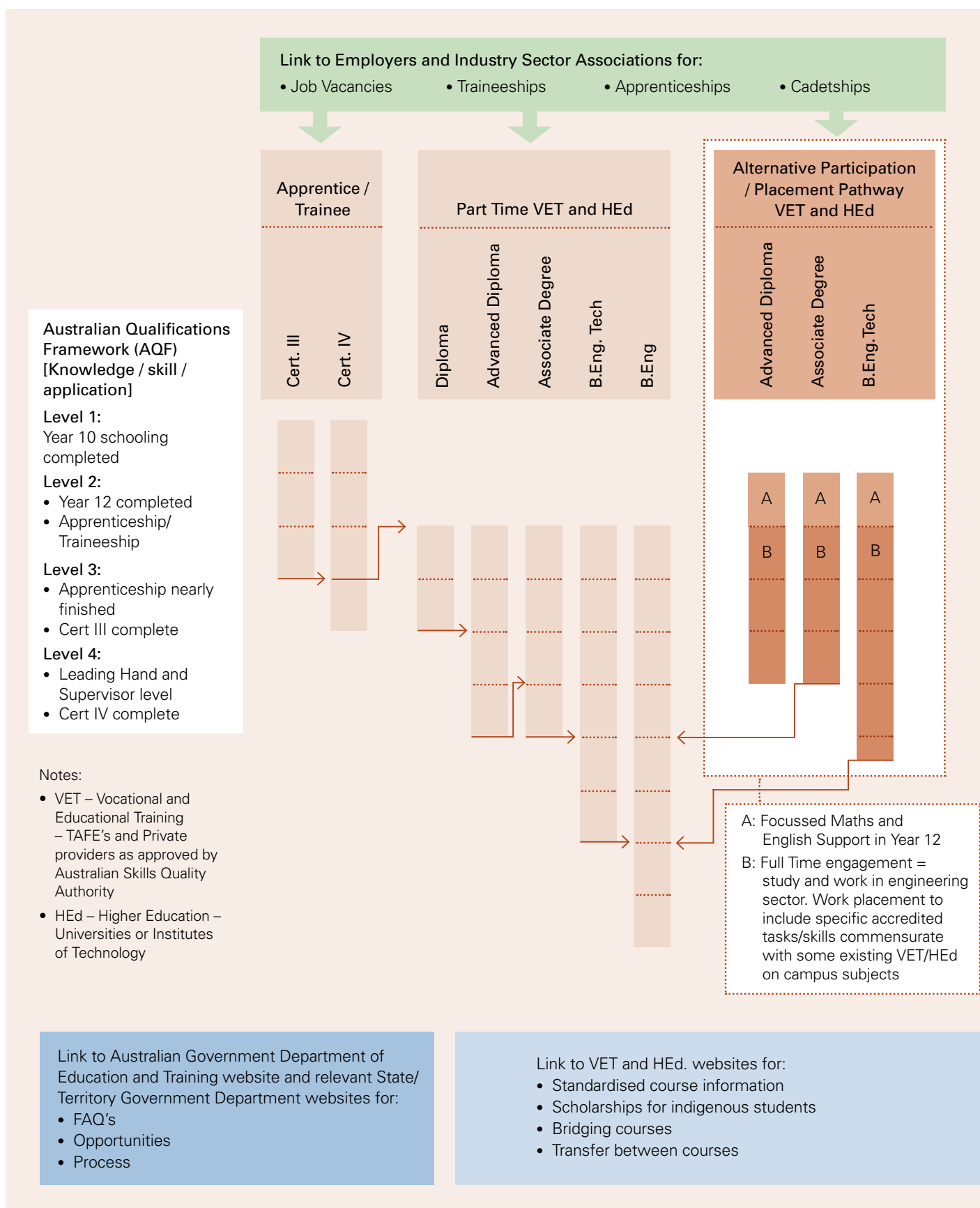
## References:

1. King R, Dowling D, Godfrey E (2011) Pathways from VET Awards to Engineering Degrees: a higher education perspective. Australian National Engineering Taskforce
2. NIES Working Group A (2015) Engineering Pathways v2.0, National Indigenous Engineering Summit (available from the Summit website)



Left to right: Charles O'Leary (Director, Murrup Barak, The University of Melbourne) and Ellen Day (Manager, Partnerships and Development, Murrup Barak, The University of Melbourne).

## Appendix 3B: Engineering pathways diagram

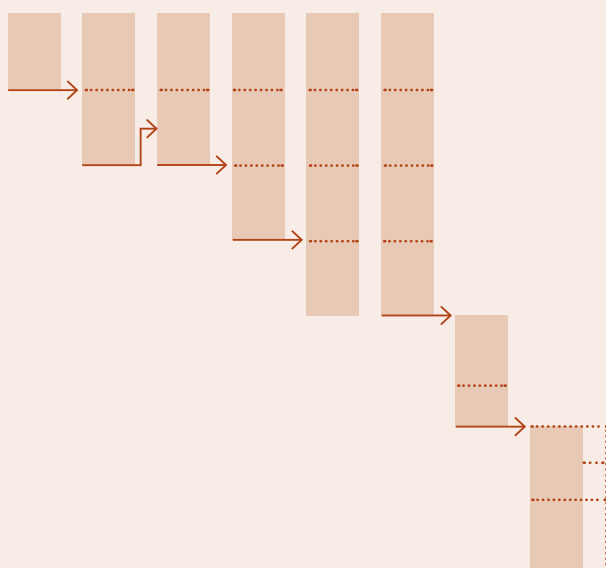




\*Note; the Master of Engineering '3+2 model' has not been depicted here

### End Game: Employment

An individual is employed at their chosen level initially and in the future can have opportunity to potentially undertake further and higher education



#### AQF

##### Level 5:

- Diploma (VET)

##### Level 6:

- Advanced Diploma (VET)
- Associate Degree (VET or HEd)

##### Level 7:

- B.Eng. Tech
- B.Eng.

##### Level 8:

- B.Eng (Hons)

##### Level 9:

- Master of Engineering
- Master of Engineering '3+2 model'

##### Level 10:

- Doctoral Degree

Engineering Trade

Engineering Support  
Engineering Associate or  
Engineering Technician =  
Paraprofessional (Dublin  
accord)

Engineering Technologist  
(Sydney Accord)

Professional Engineering  
(Washington Accord)

Link to Engineers Australia website for:  
• Accreditation information



## Appendix 3C: Student Support paper

Prepared by the Student Support Working Group

### Summary of Recommendations:

**R1:** Scholarship programs supporting Indigenous students in engineering studies broaden their focus to include not only high achieving students but also students demonstrating the potential to excel in engineering.

**R2:** Align scholarship opportunities to other support mechanisms in the formal learning environment.

**R3:** Ensure support programs are created in collaboration with Indigenous stakeholders.

**R4:** Partnerships between educational stakeholders (students, educators, family, community, industry, government) are established with structural flexibility to enable responsive student support.

**R5:** Tertiary engineering education providers revise current curricula in partnership with Indigenous Stakeholders to embed Indigenous perspectives.

**R6:** Embed Indigenous support staff within engineering schools and departments to drive responsive and proactive support.

### 1. Introduction

In 2008, just 20 Aboriginal and Torres Strait Islander students graduated from professional engineering degree programs around Australia (Calma, 2009). This figure represents just a tiny fraction of engineering degree completions overall, and highlights the need for significant action to increase the number of indigenous students completing their studies.


At present, however, engineering as a field of study faces significant challenges in increasing indigenous student numbers. DEEWR reports that the proportion of Indigenous students studying engineering and related technologies is much lower than that of non-indigenous students (DEEWR, 2008). The engineering profession is clearly under-performing in its appeal to indigenous students in comparison to health, education and the humanities (DEEWR, 2008, p. 118).

In contrast, there is strong demand from engineering industries for indigenous employees. Rio Tinto, for example, has set indigenous labour force targets in the order of 35-40% for a number of its major mining operations (Rio Tinto, 2013). Corporations such as BHP Billiton also offer substantial scholarships to indigenous student looking to study engineering at university (BHP Billiton, 2012). Engineers Australia, the peak body representing the engineering profession, is now pressing for greater participation in engineering education and professional practice (Engineers E. Australia, 2011a). This push for higher workforce participation is driven not only by employment targets, but also by the increasing acknowledgement that engineering needs to become a more socially engaged profession.



Left to right: Jade Kennedy (The University of Wollongong), Dr Tom Goldfinch (The University of Wollongong), Neil Jarvis (CEO, Graham (Polly) Farmer Foundation), Bill Lawson (Engineer), Beth Crowley (Graham (Polly) Farmer Foundation), Rhondra Davies (Manager, Indigenous Programs, Murrup Barak, The University of Melbourne).





Successive refinements in accreditation standards for the profession indicate an increasing need to value and include different perspectives and cultures in day-to-day activities to ensure the success of engineering projects (Engineers Australia, 2011b; Institution of Engineers Australia, 1996; Bradley, 2006).

The education sector, industry, government and Engineers Australia have responded to the need for greater participation among Aboriginal and Torres Strait Islander peoples through a variety of outreach activities and scholarship opportunities. There are numerous current initiatives that seek to increase interest in engineering amongst indigenous high school students through outreach programs. One of the most prominent of these is a summer school run by the organization Engineering Aid Australia ([www.engineeringaid.org](http://www.engineeringaid.org)). Engineering Aid Australia provides funding for indigenous students in years 10 and 11 from all over Australia to attend a week long program that includes site visits, talks from practicing engineers, and a range of hands on activities designed to spark students' interest in engineering. Other engineering focused programs take a travelling roadshow approach, visiting schools and running interactive engineering focused activities to engage Indigenous students in a face-to-face setting. Such programs include The University of Wollongong "Hands-on Engineering" program for years 7-12 and Engineers Australia's EngQuest (<http://www.engquest.org.au/>). There are also many examples of more general programs linking high school students with tertiary education such as the Australian Indigenous Mentoring Experience (AIME, see [aimentoring.com](http://aimentoring.com)), and other outreach and academic pathway programs including UOW's in2uni initiative (<http://www.uow.edu.au/in2uni/index.html>).

While initiatives to spark interest in engineering and in further study are well recognised and established, the slow trickle of Indigenous students into engineering education pathways continues. The National Indigenous Engineering Summit Student Support working group focused on issues surrounding Indigenous students' pursuit of and engagement with opportunities for a career in engineering. Through its deliberations, readings and experience, the working group has identified four situations in which Indigenous students may benefit from appropriate support towards engineering qualifications:

1. Support in the home
2. Support in formal learning environments
3. Support by external agencies
4. Support to study away from home

This paper details the background information used to develop draft recommendations for presentation and discussion at the National Indigenous Engineering Summit. Recommendations made in this paper are in draft, and have been developed for further refinement in partnership with Summit participants.

### **1.1 Stories from Indigenous Engineers...**

The Student Support Working Group discussed Indigenous engineers' stories as a backgrounding activity to understand some of the challenges overcome by individuals. Some of these Engineers will be in attendance at the summit to share their stories. With permission, these personal stories will be added to the working paper for completeness and to provide a personal context to many of the issues raised below.

### **1.2 What do we mean by support?**

In considering strategies for supporting Indigenous students appropriately, there is a need to avoid a deficit perspective. An over-emphasis on issues originating from Indigenous students (and their familial, cultural and community contexts) is increasingly being identified as part of the problem of ineffective support, rather than a remedy to it (Altman, 2009; Forde, Bamblett, Lovett, Gorringer, & Fogarty, 2013; Pholi, Black, & Richards, 2009; Vass, 2012). Considering ways to support students' path to engineering requires an acknowledgement of what Indigenous communities and Indigenous students can bring to engineering.

Strategies for supporting learners also needs to acknowledge that in many instances, reasons for withdrawal from formal studies by both Indigenous and Non-Indigenous learners are not related to academic performance (Baillie & Fitzgerald, 2000; Behrendt, Larkin, Griew, & Kelly, 2012; Foley, 1996). In arguing this point, Foley (1996) describes from an Indigenous university student perspective, three areas where support may be beneficial to students outside the focus on academic support:

- Housekeeping skills – organizing timetabling, time management, and study routines.
- Life skills – coping with new environments, low self-esteem, and family pressures, often in the absence of normal support structures for students studying away from home.
- Financial skills – managing study costs within available income, dealing with family pressures around money.

## Appendix 3C: Student Support paper (continued)

Foley argues that effective support cannot be delivered effectively by institutions where formal support units are not staffed by individuals who are 'stable, punctual, dedicated... with broad Community knowledge... and have an in-depth knowledge of the university' (p.55). Employing the wrong support staff imposes an institutional barrier to the provision of effective student support within the learning context.

In summary, *support is defined here as the removal of barriers to participation in formal studies leading to career pathways in Engineering*. In particular:

- Financial barriers
- Cultural barriers
- Social barriers
- Academic barriers
- Deficit perspectives

### 2.1 Support in the home

Within wider Australian population, students are twelve times more likely to attend university if their parents expect them to and four times more likely to attend university if their friends do (Gemici, Bednarz, Kermel, & Lim, 2014). This speaks to the importance of creating a cohort and engaging with parents from a strengths based position. In doing so it is also important to recognise that the difficulty in disrupting the negative historical relationship between Indigenous people and the Australian education system. Formal educational institutions were instrumental in dispossession and are often still recognised as such [REF], creating barriers to buy-in from parents.

Several current programs have demonstrated successful approaches to engaging with family and community in providing academic support for Indigenous learners. The Aspiration Initiative (<http://theaspirationinitiative.com.au/>) acknowledges the importance of parental/carer support from this perspective by valuing parents as knowledge holders who have extreme potential influence over their children and engaging them within initiatives such as the Academic Enrichment Program.

Similarly, The Graham (Polly) Farmer Foundation's (pff.com.au) Partnerships for Success initiative is a voluntary out-of-school education program targeted at aspirational and high-achieving Indigenous students in Years 7-12 operating in 28 sites across Australia. The program aims to support Indigenous students to excel academically, complete secondary school and achieve entrance to university. Although university entrance is the primary goal, the program also supports students to achieve other tertiary placements, such as vocational education

and training (VET), an apprenticeship or traineeship, or the employment of their choice. Evaluation of the WA programs indicated that they extensively addressed the issue of engagement with Family and Community (Partington et al., 2009). Supported by professional development opportunities provided by the WA Department of Education and Training, school teachers and administrators were asked to:

- consult with the local Aboriginal Community to identify community needs
- facilitate local ownership of the program
- build a community support team to sustain program operation
- engender local school community support of the program
- develop positive relations with program partners (Partington et al., 2009, p.100).

Through the experience of initiating and sustaining community partnerships, a framework was developed for guiding the interaction between Family and Community, and Schools involving 7 dimensions: communicating; connecting learning at home and at school; building community and identity; recognising the role of the family; consultative decision-making; collaborating beyond the school; and participating (Partington et al., 2009, p101). Key to this framework is the valuing of Community and Family contributions within the partnership and the flexibility to work beyond the immediate goals of the program. This is an important component of addressing social, practical and cultural barriers for students as they become apparent, rather than attempting to define them from the outset (see Recommendation 4).

In terms of academic support within the home, the challenge faced by families supporting relatives towards studies in engineering lies with the low rates of Indigenous participation in engineering fields. In particular, developing partnerships as described above for engineering pathways is problematic when Indigenous communities have so little close connection with engineering from an 'insider's' perspective, and subsequently a limited understanding of what engineering is. In the example of mathematics (essential in working towards engineering pathways), Goos (2004, p. 20) asserts that to engage any parent in supporting their children in math involves demystifying mathematics and introducing parents to current ideas about numeracy concepts and learning approaches. A NSW-based pilot program focusing on teaching mathematics in Indigenous contexts (Howard, Perry, Lowe, Ziems, & Mcknight,

2003) provides a useful example of a program where not only the existing knowledge of learners was built on, but parents/carers and families were involved in the planning and implementation of curriculum for k-6 mathematics. This pilot program was successful, but one of the main inhibitors was teacher professional development in parallel to the implementation of the program.

In the prior work described here, it is apparent that ensuring students are supported outside the formal learning environment involves active, purposeful and ongoing efforts to engage Family and Community in students' education (See Recommendation 3).

## 2.2 Support in formal learning environments

Formal Learning Environments are defined here as K-12 schools, Tertiary institutions (TAFE, Universities, etc.), and organised structured tutoring outside the classroom. In the Higher Education sector, Australian Universities have also responded to the need to support indigenous students through the establishment of dedicated indigenous support units responsible for developing and operating support programs and outreach programs. These units are generally responsible for administration of Institutional Scholarships, tuition support, and alternative admissions pathways. Many also take a leadership role across Institutions to promote awareness,

build on-campus communities and drive initiatives at the school, faculty and Institution level. Many of the Indigenous student support programs run by such central units exist largely in parallel to standard academic programs and support structures (Nakata, Nakata, & Chin, 2008), and support may be more effectively delivered when embedded within schools and faculties (Behrendt *et al.*, 2012), see Recommendation 6.

In terms of Engineering Education, Appanna (2011) argues that there are unique challenges faced by indigenous students in engaging with STEM curricula. Western cultures which have shaped engineering education in Australia emphasise facts and concepts in a decontextualised manner. In contrast, the indigenous worldview emphasises value, spirituality and holistic understandings (NTDEET, 2006, in Appanna, 2011). Western Scientific approaches can also be at odds with traditional Indigenous belief systems (Linkson, 1999). Such a clash of cultures can create significant challenges in education when these differing values and worldviews are not recognized and accommodated (Prpic & Kanjanapanyakom, 2004). The low rates of indigenous participation in the engineering profession also means there is limited role modelling within indigenous communities which may otherwise help overcome these content-related challenges (Behrendt *et al.*, 2012, p.174).



Mr Paul Douglas – Chair, Indigenous Engineering Steering Committee

### Appendix 3C: Student Support paper (continued)

These key issues mean that engineering education faces significant challenges in effectively supporting indigenous students through existing programs operating from outside the standard curriculum.


There have been a number of previous efforts to revise engineering curricula to accommodate and/or value different cultural perspectives within the university context. Much of the prior work in revising engineering curricula to embed other worldviews and cultural perspectives has focused on globalization and the international nature of the engineering profession (Becker, 2006; Lohmann, Rollins, & Hoey, 2006; Rhamdhani, Salehi, Wong, Kapoor, & Vakhguel, 2009). Other work has emphasized the need to focus on differing perspectives closer to home (Abuodha, Layton, & Goldfinch, 2011; Duff, Brodie, Furber-Gillick, Quinn, & Smith, 2011; Goldfinch, Layton, & McCarthy, 2010; Goldfinch, Leigh, Gardner, Dawes, & McCarthy, 2012). These curriculum revisions and strategies range from content focused activities to short term immersive or simulated intercultural experiences, to deeper, embedded approaches to exploring engineering in terms of different cultural perspectives (Leigh *et al.*, 2014).

Within the context of math education research, math is consistently identified as an area of crisis in education for Indigenous students (Ford, 2012). Pedagogy and classroom practices (Matthews, Howard, & Perry, 2003; Nichol & Robinson, 2000), assessment (Klenowski, 2009) and content (Harris, 1991) are increasingly being criticized as exclusionary and irrelevant to many Aboriginal and Torres Strait Islander learners. This is an important issue in terms of potential support, encouraging student involvement and keeping them interested. Matthews, Watego, Cooper and Baturu (2003) for example assert that despite the many interventions developed and implemented with the aim of enhancing the mathematical learning outcomes of Indigenous students, 'Indigenous students find little relevance within mathematics, and educators have little faith in Indigenous students' mathematics abilities'. This is also a systemic issue within schools. There is a growing body of research and literature that emphasises the significant negative impacts of low expectations and racism (in curriculum content, pedagogy etc.) on the self-concept and academic achievement of Indigenous students (Bodkin-Andrews, O'Rourke, & Craven, 2010;



Left to right: Nelson Ambar (Bachelor of Science extended student, The University of Melbourne), Eloise Bentley (Bachelor of Science student, The University of Melbourne) and Alexandra Hohoi (Bachelor of Science student, The University of Melbourne with an aspiration to study chemical engineering + business)





Craven & Marsh, 2004). This parallels a tendency within policy and practice to frame academic underachievement as a cultural incompatibility, or as the problem of the student, their family or community. Furthermore, political considerations of Indigenous educational disadvantage often fail to contend with certain significant aspects of Aboriginal and Torres Strait Islander lived realities. Within context of minority populations, high expectations and aspirations are identified as imperative for student success (Cooper, Baturo, Warren, & Grant, 2006; Vand den Bergh, Denessen, Hornstra, Voeten, & Holland, 2010).

In the Graham (Polly) Farmer Foundation's Partnerships for Success initiative, the high expectations of program staff are explicitly communicated to students. Local coordinators and tutors encourage their students to work hard and challenge them to be successful. This sometimes involves pushing students into challenging environments, building their confidence and encouraging them to enrol in demanding subjects. The program seeks to provide students with compelling real-life incentives to study hard by conveying the message that success at school can lead to further education and training or a job of their choice.

Also focusing on pre-tertiary engineering education, the newly established CSIRO Indigenous STEM Education program provides supported pathways that aim to increase Aboriginal and Torres Strait Islander representation in STEM-related professions. Recognising the fundamental importance of Aboriginal and Torres Strait Islander culture and identity in student achievement, a strong cultural, as well as a rigorous academic focus, is guiding the development, implementation and evaluation of the program.

The current research suggests that there are significant cultural barriers to Indigenous students' engagement with traditional teaching in engineering related studies. Regardless of the education sector concerned, there is a need to re-evaluate the underlying assumptions for the way curricula are designed, particularly in the tertiary education sector. To maximise effectiveness, this may be paired with efforts to engage with Family and Community in other student support initiatives (see Recommendation 5). However, gaining support to undertake such revisions is likely to be problematic in situations where few Indigenous Students, if any, are currently enrolled. Educational staff buy-in is essential to high quality, sustainable curricula that appropriately accommodate Indigenous learners, or indeed other

student cohorts who bring differing perspectives and approaches to learning to the classroom. A current project, funded by the Australian Government Office for Learning and Teaching (OLT), is aiming to work around this by establishing the foundations of engineering curricula that can value and accommodate alternative world-views to the benefit of non-indigenous students (Goldfinch & Kennedy, 2013; Leigh et al., 2014), see <https://indigenousengineering.wordpress.com/>.

### **2.3 Support by external agencies**

External agencies are defined here as institutions or organisations that don't have direct control over formal learning environments, such as not for profit organisations, industry groups and employers, government bodies, or other scholarship providers. External agencies play a key role in providing inspiration to potential students and financial support through numerous scholarships for Indigenous students seeking to enter tertiary studies. The Aspiration Initiative lists over 300 scholarship programs for undergraduate indigenous university students and over 100 for advanced postgraduate studies in various fields (see <http://theaspirationinitiative.com.au/indigenous-scholarships>). There are also many scholarships available for studies in Engineering such as the Australian Indigenous Education Foundation-BHP Billiton scholarships, Rio Tinto Indigenous Scholarships and Engineering Aid Australia Scholarships, plus others stemming from Reconciliation Action Plan commitments. These employer-linked opportunities also offer direct connection with practicing engineers and engineering technologists and employment opportunities following successful completion of studies. Despite the advantages of industry linked scholarships, many of these opportunities go unfilled each year. These programs are well promoted through education providers, websites and other agencies, raising questions as to why these scholarships are not always filled. One possibility is that many focus on a traditional model of inviting only high achieving students to apply, without clearly defining 'high achieving'. Indigenous students who are successfully progressing through their studies may benefit academically from financial support but be discouraged from applying due to their average performance to date.

Reconsidering the focus on academic high achievers to students who demonstrate the potential to succeed may result in funds benefitting a wider group of Indigenous students (see Recommendation 1). Where scholarship



## Appendix 3C: Student Support paper (continued)

funding is redistributed across a broader Indigenous student cohort, student success is also more likely where appropriate additional support is available by the funding organisation AND within the formal learning environment (see Recommendation 2)

External agencies also offer support through experiences and programs aimed at supporting aspirations towards a career in Engineering. In addition to those described in 2.1 and 2.2 (The Aspiration Initiative, AIME, The Graham Polly Farmer Foundation and Engineering Aid Australia) the Aboriginal Summer School for Excellence in Technology and Science (ASSETS) provides a residential summer school that is followed by a leadership program for Year 10 Aboriginal and Torres Strait Islander students who are interested in their cultural background as well as science, technology, engineering and mathematics (<http://www.csiro.au/en/Education/Programs/Indigenous-STEM/ASSETS/About-ASSETS>). ASSETS is just one part of the Indigenous STEM Education program managed by CSIRO and funded by the BHP Billiton Foundation, and exists among a range of aspiration building initiatives which can be complimented by other support strategies. Ensuring strong collaborative networks between Community, External Agencies and Formal Learning Environments has been demonstrated by the Polly farmer foundation and others as a critical factor for successful student transitions from K-12 education to tertiary studies (see also Recommendation 4).

### 2.4 Support to study away from home

Many of the issues experienced by Indigenous students discussed above are faced by these students when studying significant distances from family and Community. In many respects, support to study away from home has been the primary focus of funding for student support, and the financial barriers encountered by students studying away from home are well recognised. Much of the focus has been on financial support for Indigenous students living away from home. However, significant cultural and social barriers may be faced by students who are physically disconnected from family and Community support (Foley, 1996). This scenario also creates challenges for Education providers and External agencies seeking to develop support strategies in partnership with Community. Across the board for engineering students in Australia and overseas, failure to develop networks and identify with the discipline are key factors in students discontinuing their studies (Baillie & Fitzgerald, 2000; Marra, Rodgers, Shen, & Bogue, 2012). In this sense,

support should focus on building social support networks and a strong professional identity among students. Many Indigenous units within educational units currently facilitate social connections through residential colleges and student groups. However, to partner this with engineering discipline specific student-student, student-staff and student-engineer connections requires closer collaboration with engineering schools and departments, potentially facilitated through faculty or school embedded support staff (see Recommendations 5 and 6).

## 3. Discussion and Conclusion

Recommendations arising from this paper can be grouped under three general strategies for progress in this area:

- R1 & R2: Improve access to financial support, and impact of financial support
- R3 & R4: Build two-way partnerships with stakeholders and beneficiaries. Mutual learning is essential.
- R5 & R6: Build support into the core-business of engineering education providers (as it is currently for middle-class white male school leavers...)

This paper has captured only a snapshot of the complex issue of student support. In addressing recommendations made by the Student Support Working Group, there is a need to explore how gains have been made in other disciplines such as Health, Law and Education. Critically, there is a need to build stronger relationships between engineering education providers and Indigenous Communities to provide greater clarity on the present barriers to fuller Indigenous participation in engineering studies. To conclude, there is a need to change the way engagement with Indigenous stakeholders is viewed and approached within the engineering education sector. Achieving progress against these recommendations requires engagement that has parallels with current practices in Industry engagement – a recognition and acceptance of the importance of ongoing cooperation, committed to by most staff, with a view to facilitating mutual learning and mutual benefit. Closer engagement between engineering education providers, Indigenous stakeholders and other associated bodies may facilitate a greater understanding of the wider benefits of greater participation in engineering by Indigenous Australians.

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### Appendix 3C: Student Support paper (continued)

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## Appendix 3D: Adaptations – best practice resources

### Indigenous teaching and learning

Teaching from Country –  
<http://learnline.cdu.edu.au/inc/tfc/index.html>  
Charles Sturt University

Integrating Western and Aboriginal Sciences:  
Cross-Cultural Science Teaching  
[http://www.usask.ca/education/profiles/aikenhead/webpage/rise\\_article.pdf](http://www.usask.ca/education/profiles/aikenhead/webpage/rise_article.pdf)

Ways of Learning: Indigenous Approaches to  
Knowledge: Valid Methodologies in Education  
<http://atsis.uq.edu.au/ajie/docs/2001292810.pdf>  
Michael Red Shirt Semchison, University of  
Queensland

Aboriginal Ways of Learning and Learning Styles  
<http://www.aare.edu.au/data/publications/1997/hughp518.pdf>  
Paul Hughes, AM, DLitt (hon.), Associate  
Professor and Director

8 Aboriginal Ways of Learning Factsheet  
[https://intranet.ecu.edu.au/\\_\\_data/assets/pdf\\_file/0016/510073/8-Aboriginal-ways-of-learning-factsheet.pdf](https://intranet.ecu.edu.au/__data/assets/pdf_file/0016/510073/8-Aboriginal-ways-of-learning-factsheet.pdf)

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TAFE Outreach – Papers, Reports and Research  
<http://nswtox.com/>

### Supporting Indigenous students

<http://theaspirationinitiative.com.au/>

<http://www.indigenousscholarships.com.au>

Bachelor of Science (Extended)  
<http://www.bsc.unimelb.edu.au/bachelor-science-extended>

### Student Guides

Aboriginal and Torres Strait Islander Student Guide  
<https://www.adelaide.edu.au/publications/pdfs/atsi-guide.pdf>

### Indigenous engineering

Bush Mechanics – DVD  
<https://shop.abc.net.au/products/bush-mechanics-the-series-1>

### Government papers

Closing the Gap – The Prime Minister’s Report 2015  
<http://www.dpmc.gov.au/pmc-indigenous-affairs/publication/closing-gap-prime-ministers-report-2015>

STEM Country Comparisons  
[http://www.acola.org.au/PDF/SAF02Consultants/SAF02\\_STEM\\_%20FINAL.pdf](http://www.acola.org.au/PDF/SAF02Consultants/SAF02_STEM_%20FINAL.pdf)

Enriching tertiary education with Indigenous voices  
by Tom Calma Aboriginal and Torres Strait Islander  
Social Justice Commissioner Australian Human Rights  
Commission. <https://www.humanrights.gov.au/news/speeches/enriching-tertiary-education-indigenous-voice>  
<http://www.indigenous.gov.au/>

Improving outcomes for Indigenous students:  
The Work Book and guide for school educators.  
[http://www.whatworks.edu.au/upload/1269678468869\\_file\\_WorkbookEd3.pdf](http://www.whatworks.edu.au/upload/1269678468869_file_WorkbookEd3.pdf)

What Works? Explorations in improving outcomes  
for Indigenous students.  
A report prepared for the Commonwealth Department  
of Education, Training and Youth Affairs by the IESIP  
SRP National Coordination and Evaluation Team.  
[http://www.acsa.edu.au/pages/images/What%20works\\_.pdf](http://www.acsa.edu.au/pages/images/What%20works_.pdf)

What Works. The Work Program: Core Issues 5  
Student Engagement: Attendance, participation  
and belonging  
[http://www.whatworks.edu.au/upload/1250830979818\\_file\\_5Engagement.pdf](http://www.whatworks.edu.au/upload/1250830979818_file_5Engagement.pdf)

National Best Practice Framework for Indigenous  
Cultural Competency in Australian Universities  
<http://bit.ly/1JL28nj>

### Summer Schools / Camps

ASSETS  
<http://www.csiro.au/en/Education/Programs/Indigenous-STEM/ASSETS/About-ASSETS>

Australian Indigenous Engineering Summer School  
<http://sydney.edu.au/engineering/iaess/>

### University programs

Bachelor of Science (Extended) – The University  
of Melbourne

<http://www.csiro.au/en/Education/Programs/Indigenous-STEM/BSC/About-BSC>

## Appendix 3D: Adaptations – best practice resources (continued)

### Cultural Awareness Training

Indigenous Knowledge and Engineering Education  
@ UWA  
<http://bit.ly/1DserUq>

EWB On Country Cultural Awareness  
<http://www.ewb.org.au/events/92/11817>

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Shahjahan, R. (2005). Mapping the Field of Anti-colonial Discourse to Understand Issues of Indigenous Knowledges: Decolonising Praxis; *McGill Journal of Education*; 40, 2; 213.

Shiva, V. (1997). *Biopiracy, The Plunder of Nature and Knowledge*; South End Press Collective; USA.

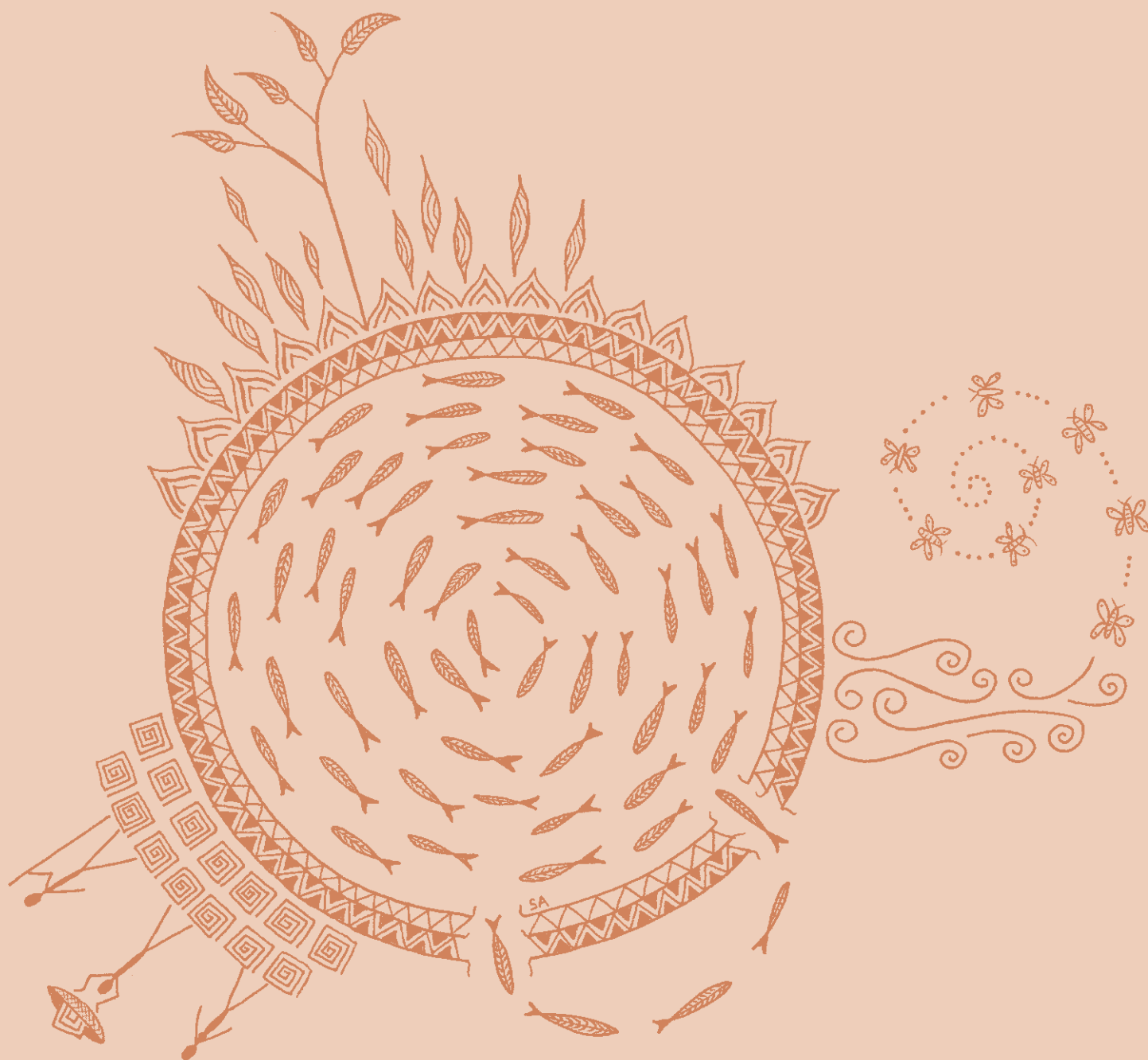
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## Appendix 4: National Indigenous Engineering Summit

<b>Appendix 4A: Summit program</b>	<b>44</b>
<b>Appendix 4B: Summit participants</b>	<b>52</b>
<b>Appendix 4C: Final Communique</b>	<b>56</b>



## Appendix 4A: Summit program

# National Indigenous Engineering Summit

June 18-19, 2015 Woodward Conference Centre The University of Melbourne



Welcome to the National Indigenous Engineering Summit. Our goal is to create sustained growth in Indigenous participation, with the aim of achieving parity in engineering graduations by 2030. The National Indigenous Engineering Summit is the beginning of this journey.

Proudly hosted by the Melbourne School of Engineering at The University of Melbourne, the Summit is an element of the Indigenous Engineers: Partners for Pathways project funded by the Commonwealth Department of Education and Training.

This event brings together stakeholders from government, industry, universities, TAFEs, and other education providers, professional bodies and not-for-profit organisations to develop strategies to create and support pathways into engineering professions for Indigenous Australians. Recommendations from the Summit will inform ongoing policy and initiatives across the following areas:

- Development of an enabling national policy environment including national scholarship schemes
- Creation of more flexible pathways and accreditation to produce professional and para-professional engineers
- Improvement in the uptake and outcomes from STEM education for Indigenous primary and secondary students

- Development of secondary school programs that support Indigenous students and promote engineering as a viable and meaningful career option
- Development of processes in the higher education system to assist Indigenous students to qualify as professional and para-professional engineers

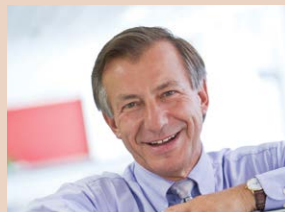
This requires a consultative approach and we feel privileged that so many committed and dedicated participants from all over Australia have come together to lay the foundations of new programs. These will have a lasting impact on the future of the participation of Indigenous Australians within the engineering industry.

This is a long-term project and we look forward to your ongoing engagement as we work together to maintain momentum and achieve these ambitious and necessary goals.



*Iven Mareels*

Professor Iven Mareels  
Dean, Melbourne School  
of Engineering  
The University of Melbourne



*Paul Douglas*

Professor Paul Douglas  
Chair, Indigenous Engineering  
Steering Committee



*Ian Anderson*

Professor Ian Anderson  
Pro Vice-Chancellor (Engagement)  
The University of Melbourne

## Appendix 4A: Summit program (continued)

### Parliamentary Speakers

Mr Dan Tehan, Member for Wannon

The Honourable Natalie Hutchins MLA, Victorian Minister for Aboriginal Affairs

### Keynote Speaker: Wayne Denning

Wayne Denning is the Managing Director and Executive Producer of award winning, Brisbane based media company Carbon Media and a proud Birra Gubba man. Since establishing Carbon Media in 2006, Wayne has produced a number of ground breaking television and multi-platform projects, ranging from Sesame Street's first ever Australian content to a mobile app for the ABC documentary 'First Footprints'. Wayne currently sits on the Board of the Aboriginal Centre for Performing Arts and is the Chair of the Brisbane Festivals Indigenous Advisory Group.



### Keynote Respondent: Marcia Langton

Professor Marcia Langton is an anthropologist and geographer and holds the Foundation Chair of Australian Indigenous Studies at The University of Melbourne. She has produced a large body of knowledge in the areas of political and legal anthropology, Indigenous agreements and engagement with the minerals industry and Indigenous culture and art.

Awarded B.A. (Hons) from the Australian National University and a PhD from Macquarie University, Marcia is a Fellow of Trinity College, Melbourne, a Fellow of the Academy of Social Sciences of Australia, and a member of the Australian Institute of Aboriginal and Torres Strait Islander Studies.

### Summit Facilitator: Sam Wylie

Sam Wylie is a Principal Fellow of the Melbourne Business School, an Associate Professor of the University of Melbourne and a Director of Windlestone Education. He teaches the finance component of the Melbourne Business School MURRA Indigenous Business Master Class Program for Indigenous entrepreneurs.

Sam obtained his PhD from the London Business School and also has a Master of Economics and a Bachelor of Engineering and his commentary appears regularly in the Australian Financial Review and on national radio and television.



## Thursday 18 June

### Day One Program

Time	Item	Speaker	Venue
0830 – 0930	<b>Registration</b>		Reception
0930 – 1030	<b>Summit Opening</b>		
	Opening Comments and Acknowledgement of Country Summit Overview and Proceedings Welcome and Summit Opening Summit Statement from Indigenous Engineering Steering Committee Chair Video Presentation “The Face of Indigenous Engineering” State Minister’s Address	Ian Anderson  Sam Wylie (MC) Iven Mareels Paul Douglas  Sam Wylie  The Honourable Natalie Hutchins MLA, Victorian Minister for Aboriginal Affairs	East Conference Room
1030 – 1100	<b>Morning Tea</b>		Foyer
1100 – 1200	<b>Working Group Overviews</b>		
	Pathways and Accreditation Student Support Adaptations STEM Education	Lincoln Wood Tom Goldfinch Juliana Prpic Bill Lawson	East Conference Room
1200 – 1300	<b>Working Lunch</b>		Foyer
1300 – 1500	<b>Strategy Workshops (Concurrent Sessions)</b>	West and South Function Rooms	
	Strategy Workshop A: Pathways and Accreditation	Lincoln Wood	
	Strategy Workshop B: Student Support	Tom Goldfinch	
1500 – 1530	<b>Afternoon Tea</b>		Foyer
1530 – 1730	<b>Strategy Workshops (Concurrent Sessions)</b>	West and South Function Rooms	
	Strategy Workshop C: Adaptations	Juliana Prpic	
	Strategy Workshop D: STEM Education	Bill Lawson	



## Appendix 4A: Summit program (continued)

### Thursday 18 June

#### Summit Dinner

Time	Item	Venue
1730 – 1900	Networking Drinks and Canapés	East Conference Room
1900 – 2130	Summit Dinner and Keynote Speakers	West and South Function Rooms

#### Program Exhibitors

Aboriginal and Torres Strait  
Islander Mathematics  
Alliance  
[atsimanational.ning.com](http://atsimanational.ning.com)

Australian Indigenous  
Education Foundation  
[aief.com.au](http://aief.com.au)

Australian Indigenous  
Mentoring Experience  
[aimementoring.com](http://aimementoring.com)

Australian Mathematical  
Sciences Institute  
[amsi.org.au](http://amsi.org.au)

Beacon Foundation  
[beaconfoundation.com.au](http://beaconfoundation.com.au)

BHP Billiton Foundation /  
CSIRO Indigenous STEM  
Education Program  
[csiro.au/indigenous-education](http://csiro.au/indigenous-education)

Career Trackers  
[careertrackers.org.au](http://careertrackers.org.au)

Engineers Australia  
[engineersaustralia.org.au](http://engineersaustralia.org.au)

Engineers Without Borders  
[ewb.org.au](http://ewb.org.au)

Graham (Polly) Farmer  
Foundation  
[pff.com.au](http://pff.com.au)

Indigenous Australian  
Engineering Summer School  
[engineeringaid.org/  
summer-schools](http://engineeringaid.org/summer-schools)

Murrup Barak Melbourne  
Institute for Indigenous  
Development  
[murrupbarak.unimelb.edu.au](http://murrupbarak.unimelb.edu.au)

OLT Project (University of  
Wollongong, The University  
of Melbourne, Queensland  
University of Technology)  
[indigenousengineering.  
wordpress.com](http://indigenousengineering.wordpress.com)

Reconciliation Australia  
[reconciliation.org.au](http://reconciliation.org.au)

The xe Project  
[xe.edu.au](http://xe.edu.au)



## Friday 19 June

### Day Two Program

Time	Item	Speaker	Venue
0900 – 0930	<b>Program Exhibition and Morning Tea</b>		Foyer
	Interact with stakeholders and view the display of current active programs		
0930 – 1000	<b>“My Story”</b>	Indigenous Engineering Professionals	East Conference Room
1000 – 1030	<b>“A National Perspective”</b>	Mr Dan Tehan, Member for Wannon	East Conference Room
1030 – 1200	<b>Working Group Final Presentations</b>		
	Pathways and Accreditation Student Support Adaptations STEM Education	Lincoln Wood Tom Goldfinch Juliana Prpic Bill Lawson	East Conference Room
1200 – 1400	<b>Summit Closing Lunch</b>		
	Recommendations and Next Steps Engineers Australia: Indigenous Engineers Special Interest Group Closing Comments	Paul Douglas John McIntosh Paul Douglas	West and South Function Rooms

## Appendix 4A: Summit program (continued)

### Summit Working Group Overviews

#### Group A: Pathways and Accreditation

**Chair:** Lincoln Wood, Engineers Australia

- Chrissy Berryman, Skills Tasmania
- Claudia Szabo, The University of Adelaide

This group is working toward defining education pathways for students in technical and engineering streams without unnecessary accreditation constraints that could inhibit their progress.

The end goal here is for individuals to be able to achieve meaningful employment at their chosen levels in technical and engineering streams, with real opportunities to further develop their careers through continued progress on the education pathway.

#### Group C: Adaptations

**Chair:** Juliana Prpic, The University of Melbourne

- Rhondda Davis, Murrup Barak
- Barbara Kameniar, Murrup Barak
- Llew Mann, Swinburne University
- Chris Matthews, Aboriginal and Torres Strait Islander Mathematics Alliance
- Colin Scholes, The University of Melbourne

The intention of the Adaptations working group has been to identify key changes to ensure that Indigenous students are successful in their engineering studies. The changes will involve not only adaptations in curriculum, student support and teaching approaches, but also in the ways in which institutions engage with each other, the engineering profession, Indigenous communities, industry and not-for-profit organisations.

#### Group B: Student Support

**Chair:** Tom Goldfinch, University of Wollongong

- Lilly Brown, The Aurora Project
- Beth Crowley, The Graham (Polly) Farmer Foundation
- Rhondda Davis, Murrup Barak
- Marj Horne, Australian Catholic University
- Jade Kennedy, University of Wollongong
- Bill Lawson

This working group has explored successful existing approaches to supporting Indigenous students through their education to develop recommendations for effectively supporting students towards a career in engineering. The group aims to promote awareness, understanding and uptake of proven strategies.

#### Group D: STEM Education

**Chair:** Bill Lawson

- Tom Cooper, Queensland University of Technology
- Rhondda Davis, Murrup Barak
- Marj Horne, Australian Catholic University
- Caty Morris, Aboriginal and Torres Strait Islander Mathematics Alliance
- Lizzy Skinner, Engineers Without Borders
- Mark Symes, Australian Maritime College

This group has focussed its attention on the teaching of maths to Indigenous primary and secondary students as well as on maths teachers themselves, drawing on current best practice.

The group has also sought to devise a strategy for connecting senior Indigenous scholars with adequate maths levels to the many unfilled scholarship and cadetship opportunities currently on offer. Finally, the group has aimed to find ways to complement the current \$28.8M BHP Billiton/CSIRO STEM education project for Indigenous students.

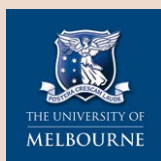
### Working with Country

This image represents Indigenous ways of knowing and working with country that reflect a reciprocated custodial relationship with nature's elements. Earth, fire, wind and water are featured as key elements of Indigenous engineering. **Earth** is represented with square blocks of knowledge that is mined not only for its industrial use and economic value but for its spiritual significance. **Fire** is represented as a significant means of land management and agricultural sustainability. **Wind** is represented through its relationship with time as cultural memories (depicted as moths) travel through generations along songlines. **Water** is represented by fish swimming in a reed-weaved fish trap. The fish symbolise students entering and exiting the trap through recruitment, retention, graduation and capacity building. *Shawana Andrews, 2015*

*We acknowledge the Traditional Owners of the land in which this event is taking place, the land of the Wurundjeri, and pay respect to their Elders and families*



We would like to acknowledge and thank all those who have contributed their time and resources to this project, in particular the Department of Education and Training for funding the Indigenous Engineers: Partners for Pathways program.



**MELBOURNE**  
SCHOOL OF  
**ENGINEERING**

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t: 03 8344 3208 Twitter: #NIESummit

## Appendix 4B: National Indigenous Engineering Summit Participants

Name	Organisation	Position Title
Mr Brendon Ah Chee	Fortescue Metals Group	Aboriginal Development Superintendent
Professor Ian Anderson	The University of Melbourne	Pro Vice Chancellor Engagement
Mrs Michelle Bellino	The University of Melbourne	Manager Student Enrichment, Melbourne School of Engineering
Mr Peter Berry	Engineering Aid Australia	(Former) Director
Julie Birmingham	Department of Education and Training	Strategy and Implementation Branch Manager
Mr Carlos Blanco	Australian Indigenous Education Foundation	Tertiary Support Executive
Ms Rebecca Blinco	Carbon Media	Marketing and Communications Manager
Mr Scott Brimelow	Melbourne Polytechnic	Lecturer
Ms Jennifer-Leigh Campbell	Griffith University	PhD Candidate
Professor Andrew Chan	University of Tasmania	Head of School, Engineering and ICT
Professor Paul Chandler	University of Wollongong	Pro Vice Chancellor (Inclusion & Outreach)
Professor Tom Cooper	Queensland University of Technology	Director, YuMi Deadly Centre
Mrs Gina Cowley	Santos	Senior Adviser Graduates & Projects
Professor Caroline Crosthwaite	The University of Queensland	Associate Dean (Academic)
Ms Beth Crowley	The Graham (Polly) Farmer Foundation	Project Manager
Mr Adam Davids	CareerTrackers	Learning and Development Manager
Ms Rhondda Davis	Murrup Barak, Melbourne Institute for Indigenous Development	Manager, Indigenous Student Programs
Mr Les Dawes	Queensland University of Technology	Professor of Civil and Environmental Engineering
Miss Cherie Dawn	The University of Melbourne	Corporate Development Manager, MSE
Ms Ellen Day	Murrup Barak, Melbourne Institute for Indigenous Development	Manager Partnerships and Development
Mr Wayne Denning	Carbon Media	Managing Director
Professor Paul Douglas	Indigenous Engineering Steering Committee	Chair



*Dr Lincoln Wood (Engineers Australia)*



Name	Organisation	Position Title
Mr Stephen Dowdy	University of South Australia	Head, UniSA College
Mr Shane Drahm	The University of Queensland	Manager, ATSiS Unit
Dr Helen Fairweather Engineering	University of the Sunshine Coast	Senior Lecturer in Environmental
Ms Kathleen Finn	Prime Minister and Cabinet	Assistant Secretary Education and Youth Branch
Professor Bronwyn Fredericks	Central Queensland University	Pro-Vice Chancellor Indigenous Engagement
Ms Nicky Frewen	The University of Melbourne	Bachelor of Science Student
Dr Tom Goldfinch	University of Wollongong	Senior Lecturer, Engineering Education
Ms Glenda Graham	Engineers Australia	General Manager, Victoria Division
Ms Sharon Gray	John Holland	Indigenous Affairs Advisor
Dr Rahul Gupta	RMIT University	Program Manager, Vocational Engineering
Ms Marian Heard	CSIRO	Director, Indigenous STEM Education
Professor Marjorie Horne	Australian Catholic University	Associate Professor Mathematics Education



Wayne Denning (Managing Director, Carbon Media)

## Appendix 4B: National Indigenous Engineering Summit Participants (continued)

Name	Organisation	Position Title
Ms Julie Ireland	The University of Melbourne	Summit Coordinator
Mr Neil Jarvis	Graham (Polly) Farmer Foundation	CEO
Ms Lesley Jolly	Engineering Across Cultures	Strategic Partnerships
Mr Tim Keely	Curtin University	Engineering Outreach Coordinator
Mr Jade Kennedy	University of Wollongong	Research Fellow
Professor Marcia Langton	The University of Melbourne	Chair of Australian Indigenous Studies
Mr Bill Lawson		
Mr Ben Leaver	Engineers Australia	Executive General Manager, Member Delivery
Dr Elysabeth Leigh	University of Wollongong	Research Fellow
Ms Caitlin Lewis	CSIRO	Assets Manager
Dr Llew Mann	Swinburne University of Technology	Director STEMEd
Professor Iven Mareels	The University of Melbourne	Dean, Melbourne School of Engineering
Dr Christopher Matthews	Aboriginal & Torres Strait Islander Mathematics Alliance	Chair
Professor Timothy McCarthy	University of Wollongong	Professor, Faculty of Engineering
Ms Janine McIntosh	Australian Mathematical Sciences Institute	Schools Manager
Mr John McIntosh	Engineers Australia	National Deputy President
Mr Etosha Milner	RMIT University	Environmental Engineering Graduate
Dr Rudra Mitra Engineering	University of New South Wales	Director, Undergraduate Studies, Mining
Ms Caty Morris	Aboriginal & Torres Strait Islander Mathematics Alliance	Executive Officer
Mr Charles O'Leary	Murrup Barak, Melbourne Institute for Indigenous Development	Associate Director
Mr Ross Peek	Rio Tinto	Project Engineer
Ms Hope Perkins	The University of Melbourne	Indigenous Engagement Coordinator, MSE
Mr Richard Potok	Aurora Project	Project Director
Dr Juliana Kaya Prpic	The University of Melbourne	
Ms Michelle Raftus	BHP Billiton	Manager, Community Development
Ms Annie Rahilly	The University of Melbourne	Senior Media Advisor
Ms Anne Rogan	Education Services Australia	Senior Manager, Digital Teaching and Learning

Name	Organisation	Position Title
Ms Tamara Salamancha	Australian Indigenous Education Foundation	Transition Support Manager
Professor Peter Scales	The University of Melbourne	Deputy Dean, Melbourne School of Engineering
Ms Lizzy Skinner	Engineers Without Borders	Aboriginal and Torres Strait Islander Program Coordinator (Strategy)
Professor Geoff Stevens	The University of Melbourne	Associate Dean, Engagement
Mr Mark Symes	Australian Maritime College	Course Coordinator, Cooperative Engineering Program
Dr Claudia Szabo	The University of Adelaide	Associate Dean for Diversity and Inclusion
Ms Leanne Taylor	The University of Melbourne	School Executive Director, Melbourne School of Engineering
Mr Sam Thorne	Jacobs	Civil Draftsperson
Ms Anne Vans-Colina	Engineering Aid Australia	Director
Ms Sally-Ann Williams	Google	Engineering Community and Outreach Manager
Dr Lincoln Wood	Engineers Australia	National Manager Accreditation
Dr Sam Wylie	Melbourne Business School	Summit Facilitator
Miss Sarah Zappia	The University of Melbourne	Summit Coordinator
Professor Justin Zobel	The University of Melbourne	Head of Department, Computing & Information Systems



Left to right: Professor Marcia Langton (The University of Melbourne), Rebecca Blinco (Carbon Media), Bill Lawson (Engineer) and Wayne Denning (Managing Director, Carbon Media)



# National Indigenous Engineering Summit

## Final Communiqué

The purpose of the National Indigenous Engineering Summit was to begin the process of achieving parity participation by Indigenous people in all aspects of the engineering profession, and in particular as tertiary-trained engineers. It has identified principles and strategies that, if adopted by all stakeholders, we believe will lead to parity in graduations by 2030.

To this end, the Summit is promoting a range of Indigenous pathways into engineering, engaging with a broad range of stakeholders, and identifying opportunities for collaboration, and thus building on and harmonising existing diverse activities that are already proving successful at raising Indigenous participation.

A preparatory workshop in September 2014 identified areas for further development, and created the following work streams:

1. Providing for more flexible pathways into the engineering profession;
2. Improving science, technology, engineering and mathematics (STEM) education for Indigenous students starting in primary schools;
3. Developing secondary education support programs for Indigenous students and promoting an interest in engineering and STEM studies;
4. Developing tertiary education adaptations and support programs to assist Indigenous students to complete engineering studies.

Consistent themes have been identified across these working groups that were developed further at the Summit. These themes are:

1. There are many existing flexible pathways and diverse support systems that are poorly articulated, not well understood, and not effectively utilised. The challenge is to coordinate these efficiently and effectively so they can be utilised as intended.
2. It is essential to support Indigenous people to develop, control, and deliver STEM teaching and support services, using respectful cultural partnerships as the vehicle.
3. Indigenous families, communities, and role models are central to the delivery of any successful support strategy for all current and future Indigenous students on a STEM journey.
4. Tertiary STEM education in particular, but STEM education in general, needs to incorporate an Indigenous perspective in the curricula.
5. Policy and program development should be based on trials, evidence and data.
6. All stakeholders, including employers, need to take a collaborative approach to improve the success of these initiatives.







### Working with Country

This image represents Indigenous ways of knowing and working with country that reflect a reciprocated custodial relationship with nature's elements. Earth, fire, wind and water are featured as key elements of Indigenous engineering. **Earth** is represented with square blocks of knowledge that is mined not only for its industrial use and economic value but for its spiritual significance. **Fire** is represented as a significant means of land management and agricultural sustainability. **Wind** is represented through its relationship with time as cultural memories (depicted as moths) travel through generations along songlines. **Water** is represented by fish swimming in a reed-weaved fish trap. The fish symbolise students entering and exiting the trap through recruitment, retention, graduation and capacity building.

*Shawana Andrews, 2015*

