

Understanding Indigenous consultation and engagement in Engineering education

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Structured abstract

BACKGROUND

Higher education participation rates among Aboriginal and Torres Strait Islander people are significantly lower than for other Australians (Behrendt, Larkin, Griew, & Kelly, 2012). In addition, Indigenous Australian participation rates in engineering and other technology related fields are lower than for other fields such as law, health and education (DEEWR, 2008). This presents a substantial challenge for engineering education to increase participation rates among Indigenous Australians towards those of other Australians. Engineering schools and Industry have responded with an array of outreach, scholarship, and support programs which have taken small steps towards this (BHP Billiton, 2012; EAA, 2013; Rio Tinto, 2013). Yet engineering educators still have ground to cover to increase the numbers of Indigenous students successfully completing their degree (Calma, 2009).

PURPOSE

This discussion paper argues the importance of creating a genuine engagement with communities to lay the groundwork for higher participation rates in engineering, and proposes strategies for progressing this.

DESIGN/METHOD

A framework for articulating Indigenous worldviews underpins this paper. A range of strategies for growing genuine engagement between Aboriginal Community and Engineering Education were identified through personal experience and wider consultation with Illawarra Aboriginal Communities. Finally, these strategies have been incorporated into an undergraduate design challenge that is Community driven and culturally, politically and technically challenging.

RESULTS

In attempting to establish engineering as a safe career pathway for Indigenous students, the work to date highlighted the need to develop sustained relationships between Indigenous communities and engineering faculty, and the importance of valuing the contribution alternative perspectives can bring to engineering education and practice. Facilitating this engagement through core curriculum based activities has been a successful first step in creating a sustainable platform for ongoing engagement.

CONCLUSIONS

While engineering may still be seen as a largely technical field, the social, or human side of engineering practice could be gainfully employed to increase the appeal of the profession among Indigenous Australians. Building relationships with Indigenous communities through honest and open collaboration may help to pave the way for Indigenous student participation and success in engineering.

KEYWORDS

Aboriginal and Torres Strait Islander, community engagement

Introduction

In 2008, just 20 Aboriginal and Torres Strait Islander students graduated from engineering degree programs around Australia (Calma, 2009). This figure represents only 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. 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 encourage and support prospective Indigenous engineering students (BHP Billiton, 2012). Engineers Australia, the peak body representing the engineering profession, is also pressing for greater Indigenous participation in engineering education and professional practice (Engineers 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 be a socially engaged profession. Successive refinements in program 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; IEAust, 1996; Bradley, 2006).

Universities, with support from industry, the 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 organisation Engineering Aid Australia (EAA, 2013). 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. The organization also provides scholarships to students who are successful in applying for engineering degree studies. The University of Wollongong also runs an outreach program targeting Indigenous high school students from Years 7-12 through its "Hands-on Engineering" program. This program takes a travelling roadshow approach, visiting schools in the region and running interactive engineering focused activities to engage Indigenous students in a face-to-face setting. There are also many examples of more general programs linking high school students with university such as the Australian Indigenous Mentoring Experience (AIME, see aimentoring.com), and other outreach and academic pathway programs including UoW's in2uni initiative (UoW, 2013).

While programs such as these focus on outreach and recruitment, universities have also responded to the need to support Indigenous students through their studies through the establishment of dedicated Indigenous support units to develop and operate support programs. However, in many cases, these Indigenous student support programs exist largely in parallel to standard academic programs and support structures (Nakata, Nakata, & Chin, 2008). Low graduation rates of Aboriginal and Torres Strait Islander engineers suggests that the current approaches to outreach, recruitment, and support are not achieving the desired results in engineering.

This paper presents lessons learned at the University of Wollongong in the drive to establish sustained engagement between Illawarra Aboriginal communities and engineering Faculty. Through this sustained engagement, the faculty aims to gradually increase enrolment rates and embed support for Aboriginal students within standard curricula. This approach is inspired in part by recommendations by the recently completed Review of Higher Education Access and

Outcomes for Aboriginal and Torres Strait Islander People (Behrendt, Larkin, Griew, & Kelly, 2012), in particular:

- “building Aboriginal and Torres Strait Islander peer and family networks to encourage higher education as a shared goal” (within recommendation 5)
- “providing relevant information to students... their families and communities about the transition to university” (within recommendation 5)
- “provide a culturally safe environment for Aboriginal and Torres Strait Islander students” (within recommendation 11)
- “locally relevant, tailored support for Aboriginal and Torres Strait Islander students and staff” (within recommendation 13)

Understandings of Aboriginal community engagement and consultation

Working towards the Behrendt review outcomes stated above was never going to be a straight forward task. A long history of institutionally driven dispossession of lands, language, culture and identity has led to varying degrees of mistrust of institutions within Aboriginal communities. In addition to this, when seeking to increase participation and engagement within institutions including Higher Education, legislation, practices and policies remain in favour of the dominant western traditions and world views (Carter, 2010).

This has led to a situation where trust and relationships are paramount in Indigenous community Engagement and Consultation. The authors were keen to avoid repeating mistakes of the past. A number of fundamental misconceptions and unfavourable practices were identified through consultation with Dharawal and Yuin communities and through the second author’s lived experience:

1. Consultation and engagement for the wrong reasons, i.e. meeting minimum regulatory/policy requirements, or ‘ticking boxes’.
2. Unsustainable initiatives and a fly-in-fly-out approach to outreach, leading to abrupt discontinuities in engagement.
3. A deficit view of Indigenous Cultures and Communities.
4. Indigenous culture and community as a singular entity.

These four *don’ts* of Aboriginal Community Engagement can be further understood through the lens of a cultural framework drawn from previous engagement with Indigenous communities. During the creation of a digital Acknowledgement of Country (Kennedy & Hoynes, 2010; Kennedy, Hoynes, & Pratt, 2010; UoW, 2010), five concepts of country were identified and agreed through consultation with Aboriginal Elders in the Illawarra region of NSW. These five concepts provide a framework for articulating Aboriginality in an accessible way:

Country – refers to one’s nature and natural surroundings. It includes: lands and waters; trees and plant life; animals, birds, fish and reptiles.

Kinship – reflects the system by which people are related to each other. It defines one’s roles and responsibilities, and obligations and commitments to the relationship.

Culture – is said by the Dharawal to be present in your everyday being. It is represented in: art; song and dance; language, stories and oral histories.

Journey – refers to the lived experiences that occur and have occurred ‘on Country’. This is presented through one’s story and one’s families stories, one’s history, past, present and future.

Connectedness – speaks of the interrelationship of everything and distinguishes how nothing can be considered in isolation.

Undertaking consultation and engagement for the right reasons

Targets set by government, institutional reconciliation action plans, and importantly, opportunities for funding are often the point of origin for initiatives that require engagement between institutions and Indigenous communities. These external drivers are important, and have been instrumental in progressing cultural inclusivity. However, such drivers can lead to tokenism in the push to ‘tick the box’. They can also inadvertently drive a push towards assimilation of culture, as opposed to recognition and inclusion of culture. A current real world example of this can be found in an ongoing stalemate between the Sandon Point Aboriginal Tent Embassy (SPATE), the Illawarra Local Aboriginal Lands Council (ILALC), and the Wollongong City Council. The Wollongong City Council recently released a draft Plan of Management for the area on which SPATE is located (WCC, 2013). While the Plan of Management acknowledged the cultural significance of the site and sought to preserve it, options laid out for activities allowed on the site demonstrated western perspectives and priorities over goals already set out by SPATE and the ILALC.

The definitions of *Kinship* and *Connectedness*, above, highlights the need for everything to be considered in context as a system of interrelated factors, both human and environmental. The authors argue that to avoid tokenism or practices that seek to assimilate culture, any effort to engage with Aboriginal communities should aim to be mutually beneficial and look beyond government or institutional targets. Goals should be considered as interconnected. What is to be gained by community and what attributes, skills, or capacity can be brought to the institution need to be clear and openly discussed. This first step should also clarify to all parties what needs to be achieved and what is achievable. This is critical in determining *why* the engagement is needed, the scope of consultation, and what relationships and connections need to be formed.

Supporting engagement through sustainable initiatives

Many initiatives that seek to establish relationships between higher education institutions and Aboriginal communities are dependent on periodic funding through competitive grant schemes. By the very nature of these funding arrangements, projects may end just as engagements are beginning to mature and become productive. If arrangements are not in place for continuing the program beyond initial funding, this can have negative implications for perceptions of the institutions’ commitment to the relationship (*kinship*) that has been established.

This is also important when considering outreach activities that are deliberately, or necessarily, short term in their design. Fly-in fly-out approaches to outreach may deliver wide and diverse reach to Aboriginal communities, but risk alienating individuals due to an apparent lack of commitment to establishing trust. In cases where this approach to outreach is necessary such as in rural and remote communities, care needs to be taken to establish feasible measures for continuing connections remotely before initial contact is made.

Moving away from a deficit view of Indigenous people

Phrases such as ‘close the gap’ and ‘parity rate’ are commonly used in government policies and reports. These phrases are generally intended to highlight disadvantages in access to education, healthcare and employment leading to outcomes below averages for all Australians (Department of Families, Housing, Community Services and Indigenous Affairs, 2010). However, continued use of these terms coupled with lingering perceptions of Aboriginal and Torres Strait Islander People from decades past contributes to a view of Indigenous Australian individuals as ‘needing help’.

The second Author has witnessed this deficit view leading to a somewhat condescending ‘help the Aboriginal people’ approach to consultation and engagement. This approach can also be seen in the SPATE example described above, where local government has sought to direct the future use of a site that is culturally significant to the local Aboriginal community in the interests of assisting the preservation of the site. Moving away from this deficit view links back to the points highlighted above in regards to engaging for the right reasons. Engagement with Indigenous communities must begin by developing an understanding of the conditions under which participation in engineering can and may occur, rather than attempting to offer solutions from the outset.

The Diversity of Indigenous Australia

References to ‘Indigenous Australia’ and ‘the Indigenous community’ are common, particularly in public discourse. Figure 1 shows the approximate distribution of Indigenous language groups as indicated by shaded areas of different colours. This map clearly demonstrates that language and cultures were many, and varied across the continent. Different government policies, progress of European settlement and modern socio-economic factors have also influenced modern Aboriginal cultures at the local level. This has created a situation whereby consideration of Aboriginal communities at the local level is critical. Modern Indigenous culture, as with culture pre-European settlement, remains diverse.

It is also important to acknowledge that, as with any other community group, internal politics and factions affect how consultation and engagement can proceed. The need to acknowledge local community priorities affects what can be expected in terms of the reach and impact of initiatives that seek measurable outcomes. In the case of engineering education, goals such as increased enrolments and completion rates or higher participation rates in key areas of study such as mathematics and physics should be long term and focus on specific communities initially.

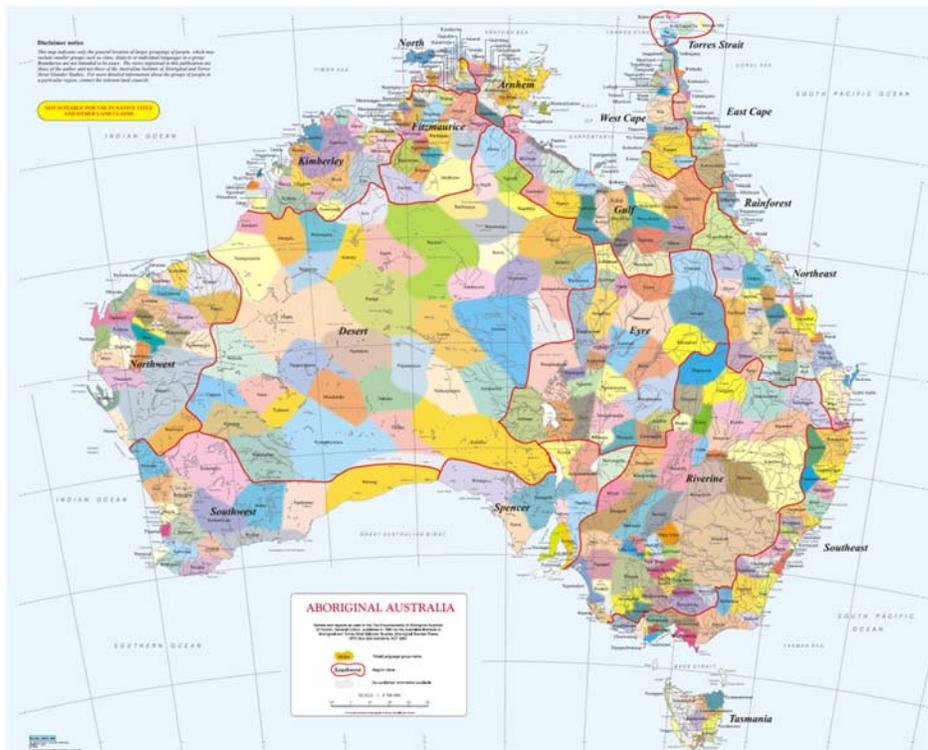


Figure 1 Australian Indigenous Language Groups (Horton, 1996)

Opportunities for Engineering education

In light of the understandings of Indigenous outreach and engagement described above, Engineering as a profession and field of study is presented with opportunities and challenges. The most significant challenge for engagement with Aboriginal communities that leads to higher participation in engineering at university is the small base of participation from which initiatives must start. The proportion of Indigenous students studying engineering and related technologies is currently 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 growing this base of participation, Apanna (2011) argues that there are unique challenges faced by Indigenous students in engaging with STEM curricula that relate back to dominant cultures (Carter, 2010). Western cultures which have shaped engineering education in Australia emphasise facts and concepts in a decontextualised manner. In contrast, Indigenous worldviews tend to emphasize value, spirituality and holistic understandings (NTDEET, 2006, in Apanna, 2011). The clash of cultures can create significant challenges in education when these differing values and worldviews are not recognized and accommodated (Prpic & Kanjanapanyakom, 2004). Low rates of Indigenous participation in the engineering profession also means there is limited role modelling within Indigenous communities which may otherwise help overcome content-related challenges (Behrendt, Larkin, Griew, & Kelly, 2012, p. 174).

These content related issues create added difficulties in consultation and engagement processes. Without due recognition of alternative ways of knowing, it may be impossible to clearly articulate the reasons for engaging with community and mutual benefits of doing so.

There have been a number of previous efforts to revise engineering curricula to accommodate and/or value different cultural perspectives. 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 within the education setting (Abuodha, Layton, & Goldfinch, 2011; Duff, Brodie, Furber-Gillick, Quinn, & Smith, 2011; Goldfinch, Layton, & McCarthy, 2010). It may be possible to capitalise on this previous work in teaching and learning to understand how to effectively generate enthusiasm for the study of engineering within Aboriginal communities. Nakata (2010) suggests creating meaning in scientific knowledge by articulating how it can be aligned with and even influence cultural knowledge.

Another issue that creates both a challenge and an opportunity for engagement with Aboriginal communities is prior interactions between community and the engineering profession. Interactions with the profession may be limited to consultation (or lack thereof) through local infrastructure and property development, and mining projects, or directly through employment in engineering related industries. Whether these interactions are positive or negative, statistics on Indigenous participation in the profession (Calma, 2009) suggest that Indigenous people are likely to have engaged in decision making in engineering projects from outside key design and planning processes.

This may present a challenge in engineering being seen as a profession that has negative influence on country and community, and as a profession about which there is limited understanding within Aboriginal communities. However, the influential nature of the engineering profession can be utilised to inspire enthusiasm for engagement with engineering education in both the short and long term.

Long term, participation in engineering by Indigenous people can be presented as a way of directly influencing and presiding over future developments. In the short term, positive engagement between Indigenous communities and Engineering Schools can be facilitated through advocacy by academic staff or student projects. Engineering schools are well placed in terms of expertise to provide independent advice to communities on development proposals that impact on country. These are just two simple examples of how engineering may be placed in a positive light within Indigenous communities.

Connecting community with Engineering education

In response to the Authors' understandings about engagement, consultation and the opportunities available, a community oriented student project has been implemented to initiate ongoing connection between the Faculty and the local Aboriginal Community. The project is structured in a similar way to the Engineers Without Borders Challenge (EWB, 2013) and focuses on the Sandon Point Aboriginal Tent Embassy mentioned earlier in this paper. The design challenge asks students to develop design concepts for structures, energy, sanitation and access for a custodial site to be established for the SPATE. Students must develop their ideas to accommodate the requirements and cultural values of SPATE and the Lands Council and the legal/developmental requirements set out by Wollongong City Council. The finalists are to be determined in an exhibition event open to Illawarra Aboriginal Communities.

The project puts into action all of the key understandings described here. First and foremost, the project establishes a direct connection between Community, the Faculty, engineering students and local government and is potentially beneficial to all parties. Community benefits through advocacy and the embedding of cultural values in an established institution. The faculty benefits by meeting community engagement goals. Students benefit through an authentic learning experience where they are able to practice consultation with an Aboriginal community directly. Representatives from Wollongong City Council are also keenly interested in the Community reaction to design concepts developed by students. All of these mutual benefits were identified and discussed between the Faculty, SPATE, the Lands Council, and Wollongong Council BEFORE the project began.

Secondly, the project is sustainable from the outset. In addition to the SPATE focused project, sites were identified for similar projects to be run in subsequent years. As the project is embedded within an annual core engineering subject, projects that focus on development issues in the local area can be conducted for several years to come with no outside funding required. Personal connections are also being established between stakeholder groups to ensure that future projects are not dependent on any one individual.

Thirdly, the project has been structured to provide students with information about the culture, history and politics surrounding SPATE. This has been done in an authentic, un-sanitised way to ensure that students are able to develop an understanding of the conditions surrounding the current situation, rather than making judgements based only on what is immediately apparent. This has been facilitated through first-hand accounts provided by Community representatives, opportunities for direct correspondence with Community in person and online, and access to media coverage spanning the 13 years that SPATE has existed.

Finally, the project recognises the diversity of Indigenous Cultures by deliberately focusing only on local Aboriginal communities and not Indigenous peoples more broadly. Students were provided with cultural advice and community contacts with clear instruction that this information may be relevant only to this particular community.

Future directions

This project is currently underway, and evaluation of its success is still a work in progress. Current indications suggest a level of 'buzz' within the Community, and student engagement with online discussions well beyond anything seen in previous years of the design challenge. It is anticipated that a qualitative analysis of discussion space conversations and final outcomes of the design competition will provide insights into how different stakeholder groups engaged with the whole process.

However, it is important to highlight here that the authors did not anticipate improvements in Indigenous enrolment rates or levels of Community engagement with the Faculty. Contributing to the goals set out in the Review of Higher Education Access and Outcomes for Aboriginal and Torres Strait Islander People (Behrendt et al., 2012) is a long term goal. This project presents only an initial step in creating awareness and acknowledgement of engineering as a desirable career pathway for Aboriginal people in the region. Ongoing work in this area seeks to position the faculty and the profession within the community as:

- Familiar, with visual elements around the faculty buildings and individuals that are known within Aboriginal communities.
- Recognisable, with the Faculty and the profession known within Aboriginal communities through consistent messages delivered in outreach activities
- Participatory, and involved in community events and business, particularly through advocacy and student projects.
- Inclusive, through curricula and pedagogy that incorporate Aboriginal values and world views.

Conclusion

This paper has presented a range of strategies for avoiding common difficulties encountered when establishing engagement and undertaking consultation with Indigenous communities. These strategies have been enacted through an undergraduate design challenge that has been positioned as a first step in a long term goal for engagement between Engineering Education and local Aboriginal communities. Early indications have suggested that this approach has been successful. However, long term monitoring and evaluation, as well as expansion of the range of community engagement activities currently underway is needed to grow awareness of engineering within these communities.

References

- Abuodha, P., Layton, C., & Goldfinch, T. (2011). Evidence of intercultural competency from engineers without borders challenge projects. Paper presented at the Australasian Association for Engineering Education Annual Conference.
- Engineers Australia, (2011a). Engineers Australia Reconciliation Action Plan. Retrieved 16th January, 2013, from <http://www.engineersaustralia.org.au/about-us/reconciliation-action-plan>
- Engineers Australia (2011b). Stage 1 Competency Standard for Professional Engineer. Melbourne, VIC
- Institution of Engineers Australia, (1996). Changing the Culture: Engineering Education into the Future. Barton, ACT: Institution of Engineers Australia.
- Becker, F. S. (2006). Globalization, curricula reform and the consequences for engineers working in an international company. *European Journal of Engineering Education*, 31(3).
- Behrendt, L., Larkin, S., Griew, R., & Kelly, P. (2012). Review of Higher Education Access and Outcomes for Aboriginal and Torres Strait Islander People: Final Report. Canberra, ACT. (A. Government)

- BHP Billiton, (2012). AIEF-BHP Billiton Iron Ore Tertiary Scholarships Retrieved 21st January, 2013, from <http://www.aief.com.au/scholarships/aief-bhpbio-tertiary-scholarships.aspx>
- Bradley, A. (2006). Australian Engineering Competency Standards - Stage 1 Competency Standards for Professional Engineers. Melbourne. (E. Australia)
- Calma, T. (2009). Enriching tertiary education with Indigenous voices. Retrieved 15th February, 2013, from http://humanrights.gov.au/about/media/speeches/social_justice/2009/20091211_don_aitkin.html#fn9
- Carter, J. (2010). Protocols, particularities, and problematising Indigenous 'engagement' in community-based environmental management in settled Australia. *The Geographical Journal*, 176(3), 199-213.
- DEEWR. (2008). National Report to Parliament on Indigenous Education and Training, 2008. Canberra, ACT. (A. Government)
- Department of Families, H., Community Services and Indigenous Affairs. (2010). Closing the Gap: Prime Minister's report 2010. Canberra, ACT
- Duff, A., Brodie, T., Furber-Gillick, D., Quinn, D., & Smith, E. (2011). Do with and not to. Building cultural understanding, enabling communication and promoting the spirit of reconciliation in first year engineering. Paper presented at the Australasian Association for Engineering Education Annual Conference.
- EAA. (2013). Indigenous Australian Engineering Summer School. Retrieved 5th June, 2013, from <http://www.engineeringaid.org/engineering-summer-school/>
- EWB. (2013). Engineers Without Borders Challenge. Retrieved 15th October, 2013, from www.ewb.org.au/whatwedo/institute/ewb-challenge
- Goldfinch, T., Layton, C., & McCarthy, T. (2010). Encouraging Cultural Awareness in Engineering Students. Paper presented at the 20th Annual Conference for the Australasian Association for Engineering Education.
- Horton, D. R. (1996). Indigenous Language Map: Australian Institute for Aboriginal and Torres Strait Islander Studies. (A. S. Press)
- Lohmann, J. R., Rollins, H. A., & Hoey, J. J. (2006). Defining, developing and assessing global competence in engineers. *European Journal of Engineering Education*, 31(1).
- Nakata, M. (2010). The Cultural Interface of Islander and Scientific Knowledge. *The Australian Journal of Indigenous Education*, 39(Supplement), 53-57.
- Nakata, M., Nakata, V., & Chin, M. (2008). Approaches to the Academic Preparation and Support of Australian Indigenous Students for Tertiary Studies. *Australian Journal of Indigenous Education*, 37, 137-145.
- Rhamdhani, M. A., Salehi, K., Wong, Y. C., Kapoor, A., & Vakhguel, A. (2009). How are engineering graduates prepared to work in a culturally changing world? Paper presented at the 20th annual conference of the Australasian Association for Engineering Education.
- Rio Tinto, (2013). Creating Aboriginal Jobs. Retrieved 16th January, 2013, from http://www.riotinto.com/ourapproach/17194_features_3629.asp
- UoW. (2013). IN2UNI. Retrieved 15th October, 2013, from <http://www.uow.edu.au/in2uni/index.html>
- WCC. (2013). Sandon Point and McCauley's Beach - Draft Plan of Management. (W. C. Council)

Acknowledgements

The Authors would like to acknowledge the Sandon Point Aboriginal Tent Embassy and the Illawarra Local Aboriginal Lands Council for their support for this work.

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