Workforce development through renewable energy

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More than 1.2 billion people –17 per cent of the world's population – are still without access to electricity worldwide, almost all of whom live in developing countries. The number of people without access to energy in Sub-Saharan Africa is projected to increase by 90–100 million by 2030. Without access to energy service, the poor will be deprived of the most basic of human rights and economic opportunities to improve their standard of living (World Bank, 2012).

Despite rapid technological and infrastructure advances, the number of people in developing countries without electricity will increase, not reduce, over the next 15–20 years. It is an unfortunate reality that the access and opportunity gap will continue to grow, given the increasing reliance on technology to deliver basic services and infrastructure. However, getting reliable electricity and connectivity to remote locations in developing countries via renewable energy is now becoming more cost effective and broadly possible, so the projections above need not become a reality.

Off-grid solutions – where energy is generated locally and not connected to a wider generation and supply grid – are increasingly efficient and affordable, and can now create the levels of power required to support sustainable infrastructure. Furthermore, and most importantly, off-grid solutions are becoming more and more portable, flexible and reliable. This, of course, means that power can be supplied to geographical locations that were previously unable to get access to national or regional energy grids, largely supplied by central power stations and facilities. In terms of all types and phases, this means access to technology can revolutionise education for those for whom it is currently out of reach. Below are examples of how this can occur.

Higher education

There has been a distinct focus on the provision of basic primary education in recent years. This is justly so, and the impetus provided by the Millennium Development Goals has concentrated the efforts of national governments and NGOs in this area. However, there has been a resultant lack of focus and investment in higher education, with many governments and NGOs recognising that the quality and quantity of appropriately trained graduates has suffered.

Enabling the most talented to access to the highest level of academic and professional qualifications has historically been served by students attending a university or higher education institution. While this is still the predominant form of degree course delivery, distance learning has been provided for many years by the likes of the Open University in the UK. Interestingly, however, the historic universities at Oxford and Cambridge have, for centuries, practised the principle of the undergraduate working independently with reference to tutors and professors on a limited basis. The proliferation and rapid growth in the last few years of massive open online courses (MOOCs) takes these principles further by using internet access. However, there are some question marks over the numbers of graduates resulting from MOOC enrolment.[1] The potential opportunities for students in developing countries are enormous if they have connectivity via reliable electrical and data sources. Therefore the creation of focused online courses that are relevant to the student and country's economic, social and developmental needs is, in my view, a priority.

Case study

Hussain lives in a remote town in North Africa. He has achieved excellent grades in his secondary education and would like to study agronomics at university so he can help the farmers in his region maximise their crop yields and maintain the land for long-term efficient use. The degree is only available in the capital city, some 400 miles away, and he could not afford to travel and stay there for the duration of his studies. However, through the provision of off-grid local solar power and internet access, Hussain is able to carry out his degree studies in his town via MOOC courses delivered by the national university in collaboration with a specialist university in another country. He travels periodically to the national university for validation and evaluation of his studies, but is able to put the lessons he has learned into practice immediately with local farmers. He also provides data for research for his national and international university, collaborates with them to test hypotheses over a short timescale and is able to develop working relationships with academics around the globe.

Exchange of expertise

The communication between higher education and research institutions is increasing as a result of technology, and this can only lead to better understanding and improvements in the quality of the work produced. However, where these exchanges occur between institutions in developing countries and others, the model is often one of communication from institutions based in capital cities and major conurbations. Having flexible, renewable power solutions can increase not only the exchanges between in-country institutions, but between remote locations and international colleagues who can interact quickly to explore theories and solutions more easily.

Teacher training and professional development

A crucial issue in the success of education is, of course, the quality of the teaching delivered. As Kevin Watkins (2013) points out when discussing the quality of education in Africa, the region's

teachers are products of the systems in which they operate. Many have not received a decent quality education themselves. They frequently lack detailed information about what their students are expected to learn and how their pupils are performing. Trained to deliver outmoded rote learning classes, they seldom receive the support and advice they need from more experienced teachers and education administrators on how to improve teaching.

Basic, secondary, tertiary, vocational and higher education all need sufficiently motivated, trained and supported teaching staff if they are to be successful.

Case study

Uzima is a primary teacher in a semi-rural town that also has a large migrant population of mine workers who bring their families with them for between two and six months. Therefore, her class can vary in size from 20–40 students and in age between eight- and 12-years-old at any one time. Uzima finds it hard to support the education of both the local permanent population and the transient students. Her challenge is to understand where students are in terms of their progress and levels of understanding at any given point, so she can adjust her teaching and provide appropriate lessons to meet the needs of all of her class. This in itself is a real challenge to her own understanding and professional abilities as she needs to constantly find different ways to engage and teach her ever changing student population.

Uzima's school has a standalone solar and wind hybrid station (a single 'telegraph pole' solution with a small wind turbine and solar panel on it) that provides enough electricity to power approximately 20 laptops for 12 hours a day. She uses the one laptop the school has as a hub to carry out real time assessments with her class every three days in literacy and basic mathematics, using hand held assessment devices that are battery powered (the batteries on each device last for between 12 and 18 months with regular use) and connect wirelessly to the laptop hub. This provides her with collated, marked feedback on each student's progress so she can group them according to ability for the next two days' activities. She also uses the assessment devices as a baseline tool to evaluate the starting points for the transient students so they immediately receive appropriate teaching activities. Uzima also uses the connectivity of the hybrid station to access international teaching resource websites twice a week to download simple differentiated tasks for her students, and to discuss with, and ask questions to, colleagues in other countries on teacher forums and blogs on appropriate teaching methodologies and techniques. She then shares these with her colleagues and a culture of sharing and professional support between teachers is established.

Secondary school students

The definition of a secondary student varies across countries and education systems but for the purposes of this article the term refers to students in the approximate 11–17 age range. The availability and uptake of secondary education across developing countries is variable and is generally below that of primary or basic education. This is due to a variety of local factors, but there is some commonality across many countries due to:

1. The need for secondary-aged children to contribute economically either to support the family or to become financially independent as soon as possible
2. The concentration of the majority of aid and development resources in basic education provision

However, what is becoming increasingly clear is that secondary school-based and vocationally based education plays a vital role in the development of a country's economic prosperity, both in terms of providing students skilled enough to train for artisanal occupations and educated sufficiently to access national and international higher education courses and institutions. Therefore this phase must be viewed at the same level of priority as primary and higher education, in other words, concentration should not be at the 'top' and 'bottom' at the expense of the 'middle'. It is therefore imperative that educational initiatives to improve standards, access and opportunities take account of this. One issue with secondary education is the proliferation of exam-based assessments that vary in quality and are great in number. A recognised and respected public examination system in the secondary phase must, therefore, be a priority if the acceptance of students at national and international vocational- and higher-education institutions is to take place. Situations such as those which occurred in Liberia in 2013 where no school leaver (out of 25,000) passed the national university entrance exam (BBC, 2013) are extreme, but highlight the issues with quality secondary provision and readiness of examination systems to prepare students effectively.

Case study

Eshe is 14 years old and wants to study to become a lawyer. She has done well at school and knows her best chance of success is to apply to both universities in her country and to several in other countries. She lives on the outskirts of a large town and needs to access a wide range of study materials, as well as sitting internationally recognised secondary examinations, if she is to apply successfully for a university place. She has no access to a reliable electricity supply or internet at home, so therefore visits a community 'solar classroom' that is a short walk from her school. This is a classroom in the style of a large shipping container that is highly insulated and covered in solar cells to power the air conditioning, 15 PC workstations and mobile internet connectivity inside. This allows her to study after school, conduct research on her schoolwork and participate in distance-learning activities and assessments. It means she can take courses related to international exam boards and sit the examinations that are recognised by different universities when she applies to them.

Educational productivity

Providing a variety of renewable energy solutions to developing countries for specific purposes – for example, for the improvement of basic education, the creation of local higher education research or simply to allow teachers and students to access a wide range of learning, teaching and professional development or training resources – has obvious benefits for the individuals concerned. However, the spread of these solutions must bear these important factors in mind if they are to succeed in the long term:

1. What are the educational priorities for the locale or country?
2. What form of technology will assist in the delivery of these priorities?
3. How can the long-term support and development of educational initiatives be monitored to ensure their effectiveness?

While the above is by no means an exhaustive list of factors, if they are considered throughout the planning, implementation and monitoring of such initiatives, the chances of maximum educational productivity are increased. What the increasing access to reliable and affordable solar and wind energy can do for education is considerable and has huge potential, if implementation is planned and focused effectively. On the other hand, if funding agencies and national governments decide on the technology to be used first, before the priorities and imperatives are decided, then the chances of failure and wasted investment are multiplied considerably. All too many instances of 'the latest and greatest', or commercially driven, initiatives have resulted in wasted resources, which, to put it bluntly, rob students of opportunities they might otherwise have had. This has to be a huge warning signal to all involved. Whilst the potential is great, the chances of misdirected initiatives are similarly great, unless thorough consultative processes are followed long before the decisions about what technologies to invest in are made.

In conclusion

Wider access to focused, directed and sustainable renewable energy sources, allied to similarly focused educational technologies, can not only improve the lot of an individual, but, if implemented correctly, can help a nation realise its economic potential faster than has been previously possible. We should not assume technology in education is the sole preserve of the developed world, and indeed we need to embrace the idea that accelerated progress for individuals and countries can be much greater in developing nations if planned and implemented effectively.

However the only way this can be practically carried out in a realistic timeframe is via the use of local, affordable and reliable renewable energy solutions.

Endnotes

1 For example, of those enrolled on courses at Pennsylvania State University up to the end of 2012, only nine per cent attained a standardised unit achievement, according to the university's own data.

References

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