Strengthen Science, Technology, Mathematics and Engineering Education to Promote National Growth and Development of Sierra Leone

Alex Blanshard, PhD (email: alex.blanshard@icloud.com) and Hudson Jackson, PhD, P.E (email: hudijay@yahoo.com)

Abstract
Sierra Leone is blessed with many natural resources and great wealth. For many years, Sierra Leoneans have relied mostly on the export of these resources to generate growth and national development. However, this mindset coupled with other factors such as the civil unrest and lack of adequate funding has resulted in deterioration of the education section. If the educational sector is structured properly to provide the right emphasis and training, appropriately educated Sierra Leoneans will be the driving force of national development and growth. Ensuring access to education for all and generating a pipeline of trained and skilled professional as well as restructuring tertiary education and better aligning it with the goals of national development are the most crucial issues that must be addressed. Current trends in technological advancement dictate that science, engineering and technology will continue to play a major role in global development and growth throughout the world. The roles that science, engineering and technology could play in the development of Sierra Leone should be identified as priority areas and respective strategies put in place to create opportunities for students in these areas to foster national growth and development.

Introduction
Throughout history, the development of many nations is directly linked to innovation, social growth and advancement in science, engineering and technology. Ensuring that the crucial educational structures are in place as well as creating an atmosphere where innovation thrives, should be the main goals of any nation seeking to foster development. A common factor in the experience of the disparate Pacific Rim countries in successfully transforming their development status is their heavy investment in education especially targeting science, engineering and technology as a priority. If current global trends continue, science, technology and engineering will continue to significantly influence our daily lives. As a developing country like Sierra Leone strives to foster its agenda of national growth and development, its role as a global entity should be promoted to advance this cause. Consequently, science, engineering and technology priority areas must first be established largely based on market requirements. Given the agrarian nature of Sierra Leone’s current economy, areas such as post-harvest technologies, biotechnology and vocational training should feature prominently. These areas were identified in the joint consolidated Plan of Action of the African Union (AU) Commission and the New Partnership for African Development (NEPAD)\(^1\). Education, especially in science, engineering and technology, therefore has a vital role to play in Sierra Leone’s quest for national development.

Sierra Leone, having recently emerged from a devastating civil war, is faced with several challenges in the step towards development. Addressing the well documented problem of the limited availability of suitably qualified and skilled personnel, that are at the different levels of specialization in science and technology in Sierra Leone, will constitute a demand–led and most appropriate approach for the country given its current state of development. A study conducted by the World Bank in 2007 highlights some of these challenges related to
Amongst these challenges, the authors concede that ensuring access to education for all and generating a pipeline of trained and skilled professional are the most crucial. It is very encouraging to note that the Ministry of Education, Science and Technology (MEST) has implemented several policies that are steps in the right direction. In moving forward, several key educational aspects should be addressed including: (1) establishing a new mission for secondary, vocational, technical schools and polytechnics, and the two universities related to national development, (2) ensuring that there is a consistent pipeline of adequately prepared students admitted in junior and senior secondary education, (3) securing proper training and continuing education for educators, (4) the revising of the curricular of tertiary education to meet the needs of the industries promoting national development, and by so doing ensure that graduates have the required skills to succeed, (5) clearly defining national development in a relevant context, including setting realistic targets or milestones, proper utilization of resources, and aligning goals where appropriate with those of international organizations such as the African Union Commission, NEPAD and UNESCO, and generating funding sources.

The authors discuss these key educational aspects and provide several recommendations on how to move forward to ensure that the national development agenda of Sierra Leone is further advanced in a way that would generate both national and international interest.

Educational Structure

The context of secondary and tertiary (S&T) education in Sierra Leone reflects the current educational system which spans over 15 years in the so-called 6-3-4-4 system and the pursuit of the Education for All (EFA) goal, a goal that stipulates universal basic education for all. The current 6-3-4-4 system was implemented in 1993 (as 6-3-3-4) amongst other reasons to ensure that the education system serves the country by producing skilled workforce at both semi-professional and professional levels as opposed to the “exclusive grammar system” that it replaced. This ensures at least 9 years of basic education with strong focus on science and vocational education. In this system, students are expected to have 6 years of primary education followed by 3 years junior and then 4 years in both senior secondary education, and tertiary education. At the end of the first 6 years, students take the National Primary School Education (NPSE) that serves as an entrance requirement for junior secondary school admission. The Basic Education Certification Exam (BECE) is taken at the end of the 3 years of junior secondary education after which students can either advance to senior secondary level education or vocational education/training. A National Vocational Qualification (NVQ) is also in place to further identify students for technical and vocational education/training. Senior secondary education is concluded with students taking the West African Senior School Certification Exam (WASSCE). Results from the WASSCE are used for admission into the tertiary education such as universities and polytechnics. The Gbamanja commission recommended a 3-6-3-4-4 system with three year pre-school and a four year instead of three year secondary senior secondary school phase. A schematic of this system is shown in Figure 1.
Within the current system, students are still not meeting expectations as evident in the 40% pass rate of the Basic Education Certification Examination (BECE). It is the authors’ view that a standardized means of regularly assessing students’ performance against the expected educational outcome is lacking. This evaluation should not only be based on records of “pass” or “fail” on the NPSE, BECE and WASSCE, but rather on regular assessment of students’ understanding of key concepts, principles and their applications as well as their grasp of key skills. Furthermore, the progression of student attainment should be related to their baseline performance (attainment in previous phases in the 6-3-4-4 system).

According to Blanshard and Weekes\(^5\), three strategic leaders, in their capacity as Principals of three of the top Secondary Schools in Freetown, articulated that the key issues impinging on the quality of education at their schools were: (a) recruitment and retention of qualified teachers, (b) the challenges of the double-shift system, (c) the nature of the physical accommodation, (d) the quality and availability of teaching and learning resources, (e) the establishing of an effective accountability and monitoring system, and (f) the adoption of a fit-for-purpose security system of school property. Other factors such as the number of subjects that students have to study at the SSS phase as well as the quality of parental support and common class sizes, were indicated as important factors in the larger Sierra Leonean context. The WASSCE results (2006 – 2010) in science-based subjects of The Prince Of Wales School (POW) a school with a longstanding tradition in science, shown in Figure 2 reflect the dire nature of science provision in the country. Table 1 puts the results of the school in the national context.

Although significant improvement has been reported in the POW School’s performance recently, the national picture remains largely the same.
Figure 2 Students Performance as % of Top Four Grades (A1 – C4) in Science Courses at WASSCE (Source Blanshard & Weekes\textsuperscript{5})

Table 1: Comparison of Performance (as percentage of top four grades secured at WASSCE) of the Prince of Wales School and the National Performance in some key Science-based Subjects. (Source Blanshard & Weekes\textsuperscript{5})

<table>
<thead>
<tr>
<th>Science Block</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>National POW</td>
<td>National POW</td>
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<td>National POW</td>
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</tr>
<tr>
<td>Chemistry</td>
<td>1.6</td>
<td>8.4</td>
<td>2.3</td>
<td>4.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Physics</td>
<td>3.0</td>
<td>19.1</td>
<td>0.9</td>
<td>0</td>
<td>2.0</td>
</tr>
<tr>
<td>Further Math</td>
<td>3.0</td>
<td>10.1</td>
<td>1.2</td>
<td>0.9</td>
<td>3.5</td>
</tr>
<tr>
<td>Engineering Science</td>
<td>11.1</td>
<td>9.9</td>
<td>4.4</td>
<td>3.4</td>
<td>11.1</td>
</tr>
<tr>
<td>Physical &amp; Health Education</td>
<td>21.0</td>
<td>41.7</td>
<td>11.3</td>
<td>18</td>
<td>17.8</td>
</tr>
<tr>
<td>Technical Drawing</td>
<td>3.9</td>
<td>0</td>
<td>1.6</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
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**Strategies in Education to Foster National Development**

In order for the positive role of Science and Technology (S & T) to be realized, its anticipated impact on development in Sierra Leone should be based on evidence and experience. Taylor\textsuperscript{6} argues accordingly, that fundamental issues that impact Science and Technology (S & T) in the sub-Saharan African region should be informed by the sufficient mass of intelligence resulting from the recurring evidence and experience that exist. He identified fundamental issues impacting science and technology development as functional deficiencies in existing policies, structures, institutions, and domestic linkages. Although he lamented the lack of honoring the commitment by constitutive government to allocate at least 1% of Gross Domestic Product (GDP) to science and technology, he challenges policy...
makers and planners to define and fund S & T development within a “system thinking approach”. The place of schools’ curricula development and monitoring in his four-tier and 12-component strategy model is highlighted in Figure 3. The major components of this model include: (1) establishing a S & T plan, (2) developing appropriate curricula and monitoring framework, (3) establishing and/or evaluating existing S & T institutions and (4) researching and coordinating the process to ensure that the required skills are developed and objectives set in step (1) are met.

Figure 3: Four-Tier Science and Technology Development Model (Taylor, 2008)\(^6\)

Relating to the type of science education required, Lewin (2010)\(^7\) posits two approaches for developing and implementing S & T policies. In the “bottom up” approach shown in Figure 4, the education policy and curricula are driven by the need. On the other hand, in the “top down” approach, shown in Figure 5, education policy and curricula are determined or established based on the overall S & T policy. It must be noted that these two options may represent two extremes; the best approach is to utilize a blend of both depending on context.
Figure 4: Science Education Policy adopting the Bottom-up Approach Source – Lewin (2010)

Figure 5: Science Education Policy adopting the Bottom-up Approach Source – Lewin (2010)
The context of S & T education in Sierra Leone reflects the current educational system which spans over 15 years in the so called 6-3-4-4 system previously discussed. The country spends about 19% of its national budget on education\(^2\). An important source of funding for education in Sierra Leone is from external donors. Although some progress has been made in reforming education in Sierra Leone, there are still major challenges that will require addition resources in order to be addressed. In moving ahead, additional strategies and source of funding (domestic and international) to ensure that the reforms are implemented successfully will be required. As stated in the 2007 World Bank Report on Sierra Leone, “to mobilize more domestic funds and attract more international resources for education, Sierra Leoneans need to show clear evidence of the effective use of funds already available, together with a credible plan for utilizing future, additional resources”\(^2\). In addition, the importance of undertaking an audit of the status of research and development as well as on level of innovation in Science and Technology, as indicated in the case of South Africa, cannot be overemphasized. While the authors acknowledge the tremendous difficulties associated with such exercises, the huge benefits of facilitating evidence-based policy making with its higher chances of success, makes it all the more worthwhile\(^8\). In summary, in this section the authors have highlighted some key aspects that should be considered in advancing the role of education in national development.

Infusing Global Perspective

Lawson et al\(^9\) note that globalization is tied to technological advancements and should be understood as the rapid and unprecedented global circulation of cultural forms. Similarly, Toombs et al\(^10\) argue that the growth of globalization depends on culture rather than economics. The authors argue that much of the promise of the globalization movement also depends on how successfully cultural differences are addressed. More than ever before, the national economic wellbeing, national security of Sierra Leone and world stability as a whole depend upon the understanding of and communication with other countries. For projects to be constructed today, financing, materials, specialized equipment, and several facets of technology come from all over the world. If Sierra Leone is to remain competitive and foster national development, the government and other decision makers must become more aware of the opportunities that international markets offer; the educational institutions and industry must improve the skills of the future workforce in order to fully take advantage of these opportunities. This responsibility falls not only on academic institutions but also on the industries and the government. Tertiary educational institutions should acknowledge this trend and move towards finding a local solution that is appropriate to conditions in Sierra Leone. Part of the current approach in other countries includes co-op or internship experience, partnership with industry, capstone projects, international exchange programs, and encouraging students to take non-technical courses in humanities, business and management. In order to provide undergraduates with a well-rounded education and have them ready for global scientific and engineering practice, their education must be structured to provide a balance between theory and practice, as well as global perspectives in science, engineering and technology. There has to be a shift of emphasis within the academic community in developing countries such as Sierra Leone, to use practically oriented approaches and highlight the needs of the various professions as the next generation of professionals is prepared for the global market place. Meeting the needs of industry by producing scientists, engineers and technologists with the basic technical knowledge, analytical skills, professional skills, and practical experience deemed adequate in a globalized technology industry has to be the new objective.
There are several principal ideas that should be contained within the dimension of infusing global perspectives to meet these challenges. Efforts should be made to address issues related to economic and political development, the environment, public policy, culture, gender and race equity, health, terrorism, peace and conflict resolution, rights and responsibilities. In today’s society, there are positive and negative linkages with people throughout the world. To help students understand the nature of this interdependence, science and engineering education must provide students with opportunities to study various interacting global systems—economic, political, environmental, and technological—to see the similar characteristics among those systems. This would help students see how they are affected by the global systems and how they can develop strategies to live and work within those global systems. Science and engineering education should enable students to understand their roles in developing solutions to the issues and problems that exists within the global economy. This transition is a policy decision and may not necessarily require significant resources to implement at the early stages as simple steps can be taken to create this awareness. Global perspectives, can for example be addressed at different levels of education by simple discussions of global trends and their impacts as well as inviting guest speakers from industry.

Infusing More Science, Engineering and Technology Awareness in Primary and Secondary Education

The authors subscribe to the view that national development should be tied to creating a well-qualified and competent workforce or professionals especially in science and engineering. Unfortunately, a lot of students in Sierra Leone shy away from the sciences partly due to low confidence in their ability and poor academic background. This has led to not only a general misconception that mathematics and the sciences are only for the very smart students but also a scarcity of school teachers in these subjects. While there are several ways in which to encourage secondary school students to develop interest in science and engineering as a profession, the authors subscribe to the belief that systemic change will only occur with a high rate of success when a well-developed strategy is adopted; a strategy that includes a systematic long-term grade/level-appropriate infusion of science and engineering concepts and ideas, into all subject-matter disciplines from primary through to secondary level curricula. The success of the Singapore Science Education policy underlies the country’s superior position in the international science education league table as indicated by the TIMSS 2007 report as well as its astronomical development over the last three decades to achieving a position as one of the Pacific Rim Asian tiger economies. Singapore’s science educational policy has resulted in the supply of a highly trained workforce in science and technology at every level. Its mission to mold the future through seeking new ways to develop and groom a diverse range of Singapore talents to meet the challenges, include strategies such as: i) the promotion of bilingualism, ii) the facilitating of creative and critical thinking skills and a lifelong passion for learning (termed the “Thinking Schools, Learning Nation” concept, TSLN), and iii) the promotion of pedagogies that facilitate the quality of interaction between teachers and students, equip students with the knowledge, skills and values that prepare them for life, and focus on developing understanding, critical thinking and the ability to ask questions and seek solutions (this is termed the “Teach Less Learn More” strategy). These strategies are applied within a science framework based on the inquiry approach (Figure 6) which involves the prominence in the curriculum, of science research projects and collaboration with higher education and research institutions. The establishing of Advanced Elective Modules and Specialized schools to develop talents in mathematics, sciences and technology also forms part of the approach adopted. With such an
infusion of science and technology, it is therefore not surprising that the percentage of students that secured the required grade of 3 'A' / 'H2' to gain entry to tertiary institutions in the period 1999 – 2008 was in the eighties\textsuperscript{14}. This is phenomenally much better than the 5 percent of students in Sierra Leone who secured the minimum requirement for tertiary institutions between the period 2006 -2010 (Blanshard and Weeke\textsuperscript{s})\textsuperscript{5}.

**Figure 6: Singapore Science Curriculum Framework (Source D. Chwee\textsuperscript{12})**

Another strategy, the authors suggest, is based on the principle of “career imprinting” to create interest in science or engineering as a profession\textsuperscript{15, 16}. Compared to 20-30 years ago, technology now plays a more significant role in day-to-day living and youngsters seem to naturally develop an aptitude for electronics. Why is this the case today? Some would argue that at an early age, today’s youth see the need and relevance of technology. Youngsters, therefore, identify with and embrace the idea that technology is a necessary part of their daily lives. Thus, without much thought or even detailed instructions in some cases, they seem to be able to master a wide range of technology-based and relevant operations. The desire to be able to play a video game, or operate a cell phone, instills a precise or particular imprint that causes a young person to be motivated to learn. Thus, the capacity for youngsters to be able to apply complex principles at an early age cannot be dismissed. This is how science and engineering should be introduced in Sierra Leone’s primary and secondary schools--make it relevant to everyday living and students will most probably embrace it as a “way of life”. The “classroom experiences” students have during “school at each grade level” serve to imprint them. The objective of the strategy is to help students develop the capabilities to make the right connections and build the confidence and cognition to become scientists, engineers or technologists through a series of shared experiences by introducing them to science and engineering via the subject matter to which they are exposed. The desired outcome is that the “imprints” made through these exposures will create linkages for students between science, engineering and course content, as well as among students’ learning environments, personal daily lives and the various scientific and engineering disciplines. This may then lead students to select careers in science or engineering when they move to the tertiary level.
The authors are proposing consistent and systematic exposure at each grade level. By implementing this strategy, it is anticipated that students would be imprinted with some qualities or characteristics typical of scientists and engineers by the end of each grade level. These qualities could be further developed at the next grade level or qualities could be grouped by grade level. That is, some qualities could be addressed in certain grades and not in others. The emphasis of the proposed strategy, however, would be to provide to students--by the end of the senior secondary school--well-rounded exposure to most facets of science and engineering thereby making the concepts presented to them more relevant and minimizing misperceptions about these professions. This strategy should, therefore, not be rigid, but flexible enough to allow variation from region to region as well as from school to school, and even from classroom to classroom, if necessary. Some of the variations would depend on schools’ structure and the qualifications of teachers. The implementation of this “career imprinting” strategy should ensure that:

- Students acquire and develop grade level, developmentally appropriate, specific knowledge, skills and capabilities.
- Students make the right connections. This should involve addressing the social impact of science and engineering, relevance to daily life and connections to the various scientific engineering disciplines, as well as role in national growth and development. These connections will, no doubt, vary from individual to individual depending not only on students’ individual personality traits, but also on their additional exposure to science and engineering outside of the school’s curriculum.
- Students at all grade levels would be nurtured to develop the confidence needed to succeed not only in math, science, engineering and technology based courses, but also in non-technical courses.
- Students would widen their cognition of stereotypes, taken-for-granted assumptions, myths, and so forth that may affect their desire and/or ability to succeed. Examples of some stereotypes include: “I’m just not good at Math and can’t learn it”; “Engineering is boring and has no social relevance; and Engineers are nerds.”

Aligning Tertiary and Technical/Vocational Education to National Development

There are several tertiary-level educational institutions in Sierra Leone including the University of Sierra Leone, The Njala University, several polytechnics and teacher colleges. Their programs are not necessarily properly aligned with the needs of the country. The contribution of these institutions to the overall national development of Sierra Leone is therefore questionable. Approximately 4% of secondary students in Sierra Leone enroll in tertiary education based on the 2007 World Bank report. It is imperative for clear alignment to be made between tertiary education, technical and vocational education with the human resources required to promote development based on the labor market needs. As started in the World Bank report: “The analysis of technical vocational education and training (TVET) and tertiary education points out disturbingly poor learning outcomes and low relevance to the labor market.”

In order for tertiary institutions to contribute in more meaningful ways, administrators should first understand what is needed for development and then design programs and curricula to meet those needs. For over 100 years, Fourah Bay College, for example, has produced graduates without much consideration to their role in enriching the workforce of Sierra Leone. By first understanding the type of industries and institutions relevant for national development, suitable programs can be developed or existing program modified to ensure that graduates are properly prepared to play their role in the process of national development. A schematic of the proposed approach is shown in Figure 7. The first step in the process is to identify the various professions and/or disciples that are required to foster national
development. In order to accomplish this, the government and policy makers should provide input on the priorities. There should be consistent feedback between the government representatives and the tertiary institutions throughout the entire process. For example, if two areas with potential to foster development are identified to be food processing and establishing a manufacturing base for developed countries, the tertiary institutions would then conduct a review of their program and identify areas for improvement in order to meet the stated needs if appropriate. If there are no courses that address the fundamental science related to food processing, then these courses should be added to the curriculum or a special program developed to address this. The other example on establishing a manufacturing base ties in well with infusing global perspectives. China has done an excellent job in identifying the role they can play globally and have used it to their advantage. Sierra Leone has much to offer globally and with the right governance this can really foster national development. With the right programs in place, graduates from tertiary institutions will be equipped with the right set of professional skills to contribute to the development of Sierra Leone.

Figure 7: Schematic of Proposed Steps for Alignment of Tertiary Institutions to Development

Another key factor that must be considered is allocating appropriate funds to strongly develop the technical and vocational education sector. Technical and vocational training greatly contributes to growth and development in Germany and China because of their strong manufacturing and production industries. In Germany, with an economy highly dependent on export, the emphasis placed on technical and vocational education and training to provide the required skilled manpower drives production. China is another good example where the global need for the manufacture of cheaper goods has led to tremendous growth and development. In Sierra Leone however, the production industries are weak or the market is very immature as there is a
strong need for training. Take the automotive repair sector in Sierra Leone for example; there are many so-called “mechanics” with little or no technical training. A large number of these “auto-repair” workers lack the basic understanding of automotive, mechanical and electrical principles of auto repair. Developing a formal technical and vocational training for auto mechanics will help to regulate the quality of car repairs as well as create a market with potential for national growth. If policy makers in Sierra Leone can identify what role the country can play in the global market, there is potential for growth by establishing appropriate institutions to train the workforce and produce skilled professionals. The success of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Government of the Federal Republic of Nigeria collaborative “Support for Revitalizing Technical and Vocational Education in Nigeria” program could act as a blueprint for Sierra Leone as well, especially given the many benefits Nigeria derived from the program. The benefits included: i) establishment of 13 Staff Development Centers (SDC) spread equally across the country, ii) training of core team of trainers, as well as technologists and guidance and counseling officers, iii) development of teaching materials and resources for technical teachers, iv) review and development of curricula for the Polytechnics, Vocational Enterprise Institutions (VEIs) and Innovation Enterprise Institutions (IEIs), v) the preparation of textbooks for TVE programs, vi) assistance given in the development of the National Vocational Qualifications Framework (NVQF) and vii) the provision of skills training for the target population.

The program cited above is particularly relevant as many authors have indicated that in Nigeria, one of the greatest problems facing the effective implementation of the technology and vocational education program is qualified personnel in quantity and quality. In fact Puyate identified other major constraints such as inadequate infrastructure and equipment in schools, insufficient instructional materials and books in schools, and the poor financing of schools. In addition there is the need for different areas of a developing country to concentrate on different aspects of the TVE system given the broad spectrum of subjects that any such program typically covers; namely - (i) Auto mechanics, (ii) Basic electricity, (iii) Metal work and wood-work, (iv) Food storage and preservation, (v) Technical drawing, (vi) Ceramics, (vii) Polymers (plastic and rubbers), (viii) Building etc. The fact that not all of the raw materials needed for some of these subjects are available locally in all parts of the country lends credence to this stance. It is therefore the authors’ position that MEST should draw on the achievements and experience gained from the Nigerian project highlighted above and other successful TVET Projects when a review of the implementation of the current Education Sector Plan is conducted.

**Training, Facility Improvement and Maintenance**

One of the key components for longevity and success of any education program is to ensure that the staff and faculty are adequately trained. Training of faculty and staff should therefore be carefully planned and managed. Within the current educational structure in Sierra Leone, a sizeable amount of teaching staff are either unqualified or have knowledge and skills that need updating; these teachers are information providers instead of facilitators. In such a system, students do not attain a sound understanding of key concepts and principles or their relevance in life applications. Providing professional development opportunities for the teaching staff could be achieved through the following suggestions:

1. **In-service training:** The current teacher in-service training needs to be reformed to facilitate teacher qualification standards and promotion structure (World Bank, 2007). An in-service training should be mandated for lecturers and professors in tertiary education. The number and structure of the training will depend on the needs of the institution.
2. Short specialization courses for teaching staff: Technology is constantly changing; advancement and development in most disciplines are also on the fast track. Teachers and professors must strive to remain current and relevant to the changes in their fields.

3. Post graduate studies: Some training course could command credits/points towards a Higher degree or diploma

4. National and international educational conferences and workshops: Minimum of one national conference can be organized annually by MEST.

5. Professional organizations: The Sierra Leone Institute of Engineers (SLIE) for example seems to have taken a leading role in organizing several workshops and training relevant to the practice of engineering in Sierra Leone. Similar organizations, including SLAMAST (Sierra Leone Association of Science and Maths Teachers) or RSC (Royal Society of Chemistry Sierra Leone can follow suit. Others can be established based on the collective interests of professionals within a given discipline. This is also a good avenue to encourage student involvement through student chapters.

6. Create an awareness of the benefits of professional excellence: Promotion and pay increase could be linked to excellence.

Improvement and maintenance of the educational facilities is a major problem in Sierra Leone due to lack of adequate funds. Most of these facilities are in a deplorable state and not conducive to learning. Some of the alumni associations have benefited from the Diaspora assistance from overseas. Proper maintenance of the nations’ educational infrastructure cannot be fully achieved this way because funding from alumni overseas could be ad hoc and sometime irregular. Generating funds for facility improvement and maintenance should be considered as vitally important.

Conclusions
There have been admirable policy improvements in Sierra Leone’s education system after the civil war; but there still remain major challenges to be overcome to promote national development. Students’ performances in the national exams continue to be poor or marginal within the current 6-3-3-4 educational system as a significant proportion of teachers are either inadequately trained or unqualified or both, to provide students with the tools they need to succeed. Furthermore, the role of tertiary education to national development is questionable. Strategies such as infusing global perspective and awareness, encouraging students to pursue careers in science, engineering and technology by including more of these principles continuously and consistently into the curriculum; aligning the role of tertiary education to national development; and providing adequate training and continuing education opportunities for educators were proposed as crucial to ensure that suitable and adequately trained professionals are available to foster national development in Sierra Leone.

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