ROYAL ACADEMY OF **ENGINEERING**

Enriching Engineering Education Programme

Engineering in Sub-Saharan Africa

Welding taking place at the University of Dar es Salaam

Engineering makes a crucial contribution to the improving quality of life of citizens, and economic prosperity of nations, across the world. Engineering has an important role to play tackling challenges from food security and healthcare to sustainable energy, water, and transport infrastructures.

In developing countries engineering challenges are even more pronounced, often coupled with the largest engineering skills shortages and skills gaps.

Across sub-Saharan Africa engineering skills shortages are prevalent, and students are enrolling in engineering courses hoping to fill this gap.

Yet too-often, outdated equipment and teaching methods at higher education institutions mean that these students graduate without the skills and practical experience needed to prosper in engineering-based industries.

INDUSTRIALISED COUNTRIES HAVE

20-50

SCIENTISTS AND **ENGINEERS** PER 10,000 POPULATION. IN THE POOREST AFRICAN COUNTRIES THIS IS JUST

ONE

PER 10,000.

AFRICA'S GRADUATE UNEMPLOYMENT RATE IS BETWEEN

16% AND **46%.**

> "Recession in the region from 2000 led to a brain drain with experienced professionals seeking work abroad. As a result, most higher education institutions have had to appoint fresh graduate engineers with little or no practical experience to offer training to future engineers."

Engineer Nyemba
University of Zimbabwe

> "We noticed a mismatch between what industry wants, and what we're delivering."

Professor Nyichomba
University of Dar es Salaam

Programme Activities

Students being taught at the University of Zimbabwe

The Enriching Engineering Education Programme is centred on a combination of two-way secondments and collaborative workshops. These secondments and workshops have led to improved industry-academia links and resulted in wide-ranging benefits for both parties, for example by aligning the curriculum more closely to national and regional development priorities.

Secondments

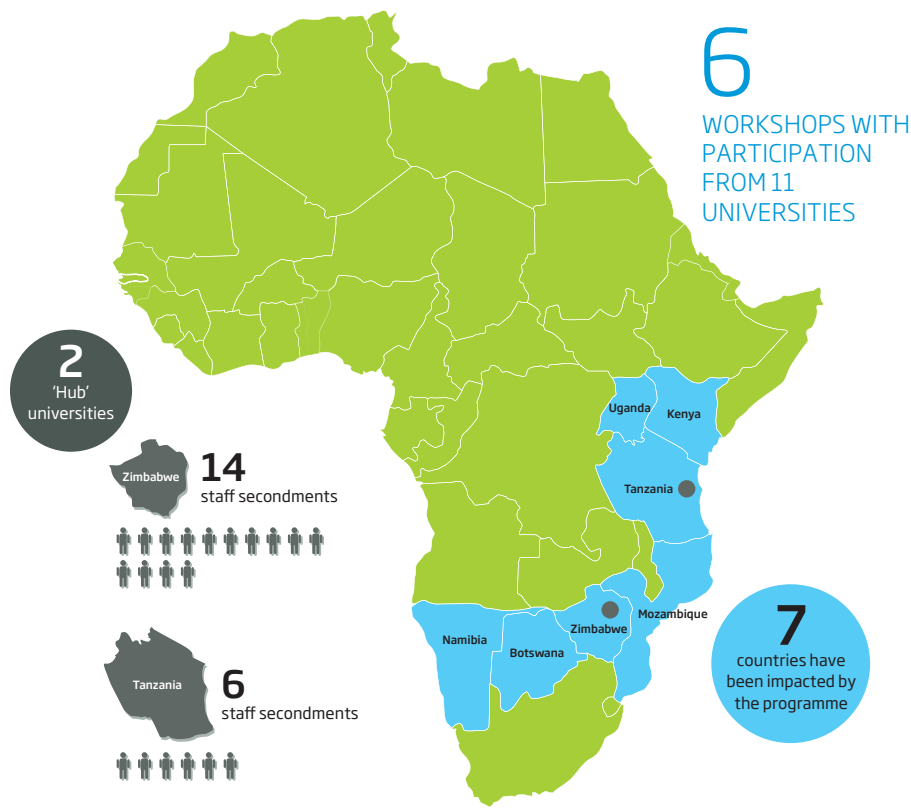
Elected 'Hub' universities arrange secondments with industry partners whereby members of university staff spend up to two months working within their chosen partner organisation. While there, staff acquire hands-on experience, enabling them to better understand the requirements of, and build important links with, the engineering industry.

Industry partners also have the opportunity to be seconded into academia, where they mentor students, deliver lectures and advise on curriculum updates.

Workshops

Periodically, workshops involving the 'Spoke' universities are held to share and discuss the lessons learned from the secondments. These workshops enable all involved universities to hear from secondees from academia and industry, and consider how to implement positive change in their own institutions.

> "The future of ZIMPLATS, and indeed every company, relies on adequately trained human resources. To ensure that there is a pipeline of individuals with the right skills, we have a shared responsibility in developing our future engineers. The Enriching Engineering Education Programme has proved a fantastic way of joining up engineering education with the needs of engineering organisations, and as a result, we have decided to invest in the programme, as well as support it."
>
> **Mr Jeremy Langworthy**
> **Training Manager, ZIMPLATS**



These figures represent progress made in the pilot stage of the Enriching Engineering Education Programme.

Enriching Engineering Education

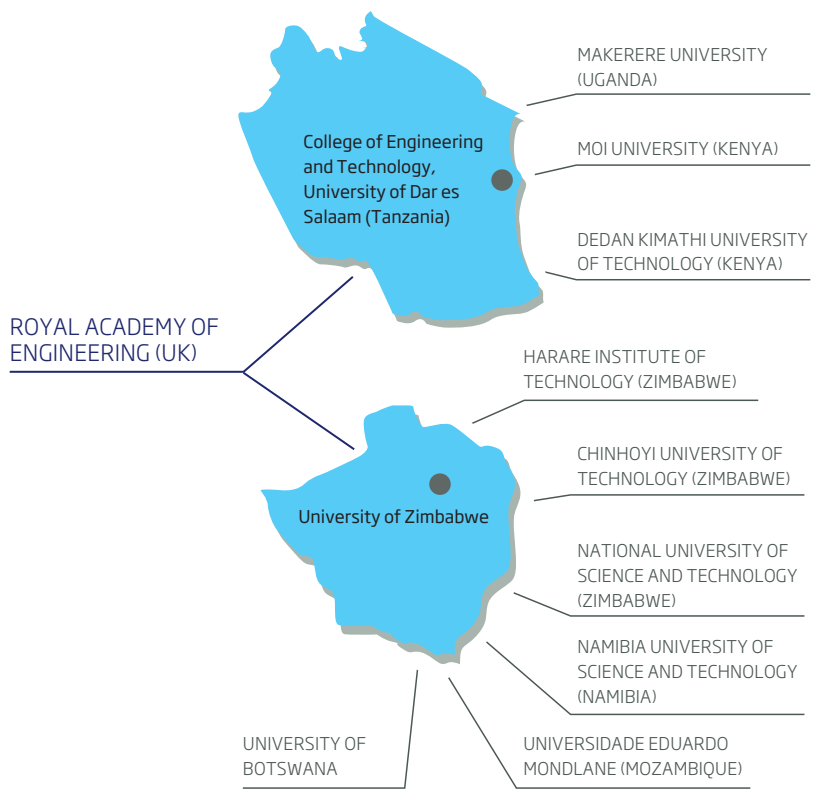
Top: A staff member from the University of Zimbabwe on a work placement at a foundry in Harare

Bottom: Two students work together

The Enriching Engineering Education Programme – supported by the Anglo American Group Foundation – was established by the Royal Academy of Engineering in 2013 to help address the engineering skills shortage in sub-Saharan Africa and to showcase engineering's role in driving economic development in the region.

By forming and strengthening relationships between academia and industry, the programme aims to ensure that the higher education system produces engineers with the skills and knowledge required to meet the needs of industry and to tackle local challenges.

To maximise the impact of this collaboration, the programme is implemented through two 'Hub' universities, the University of Zimbabwe, and the University of Dar es Salaam in Tanzania. These Hubs participate in staff exchanges with local industry partners, and in turn, share their experiences with nine 'Spoke' universities across a further five countries in sub-Saharan Africa.



Groundwater Project

Technicians test water from a borehole at the University of Zimbabwe

The University of Zimbabwe (UZ) had struggled for five years to get sufficient water from the city of Harare, and water shortages frequently delayed the start of semesters.

Through the Enriching Engineering Education Programme, three technicians from UZ's Engineering department were tasked with creating a solution with a very limited budget. Using the valuable expertise they had gained from their industry secondments, and working with a team of young students, the technicians created a system of boreholes, a water reservoir and a pump station.

Since becoming fully operational in early 2014, UZ has independently sourced enough water to operate, bringing stability to campus life.

UZ's groundwater project involved teamwork and, by involving students at every step of the process, gave the next generation invaluable exposure to engineering in practice. The project continues to offer inspiration today, with current student projects focusing on measuring and improving the system's efficiency.

Dr Mwinuka, University of Dar es Salaam

Dr Mwinuka, a Lecturer at the University of Dar es Salaam, spent four weeks for two consecutive years with TEMDO, a Tanzanian engineering company, under the Enriching Engineering Education Programme.

"Through the secondment, I could establish the gap between what the College [College of Engineering and Technology] is teaching and what industry is expecting from our graduates. It was very pleasing to propose and supervise several student projects which originated from real industrial problems and later share the results with the engineering company (TEMDO).

"I have since been involved in much wider areas of engineering which I was not dealing with before due to the specialist nature of my teaching and research. I am now undertaking projects and research in new areas like renewable energy and refractory materials. The attachment has enabled me to co-author one conference paper in August 2014. Another paper will be ready for submission in a journal very soon. I can therefore say that the attachment has been very beneficial to me and my College."

SINCE JANUARY 2014, THE PROJECT HAS MET A DEMAND OF

580

CUBIC METRES OF WATER PER DAY WHEN STUDENTS ARE ON CAMPUS, AND

100

CUBIC METRES PER DAY DURING SEMESTER BREAKS: A TOTAL OF AROUND

134,000

CUBIC METRES (134 MILLION LITRES)

– ENOUGH TO FILL AN OLYMPIC SWIMMING POOL FIFTY TIMES OVER.

ROYAL ACADEMY OF **ENGINEERING**

AngloAmerican GROUP FOUNDATION

The Enriching Engineering Education Programme is run by the Royal Academy of Engineering as part of its work targeted at supporting and celebrating the next generation of global engineers and building institutional capacity internationally.

The programme is run with the generous support of the Anglo-American Group Foundation.

Following a successful pilot of the programme, the Academy is considering its extension and expansion within sub-Saharan Africa and other nations around the world.

If you are interested in getting involved or would like more information, please get in touch:

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