

VOCATIONAL TRAINING IN THE
CONTEXT OF OIL AND GAS
DEVELOPMENTS:
BEST PRACTICE AND LESSONS LEARNT



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Foreword

Uganda is on the cusp of becoming an oil-rich nation. Proven reserves in the Lake Albert region are two billion barrels but may exceed six billion barrels, making Uganda the third-largest African producer. The World Bank projects that Uganda's oil production will reach at least 350,000 barrels a day by 2018, with the country earning at least \$2 billion in oil revenues each year.

However, experience tells us that expectations for an economic boom and the creation of new jobs may not be felt by poorer parts of society. In fact, poverty can deepen, with conflict and unrest often emerging in the face of widening inequality. Living Earth Foundation has over 15 years experience and a strong track record of working in oil producing regions including the Niger Delta, which provides us with unique expertise in addressing these complex issues.

Living Earth Foundation and Living Earth Uganda are currently working with communities living around Hoima and Buliisa who are affected by oil and gas developments. The aim of our work is to enhance the social and economic benefits of incoming oil and gas operations for local people, by improving vocational training, increasing opportunities for enterprise and employment, and strengthening the ability of communities to engage with stakeholders such as the government and oil and gas companies.

Through our activities with communities and through targeted research, we also aim to provide evidence and share learning on the impact of interventions such as vocational training, learning from best practice around the world. Living Earth aims to put 'ideas into action', therefore the focus of this report is not an analysis of vocational education policies, but an analysis of existing best practice and the lessons to be learnt from this practice.

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Executive Summary

The aim of this report is to analyse existing evidence and examples of vocational training and work force development programmes leading to the creation of equitable, sustainable and appropriate employment for local people – in the context of the growing oil and gas industry in Africa. While a lot has been said about the significant efforts made by many countries to improve their national Technical and Vocational Education and Training (TVET) policies introducing radical reforms based on the evidence emerging from successful TVET systems (such as the German dual system or the Singaporean model); there is still a lot to learn about the teaching and learning challenges faced by the practitioners working in this field. We therefore propose to look at the challenges grounded in the distinct nature of vocational pedagogy; the lessons learnt in terms of jobs creation by the oil and gas industry and local content; specific issues around functional literacy, numeracy and business skills; opportunities behind the use of technology; ways of tackling gender inequalities and possible alternatives to formal education such as traditional apprenticeships.

The report suggests that;

1. An understanding of the unique nature of vocational pedagogy has to be central to the development of TVET quality improvement programs.
2. An accurate assessment of the nature of the primary education attended by the TVET students is fundamental in order to develop strategies to address possible flaws.
3. Formal TVET programs have much to learn from non-formal adult education programs, especially in the field of functional literacies.
4. Any program aimed at filling the skills gap for the gas and oil industry in a equitable and sustainable way has to carefully analyse the direct, indirect and induced job opportunities that could be triggered by the industry. The literature tells us that it is important to focus on the whole value chain and also explore the opportunities that local content policies create.
5. Providing some skills training through the informal apprenticeship system should be explored.
6. E-learning and mobile learning might be particularly appropriate to deliver TVET programs in hard to reach areas or to a very large number of students when infrastructures are insufficient.
7. The participation of women in TVET is generally hindered by a variety of cultural, attitudinal and institutional obstacles. It is crucial to identify and address these issues in order to reduce gender inequity that normally characterises TVET programs.
8. Training TVET teachers in both teaching skills and updated vocational subjects is fundamental to the quality of TVET provision. To train teachers in new approaches such as the Competence Based Training requires a thorough understanding of the vocational pedagogy and a long-term commitment to promote a real 'paradigm shift'.

1. Vocational education systems and Vocational teaching and learning

Technical Vocation Education and Training (TVET) is concerned with the acquisition of knowledge and skills for the world of work. As it is used in this document, it refers to profession-oriented education and training taking place mainly at the secondary level of the formal education system, but also to the rich but often unregulated world of training, apprenticeships and similar practices taking place in the informal, private sector.

TVET systems in Africa differ from country to country and are delivered at different levels in different types of institutions, including technical and vocational schools (both public and private), polytechnics, enterprises, and apprenticeship training centres. The duration of school-based technical and vocational education is between three and six years, depending on the country and the model. Some countries like Ghana, Senegal, and Swaziland have tried to 'vocationalise' the lower or junior secondary school curriculum with mixed results (AU, 2012). Other countries offer secondary school vocational training for the purpose of inculcating technological literacy, rudimentary technological aptitude and enhancing capabilities for success in technological studies in higher education institution. In many African countries traditional apprenticeships still offer the largest opportunity for the acquisition of skills for employment.

The African Union (AU, 2012) recognises the recent interest and efforts – often supported by World Bank - of its member states in developing stronger TVET systems as a main approach for building capacity for national development. The AU values TVET as an essential part of general education and has developed a strategy based on a wide perspective, linking TVET not only to secondary education, but also to higher education. This approach shall in the long run overturn the TVET reputation as a dead end in terms of academic progression only fit for those pupils who are unable to continue to higher education. Importantly the AU also recognises the fact that currently a very large number of young people are either outside the formal school system or were failed by a poor quality basic education. They therefore recommend the integration of non-formal learning methodologies and literacy programmes into national TVET programmes (AU, 2012).

In order to respond to a number of important challenges that national and regional economies are facing

(such as the globalisation, the ICT revolution, the speed of the technological advancements) a growing number of countries in Africa are undergoing radical reforms of their TVET systems. Based on a number of international best practices in TVET these reforms have started focusing mainly on a number of key policy issues such as: the establishment of national training bodies; the enactment of laws to strengthen national vocational training programs and the establishment of National Qualifications Frameworks (NQF). In terms of national policy development it is already possible to mention a number of best practices and innovative approaches performed by some African countries. For instance in South Africa the establishment of a NQF has allowed the harmonization of all the vocational education initiatives, allowing the accumulation of credits and the recognition of prior learning. In Ghana the establishment of the apex body known as the Council for technical and vocational education and training (COTVET) by an Act of Parliament under the Ministry of Education to oversee all TVET activities has allowed the centralised coordination of all the stakeholders involved in the fast changing TVET initiatives in the country. COTVET has been in charge of piloting the implementation of Ghana's TVET reform through the Competency Based Training (CBT) system and although results of the tracer studies that will confirm the efficacy of this approach are still to be released, there seems to be enough evidence that CBT is 'the way to go for TVET programmes' in Ghana (Aba Anane, 2013:10).

In the African continent many recent TVET policy reforms also try to find solutions to global issues such as the 'employability' of the students and, as mentioned above, the need to introduce 'competence based trainings (CBT). In response to the global trend that sees more and more career mobility, TVET education is supposed to enable future employees to prove themselves to be flexible and have a tool-kit of soft skills that would enhance their 'employability'. While teaching competency is about allowing the future employee to apply the knowledge and the skills – both technical and social - relative to a specific industry standard focusing on what is expected from an employee in the workplace, rather than just imparting knowledge. Lastly, at the policy level, there seems to be a common understanding of the need to improve the responsiveness of the educational systems to market needs. Yet most TVET curricula seems to be supply driven (NUFFIC, 2010); the solution requires improved involvement of labour market stakeholders with TVET institutions when planning and developing new curricula.

The policy 'Skilling Uganda' is in line with these examples fully recognizing the challenges of modern TVET proposing the implementation of a coherent set of measures to address them (Republic of Uganda, 2011).

If the efforts and the evidence of change and the potentialities of new TVET policies in some African countries are quite well documented, it would be equally important to explore possible innovative solutions to the teaching and learning challenges faced everyday by TVET practitioners. It is widely recognised that a lack of attention to the quality of the education is one of the major factors that have led to the learning crisis that affects many developing countries (UNESCO, 2014). If this is true for basic education, it is even more relevant to TVET education for two main reasons: firstly vocational education has historically been regarded as a 'second class' education, good only for students that could not achieve academically. Therefore this kind of educational systems have been systematically neglected in terms of resources, human capital investments and pedagogic research. Secondly teaching vocational curricula poses more challenges than academic education as it requires, by its own nature, a blend of teaching methods. Learning has to be hands-on and experiential as well as theoretical and reflective. Only by recognising this complexity we can promote a quality vocational education that better responds to the labour market needs, 'the real answers to improving outcomes from vocational education lie in the 'classroom' (CSD, 2012).

1.a Vocational Pedagogy

This section will briefly present the most recent findings in terms of vocational pedagogy, because an awareness of the complexity of teaching and learning a vocational subject, as well as the richness of the intended educational outcomes, needs to be at the centre of any intervention aimed at improving TVET provision.

'How to teach vocational education: A theory of vocational pedagogy', recent research by the Centre for Real World Learning at the University of Winchester sets out six vocational education outcomes that are critical to understanding working competence.

1. Routine expertise: mastery of everyday working procedures in the domain.
2. Resourcefulness: having the knowledge and aptitude to stop and think effectively when required.
3. Functional literacies: adequate mastery of literacy, numeracy and digital literacy.
4. Craftsmanship: an attitude of pride and thoughtfulness towards the job.
5. Business-like attitudes: understanding the economic and social sides of work.
6. Wider skills for growth: having an inquisitive and resilient attitude towards constant improvement – the 'independent learner'.

A good outcome of a vocational training is a worker equipped with the routine expertise to deal with

everyday problems; the resourcefulness to solve trickier problems; the functional literacies to explain their solutions to customers; the business-like attitudes to do so in a way that values the customer; the craftsman's desire to do a job well; and the wider skills for growth to innovate for future solutions.

They also identify an exhaustive list of commonly used and effective teaching and learning methods, including: learning by watching, by imitating, by practising (trial and error), through feedback, through conversation, by teaching and helping, by real-world problem-solving, through enquiry, by thinking critically and producing knowledge, by listening, transcribing and remembering, by drafting and sketching, by reflecting, on the fly, by being coached, by competing, through virtual environments, through simulation and role play, and through games.

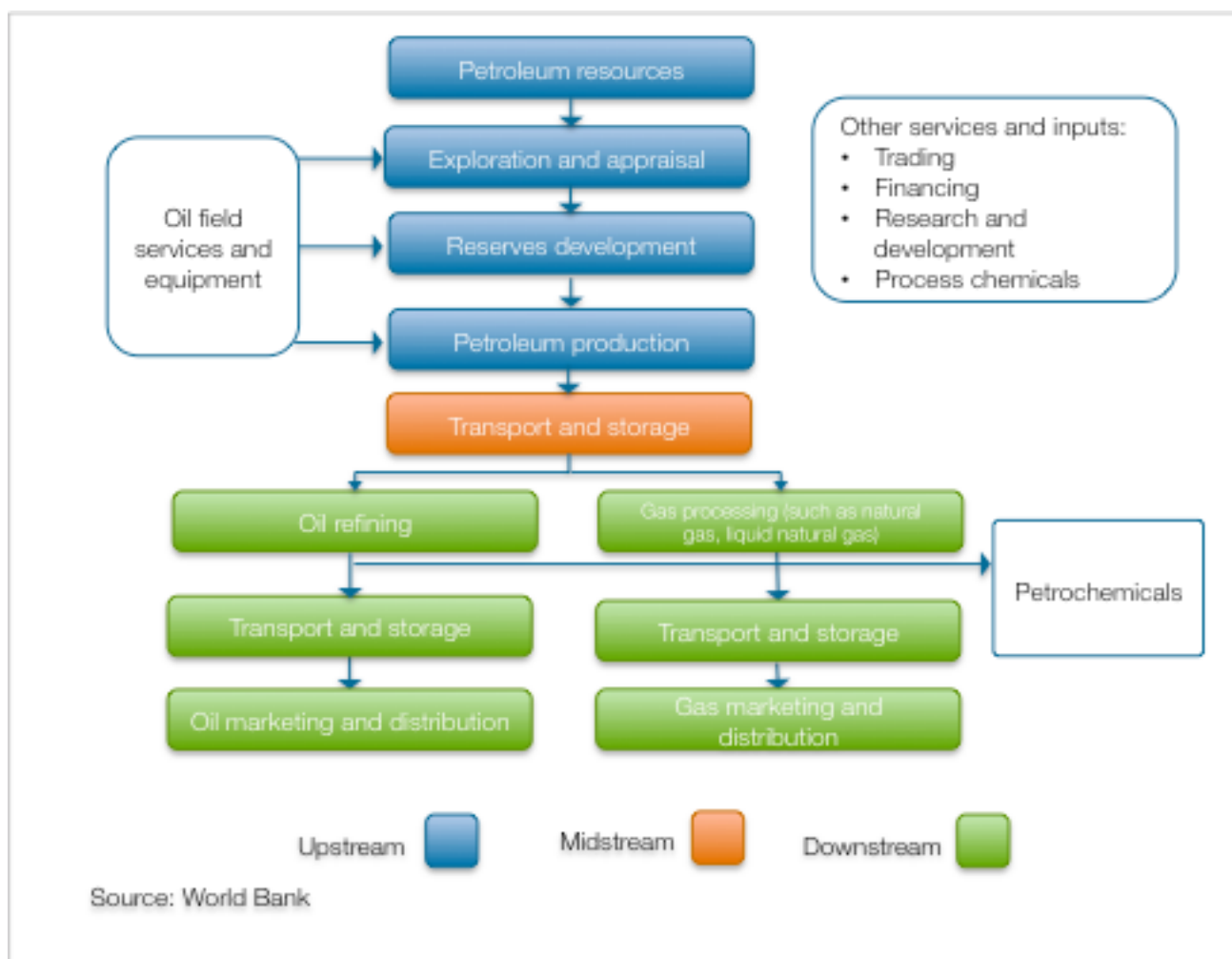
Given that vocational education requires a blend of teaching methods, a vocational teacher needs to have a clear understanding of all the learning methods and the learning outcomes that they lead to in order to take informed and effective teaching decisions. 'Without this process of thinking through the relationship between desired outcomes and instructional design, neither teaching nor learning are likely to be good enough' (CSD, 2012:10).

All these observations also stand true when a country or an institution decides to utilise the Competency Based Training (CBT) approach as we will see in the Training of Trainers chapter of this report.

2. Oil, gas and local content

After agriculture, the extractive sector is the most important in most countries in Sub-Saharan Africa. The continent is resource-rich, hosting 30 percent of the world's total hydrocarbons and mineral reserves and 12 percent of its crude oil reserves. According to the World Bank a strong focus on skills enhancement will be a key factor for African countries to transform their natural capital into long-term economic development (World Bank, 2014). However in order to develop sustainable and pro poor employment strategies it is important to analyse where in the framework of a typical oil development industry most of the employment takes place. Therefore it is important to understand the oil and gas value chain and the potential of local content development. The oil industry has three levels: upstream, midstream, and downstream (see figure below).

Figure 1:



Often the first efforts to develop a TVET system that responds to a new oil and gas development focus on the upstream. For instance in Ghana most of the training activities have been developed in order to fill the skills gap of the upstream part of the value chain:

- Exploration and associated services
- Drilling services
- Petroleum engineering
- Engineering, surveying design, and support services
- Construction, fabrication, and installation
- Production, operation, and maintenance
- Health, safety, and environment
- Security and personnel services

(Darvas and Palmer, 2014)

Unfortunately, as shown by the case of the Jubilee Hills field, this focus is likely to be too narrow. The Jubilee Hills oil field was discovered in 2007 and started producing oil in 2010. In 2012 in the framework of the 63rd Annual New Year School and Conference in Accra the Training Coordinator on Oil and Gas of the Management Development and Productivity Institute (MDPI) declared that in spite of the high job expectations the Jubilee Hill field would offer only about 10,000 direct jobs in the following five years. He therefore urged to develop a strategic skills development plan to enable the youth to 'explore other existing opportunities in the sector' (Ghana News Agency, 2012). The vision of this practitioner seems to be shared by the World Bank in a recent and exhaustive report called 'Demand and Supply of Skills in Ghana' which suggests that 'to convert the growth spurt from oil and gas into significantly higher employment, Ghana needs to diversify value chain participation to employ more youth and tap into opportunities that exist midstream and downstream', (Darvas and Palmer, 2014:103); also suggesting that to expose more young people to midstream and downstream opportunities - along with the necessary policy and infrastructure reforms – would help to achieve local content across the value chain.

According to a recent study of the skills gap for the petroleum related education in Tanzania carried out by Norad (Norad, 2013), the international experience has shown that for every person directly employed by the oil industry, at least four times as many indirect jobs (manufacturing and service jobs created in associated industries that supply intermediate goods) are created and ten times as many induced jobs (retail and wholesale jobs created by workers in these constructions, manufacturing, and service industries when they spend the money they earn on other products in the economy). Even though the number of

indirect and induced jobs created by the development of the oil and gas industry can vary significantly from country to country, generally speaking the bulk of the employment opportunities lies beyond the direct employment in the oil extraction.

This data is also confirmed by the study 'Planning for the Future' commissioned by CNOOC Uganda Limited, Total E&P Uganda and Tullow Uganda Operations Pty Ltd. The report estimates that the Lake Albert Basin Development projects will create between 100,000 to 150,000 jobs through direct, indirect and induced employment. In terms of direct employment it is foreseen that it will employ a peak of about 13,000 workers in the construction phase and a plateau at 3,000 people in the operation phase.

Most of the indirect jobs will be created in the following industries: environmental services, manpower agencies, construction materials, food industry, etc. If all the stakeholders positively engage in maximising the local content a large number of job could be 'induced' by oil and gas activities.

'By 'induced', we refer to wealth generated through the redistribution of oil revenues in the local economy. This distribution happens either naturally through individuals spending the money earned through oil and gas projects or deliberately with the Government distributing oil revenues in other industrial projects like infrastructure. This re-investment of oil and gas revenues in the economy shall induce jobs in sectors like hotels, banks, insurance companies, or even education system' (IBS, 2014).

It is important to note that the report highlights that 80% of future direct, indirect and induced jobs will be short-term for the peak of construction suggesting that they will have to be transferred to other sectors (like cement or structural steel) or to the neighbouring countries to remain sustainable. The picture described by this report, as well as the experience of Ghana tell us that when planning a sustainable, long term and pro poor strategy to fill the skills gap created by a newly developed oil and gas industry, we have to be aware that:

- the majority of jobs are normally created in the midstream and downstream of the oil and gas value chain and in the local content;
- most of the jobs, direct, indirect or induced, are employed only short term during the peak construction phase, therefore it is important to understand which industry might absorb these workers and what kind of transferable skills have to be central to the TVET trainings in order to equip the prospective workers with the needed flexibility.

3. Teaching and learning key challenges and best practice

We will now analyse a number of key issues that are commonly associated with teaching and learning challenges in the context of vocational education. These relate to the acquisition of so-called functional literacies (numeracy and literacy), to the use of Information, Communication Technology (ICT) as a tool for improving the quality and the reach of teaching, the creation of business-like attitudes, gender dimension as a main source of inequality in TVET and lastly to informal apprenticeships as the main informal workforce skills development practice. When available in the literature one or more case studies of documented best practices from a variety of contexts will illustrate the key issue.

3.a Maths and Science

According to the OECD (2012) Africa has proportionally the highest number of social science and humanities graduates in the world, 70 per cent of the total students population versus the 53 per cent in Asia.

There are many reasons for this low interest in science based studies as well as differences from country to country, however some commonalities might be found: a general low quality of teaching that begins at the primary school level, aggravated by the huge increase of enrolment rates due to Education for All policies, which is further compounded at the secondary level. In addition, dated secondary and higher education infrastructure and teaching methods limit the possibility of teaching applied sciences (Templeton Foundation, 2009).

Applied sciences are key to development of the oil and gas industry that can offer a relatively limited number of jobs to highly qualified technicians (geologists, petroleum engineers) but also to a higher number of technicians that shall receive an adequate scientific preparation in the framework of their TVET secondary studies. Whereas the development of tertiary level education programs is fundamental, the highest impact on poverty and jobs is likely to come from improving the relevance and quality of vocational secondary level education (World Bank, 2014). Moreover at secondary level a weak preparation in science does not allow students' progression into engineering and science degrees.

Case study: Young Scientist - Tanzania

Modelled on the internationally acclaimed Young Scientist exhibition in Ireland, which is now in its 50th year, and sponsored by the Pearson Foundation, Irish Aid, and BG Tanzania Young Scientists Tanzania helps to popularize science among young people through an engaging annual exhibition and competitions. The main objectives of YST are the promotion and popularization of science and technology; linking science and technology to active citizenship and the fight against poverty; and improving the teaching of the sciences. Participating schools are supported through workshops for teachers who receive mentoring and practical advice on suitable projects and research methodologies. Participating students themselves will generate the ideas for their projects based on the realities in their communities. Young Scientists Tanzania seeks to link participating schools with appropriate mentors from academia, NGOs and the private sector. Participating schools are also be supported financially for transport and accommodation to attend the exhibition in Dar es Salaam. In 2012 over 100 schools from 10 regions across Tanzania participated in this outreach program, the majority of which then submitted projects for the Exhibition.

www.youngscientists.co.tz

3.b ICT and E-learning

If ICT skills – as part of functional skills - are an important outcome of TVET education, the potential for the integration of technology into vocational teaching and learning needs to be explored. There are several advantages of utilising technology to teach vocational education: one is that it facilitates the shift from a reproductive mode of learning to an autonomous learning model that can promote critical thinking and independent research. 'The major emphasis of ICT infusion in pedagogy should be such that it tends to improve learning, motivate and engage learners, promote collaboration, foster enquiry and exploration, and create a new learner centred learning culture' (Majumbdar). Moreover the use of technology, such as in distance or mobile learning is believed to be the only way of addressing 'the scope and scale of the challenge of bringing TVET to the millions of people of Africa' (Unesco, 2007).

Case Study: Flexible Skills Development programme at the Commonwealth of Learning (COL) – 11 African Countries

Commonwealth of Learning was created to encourage the development and sharing of open and distance learning resources and technologies. COL helps developing Commonwealth countries to increase access to learning using distance education and appropriate technologies. It is currently working in partnership

with the Commonwealth Association of Polytechnics in Africa to help education institutions in Africa adopt sustainable flexible learning approaches to improve access, quality and equity in TVET. These approaches include using technology in the delivery of both face-to-face and distance learning, and offering flexibility in time, place and pace of study. The ultimate goal is to extend the reach of skills development.

COL's Flexible Skills Development programme includes creating 'flexible skills champions', supporting an online community, and building capacity through web-based courses and training workshops. COL works with 11 African TVET institutions, known as 'Key Institutions', with the aim of creating a network of providers capable of implementing flexible and blended learning approaches in TVET. COL is building capacity in these institutions and assisting with ICT infrastructure management. In return, Key Institutions are including flexible programme delivery and putting human and financial resources into expanding access and improving quality in teaching and learning.

www.col.org

Case study: Dr. Math – South Africa

Dr Math provides maths tutoring for primary and secondary school students via mobile phones. Students communicate with tutors using Mxit (social media site) or Google Talk on their mobile phones. Workflow software distributes requests from users to available tutors, who are instructed to guide students in learning instead of simply giving them the answers. Volunteers are usually university students from South Africa. All "conversations" between students and tutors are recorded for research, quality, and security purposes, as well as for potential use in other studies. Over 25,000 users have registered since the program's inception in 2007. Dr. Math tutors are available Sundays to Thursdays between 14:00 and 20:00. There are currently 110 volunteer tutors from around the country – most are engineering students from the University of Pretoria.

www.meducationalliance.org

3.c Literacy – complementary models of education

Being able to read and write is not only a fundamental right but also a necessary skill in order to be able to get a job that pays a decent wage and become a productive force in the economy. Low functional literacy is not only the result of not being able to attend primary school or early drop out, unfortunately it can also be the result of bad quality primary education. According to Unesco (UNESCO, 2014) over 250 million children in developing countries are not learning basic reading (and maths) skills after attending four years primary education. Therefore it is not unlikely to have students attending secondary TVET education

needing to reinforce (or even build) their literacy skills. There is a live debate on how to teach literacy in the framework of vocational education. Some think that literacy should be embedded in authentic contexts therefore thought by vocational teachers; others think literacy specialists should teach it instead (CSD, 2012). Some of the findings of an exhaustive review of livelihood and literacy programs carried out by the World Bank (Oxenham et al, 2002) are particularly relevant to this debate and can apply to both formal and informal vocational education programmes aiming to improve literacy skills:

1. Deriving literacy/numeracy content from livelihood skills and integrating it with the livelihood training from the very start seems more promising than either running the two components parallel with each other or using standard literacy materials to prepare people to train for livelihoods.
2. Livelihood-plus-literacy/numeracy programs can greatly improve their chances of success, if they incorporate training in savings, credit, and business management, along with actual access to credit.
3. While differing levels of proficiency in different livelihoods required different periods of learning, the minimum period needed by a really illiterate person with normal learning abilities to attain a degree of literacy and numeracy sufficient to support advancement in a livelihood seemed to be some 360 hours of instruction and practice.
4. The broad experience of income-generating projects suggests that arranging for both livelihood specialists and literacy instructors is more prudent than relying on literacy instructors to undertake livelihood instruction or income-generating activities in addition to teaching literacy and numeracy. The broad trend appears to treat literacy instructors on a similar basis to livelihood specialists and to pay them for their efforts.
5. Workplace literacy - mining companies in South Africa, Zambia, and Zimbabwe have for several decades offered their non-literate employees classes in English literacy and numeracy. Public corporations in India are also known to have organized such classes. This study was unfortunately unable to locate any assessments of the effects of these classes on either their beneficiaries or their providers. It is possible that the corporations regard these educational efforts more as welfare expenditures for the less qualified members of their workforces and less as investments in raising the quality of their human resources.

Case study: The Somaliland Education Initiative for Girls and Young Men (SEIGYM) – Somalia

Supported by the Africa Educational Trust, The Somaliland Education Initiative for Girls and Young Men (SEIGYM) has adopted an unusual, possibly unique, approach for its urban participants. It gives them vouchers they can use to obtain the training they want. As all the vocational and technical training on offer requires some school qualification, non-literate participants can locate and pay for instruction in literacy and numeracy before moving on to specifically livelihood training. Over three years, 5,000 disadvantaged girls, young women, and young ex-militia men have received literacy/numeracy and/or vocational skills training. Two systems operated: In the first system, students could receive a voucher, which they could use to purchase education or training of their choice. The voucher was redeemable only through the Africa Educational Trust (AET) and only if AET inspected the training provider and certified its standards. This system worked best in the larger towns where there were craftsmen and women who wanted to provide the training and where there were enough students with vouchers to make it worth their while to run a course. The second system, in effect outside the larger urban areas, also offered vouchers, but in addition, there were meetings and discussions with the students to ask what they wanted to purchase with them. Based on this, AET then recruited local trainers to provide the course, paying them against the value of the vouchers. This worked best in the smaller towns and was also important when the majority of students wanted literacy and numeracy.

Case study: ACOPAM – Senegal

ACOPAM was based in Dakar, Senegal, and included several countries in West Africa. The program was sponsored and promoted by the International Labour Office and the Norwegian government. ACOPAM aimed chiefly to help poor rural people, especially women, to improve their livelihoods and make more productive use of available resources. It also aimed to enable members of cooperative groups, again especially women, to gain fuller information about the state of their groups, literacy—and even more, numeracy—were necessary for these purposes, and not only for the basic livelihoods themselves. ACOPAM found that existing literacy instructional materials did not fit its purposes. Over the years, it developed no fewer than 22 of its own literacy curricula in several West African languages, all derived from the vocabularies and practices of crops, cooperatives, savings, credit, and micro-enterprise management and marketing. The instructional method combined straightforward technical content with an adaptation of Paulo Freire’s consciousness raising approach.

www.worldbank.org

3.d Entrepreneurship education

Enterprise education is particularly significant in Africa given the prevalence of the informal economy and the many opportunities of becoming self-employed. There is not a common understanding and definition of enterprise education however we can say that in most cases entrepreneurship programmes try to develop attitudes, knowledge and skills that are considered to be relevant to the start-up and management of business activities (CSD, 2012a). Entrepreneurship skills are believed not only to enhance students' capabilities of managing their own business but also to improve their employability.

The OECD (2008:112) states that 'entrepreneurship education is important as a crucial determinant of the supply of entrepreneurship by forming (potential) entrepreneurs as well as contributing to a positive entrepreneurship culture. In this respect, entrepreneurship education should not only focus on narrow defined tools (e.g. how to start a business, financial and human resource management) but also on broader attitudes (like creativity, risk taking, etc) especially on the lower and secondary level'.

Entrepreneurship programmes have been developed and delivered in a variety of contexts, from the formal education – mainly in lower and upper secondary schools – to livelihood trainings for adults working in the informal sector, moreover it can be quite difficult to clearly prove the evidence of these kind of programs; it is therefore quite difficult to single out a single set of best practices. However the International Centre for Technical Education and Training based at the Unesco suggests that the following two programs based in Kenya and Zambia are to be considered 'promising practices'.

Case study: Entrepreneurship Education as a Tool to Support Self-Employment, Kenya

Kenya was among the first countries in Africa to introduce aspects of entrepreneurship education in its education and training systems. It was realized that vocational education alone without entrepreneurship would not generate jobs. The rationale was to create awareness in young people's minds of the existence of various options in the world of work. Equally, the new system of education introduced in 1985 had a technical and vocational component to ensure that at the end of each level school-leavers, especially at primary and secondary levels or those who drop out of school for one reason or another, would have sufficient knowledge and skills to enter the labour market, including self-employment.

Today, many TVET institutions in Kenya are related to small business centres (SBCs) through which consultancy is given to small-scale entrepreneurs. Their response to the continued training needs of

business enterprises brings training closer to the demands of the labour market. Many TVET institutions also benefit from entrepreneurship in-service programmes introduced by universities and other institutions. The need to link training to employment (self or paid) is at the base of the best practice and strategy. Kenya has a well-established system of involving enterprises in establishing the content of training, which makes it possible to train young people more effectively for the workplace. Because of entrepreneurship initiatives, over 40% of TVET graduates in primary and secondary schools who have passed through the training become self-employed and over 20% of those who enter salaried employment also start their own businesses, hence creating jobs for others. This initiative has reduced the number of educated but unemployed graduates and enhanced the status and attractiveness of TVET.

<http://www.unevoc.unesco.org>

Case study: TEVET Graduate Empowerment Toolkit Scheme, Zambia

The Technical Education, Vocational and Entrepreneurship Training (TEVET) Graduate Empowerment Toolkit Scheme was implemented in 2008 in technical and vocational education and training colleges to curb unemployment by empowering and motivating TEVET graduates to start small businesses. Based on the lessons learnt, before the toolkits were distributed the Department of Vocational Education and Training conducted workshops at which TEVET graduates were taught various skills, such as business planning, financial mobilization, entrepreneurship and business management. This was done to ensure that graduates were prepared to start and run their enterprises once they were given the toolkits. The issue of forming partnerships in enterprises was recommended as one way of ensuring that graduates combined their different skills in providing services to those that needed the services. The issue of obtaining start-up capital for businesses was also addressed. After the workshops, graduates were given some time to write their business plans and to form companies, after which they became eligible to apply for the toolkits. Administrators in training institutions were also trained on how to manage the TEVET Graduate Toolkit Scheme. This included providing working space for graduates before they found their own premises, providing security for the toolkits and having a co-ordinator for the scheme in each institution. A total of twelve institutional companies and nineteen graduate companies have been established as a result of the implementation of the scheme. The Graduate Toolkit Scheme has generated considerable interest in entrepreneurship among TEVET graduates and training institutions.

<http://www.unevoc.unesco.org>

3.e Gender inequalities

The training needs of young women are particularly neglected. Women carry a heavy workload and face discrimination in education and labour markets, especially in rural areas, where their mobility is often highly restricted. When they are able to take part in the education system, women enroll in greater proportions in arts and social sciences rather than mathematics, science or technology, this is a worldwide under-representation due to social structures in institutions and the composition of the labour market. There are multiple causes for women discrimination in TVET systems, they are well summarised by Commonwealth of Learning (2012):

- **Cultural barriers:** common patterns in role and status of women emerge across countries, despite widely different circumstances (see world wide under representation of women in science studies).
- **Attitudes:** perceived differences in male and female roles and capabilities are often reinforced through schools and career guidance. Such attitudes actively discourage young women to participate, or reduce their confidence and self-esteem to do so.
- **Qualifications:** as many girls as boys achieve general proficiency in maths and science, but girls are under-represented in Science, Maths, Engineering, Technology (STEM) subjects at higher levels once "choices" are made.
- **Situational:** family commitments, fee requirements.
- **Institutional barriers:** lack of childcare facilities, "unfriendly" course information, lack of female teachers/assumptions and attitudes of male teachers.

Targeted programmes that address the multiple causes of this disadvantage have proved effective (UNESCO, 2012). Unfortunately the promotion of participation is not enough to achieve empowerment. Curriculum elements that challenge current gender stereotypes and provide students with alternative visions of society without gender inequality are also required (Murphy-Graham, 2008).

INVEST Africa - Commonwealth of Learning (COL)

The Innovation in Vocational Education & Skills Training is a COL initiative that is focused on expanding access to technical and vocational education and training (TVET). INVEST is working with partner institutions in The Gambia, Ghana, Kenya, Nigeria, Tanzania and Zambia to build capacity in integrating information and communication technology (ICT) in flexible and blended approaches to TVET. Expanding access to TVET involves addressing gender issues.

Nigeria: The National Board for Technical Education has taken the bold step of establishing a new Gender

Desk to spearhead activities to promote the participation of women and girls in TVET. This came as a result of a recommendation made following COL's Flexible Skills Development Gender and Policy workshop at Auchu Polytechnic. COL commends this important development and will be supporting the unit to develop a strategy for actions to make TVET in Nigeria more accessible for women and girls.

Tanzania: Mbeya Institute of Science & Technology (MIST) has a very low percentage of female students, less than 15 per cent. To address this, they developed an access course that was offered through an outreach centre, a 3-month bridging programme with a guaranteed place on successful completion. As a result, 160 girls gained a place on MIST Diploma programmes and the institution increased female enrolment by 100%.

Kenya: To commemorate the United Nations first International Day of the Girl on 11 October 2012, the dynamic team at Mombasa Technical Training Institute in Kenya launched their new Women in Technical and Vocational Education and Training (WITED) Chapter. The Chapter brings together individuals who work together to encourage more female students and teachers into TVET. A team of female teachers in Mombasa Technical Training Institute have decided to go beyond the call of duty, work together to reach out to the less privileged girls and women in the society. Women technical teachers as role models need to be at the forefront in encouraging other women and girls into pursuing relevant education.

www.kenyacoastpoly.ac.ke

Case study: The Institution for Engineers in Tanzania

The independent professional organisation for engineers in the country offers an example of one measure for the way forward in terms of addressing the gender imbalance in jobs and education system in petroleum sciences. The organisation is running campaigns targeted at girls in school to promote engineering (Norad, 2013).

3.f Informal Apprenticeships

As previously mentioned skills development can take place in formal or informal education environments. In some parts of Africa, especially in the west, informal skills training account for more than 80% of the total. Informal apprenticeships are found to be one of the most successful forms of vocational training and are generally cost-effective and culturally appropriate. The informal apprenticeship systems are more flexible

than formal education resulting in lower entry barriers, moreover the media of learning is local language making knowledge transfer more accessible. The cost of attending tends to be more sustainable than formal education. However informal apprenticeships have also some evident shortcomings (especially in the context of small enterprises): the quality of education varies according to the master craft person capacity and might suffer from lack of standards, underpinning knowledge is not provided and they rarely promote innovation. Therefore there are a number of programs and national policies that are attempting to 'formalise' parts of the informal apprenticeships in order to address these shortcomings.

Best practice, as summarised by UKAID (2010), for apprenticeships and other informal sector training include:

- Literacy needs to be addressed and training provided when required.
- Quality assurance mechanisms should be adopted.
- Master craft-workers should be encouraged to enter the training market. They may also need training themselves to ensure apprentices are learning the latest skills.
- Working through informal sector associations can be helpful.
- End-of-training assessment tests should be introduced.

3.g Training of Trainers

Lastly it is imperative to mention that most of the key challenges described above can be faced only through the support of properly trained teachers. Although educating the educators is a hard task in the context of scarcely resourced educational systems, selecting and train the right teachers for TVET it is even more challenging. Well qualified instructors are supposed to have a significant industry-based experience and this poses two main potential problems: firstly these kind of workers can easily be employed in the labour market therefore they need the right motivations to choose a career in education. Secondly the fact that they have an industry-based expertise does not mean that they have the required teaching skills. In addition to that the changes due to the new global economy require educators to develop capacity to adapt to 'key features which includes Globalization, ICT Revolution, Sustainable Development, Emergence of Knowledge Worker and Rapid Knowledge Obsolescence' (NEXTGEN EDUCON, 2013:35).

As mentioned in the first part of this report there is evidence that the Competency Based Training (CBT) approach is successful in terms of enhancing TVET responsiveness and relevance to market needs. This approach provides some specific guidelines to how teachers should be trained. A drastic 'paradigm shift' of the role of the teacher is advocated through the promotion of a student-centered approach. As we have seen this particular methodology combined with the specific requirements of the vocational pedagogy impose the use of a mixed methods of instructing approaches. Awareness of teachers of the different approaches and their ability to use them has to be a main outcome of their teachers training. It is important to notice that, as the CBT Ghana experience shows, teachers once trained need to 'follow up assistance' on a periodic basis as 'there is a tendency to “teach as we were taught” and CBT trainers quickly slip back into the role of the traditional teacher' (Aba Anane, 2013:125).

Unfortunately there seems to be a lack of documented lessons learned in the field of TVET training of trainers in Africa.

Concluding remarks and issues for consideration

This literature review looks at the challenges faced by TVET systems in the context of oil and gas exploration in Africa through a teaching and learning lens. This approach has been selected to stress the urgency of developing 'practical' tools to improve the quality of TVET provision alongside the necessary policies and national frameworks.

Although TVET systems in Africa differ from country to country and are delivered at different levels in different types of institutions, including public and private technical and vocational schools, the literature shows that there are a number of key teaching and learning challenges that need to be central to any program focused at improving the quality of TVET education.

1. The understanding of the unique nature of vocational pedagogy has to be central to the development of TVET quality improvement programs.
2. An accurate assessment of the nature of the primary education attended by TVET students is fundamental in order to develop strategies to address possible flaws. This is particularly important when looking at functional literacies (literacy, numeracy and ICT).
3. Formal TVET programs have much to learn from non-formal adult education programs, especially in the field of functional literacies.
4. Any program aimed at filling the skills gap for the gas and oil industry in a equitable and sustainable way has to carefully analyse the direct, indirect and induced job opportunities that could be triggered by the industry. The literature tell us that it is important to focus on the whole value chain and also explore the opportunities that are to be created in the local content. Moreover it is crucial to understand which industry might absorb the workers trained and employed by the industry in the construction peak time, and what kind of transferable skills have to be central to the TVET trainings in order to equip the perspective workers with the needed flexibility. Lastly, it is recommended to explore the possibility of providing some skills training through the informal apprenticeship system, as in some cases they might prove to be a faster and cheaper solution.

5. E-learning and mobile learning might be particularly appropriate to deliver TVET programs in hard to reach areas or to a very large number of students when infrastructures are insufficient.
6. The participation of women in TVET is generally hindered by a variety of obstacles of different nature (cultural, attitudinal, institutional and other). It is crucial to identify and address most of them in order to reduce the gender inequity that normally characterise TVET programs.
7. To train TVET teachers in both teaching skills and vocational subjects is fundamental to the quality of TVET provision. To train teachers in new approaches such as the Competence Based Training requires a thorough understanding of the vocational pedagogy and a long-term commitment to promote a real 'paradigm shift'.

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