BIOMEDICAL ENGINEERING TECHNOLOGIST (BMET)
CURRICULUM AND PROGRAMME DEVELOPMENT IN ZAMBIA

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Keywords: developing countries, curriculum, training, capacity building, biomedical engineering technologist (BMET)

Abstract

Zambia, like many other countries in Sub-Saharan Africa, faces significant challenges managing and maintaining its medical equipment. Within Ministry of Health (MoH) hospitals, there is a significant shortage of qualified biomedical engineering professionals (technicians, technologists and engineers) to perform these vital functions and there are currently no programmes in Zambia to produce these professionals. The curriculum was developed for a three-year biomedical engineering technologist (BMET) diploma programme at a leading technical college in Zambia. This process engaged a wide variety of stakeholders within Zambia and biomedical engineering experts from abroad. The curriculum was approved by Zambia’s technical and vocational training authority in late 2011 and planning is underway to commence the programme in 2013. Many lessons have been learned throughout the process.

1 Introduction

Zambia is a land-locked country in Southern Africa. With a population of just under 13 million, life expectancy at birth is 46 for males and 50 for females. Sixty-four percent of the population lives under the international poverty line of $1.25 US dollars per day [1]. Like many countries in Sub-Saharan Africa, Zambia faces significant challenges managing and maintaining its medical equipment. One of the most significant challenges is the lack of qualified biomedical engineering professionals (technicians, technologists and engineers). There is currently no biomedical engineering programme in Zambia to produce these professionals, who are vitally needed in public, private and faith-based health facilities, as well as in the private sector.

The Tropical Health and Education Trust (THET) is an international development organisation that works to strengthen healthcare services in Africa and Asia by harnessing the skills and expertise of UK health professionals. THET supports health partnerships between UK and low-income country partner institutions, including those focused on curriculum development and delivery for health professionals in low-resource settings. It is based in London and has country programme offices in Somaliland and Zambia.

2 Medical equipment in Zambia

There is no nation-wide inventory of medical equipment in Zambia, however two recent surveys provide some insight on the state and availability of medical equipment in Ministry of Health (MoH) hospitals. A needs assessment performed in six Ministry of Health (MoH) hospitals in May 2011 on behalf of THET found that 35% of equipment was out of service at the one hospital with in date records. Interviewee estimates at the remaining five hospitals suggested that between 25% and 60% of equipment out of service in their hospitals [2]. A baseline study performed in early 2010 by the Japanese International Cooperation Agency (JICA)’s Health Capital Investment Support Project (HCISP) found that 39% of the equipment at University Teaching Hospital (UTH), which is the main referral hospital in Lusaka, was out of service. Furthermore, 61% of equipment in all hospitals surveyed in HCISP pilot hospitals in three provinces (Western, Eastern and Lusaka) was more than ten years old, and health posts had, on average, only 40% of their required equipment [3].

The MoH is currently procuring a large volume of new medical equipment, with support from cooperating partners (CPs). New procurement includes emergency obstetric care equipment, theatre equipment, imaging equipment and radiotherapy equipment. Centralised procurement in recent years has included first-line troubleshooting and maintenance training for maintenance staff within the hospitals.

3 Biomedical engineering in Zambia

Despite the challenges, much progress has been made to improve the state of medical equipment maintenance and management in Zambia over the last decade. Within that time, a medical equipment specialist (MES) post has been created and filled at the Ministry of Health and provincial medical equipment officer (PMEO) posts have been created in each of Zambia’s ten provinces. With support from the HCISP project, standard equipment lists have been developed.
for health posts, health centres and level 1 (district) hospitals. Furthermore, a national medical equipment management guideline and standard equipment lists for level 2 (provincial) and level 3 (central) hospitals are all in draft format and due to be finalised before the end of 2012.

There are a total of 20 biomedical engineering workshops in MoH hospitals: four at central hospitals and an additional sixteen at level 2 hospitals; other level 1 and 2 hospitals have general maintenance workshops [3]. At the district level, cold chain specialists assigned to the district medical offices (DMOs) tend to be responsible for medical equipment as well as cold chain equipment because there are inadequate numbers of medical equipment technicians assigned to DMOs. In the health posts (HPs) and health centres (HCs), electricians, mechanics and plumbers are often charged with equipment repairs [2,3].

### 3.1 Personnel

THET’s needs assessment and the baseline study for the HCISP provide data on the qualifications of biomedical engineering personnel in their respective study areas. Table 1 presents the job titles and qualifications of the fourteen medical equipment (ME) maintenance personnel involved in THET’s needs assessment. Qualifications range from 1-4 year programmes, with the following nomenclature:

- Crafts certificate (CC) – 1 yr
- Advanced crafts certificate (AC) – 2 yr
- Diploma (Dip) – 3 yr
- Bachelor of Science (BSc) engineering degree – 4 yr

<table>
<thead>
<tr>
<th>Hospital (level)</th>
<th>Job Title</th>
<th>Qualifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monze(2)</td>
<td>Hospital engineer</td>
<td>BSc (civil)</td>
</tr>
<tr>
<td></td>
<td>ME technician</td>
<td>AC (electrical)</td>
</tr>
<tr>
<td>Livingstone(2)</td>
<td>Hospital engineer</td>
<td>BSc (mechanical)</td>
</tr>
<tr>
<td></td>
<td>ME technician</td>
<td>Dip (electronics)</td>
</tr>
<tr>
<td>Lewanika(2)</td>
<td>ME technician</td>
<td>Dip (electrical)</td>
</tr>
<tr>
<td></td>
<td>ME technician</td>
<td>AC (electrical)</td>
</tr>
<tr>
<td>Senanga(1)</td>
<td>Electrical technician</td>
<td>Dip (electrical)</td>
</tr>
<tr>
<td>Ndola(3)</td>
<td>Senior ME technologist</td>
<td>Dip (mechanical)</td>
</tr>
<tr>
<td></td>
<td>ME technologist</td>
<td>Dip (electrical)</td>
</tr>
<tr>
<td></td>
<td>ME technician</td>
<td>AC (electrical)</td>
</tr>
<tr>
<td>UTH(3)</td>
<td>Senior ME technologist</td>
<td>Dip (electronics)</td>
</tr>
<tr>
<td></td>
<td>ME technologist</td>
<td>BSc (elec-mech)</td>
</tr>
<tr>
<td></td>
<td>ME technician</td>
<td>AC (electrical)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CC (electrical)</td>
</tr>
</tbody>
</table>

Table 1: Job titles and qualifications of medical equipment maintenance personnel involved in needs assessment [2]

Results in Table 1 show that many personnel qualified with a diploma are working as technicians (which requires an advanced crafts certificate) as opposed to technologists. Only one individual interviewed had received biomedical engineering training prior to joining the workforce, which took place abroad. The two central (level 3) hospitals have more established career progression structures and the qualifications of their staff correlate more closely with their job title and grade. Outside the scope of the needs assessment, many PMEOs and the MES have received significant amounts of biomedical engineering training abroad.

Data from the 2010 HCISP baseline study shows a similar trend for Eastern, Western and Lusaka provinces. Of the forty technical personnel in charge of equipment maintenance at all facility levels, 80% had a background in electronics and engineering, 3% had a mechanical engineering background and 17% had other specialities. Of the forty, 55% were qualified as technicians, 23% as technologists, 5% as engineers and 18% had no formal qualifications [3].

Table 2 presents the number of medical equipment maintenance personnel posts approved by the Ministry of Health per health facility included in THET’s needs assessment. This figure is presented along with the actual number in post and the recommended number based on the hospital’s size, service and equipment profiles and maintenance work request records. The “How to Manage” Series for Healthcare Technology: Guide 1 also provides useful staffing projections based on various developing country experiences [4].

<table>
<thead>
<tr>
<th>Hospital (level)</th>
<th>Approved</th>
<th>Recommended</th>
<th>Actual (% of R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monze(2)</td>
<td>3</td>
<td>4</td>
<td>2 (50%)</td>
</tr>
<tr>
<td>Livingstone(2)</td>
<td>3</td>
<td>6</td>
<td>2 (33%)</td>
</tr>
<tr>
<td>Lewanika(2)</td>
<td>2</td>
<td>6</td>
<td>2 (33%)</td>
</tr>
<tr>
<td>Senanga(1)</td>
<td>1</td>
<td>2</td>
<td>1 (50%)</td>
</tr>
<tr>
<td>Ndola(3)</td>
<td>3</td>
<td>10</td>
<td>3 (30%)</td>
</tr>
<tr>
<td>UTH(3)</td>
<td>11</td>
<td>12</td>
<td>4 (25%)</td>
</tr>
</tbody>
</table>

Table 2: Number of medical equipment maintenance personnel in post: approved, recommended and actual [2]

There were discrepancies between the number of medical equipment personnel approved by the MoH for each facility and the actual number in post in many cases. This is due to a lack of funding being allocated centrally for posts and competing priorities at the facility level (i.e. the funding being diverted to other areas within the hospital). The ratio of actual personnel in post vs. recommended in post is no more than 50% in any hospital and the total ratio is only 35%. There is a significant need for more qualified biomedical engineering personnel in health facilities at all levels.
4 Curriculum development

4.1 Level of training

Based on the results of the needs assessment and wide consultation with stakeholders, it was determined that the development of a programme that produces qualified medical equipment technologists (who theoretically spend approximately 60-70% of their time on maintenance and the remainder on management) was most appropriate to meet Zambia’s current needs in MoH hospitals.

Furthermore, the University of Zambia (UNZA) in Lusaka is currently working with collaborators from Boston University in the United States to introduce biomedical engineering at the degree level within its Faculty of Engineering, which currently offers programmes in electrical and mechanical engineering. Stakeholders from both initiatives agreed that their respective curriculum development and delivery efforts should be complement one another (i.e. producing graduates with different, complementary skill levels), as opposed to competing with one another.

4.2 Selection of host institution

Northern Technical College (NORTEC) in Ndola, Copperbelt province, was selected as the most appropriate institution to host the planned biomedical engineering technologist (BMET) programme. NORTEC has well-established programmes in a wide variety of technical and vocational areas, and offers programmes at the crafts/artisan (1 year), advanced crafts/technician (2 year) and diploma/technologist (3 year) level in the related subjects of electronics, electrical engineering, mechanical engineering and instrumentation. The college also has well-equipped laboratory facilities on site and a good track record of working with industry to place students for workplace attachments and future employment.

4.3 Stakeholders

The following stakeholders were identified and brought together for the curriculum development process:

1. Technical and Vocational Education and Training Authority (TEVETA) – organisation that regulates technical and vocational training institutions, curricula and programmes in Zambia, and facilitates curriculum development
2. NORTEC – host institution with lecturers in related subject areas (electronics, electrical and mechanical engineering, instrumentation)
3. MoH – ideally the main employer of programme graduates; with biomedical engineering professionals including the MES and PMEOs and working technicians and technologists, as well as a consultant physician from UTH
4. Engineering Institute of Zambia (EIZ) – institute that registers professional engineering associations in Zambia (although biomedical engineering is not yet a recognised profession)
5. Evelyn Hone College – biomedical sciences college in Lusaka that includes subject matter experts in anatomy and physiology
6. THET – leader of the curriculum development process
7. International biomedical engineering and diploma programme experts – engaged to validate the curriculum developed in Zambia

4.4 Process

A two-week curriculum development workshop was convened with representatives from each of the stakeholder organisations in Lusaka in June 2011. The process was led by THET’s biomedical engineering consultant and facilitated by TEVETA, which uses an established curriculum development framework to produce new programme curricula.

4.4.1 Skills identification needs assessment

The first step in TEVETA’s curriculum development framework was to perform a ‘skills identification needs assessment’, which identifies technical gaps in existing personnel performing a particular technical or vocational job. THET’s needs assessment provided the basis for such an exercise; it was clear based on the findings that those working as medical equipment professionals lack training in biomedical engineering prior to joining the workforce and that this impacts the scope of their ability to perform medical equipment maintenance and management functions.

4.4.2 Job profile development

The second stage of the process was to generate a ‘job profile’ that addressed the skills gap identified: in this case the job profile of a medical equipment technologist. The job profile outlines the sector in which a programme graduate (or job holder) may be employed; the purpose of the job; the main roles and responsibilities of the job; the equipment a job holder may be responsible for in the workplace; indicators for a job holder to measure quality of service and process; dilemmas, challenges and complexities (along with possible solutions) that may face the job holder; parties interacting with the job holder, both inside and outside her or his organisation; working conditions and environment; required abilities and knowledge; important values and attitudes; licencing requirements; and different employment pathways for the job holder.

Starting with such a comprehensive profile of a programme graduate enabled the remaining curriculum development process to be very focused, as the curriculum generated must have addressed all areas outlined in job profile. The ‘required abilities’ and ‘required knowledge’ sections in particular guided the structure and development of the programme’s technical course modules.
4.4.3 Curriculum chart development

The third stage of the process was to develop a ‘curriculum chart’, akin to a course or programme overview in other settings. The curriculum chart provides details on the following aspects of the programme: purpose and objectives; course duration and outline; teaching strategies; programme evaluation strategies and student assessments; entry, attendance and progression requirements; staffing and certification.

Developing the chart began with a thorough review of the charts of the electronics, electrical, mechanical and instrumentation programmes to identify similar content and incorporate it into the new BMET programme. New course modules were then developed for all of the new biomedical engineering-specific content required for the programme.

The curriculum chart broke the BMET programme down into distinct course modules for each year of the programme, including existing and new modules. For example, ‘Fundamentals of electrical & electronics’ is an existing NORTEC course that BMET students will take alongside other students, while ‘Fundamentals of biomedical engineering’ is a new module they will take independently of students from other programmes during their first year.

Each module was then broken down into individual units of instruction. For example, ‘Roles of different health professionals’ and ‘Health services in Zambia’ are two units in the ‘Fundamentals of biomedical engineering’ module. The chart also outlines the duration (in number of hours of instruction, both in the classroom and the laboratory), purpose and objectives of each module in the programme.

4.4.4 Curriculum detailing development

The final stage of the workshop was to break the modules of the chart down into a full programme syllabus, or ‘curriculum detailing’. Each unit was broken down into the following:

1. Learning outcomes
2. Learning conditions (for example, the student must have access to textbooks and lecture notes, etc.)
3. Learning activities to meet the objectives of the unit
4. Assessment criteria
5. Assessment methods
6. Recommended textbooks and learning aids

The curriculum detailing was performed in small breakout groups based on workshop participants’ areas of expertise. Some textbooks used in existing modules and those recommended for new modules were used in the breakout exercise, as were experts’ personal collections of technical and professional literature and resources.

4.4.5 Curriculum package validation

After workshop completion, the three curriculum package documents (job profile, curriculum chart and curriculum detailing) were then sent to nine external (international) biomedical engineering experts, including several who run similar programmes. The volunteer experts were from South Africa, Uganda, Qatar, the UK, Canada and the United States. They were given one month to review the job profile and curriculum chart and provide feedback. THET’s biomedical engineering consultant then incorporated their feedback into a final draft version of the documents.

4.5 Approval

In December of 2011, the MoH’s former medical equipment specialist presented the curriculum package to TEVETA’s Occupational Standards, Curriculum, and Qualifications Development Sub-Committee. The committee recommended minor changes and approved the curriculum.

5 BMET diploma programme overview

5.1 Schedule of modules, attachments and project

Table 3 presents the programme modules, workplace attachments and final project by year (new modules and programme elements are bolded).

<table>
<thead>
<tr>
<th>Yr</th>
<th>Module</th>
<th>Hours of instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fundamentals of biomedical engineering</td>
<td>300</td>
</tr>
<tr>
<td>1</td>
<td>Anatomy and physiology</td>
<td>80</td>
</tr>
<tr>
<td>1</td>
<td>Fundamentals of electrical &amp; electronics</td>
<td>80</td>
</tr>
<tr>
<td>1</td>
<td>Engineering science</td>
<td>210</td>
</tr>
<tr>
<td>1</td>
<td>Engineering mathematics</td>
<td>210</td>
</tr>
<tr>
<td>1</td>
<td>Engineering drawing</td>
<td>150</td>
</tr>
<tr>
<td>1</td>
<td>Communication skills</td>
<td>120</td>
</tr>
<tr>
<td>1</td>
<td>Introduction to computers</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>Medical equipment management and maintenance</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>Electrical technology II</td>
<td>180</td>
</tr>
<tr>
<td>2</td>
<td>Electronics II</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Engineering mathematics II</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>Medical instrumentation I</td>
<td>400</td>
</tr>
<tr>
<td>2</td>
<td>Pneumatics and hydraulics</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>1st workplace attachment</td>
<td>480</td>
</tr>
<tr>
<td>3</td>
<td>Management and organisation</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>Regulations, standards and ethics</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>Power electronics III</td>
<td>150</td>
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<tr>
<td>3</td>
<td>Medical instrumentation II</td>
<td>450</td>
</tr>
<tr>
<td>3</td>
<td>Entrepreneurship</td>
<td>150</td>
</tr>
<tr>
<td>3</td>
<td>Industrial motor control</td>
<td>150</td>
</tr>
</tbody>
</table>
For The units in Medical Instrumentation II (year three) are:

The units in 'Medical instrumentation I and II' modules in years two and three teach students about Zambian and international regulations for medical devices, professional practice and ethics.

The ‘Medical instrumentation I and II’ modules in years two and three are the core medical device modules; they each comprise approximately 40% of the students’ instruction time in their respective years. Medical devices are organised in the modules into functional areas students will encounter in the hospital, as opposed to strictly device theory and operation.

The units in Medical Instrumentation I (year two) are:
1. Measuring biological signals
2. Medical equipment uses and categories
3. Maintaining general bedside nursing equipment
4. Maintaining utility & medical gas system equipment
5. Maintaining dental and dental laboratory equipment
6. Maintaining theatre and surgery equipment
7. Maintaining ventilation and anaesthesia equipment
8. Maintaining laboratory equipment
9. Measuring electrical signals
10. Measuring pressure signals
11. Measuring temperature signals
12. Measuring fluid flow signals
13. Measuring oxygen signals
14. Measuring radiation signals
15. Measuring cardiac signals
16. Measuring respiratory signals
17. Measuring neurological signals
18. Measuring surgical signals

The units in Medical Instrumentation II (year three) are:
1. Maintaining cardiovascular & monitoring equipment
2. Maintaining gynaecology and obstetrics equipment
3. Maintaining paediatric equipment
4. Maintaining physiotherapy equipment
5. Maintaining physiotherapy equipment
6. Maintaining haemodialysis equipment
7. Maintaining medical imaging equipment
8. Maintaining laboratory equipment
9. Measuring biological signals
10. Measuring electrical signals
11. Measuring pressure signals
12. Measuring temperature signals
13. Measuring fluid flow signals
14. Measuring oxygen signals
15. Measuring radiation signals
16. Measuring cardiac signals
17. Measuring respiratory signals
18. Measuring neurological signals
19. Measuring surgical signals

For each device included in a unit, students will cover some to all of the following information:
1. Principles of operation (function, use, scientific principles)
2. Device construction (components, system diagram, inputs/outputs)
3. Troubleshooting (identifying and rectifying common faults, replacing components)
4. Preventive maintenance procedures (replacing components, calibrating)

5. Safety considerations (user safety, electrical safety)
6. Performance monitoring (quality assurance and control)

Which information is covered will depend on the device complexity, applicability of the information and the likelihood that a technologist (as opposed to an external service engineer) would be the primary maintenance service provider for the device in the hospital setting. Some devices will be taught hands-on in the laboratory at NORTEC, while other more complex devices will be observed in operation. After the completion of each unit, students will visit the respective ward at nearby Ndola Central Hospital to observe the devices in use in a clinical setting.

5.2 New module content

In year one, the ‘Fundamentals of biomedical engineering’ module will introduce the field of biomedical engineering, the health system in Zambia and the fundamentals of workshop practice. Together with the ‘Anatomy and Physiology’ module, it will lay the theoretical foundation for hands-on learning in subsequent years.

Students will learn the principles of medical equipment management and organising a maintenance system in the ‘Medical equipment management and maintenance’ module in their second year. The ‘Regulations, standards and ethics’ module in year three teaches students about Zambian and international regulations for medical devices, professional practice and ethics.

5.3 Instructor model

Existing lecturers will deliver the modules that already exist at NORTEC. For the new modules, THET plans to recruit a long-term (18 to 24 month) volunteer course coordinator to coordinate the delivery of the new modules, as well as workplace attachments and the final year project. Local instructors and guest lecturers will be used wherever possible. For example, it is proposed that one of the MoH’s PMEs teach the ‘Fundamentals of biomedical engineering’ course be on secondment.

The model for the ‘Medical Instrumentation I and II’ modules is to recruit five specialist volunteer instructors per module for a period of two weeks each to cover the units of instruction. Where possible, these instructors will be recruited from the Sub-Saharan African region and from other developing countries, to promote South-South partnerships. In order to make the programme more sustainable, two existing lecturers from NORTEC will attend all new modules and be mentored by the volunteer specialist instructors in order to train them to become programme lecturers.

5.4 Workplace attachments and final project

Students’ first workplace attachment at the end of year two will place them in a large, central (level 3) hospital with a standalone biomedical engineering department. In this environment, they will receive mentorship from existing staff members. Their second workplace attachment (their internship) at the end of their programme will take place in a smaller hospital, either level 1 or level 2, where they will likely be working in a general maintenance department and will need to work more independently than during their first attachment (although still under supervision).

Students will work on their final project in the medical instrumentation laboratory during the second half of their final year, directly before their internship. The course coordinator will coordinate the final projects and MoH and industry professionals will be recruited to advise and assess the projects.
6 Programme implementation

In order to implement the new BMET diploma programme, funding must be secured for various components and stakeholders must commit to programme delivery.

6.1 Fundraising

Funds must be raised to set up the medical instrumentation laboratory at NORTEC (with medical devices, laboratory equipment, tools and test equipment). They must also be raised to cover the human resource inputs required for the programme, and the learning materials. Full budget projections for each of these components were prepared in early 2012. Potential donors have been approached in Zambia and the UK. These include: CPs (bilateral donors and international organisations) who currently work with the MoH; equipment manufacturers and suppliers who may supply medical devices in-kind; other private sector organisations including mining and banking companies with active corporate social responsibility (CSR) programmes in Zambia; and philanthropic organisations.

6.2 Stakeholder engagement

In June 2012, THET’s biomedical engineering consultant spent two weeks in Zambia meeting with programme stakeholders as well as potential funders. Within the MoH, meetings were held with the Directors of (1) Clinical Care and Diagnostic Services and (2) and Policy and Planning, as well as with the acting Permanent Secretary (PS) for Health. The MoH has committed to providing support for the programme in the form of secondee instructors, upgrading of workshops that will host student attachées and creating new posts for programme graduates. It has also proposed covering the course fees of the first intake students. NORTEC is ready to begin the programme as soon as possible and can supply instructors for the existing courses. The Ndola School of Biomedical Sciences (NSBS) can provide a lecturer for the ‘Anatomy and Physiology’ module. All stakeholders are keen to commence the programme.

6.3 Planned start date

Year one is currently projected to commence in September 2013. The start date may move forward to May 2013 if funding is secured for the medical instrumention laboratory at NORTEC (which needs to be operational for year two of the programme) shortly. The first intake will likely include 1/3 of students who are currently working for the MoH with lesser qualifications (i.e. such as an electrical technician) and 2/3 new school leavers. Conversion courses for existing MoH staff are being discussed.

7 Lessons learned

Many lessons have been learned through both the curriculum development process and the ongoing process of fundraising and stakeholder engagement.

While developing the curriculum, it was challenging at times to balance the expectations and inputs of various stakeholders. It was also difficult to strike a balance between quality and flexibility of the curriculum being developed. In the absence of a large cadre of trained biomedical engineering professionals in Zambia, expertise needed to be sought from abroad to validate the curriculum. Without a professional body that regulates the biomedical engineering profession in Zambia, external validation will continue to be required, along with TEVETA’s accreditation, to ensure quality of the curriculum and its delivery. Working with an established and very formalised curriculum development framework also had its benefits and drawbacks. Fundraising can be challenging and one key lesson learned was the importance of having ‘on the ground’ champions who are well connected and supportive of the efforts to implement a new BMET diploma programme. It is vitally important that new posts are created to absorb graduates or they will be lost to ‘brain drain’, the private sector and other industries.

Both the needs assessment and curriculum development process highlighted the fact that there are currently no payscale mechanisms for recognising ‘on the job’ (OJT) training and informal qualifications. The MoH must address career progression for biomedical engineering professionals, both with and without formal qualifications. There is the danger of programme graduates being placed at higher levels than medical equipment maintenance staff currently in post who have lower qualifications but a significant amount of OJT and experience. Generally, it is important to advocate within and outside of Zambia for biomedical engineering professionals to be recognised as health professionals. Policy level change is required to help meet Zambia’s equipment maintenance and management needs.

Acknowledgements

This work was funded through THET by the UK Department for International Development (DFID). All organisations and their representatives listed in this paper have contributed to the work.

References