Medical Aid International

Supporting Healthcare in Low Resource Environments

GLOBAL BIOMEDICAL ENGINEERING TRAINING: WORLDWIDE ACCESS TO WORLD-CHANGING SKILLS

Introduction

All of us who work in the aid sector want to deliver services that are suitable, effective, value for money and relevant for the environment and people we serve. We all know this support can take many forms, but with the varying challenges faced on a daily basis in all of our work, we must often strive to find innovative ways of achieving our objectives.

Most recently, Covid-19, for example, has placed significant additional pressure on this process, and whilst the virus is certainly a major challenge for us all on so many levels, it does also present opportunities for us to explore alternative ways of working that will deliver benefit not only during Covid, but also beyond it.

Take our Biomedical Engineering Training Programme, for example, which is the subject of this document. Having run residential training courses for a wide variety of organisations, we knew that this programme was vital in enabling healthcare institutions in LMICs (Low and Middle Income Countries) to keep their equipment functioning better and more safely for longer.

But such courses were not only relatively expensive and therefore only accessible to a minority – they also became unworkable once the Covid restrictions on travel and social contact hit home.

This is just one more reason why we have realised our vision of providing global access to effective biomedical engineering training, foundational knowledge, and support *online*, with no travel or face-to-face tuition required, in a holistic package that can be used on its own or as part of a wider support strategy.

Medical Aid International:
Doing the right things, not just good things

We're all familiar with the moving story of the Good Samaritan, who helped a stranger in need. But at Medical Aid International, we understand that it is not enough for help to be compassionate – it must also be *appropriate to the circumstances*.

In LMIC regions, this means having the courage to take risks in order to supply and develop alternative solutions that are suitable for the often difficult conditions in these countries. It's what Medical Aid International has been doing throughout its 20 year history – and our online Biomedical Engineering Training Programme is a shining example of the innovations on which we have built a reputation for delivering positive, practical and long lasting changes across the LMIC world.

Based on our extensive experience, and feedback from those working in this sector, we rose to the challenge of creating a package that was accessible to all, and cost-effective. We invested heavily and worked for two years in order to make it happen – and now it is having a direct positive impact.

> Unit 0 (Health & Safety) This unit has helped me a lot, as biomedical engineer, we frequently work on dirty machines which normally carry pathogens, this unit outlines the safety producers that, as engineers, we must follow to avoid cross contamination from the machine to an engineer.
>
> Unit 2 (Electrical Safety) This unit outlines the electric safety producers, as biomedical engineers, we frequently work with machines that needs electricity to power them, the electric safety producers outlined in this unit are beneficial and it will prevent the occurrence of accidents, for example fire, electrocution in the hospital as well as in the workshop.

What is Biomedical Engineering? Who is the Engineer? What is the Reality? Why this Programme?

The course content reflects the unique needs of the LMIC environment and includes context appropriate first aid, train the trainer and first line fault finding aspects.

Definitions and answers to these questions vary considerably. In more developed settings the role tends to be more tightly defined, with engineers specialising in very specific areas and generalisation being less common than it was.

In LMIC environments this is very rarely the case. Maintenance, if the concept exists, and repairs are often done by 'fixers', whoever that may be. Often repairs simply fall to someone who has a natural inclination to repair things, or by default it goes to someone who looks after the property. Often that very person will have little or no knowledge and often very few tools.

Yet in our 20 years of experience, it has become clear to us that the 'fixers' often have great knowledge and passion. They also respond very positively to the local teaching we give them when on site carrying out installations. They want to make a difference and are frustrated that they cannot.

Medical Aid International's CEO, Tim Beacon, has a medical; educational and personal development; and organisation consultancy background; and was determined to do something about this. Initially Medical Aid International started running eight week residential courses for Mercy Ships, supplying education, consultancy and accompanying infrastructure aspects. However, it became clear that whilst these were very successful, it was not a cost effective way of working, in terms of delivering to a global audience.

From this, the online programme was born. Holistic in nature, it includes a professional tool kit, textbooks, and an electronic library of service manuals. The course content reflects the unique needs of the LMIC environment and includes context appropriate first aid, train the trainer and first line fault finding aspects.

Aggrey in Kenya, after he had completed the online course and using his toolkit – including headtorch to install an operating light we had sent.

The light working.

> ***We wanted this programme to be relevant in both major cities and the most remote rural environment.***
>
> Tim Beacon, CEO, Medical Aid International

Biomedical Engineers: Motivated, Committed, Upskilled

But this programme is about more than just technical skills, knowledge and tools. It is the people who are at the core of what we deliver, and why.

So often in our work, we have met ill-equipped but nonetheless motivated hospital maintenance staff and engineers. When we worked with them, it was wonderful to see them grow in stature as they enthusiastically assisted and learned from us.

But it was also upsetting to realise that they had sufficient abilities to make a real difference on a sustained basis, *if only they were equipped with tools and some basic training*.

Our experience is that the engineers, when trained and equipped appropriately, radiate a confidence that is then reflected in their day-to-day work. This, in turn, inspires the people they support, exerting a significant positive influence on clinical outcomes.

We know from experience that the process of training and supporting engineers, in the way we describe in this document, can create a network of motivated technical personnel across any given country, with transferable skills that can also be applied to general communication and support across other projects.

The benefits of upskilling already motivated and committed engineers can therefore not be overestimated.

> Unit 13 (Train the Trainer) This unit has helped me realize the importance of communication. Indeed my ability to interact well and professionally with others will mean that they are more likely to listen to my opinion, have more confidence in me and involve me in decisions moving forward.

Our trainee Callixte at Madagascar's CHUT medical facility. Our assessment visit revealed a lack of training, tools, and professional confidence.

Callixte, post-course, with the City & Guilds certificate awarded through our Biomedical Engineering Training Programme. Proud, fully trained, self-confident, he is now part of a motivated team properly equipped with a full comprehensive toolkit to provide long-term support.

How does the Biomedical Engineering Programme Work?

The training is designed to be simple to implement and monitor. The programme is delivered entirely online, so can be accessed and completed from anywhere in the world.

There are 13 units, and at the end of each unit there is a series of multiple-choice questions (MCQs), totalling 300 over the entire programme. The student must achieve 100% in order to move onto the next unit.

Students can retake as many times as necessary, but each time the questions and answers shuffle, to ensure genuine understanding and robust learning.

The programme also includes:

- A comprehensive professional engineering toolkit
- Four textbooks
- A full electronic library of service manuals
- Reporting tools to enable sponsors and team leaders to track their students' progress
- Laptop in ruggedised military specification briefcase (a highly recommended optional extra)

Professional toolkit and textbooks – all supplied as part of the training programme, with optional laptop and ruggedised, military-specification briefcase.

The Course Content

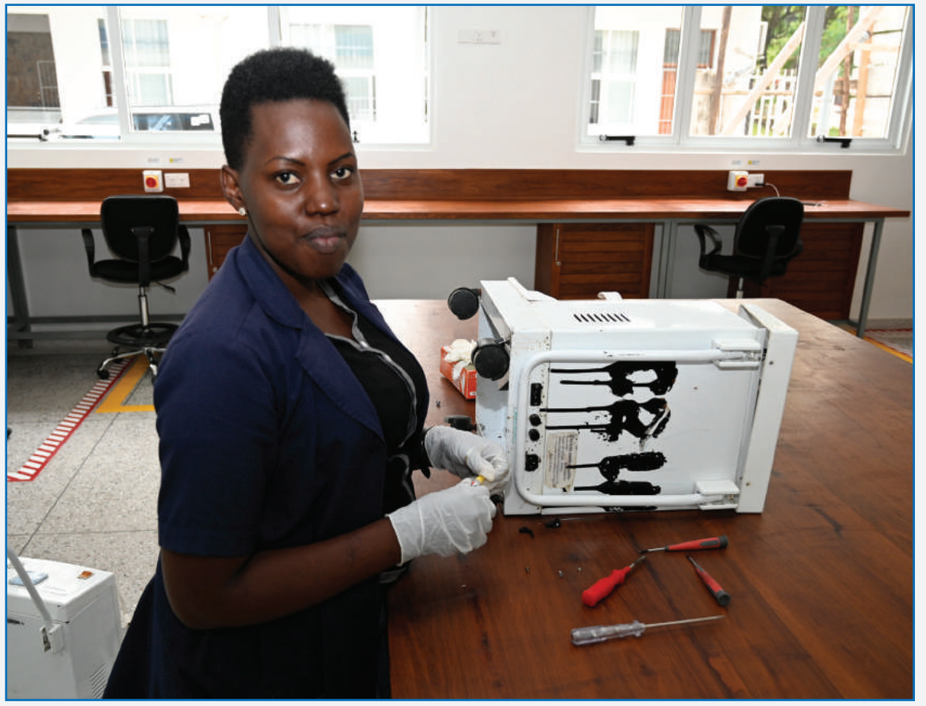
The course content covers the many relevant and vital topics that will give students the basic foundations of biomedical engineering knowledge, including:

- Health & Safety
- Electrical Safety
- Electrocardiogram (ECG)
- Defibrillation
- Patient Monitoring
- Infusion Devices
- Premature Baby Incubators (PBIs)
- Ultrasound
- Surgical Diathermy/ESU
- Hygiene Guidelines – with Covid-19 Updates
- Anaesthetics and the Operating Department – includes Oxygen Concentrators
- First Aid
- Train the Trainer
- Principles of Fault Finding
- Covid-19 Guidance across all Subject Areas

Upon completion of the course, the candidates who pass will receive an Assured Biomedical Engineering certificate from City & Guilds – a globally recognised awarding body.

> *I greatly appreciate you Medical Aid International for the program you offer and a simple demonstration of the course which makes easy to understand we have learned a lot it might be hard to explain almost everything. Most questions I had concerning medical equipment has be answered.*
> *They will be great improvement from now. THANK YOU VERY MUCH KEEP IT UP.*

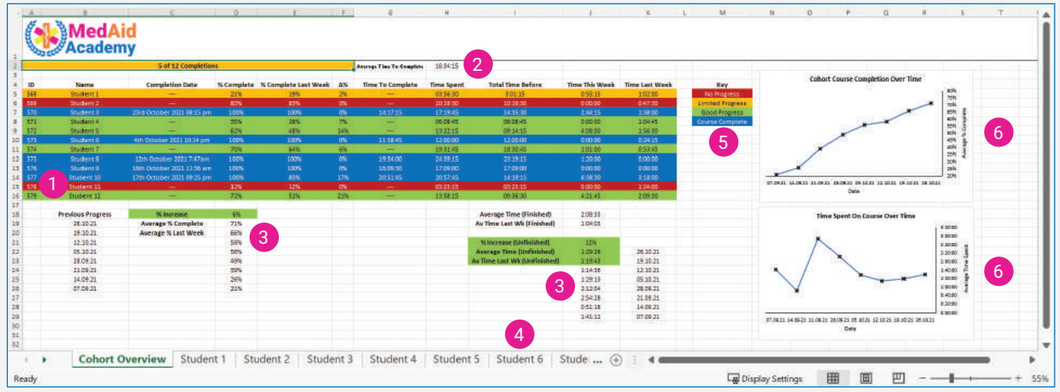
Helping you Identify the Right People



As long as the student can read and write in English or French and has basic numeracy skills, they can successfully complete the programme. What is absolutely essential is that the student is enthusiastic, passionate and motivated. In our experience, apparent prior knowledge is not always reflected in the student's learning.

Our Comprehensive Reporting System

To help support our students and partners, as well as building relationships, Medical Aid International provides a comprehensive reporting system, included as part of the Biomedical Engineering Course.



1. Cohort Progress Table, tracking a variety of time and completion metrics.

2. Average time to complete the programme.

3. Data from previous weeks.

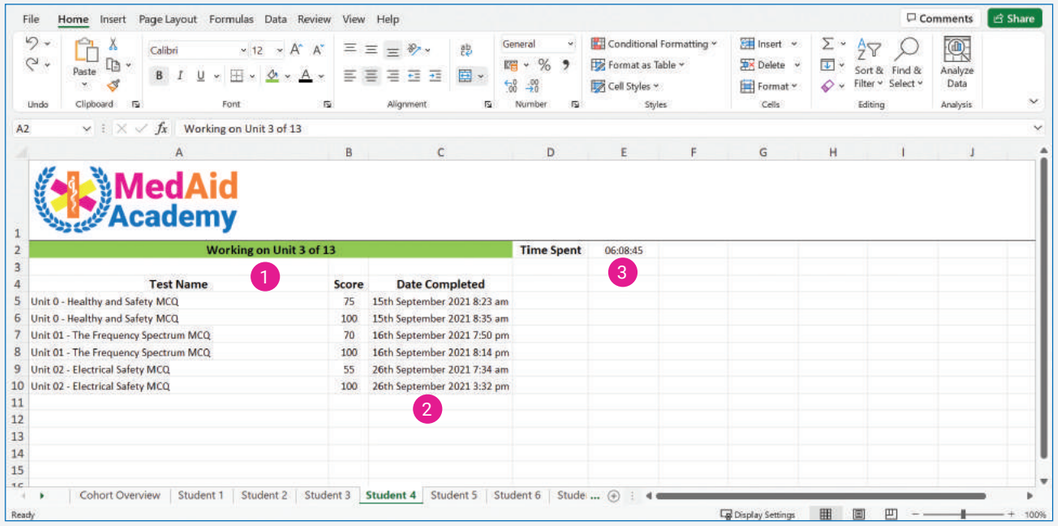
4. Marks for each individual student.

5. Key to quickly identify student progress at a glance.

6. Graphs of cohort completion and average time spent over all weeks.

Their performance will be closely monitored via our Education and Data Analysis Manager who will provide the following comprehensive report service:

- Weekly progress reports
- A bespoke data analysis report – analysing student programme feedback, investigating the impact of the programme, analysing the impact on education level on programme achievement/outcome
- Access to all student data for the coordination group
- Student survey data that details the impact of the course
- Student enrolment management and support



1. Unit Student is Working on.

2. Results of all Multiple Choice Question test, including score and date completed.

3. Time spent on the programme overall.

> *For WFSA, partnering with MAI has been a real plus. Not only are they experts in providing appropriate equipment for low resource environments, but their biomedical engineering courses address the essential skills needed to keep that equipment functioning properly. And we've been kept updated on students' progress via regular progress reports and self-evaluations so we know where our investment is going. By supporting these courses we are making anaesthesia and surgery safer.*
>
> ***Stuart Halford, Head of Development, World Federation of Societies of Anaesthesiologist***

Supporting Our Students

Using the data contained in the weekly updates, students can be motivated and encouraged accordingly. They also help to identify any students who might need additional support to complete the course, such as providing internet access or helping them set aside time for this valuable training.

The data contained within the weekly reports can also be accessed in real time by the course coordinator(s). Guidance and training can be offered to help the coordination team interpret the data.

After all students in the cohort have completed the course, a bespoke data analysis report is written that reflects the unique performance, characteristics, and feedback from the group. This tailored approach allows for detailed insights to be uncovered.

A small selection of data taken from one such data analysis report is shown opposite. The graphs on the right exemplify the type of data analysis provided in the bespoke data analysis report.

This real-world data contained in the bespoke data analysis reports demonstrates how vast an impact this course has on students and the clear benefits for everyone who completes the course.

Fig.1 The figure shows that students found Unit 11, Anaesthetics and the Operating Room, the most useful unit. This likely reflects the need for a better equipped operating room.

Fig.2 The figure highlights the fact that students reflected very positively across all aspects of our Biomedical Engineering course.

Fig.1

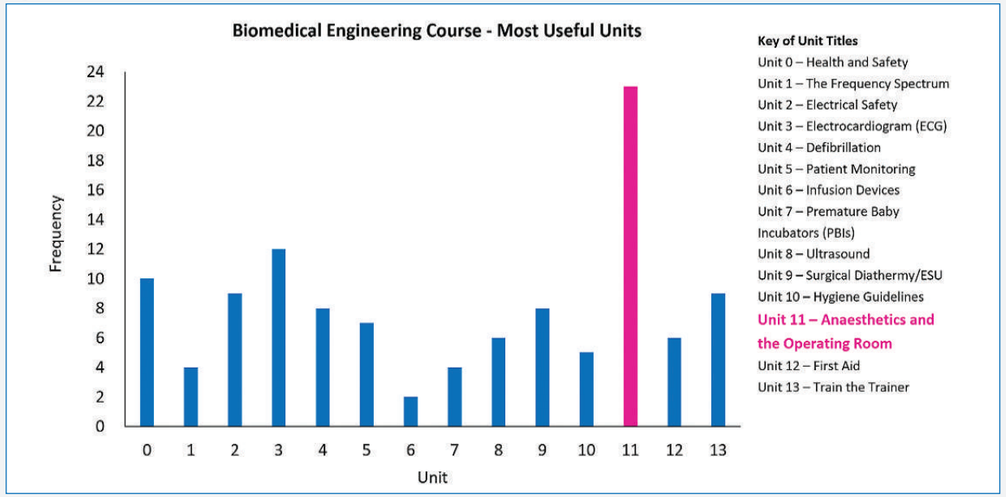
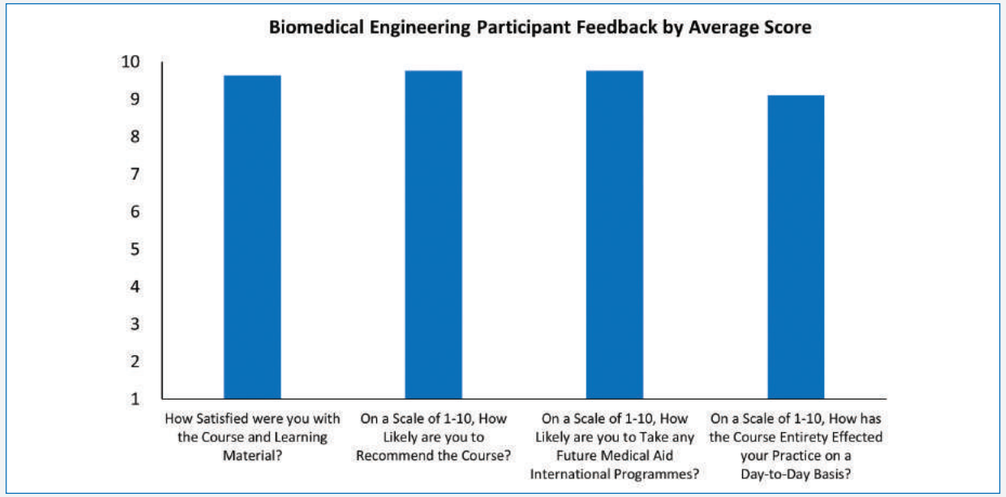


Fig.2



Budget

We suggest, if funds are available, that students are provided with the optional laptop and ruggedised military-specification briefcase that we can supply. This combination will enable students to follow the course, research solutions in their role as Biomedical Engineers, and communicate easily with project coordinators both directly and through internal forums (e.g. Microsoft Teams).

The Biomedical Engineering programme is £1,950 without a laptop and £2,750 with a laptop per student. This includes:

- Professional toolkit
- City & Guilds certification
- All associated freight costs to the Ministry of Health, or other nominated address
- Framed certificates, shipped to a nominated address

Consultancy on the provision of an effective and efficient Biomedical Engineering service can be provided by Medical Aid International.

Summary

At Medical Aid International, we are passionate about delivering efficient, value-for-money training that empowers LMIC healthcare communities and enables them to proudly and confidently take ownership of their patients' current and future treatment and wellbeing.

Our online Biomedical Engineering Training Programme model is effective, simple, quick to implement, and proven to benefit patients rapidly. **It means equipment keeps working, treatment keeps going, and patients keep recovering.**

Graduation of Guinea Biomedical Engineering Students in 2019.

Medical Aid international

More About Us

Medical Aid International is a long-established, UK based, successful Social Enterprise with a culture of delivering effective aid solutions, as well as constantly reflecting on past experiences and events in order to learn and become still more effective in the future.

Alongside our work of equipping healthcare facilities in LMICs, we have always had an underlying belief in the value of education that is truly relevant to the environment and people it is delivered to – hence our development of the online Biomedical Engineering Training Programme.

Tim Beacon, CEO

Tim, the CEO of Medical Aid International, has a clinical and commercial background in orthopaedic trauma and is also a qualified teacher who taught for several years in the UK NHS and university-based nursing schools.

He has directed Primary Trauma Care courses in Uganda and advised on them in Zimbabwe. He was also a part-time instructor on the UK military special forces medical training course for five years and has completed the Oxford University Anaesthesia in Developing Countries course.

He ran an adventure training-based personal development company for healthcare staff for 20 years, in addition to a church leadership role.

It was Tim's extensive training and education background that led him to consider more innovative ways of teaching, and it was this reflective process that inspired the team at Medical Aid International to put together a Biomedical Engineering Training Programme that could be followed online by anyone, anywhere in the LMIC regions and, indeed, the wider world.

Engineering Innovation for LMIC Regions

We are innovative and lateral-thinking in our approach, to the point where we have even designed and built our own LMIC-appropriate medical solutions where none previously existed. These include the EcoClave™ wood-fuelled autoclave, and, in partnership with a major UK university, an LMIC-friendly CPAP device that is currently undergoing clinical trials.

We have also designed and produced, in partnership with a major Western orthopaedic manufacturer, a CE/FDA marked external fracture fixator package designed specifically for LMIC use.

What You Can Do Next

Thanks so much for taking the time to read this brochure. We hope it explains how our online Biomedical Engineering Training Programme is helping to create real change for the better in hospitals and healthcare facilities in LMIC regions, and why we're proud of it.

Why not take the next step and find out more?

- **Visit our online training web page: find out more detail** - www.medaidacademy.co.uk/biomedical-engineering/
- **See what engineers help maintain:** the healthcare solutions that change and save lives. https://www.medaid.co.uk/healthcare-solutions/
- **Get in touch:** ask us how our online Biomedical Engineering Training can help your work. www.medaid.co.uk/contact/
- **Want to go ahead with training?** Enrol yourself or your students here: www.medaidacademy.co.uk/product/biomedical-engineering-theory-course/

Lameck and Kondwani, the Biomedical Engineers at Cure Orthopaedic Hospital in Blantyre, Malawi, proudly receive their City & Guilds Certificates from Elly, the Director of the hospital.

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