



Position Statement

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Humanitarian Engineering Education Providing an opportunity for a new generation of engineers

The Vision

The role of engineering in providing benefits to society has been articulated since the first civilian professional associations emerged in the early 1800s. From this tradition, engineering has sought to bring expertise and benefits to short- and long-term humanitarian responses and domestic and international development work. The incorporation of humanitarian and development principles into existing engineering education, as well as dedicated Humanitarian Engineering initiatives, will create engineers equipped to work in complex humanitarian and development contexts. In turn, this will impact in all engineering practice, fostering a generation of engineers able and willing to achieve positive community benefits in all engineering work.

What is Humanitarian Engineering?

Since the early 1980s dedicated organisations utilising engineering to address humanitarian and development challenges have emerged including Engineering for Change (EfC), Engineers Against Poverty (EAP), Engineers for Overseas Development (EOD), Engineers Without Borders (EWB) and Registered Engineers for Disaster Relief (RedR) (UNESCO 2010). These work across the humanitarian spectrum addressing disadvantage, vulnerability and marginalisation, from immediate disaster response, through recovery and stabilisation, to long-term community and infrastructure development, disaster preparedness, and capacity building (Greet 2014). Alongside the growth of these organisations has been the development of education initiatives in the USA, UK and Canada.

In Australasia Humanitarian Engineering is understood as the application of an engineering discipline to a specific humanitarian or development response across the breadth of contexts and locations, from disaster response through to community and technology development, both internationally and domestically. Humanitarian Engineering is an area of practice requiring additional dedicated knowledge, skills, and competencies (Greet 2014, Smith et al 2017). All engineering should have its basis in humanitarian objectives, with Humanitarian

Engineering specifically engaging disadvantaged, marginalized or vulnerable communities by actively addressing and prioritising in engineering practice.

Humanitarian Engineering in Australasia

A small number of not-for-profit organisations have led the development of education and training. RedR Australia was established in 1992 to make engineering available to disaster relief and has expanded to offer expertise across all aspects of humanitarian emergencies (excluding medical). RedR Australia provides training courses for professionals and more recently to students through university partnerships.

The first wide-scale offerings were developed by Engineers Without Borders Australia (EWB-A), established as an independent national organisation in 2003 with a focus on community development in Australia and the surrounding region. EWB-A delivers three tertiary education programs, the EWB Challenge, Undergraduate Research Program and Humanitarian Design Summits. EWB New Zealand (EWB-NZ), established in 2008, provides three similar opportunities to NZ universities. Since 2016, further opportunities have commenced including Australia chapters of Engineering World Health (EWH), Unbound (formerly Laika Academy) and Project Everest. These provide experiences across allied topics including design for social change, sustainable development, health service delivery, social enterprise and community rebuilding.

University Offerings

Since 2016 several universities have launched diplomas, majors and minors. Dedicated elective courses are available at least six institutions with these and others proposing a range of new courses and programs within the next two years (a full list of these can be found in Smith et al 2017). Approximately 60% of the universities that offer engineering in Australasia are involved in some form of Humanitarian Engineering with an estimated 9,500 students engaged in 2017 through programs such as the EWB Challenge and EWB Design Summits.

Why introduce Humanitarian Engineering Education?

Humanitarian Engineering education produces engineers with discipline depth supported by professional breadth. Through a broader range of experiences such as stakeholder engagement, cross-cultural immersion and working in complex socio-technical systems, graduates are better equipped to support community aspirations, achieve empowerment through technology, and develop robust and creative engineering in all their practice.

There is evidence of greater female participation in Humanitarian Engineering with current initiatives reporting 50-100% higher female engagement. This could encourage female students to study engineering and increase the current level of about 15%, leading to greater diversity in Australia's future engineering workforce. This leads to a profession with greater emotional intelligence and societal awareness, able to realise Engineers Australia's 2017/18 – 2019/2020 Strategic Plan's new purpose "Engineers Australia shapes the future of Australia – creating happy, healthy, prosperous and sustainable communities". Humanitarian Engineering will play a vital role in achieving this vision and ensuring all communities domestically and internationally have access to engineering and the positive benefits it brings.

Challenges

Humanitarian contexts are highly complex and multi-disciplinary, often involving engagement with vulnerable and at risk individuals and communities requiring the highest level of ethical practice and safe conduct. Time must be committed to developing long-term relationships to support collaborative decision making and ensure outcomes are generated for all parties. Support must be provided to academics to allow for the required planning and engagement, as well as acquisition of new skills and relevant experience. Education opportunities must be able to extend beyond short-term academic delivery cycles.

The cost of participation in activities such as immersive study experiences, which are critical for student learning, can be prohibitive. The Federal Government's New Colombo Plan (NCP) has provided scholarships and eased the costs but these are only available to domestic students, may still leave a funding gap, and are not necessarily ongoing.

The way ahead

There is a need to professionalise Humanitarian Engineering to ensure appropriate practice and trust for the students and communities involved and the public at large. In 2017 the Humanitarian Engineering Education Network of Australasia (HEENA) was established by universities and organisations in the area to support and encourage continued growth.

HEENA has identified the priorities below to foster student outcomes and academic excellence, and achieve positive impacts for communities and individuals in Australasia and overseas.

Expand and provide appropriate support, recognition and CPD for staff to deliver programs utilising safe, ethical and appropriate humanitarian practices. Academic fellow roles on EWB Summits are available to provide staff with experience of humanitarian practice. Capacity is being built through EWB Challenge academic workshops, new dedicated academic positions, and expertise provided by HEENA, EWB-A and RedR. Staff recognition and support must capture the long-term and complex nature of the engagements and programs involved.

A shared understanding of Humanitarian Engineering, its competencies and its application to enable appropriate delivery of education, research and impact. In professionalising the sector, Australasia can demonstrate international leadership in the area.

Establish a national advisory board to provide guidance, advocacy and engagement across stakeholders. Under this, HEENA will continue to work with a broad range of organisations to develop shared resources, training, support and understanding of practice. Opportunities for funding for staff development, student opportunities and community benefit, should be identified and championed.

Portray engineering in a new light with EA, as a profession able and willing to meet 21st Century challenges and achieve positive and sustainable benefits for communities. Engineering Faculties should consider implementing award programs or part thereof on Humanitarian Engineering, which has the potential to attract greater diversity of students, including higher female participation, to create an inclusive engineering profession.

References

1. UNESCO (2010). Engineering: issues, challenges and opportunities for development. *UNESCO Publishing*.
2. Greet, N. (2014). Building a humanitarian engineering network – A collaborative challenge. *Collaborative Outcomes Pty Ltd Australia*
3. Smith J et al (2017). The Rise of Humanitarian Engineering Education in Australasia. Proc AAEE2017 conference, Manly, Australia.

Australian Council of Engineering Deans Inc.

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

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