

## **Editorial: Training engineers for local engineering excellence**

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The global engineering sector is in need of introspection. Engineers have always been recognised as being fundamental to the development and advancement of human society. Perspectives on how engineers should interact with and shape the development agenda are however changing. Young engineering leaders in particular are questioning technical autocracy. Empathy is increasingly spoken of as a required attribute, alongside technical competency. Two paradigms have been instrumental in promoting a shift in traditional engineering training - humanitarian engineering and global engineering education principles. While humanitarian engineering focuses on meeting the needs of communities through the development of appropriate and sustainable technologies, global engineering principles focus on practicing as an engineer within a global and interdisciplinary context. The Engineers Without Borders (EWB) community has been a driver in defining and advancing both these paradigms.

Having graduated as an engineer in South Africa and accompanied many of my peers on their journey of developing technical competency, we are starting to see a third paradigm emerging as a fundamental aspect of engineering for the development and advancement of civil society - local engineering excellence. Since the 'Fees Must Fall' movement in South Africa, a series of student protests that swept South Africa's higher education sector in 2015 and 2016, students have initiated prominent debates to claim ownership of their learning journeys and shape knowledge production processes. Calls to 'decolonise engineering education' address the desire for technical education to be locally relevant and serve the lived experiences of economically marginalised South Africans, not only business districts in large metropolitan areas.

Humanitarian and global engineering practices are complementary to, but clearly distinct from, local engineering excellence. To realise pivotal progress towards the Sustainable Development Goals, it is vital to build local technical capacity beyond global corporations and international aid relief. For example, South Africa's water and sanitation sector is facing severe challenges of source contamination and overuse, which are amplified by drought and climate change. The Vaal River, one of the country's main water supply arteries, has been labelled a humanitarian crisis for several months. While humanitarian engineers may have the skills to address the crisis, and global engineers may have the perspective to develop long term interventions, it is the absence of competent, excellent and dedicated technical staff in the public sector that drives failures of public infrastructure due to insufficient record keeping, neglected maintenance and poor operating practices.

So how can local engineering excellence be promoted within engineering curricula? The Engineers Without Borders (EWB) international community has been a driver for transformation in the engineering sector across different geographies, and educational design challenges promoting humanitarian and global engineering principles have been pioneered in Australia and Canada, amongst other countries. At the end of 2018, EWB South Africa (EWB-SA) entered into a partnership with EWB-UK and EWB-USA to pilot an approach that converges humanitarian and global engineering principles with local engineering excellence. By locating EWB-UK's Engineering for People Design Challenge within a complex South African urban environment, we are exploring where synergies exist between delivering 'global' engineering curriculum content that has in the past produced primarily humanitarian engineering design solutions, to both international and local student audiences.

While still in the early stages of the project, we have observed that contextual sensitivity is critical when developing content for local student and academic audiences, as these are highly discerning about the power dynamics inherent in community representation. Careful selection of diverse local voices is thus key when local legitimacy must be retained. Similarly, it is important that communities are presented not only from a 'problem' perspective, but that agency, self-efficacy and the opportunity space that communities harness receive attention. Finally, we are observing that a purely educational approach with no roadmap for tangible delivery of results is viewed as insufficient by community partners, community members, academics and students alike. Local stakeholders view community insights as carrying intrinsic value, and a 'fair exchange' should reach beyond financial compensation for community partner organisations and into tangible improvements for community members more broadly. The dilemma is that community engagement at educational scale is intractable, while failure to engage deeply raises questions of knowledge extraction and threatens long term local legitimacy and sustainability.

It remains an exciting opportunity to explore curriculum transformation within a global EWB partnership. The shared organisational background allows us to build from a basis of good intentions and respect, which are critical foundational blocks when systemic power structures are brought under the microscope. Intentionally questioning the power dynamics inherent in humanitarian engineering and global development work remains an area of importance for EWB organisations as we collectively work towards building a more inclusive future for all people.