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Message From the Editor

Welcome to this special issue of the *International Journal of Vocational Education and Training.* This issue is a collection of articles vetted by the scientific community and presented at an IVETA regional conference held in Kampala, Uganda, June 17-20, 2014. The theme for the conference was *The Role of TVET in Building Regional Economies.*

As the world becomes a global village, today's workforce education and training has shifted accordingly and focused on skills needed for the global marketplace. Articles in this issue cover a broad range of issues directly and indirectly affecting the global workplace skills, namely: perspectives on the role of TVET in building regional economies, potential of vocational education and training in promotion of regional economic integration, vocational education training methods, gender equality in TVET, relationship between cognitive entry characteristics and academic performance, as well as digital-based and innovative academic strategies. These articles highlight new ideas, practices, or simply seek dialogue on pertinent issues affecting TVET. Thanks to the authors for their efforts in keeping us up-to-date on current regional and global TVET practices.

As in the previous issues, readers are reminded that articles published in *IJVET* come from all over the world, and as such, some authors do not speak English as their first language. While great care has been taken to correct the verbiage, there may be some errors that went unnoticed. Like other past *IJVET* issues, the journal continues to touch on timely and relevant TVET issues. I wish to thank the scientific committee (for the blind review), authors, and specifically the editorial staff, who worked tirelessly in the production of this *IJVET* issue. Please note that the articles in this journal do not reflect the position of the journal's editorial staff, reviewers, or policy of IVETA.

Davison M. Mupinga
IJVET Editor

The Role of TVET in Building Regional Economies

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Wilfred Karukuza Nahamya
Uganda

Abstract

The 21st Century has been characterized by rapid movement of skilled labor from one part of the globe to another. Technical and Vocational Education and Training (TVET) plays a key role in transforming economies by providing skilled human resource. There are several success stories of countries that in the sixties were purely peasantry economies, and now have developed economies as a result of strong support for TVET. Skilled human resource is an engine of change and with the current free movement of labor, countries find it convenient to import or hire labor from any part of world. The trend today is that training in knowledge and skills acquisition is no longer for the local market but for the entire world. This paper is sharing conceptual on the role of TVET in building regional economies.

Key words: Technical and vocational education, regional economies, human resource, skill acquisition,

Introduction

Technical and Vocational Education and Training (TVET) is concerned with the acquisition of knowledge and skills for the world of work. Throughout the course of history, various terms have been used to describe elements of the field that are now conceived as comprising Technical Vocational Education and Training. These include: Apprenticeship Training, Vocational Education, Technical Education, Technical-Vocational Education (TVE), Occupational Education (OE), Vocational Education and Training (VET), Professional and Vocational Education (PVE), Career and Technical Education (CTE), Workforce Education

(WE) and Workplace Education (WE) among others. Several of these terms are commonly used in specific geographic areas. UNESCO provides comprehensive and relevant information in regard to TVET (see, http://www.unevoc.unesco.org/go.php?q=What+is+TVET).

In many countries, TVET is often considered as second last education compared to the mainstream academic branch, but TVET is increasingly seen as the master key to poverty alleviation and social cohesion and a chance for countries to jump on the bandwagon of development and globalization. In China for example, where skilled laborers represent the backbone of the current economic expansion, at least one third of all secondary school students are enrolled in vocational schools.

On the hand of the other of the spectrum however, many nations are still struggling to create those indispensable bridges between education and the world of work. For many countries like China, TVET is not an option; it's a necessity. With primary school leavers on the rise throughout the world, the need to expand further learning opportunities is urgent. Yet, many secondary school systems are unable to absorb these large numbers and jobs are even harder to come by. Young people need skills that are flexible and relevant to the demands of a constantly evolving, globalized labor market.

In order to ensure quality in TVET, responsible national authorities should establish criteria and standards, subject to periodic review and evaluation, undertake benchmarking from other countries, applying to all aspects of technical and vocational education, including: all forms of recognition of achievement and consequent qualification; staff qualifications; ratios of teaching and training staff to learners; the quality of curricula and teaching materials; safety precautions for all learning and training environments; and physical facilities, buildings, libraries, laboratories, workshop layouts, quality and type of equipment. For instance in regard to safety precautions a welder, rigger, operator, driver, scaffolder, and electrician must have Helmet, coverall, safety boots, safety glasses, high visibility vest and gloves while at work or in a workshop.
To meet international training standards, programs need to fully reflect on modern industry practices, have a strong focus on competency-based training methods and provide students with robust practical experience as the guidelines in table 1 shows.

Table 1: Guidelines to Attain Good International Standards

Student Entry Skills	Good levels of attainment and qualifications from school especially in literacy, numeracy, science, and technical subjects

Table 1 continued

Program Delivery	Strong focus on practical, industry relevant, skills based training in terms of time spent and competency based training methods
Student Employability	Practical training that meets real workplace standards with exposure to industry throughout the training. Students must acquire Industry recognized certification

Thus focus on exploitation of technical advancement in promoting TVET; and the informal sector; balancing academic grades and skills in competency based education and training; promoting vocational education for regional economic integration; and the role of technical and vocational education to the oil and gas industry in East African Region are all paramount in driving the growth of regional economies.

Exploitation of Technological Advancement in Promoting TVET

The world of work has changed dramatically over the past decade. It has become mobile and technologically complex, demanding highly sophisticated and transferable work skills in an increasingly globalized world. Thus, this calls for more efficient, effective and reliable methods of skills enhancement and transfer through innovative technologies.

E-learning technologies have indeed changed the roles of teachers, instructors, trainers and learners. They have changed countries approach to developing digital literacy. The use of e-learning technologies has enhanced and improved management, learning programs, assessment and overall quality and inclusiveness of education. Technology is being used to improve management tools, the quality of programs and institutions, facilitated assessment and certification and developed pre-work competence and skills. Technology is enabling lifelong learning, provision of ubiquitous education and undertaking massive training. Digital-based academic strategies bear the potential to produce new skills; and up-to-date educational resources among instructors and learners. As part of information and communication technologies (ICT), digital devices are recently emerging technologies that need to become integral to the school system (Makewa, 2008). Similar arguments are advanced by Redecker and Johannsen (2013) who advocates the need guide technological innovation in TVET. This is in addition to lack of other facilities including software, computer consumables

and other ICT equipment like digital camera. This implies that support is not only required in making budget provisions to purchase computers and other ICT facilities but also general Digital Literacy skills to the Instructors.

Technology is helping bridge the gap in regard to staff, teaching materials, libraries and laboratories through promotion of e-learning. E-libraries and Internet-based laboratories are on the rise and as a result students can perform practicals and access library resources online. E-tutoring or e-instruction is also on the rise to address lack of qualified tutors/instructors in certain localities. There is also an increase in free and open resources developed by experts for skill enhancement to lifelong learners. However, there is lack of localized content suitable for the local people to acquire the necessary hands on skills necessary for sustainable development. This calls for immediate response from both TVET and the inform sector in generating local content that is necessary and suits the local population.

TVET and the Informal Sector

In defining the informal sector, the ILO (International Labor Organization) and OECD (Organization of Economic Cooperation and Development) tend to use economic definitions, focusing on parameters like the status of employment, the level of formalization of the business activities, and government registration (Langer 2013). However, the International Conference of Labor Statisticians (ICLS) presents the most commonly used definition for informal sector in the context of poverty reduction and development cooperation that also illustrates the wide range of employment statuses in the informal sector. Informal employment was defined by the 17th ICLS (2003) as encompassing:

> (a) own-account workers and employers employed in their own informal enterprises; (b) members of informal producers' cooperatives (not established as legal entities), if any; (c) own-account workers producing goods exclusively for own final use by their household (if considered employed given that the production comprises an important contribution to the total household consumption and is included in the national definition of employment); (d) contributing family workers in formal or informal enterprises; and (e) employees holding informal jobs in either formal enterprises or informal enterprises or as paid domestic workers employed by households.

Some authors argue that the informal economy should be divided into two main segments: the upper tier and the lower tier, where the "upper tier has access to requirements that make it unavailable to workers in the lower tier.

This upper tier comprises the competitive part, that is, those who voluntarily choose to be informal, and the lower tier consists of individuals who cannot afford to be unemployed but do not have access to more productive employment in either the formal or the informal sector." Technical Vocational Education and Training in the informal sector is about technical and vocational skills development in the informal sector.

Wide ranging examples can be found in the book: Technical and Vocational Skills Development in the Informal Sector Contributions to the 4th Bonn Conference on Adult Education and Development (BoCAED), October 2013. Karen Langer (ed.) (see, http://www.dvv-international.de/files/ipe_68_gb_web.pdf).

Balancing Academic Grades and Skills in Competency Based Education and Training

It is generally agreed that a modern and responsive TVET system needs to take into account current and expected socio-economic conditions including labor market demand, the needs of both the formal and informal sector in relation to employment, and the professional capacity of TVET teachers and instructors. Further, TVET must attend to the specific employment needs of both rural and urban situations and take account of belief and value systems, religions and customs, and different regional and indeed climatic variations between regions within a country or region particularly in relation to gender and social dimensions in training and employment.

Working TVET systems are not those that are copied from other countries and pasted in another local setting. There is need for development of a TVET system that is localized to the local setting and characteristics. It is important to note that a TVET system that works well in Indonesia may not work as well in Uganda. Since each country and economic situation is different, it is important to search, identify, define, and apply what can be considered the basic principles of an effective TVET system. The top six (6) principles inherent in a successful TVET system are; relevance to the labor market that meets employer's needs and expectations; access for trainees; quality of delivery; standardization; inclusion of soft skills and funding for the system is secure and uninterrupted.

A country or regional contextualized and customized developed TVET system is best as it permits one to validate skill sets and adjust the approach of learning as it best fits the country or region. However, integrating the TVET system at both primary and secondary education to form comprehensive schooling may go a long way in equipping the youth with the appropriate skills required for development.

In light of the above, it is important to strike a balance between academic grades and skills acquisition within the TVET sector. However, every TVET

graduate must possess the minimum skills required by employers and also comply with international standards. This calls for a paradigm shift towards innovative assessment in the TVET sector and systems. The argument is that assessment can retain its quality in the face of demands by different players in the world of work due to the different socio-cultural clientele for it to respond to their different needs. This thus requires careful examinations of all the processes involved in the training for one cannot deny the fact that national or public examinations have made their mark on the landscape of African education. Moreover, examination boards need to always keep in view the changing conditions in the world of work where the demanders of services of labor. Assessment is thus an essential component of learning and teaching, as it allows the quality of teaching and learning to be judged and improved as has been argued by different authors (Ferrari, Cachia, & Punie, 2009). However, it needs to be noted that in many countries, curricula development initiatives are not embedded in a wider reform program. They are stand-alone type of initiatives. In a few cases, developing the competency-based curriculum is part of a broader objective, which are involving private sector businesses in a systemic TVET reform process as argued by some reports (World Bank 2005).

Promoting Vocational Education for Regional Economic Integration

Countries in Southeast Asia have undertaken a number of reforms in their training and education systems; most notable of which is the 're-shifting' to training and education priorities that relate to work productivity, a greater focus on providing skills and training and practical work experience to the students/youth. They have shifted the agenda to TVET because Southeast Asia is in fact merely revitalizing their efforts on TVET for the region long realized the vast potential of TVET to alleviate poverty and bring national and regional economic advantage through better and gainful employment of the youth and labor force. Given the growing awareness of how TVET can potentially bring new skills that will be crucial in facilitating regionalization and internationalization, countries in Southeast Asia have reinforced their efforts to improve their respective TVET systems with special emphasis on improving the quality of vocational teacher education.

The African region can thus borrow a leaf from this experience. But for TVET to support regional integration a number of parameters and measures must be put into consideration and these include but not limited to improving the quality of TVET systems and establish national and regional qualification frameworks on TVET; guarantee evidence-based TVET planning and adequate national financing of TVET initiatives; ensure the relevance of TVET

curriculum to industry needs through education agency- industry collaboration; and encourage national governments to put greater focus on quality of vocational teacher training.

The region needs to assess and evaluate past policies where Uganda turned well established TVET institutions into degree awarding institutions or Universities. This includes the case of Kyambogo and Busitema Universities that were created out of TVET certificate and diploma awarding institutions. This upgrade in a way hampered the growth of the programs that were under these TVET institutions. Also in the National Resistance Movement (NRM) Manifesto 2011-2016, it promised Ugandans that Uganda Petroleum Institute Kigumba (UPIK) would be become a degree awarding institution before 2016. If this falls through it would another blow to the TVET sector especially the oil and gas sector. Such TVET institutions should always be looked at as Centers of Excellence accredited by international bodies.

Specialization in vocational training is very critical and the same concept could be borrowed in the TVET system to be integrated within the region. Any institution that has been found to have specialized in particular vocational skills should be allowed to develop content and assessment procedures for the rest of other institutions running the same course. This will allow easy development of e-content that can easily be shared through innovative technologies. Therefore tapping into e-learning for regional integration is possible in this era to improve on how TVET is undertaken.

The Role of Technical and Vocational Education to the Oil and Gas Industry

The most numerous roles that are expected to be generated both directly and indirectly across the oil and gas sector are those of a vocational nature. Core trades identified are transferable to other sectors. There is need to meet international standards to be employable in the sector. Below we give trades and the corresponding professional profiles:

Table 2: Trades and corresponding profiles

SN	Area	Professional Profiles
1	Metal Work	Steel worker Pipe welder Pipe fitter Metal sheet worker

Table 2 continued

2	Building works	Mason Brick worker Carpenter/ Joiner Painter Scaffolder
3	Civil engineering/ infrastructure	Asphalt and/or concrete worker Heavy equipment operator
4	Mechanical Work	Mechanic and/or heavy equipment repairs
5	Electrical work	Electrician

In the case of Uganda, Uganda Petroleum Institute Kigumba (UPIK) has come up with an institutional development plan (2014-2019) that lays out strategies for developing core human resource for the oil and gas sector in Uganda. Similar initiatives are taking place in the region especially in Kenya and Tanzania. So there is need for coordination and sharing of mandate in the implementation of TVET training across the region to avoid unnecessary duplication as TVET is capital intensive.

Conclusion

Developing countries have no choice but to embrace TVET as a necessity and precondition for socio-economic transformation. They also need to note that innovative technologies can easily be tapped into in order to deliver TVET ubiquitously, effectively and efficiently. It is now a commonly agreed fact that TVET has a high impact on the country's productivity growth; makes its recipients relatively secure from poverty and extends and sustains this security into retirement years; reduces inequality, filling income gaps that would otherwise exist between the rich and the poor; reduces migration and offsets the high costs of the brain-drain and TVET perpetuates its benefits into retirement by maintaining or raising income during retirement years.

Policy Options

i) The Ministries responsible for education need to come up with initiatives that create *incentives for the development of ICT environments and tools that allow instructors to quickly, easily and flexibly create customized electronic learning and assessment environments*. This would require promotion of tailored

source tools that can be adopted by the instructors in training institutions to fit their teaching style and their learners' needs.

ii). There is need to involve the informal sector and generally the private sector in the training and assessment by the TVET key players mainly the training institutions and assessment boards. This is mainly because trainees should only be those that are demanded by the world of work. This can be done through development of a comprehensive public-private partnership among key TVET players. This can be done through certain agreements that enforce the creation, extension or restructuring of a training centers, involvement in curriculum development and assessment.

iii) TVET systems should incorporate regional players and the training needs to be shared in such a way that regional integration needs to go beyond political and economic integration but also integrating educational aspects. This can be done by intensive collaboration between countries so that there is training of graduates for particular fields.

Acknowledgments

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Vocational Education and Training for Regional Economic Integration: From Ideas to Action

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Abstract

Africa desires to integrate her regional economies and achieve a continental common market by 2028. Such economic arrangement removes border barriers and allows free movement of goods and services between member countries. Ideally, countries have unrestricted free trade which maximize opportunities of broader market. However, if a country lacks skilled workforce, its goods and services may not meet consumers' expectation, and as a result it may not benefit from the economic integration. This paper provides an overview of regional economic integration with its enabling and constraining effects. Insights into potential for increasing economic integration through promotion of vocational education and training are also provided.

Key words: Economic integration, Free trade, Regional economy, Vocational education and training, Workforce

Introduction

Africa desires to integrate her economy on regional basis and to achieve a continental common market by 2028 (Draper, 2014). This desire is based on the fact that Africa is fragmented and individual countries have small domestic markets which inevitably makes production costs of goods high. This situation limits economic development and frustrates efforts to reduce poverty. Regional Economic Integration (REI) is an approach where sovereign countries in a region form close ties and agree to remove border barriers to allow free movement of goods and services (Hartzerberg, 2013). There are various regional integration agreements in Africa and a country is free to belong to one or more regional groups. For example, Uganda belongs the East African

Community (EAC), COMESA (Common Market for Eastern and Southern Africa) and Inter-Governmental Authority for Development (IGAD).

Belonging to these regional economies may benefit a country socially and economically. For example, with unrestricted free trade, a country can specialize in producing goods and services and in turn maximize its opportunities of a broader market (Draper, 2014). Market enlargement results in increased production and creates competition between firms. This in turn leads to lowering of prices of goods thus benefiting the consumers. Additionally, REI scheme broadens employment opportunities making it easier for a person to earn a living away from home (Mungai, 2014).

On the other hand, REI may not benefit a country because of a number of reasons. Firstly, if countries in the REI have a popular language it reduces the barrier of human movement across member states. For example, in the EAC Kiswahili is an official language used in both Kenya and Tanzania. However, in Uganda although efforts to popularize Kiswahili have been made, many people do not speak Kiswahili. Ugandans therefore, find it challenging to conduct business in the region and this limits the opportunity of getting employment in Kenya and Tanzania. Secondly, a country with more developed infrastructure such as communication network, industries and factories will benefit more in the REI and may dominate the regional markets.For instance, in the EAC, Kenya has a comparatively more developed economy than Uganda (EAC, 2012). It is evident that Kenyan institutions including banking, insurance and security have been established in Uganda. Banks such as Kenya Commercial Bank (KCB), Equity Bank, and security companies like G4S and Securex have branches in Uganda yet there are hardly any Ugandan institutions situated in Kenya. Additionally, supermarkets owned by Kenyans namely Uchumi, Tuskys, Nakumatt and Kenjoy have been set up in Kampala the capital city of Uganda and these sell products produced in Uganda and Kenya as well. Uganda basically exports produce to Kenya and on a small scale level and this minimizes profit. Further still, handicraft products from Kenya apparently dominate craft shops at the African Village craft center in Kampala despite the fact that Uganda has its unique handicraft products.

The question arises: Why is it easier to find Kenyan institutions and products in Uganda or why are Ugandan products hardly exported to Kenya? The answer may be related to the quantity and quality of services and products produced in both countries. Anecdotal data reveals that Kenyans offer better professional services and their industrial products are relatively of a higher quality. Also, Kenya has more industries and factories and therefore, produces products in larger quantities than Uganda. There is, therefore, a need for Uganda to develop her economy to counterbalance the economic predominance so as to profit

from the REI. This can be achieved by building a critical mass of skilled workforce with competitive knowledge, skills and attitude to manage production of goods and services. Such development can only be realized by provision of quality education.

Education System in Uganda

The education system in Uganda has gone through a series of transformations. Traditionally, there was indigenous education where elders taught young ones skills that enabled them become self-reliant and benefit the communities they lived in. Men taught boys skills such as hunting, farming and grazing. Women taught girls skills that included among others cooking, housekeeping and weaving. The learning was through practice and verbal instructions were given to a learner from a skilled master (Ssekamwa, 1997). Such learning helped with transference of skills from one generation to another.

However, during colonial days such indigenous education was not promoted, instead formal schooling was introduced. For example, the Castle Education Commission of 1963 abolished vocational schools like farm schools and home craft centers and put more emphasis and support on general secondary schools (Ssekamwa, 1997). Gradually, the society started to appreciate white collar jobs and developed a poor attitude towards manual work. To date, the education system continues to promote higher level of formal education geared towards attainment of certificates (Baryamureeba, 2014).With a curriculum that emphasizes linear progression, students have been conditioned to aiming at university education. This has led to an examination-oriented society that measures student's success basically through attainment of good grades in written examinations with minimal regard to acquisition of practical employable skills and competences.The tendency to promote such education is exhibited in the period when national examinations are released by the Uganda National Examinations Board (UNEB) for primary and secondary levels. During such times the media, both in print and broadcast, is filled with reports that reveal best students and best performing schools ranked according to district and national levels. The pictures and comments of best students and their parents or guardians are found on front pages of the local newspapers. Anecdotal data indicates that the time when national examination results for primary and secondary levels are released, newspaper sales are high. The schools, parents and students, therefore aim at excellent academic performance so as to draw the attention of the public through media. Such performance essentially involves learners memorizing and reproducing knowledge during examinations. Indeed, a learner does not have adequate time to reflect and relate confidently with the knowledge that is primarily passed on to him or her by a teacher. Ac-

quisition of practical skills and competences needed for creation of jobs that sustain and develop the country, is therefore, not given its due attention.

Consequently, learners who graduate from primary and secondary schools are in most cases unproductive and unable to become self-reliant. Higher education is equally affected. According to National Council for Higher Education Report (as cited in Eupal, 2014), many graduates from tertiary institutions lack employability skills due to a number of factors. Firstly, many of these institutions have programs that are not only irrelevant to the world of work but also too theoretical to develop required skilled labor force. Secondly, the curricula in many institutions are obsolete. Thirdly, learning in these institutions is predominantly geared to memorization of facts rather than promotion of critically thinking and employment of knowledge to solve life problems. Fourthly, these institutions are underfunded which hinders promotion and development of highly demanded courses that require a lot of financial assistance. Unfortunately, the report further indicated that a number of institutions that used to produce middle-level workforce for various professions has been reduced. And some of these institutions have been converted into poorly equipped universities that offer basically theoretical courses and inadequate hands-on training.

Employers justifiably complain about poorly educated graduates who sometimes have very good academic grades but lack employable skills required for jobs related to production of goods and for jobs in the social service sector. When goods and services fail to meet the consumers' expectation, opportunity for large labor markets offered through the REI scheme is minimized. This may be partly the reason for the increased unemployment among youths in Uganda. Kagolo (2014) reported that according to the World Bank Report of 2008, Uganda had the highest number of unemployed youths in the world, with 83 percent youth unemployed as per Africa Development Indicators 2008/2009.

Vocational Education and Training in Uganda

However, the country has for a long time realized the need for adopting an education system that empowers the learners with knowledge, skills and attitude that will make them employable.In 1987 National Education Policy Review Commission (NEPRC) was set up to review the education system in Uganda (Uganda Government [UG], 2001). This Commission recommended improvement and emphasis on vocational education (UG, 2001). Vocational Education (VE) can also be referred as Vocational Education and Training (VET), Technical and Vocational Education (TVE) or Technical Vocational Education and Training (TVET). Although there is various nomenclature for this type of education, TVET basically implies the education that focuses on equipping learners with knowledge, skills and attitude required in the world of

work. UNESCO and International Labor Organisation [ILO] (2002), refer to TVET as the aspects of the educational process involving, in addition to general knowledge, the study of technologies and related sciences, acquisition of practical skills, attitudes, understanding and knowledge relating to occupation in various sectors of economic and social life.

The NEPRC report translated into the Government White Paper of 1992 which made recommendations that included the following: 1) integration of technical and business education; restructuring of technical and vocational education to cater for vocationalisation from primary to tertiary levels of education; 2) establishing at least one technical school in each district; and 3) re-equipping technical and vocational institutions with tools, equipment, scholastic materials and training of technical teachers (UG, 2001). However, these recommendations were good ideas that could have led to production of graduates with employable skills but there are no tangible results yet.

The Business and Technical Vocational Education and Training [BTVET] Act of 2008 was another indicator for the country's desire to continue developing technical and vocational education training. The Act was based on principles and concepts of promoting an integrated, demand driven and competent based modular BTVET system. The system was to allow learners to enter at various points that suited their skills and needs. The Act also proposed establishment of a qualification framework based on defined occupational standards and assessment criteria for different sectors of the economy (MoE&S, 2008). Some progress in this direction has been realized because a Vocational Qualification Framework (UVQF) was put in place according to Ministry of Education and Sports [MoE&S], 2014). In 2011 the BVET Strategic Plan 2011-2020 final draft copy (known as Skilling Uganda) was released based on the progress of the BTVET Act of 2008. One of the objectives of Skilling Uganda was to strengthen institutional capacities for BVET provision and ensure that by 2020, 70 percent of the employers are satisfied with the competences of BTVET graduates (MoE&S, 2014).

The country is commended for its efforts in laying out strategies for VET. For example, the government has operationalized the Uganda Business and Technical Examinations Board (UBTEB) statutory instrument 2009 No. 9. This Board streamlines, regulates and coordinates examinations and awards in the business and technical profession in Uganda. The government has also set aside two trillion shillings (equivalent to 800 million USD) to help increase skills development and certification for learners under the Skilling Uganda program (Alupo, 2014).

However, since the program was initiated, the implementation of the Strategic Plan has not taken giant steps. For example, the VET institutions still remain few in the country. The Uganda National Development Plan (2010) revealed that

there are about 1000 VET institutions of which 600 are registered by Ministry of Education and Sports and only 137 are owned by the government. Presently, not much has been achieved regarding establishment of more VET institutions. The limiting factor has been that these institutions require substantial funds for establishing and operating them (Okinyal, 2006). In addition, VET still lags behind and continues to take a second-tier position among the public. The government has continued to promote academic secondary school education by introducing Universal Secondary Education (USE) while Universal Vocational Education is still to be established. Furthermore, the government has continued to promote science-based subjects at the expense of arts-based subjects. This underscores the contribution of the arts to the economic development of the country especially in service sectors like business, banking, hospitality and tourism. In the 2014/2015 budget, the government pledged to establish a loan scheme for tertiary institutions which will benefit students mainly in universities and not in vocational training institutions.

It has also been noted that courses offered in VET institutions are generally obsolete. Also, incorporation of information and communication technologies (ICT) in the learning has been limited by lack of adequate computers and trained personnel for computer studies. The institutions also lack well trained teachers or instructors with up-to-date technologies and the appropriate vocational pedagogical skills that can enable them to equip learners with adequate knowledge and skills required in the world of work (Nalumansi et al, 2002 & Arinaitwe, 2014). Also, the number of students enrolled in VET is comparatively low and does not enable production of a critical mass of professionals required. This is partly attributed to the public attitude which has continued to view VET as a second-tier offering left for the "academic failures", school drop-outs and needy children (UGAPRIVI, 2004).

The curriculum in these institutions has continued to limit hands-on training. This has been attributed to the fixed and structured nature of programs and the expenses involved in offering practical training. In addition, financial constraints have led to reduction in time allocated for practicum, industrial training or internship in many institutions. Yet, this time offers valued experience for students to put the theory into practice and familiarize with workplace operations that develop their practical skills.Also, some employers are reluctant to offer their premises for learning experiences since many students are not conversant with the operations of the workplaces.

Appropriate TVET learning caters for the development of both soft and hard skills. However, it is reported that many graduates have very good academic certificates and may possess the required hard skills but lack soft skills. Hard skills refer to personal knowledge and occupational skills required for a given trade or profession whereas soft skills are concerned about how well a

person relates with other people (UDEP, 2014). Examples of soft skills include empathy, time management, hardworking, dependability, adaptability and effective communication skills. Ideally, every person who possesses good academic grades, should relate well but the prevalent aberrant behavior of workers towards their clients, customers, colleagues, supervisors reveal that soft skills are neglected in VET institutions. Soft skills are becoming increasingly more important as enterprises struggle to discover more avenues to remain competitive and be more productive (UDEP, 2014). The methodologies used in teaching and learning in many educational institutions emphasize individualism and competition and do not promote acquisition of major soft skills. Arinaitwe (2014) noted that methodologies that involve team work, problem solving skills and critical thinking develop soft skills. For example, communication skills are developed if learners are given opportunity to interact with knowledge through creative and critical thinking and enable verbal and written expression. The learners need to be given practical activities and expected to write reports about what they have done. Teamwork offers learners an opportunity to become active listeners and articulate themselves ably, develop conflict resolution skills and promote cooperation with others.

Therefore, when the country's education system does not adequately address VET its graduates will continue to struggle for employment and the country's economy will continue to suffer. Institute of Public Policy Research[IPPR] (2014) confirmed that many jobs expected to drive the economic growth and mobility in future will not necessarily require traditional academic education pathway, and VET can open doors to endless array of careers. Also, according to Hardisty, Jones and Murray (2013) most of the top jobs of the future will be attained through vocational qualifications. On the other hand, when VET is adequately integrated in the education system, highly skilled workforce will be produced, capable of being innovative, producing quality goods and offering quality services. Thus, the country will grow economically and the regional economic integration will become a profitable venture for Uganda.

Recommendations

The Government through MoE&S should increase number of VET institutions to cater for the needs of middle-level personnel for various trades, occupations and professions. Also, MoE&S should ensure that the curriculum in VET institutions is market driven and include adequate apprenticeship and on-the job training that facilitate workplace learning. Practicum, Industrial training and internship that support young peoples' transition to employment should be accorded more time than is currently allocated. Furthermore, trainers in the VET institutions need to be equipped with appropriate vocational

pedagogy through retraining and refresher courses to enable them train learners using modern methodologies and technology.

The curriculum scope in the VET institutions should be made broader to allow acquisition of knowledge and skills in a variety of vocational trades other than the traditional courses. Thus relatively new fields such as fitness training, floristry and hair dressing should be introduced in the VET curriculum. Activities that are apparently unique to Uganda, based on its cultural settings, need to be promoted in VET institutions. For example, weaving using the available local materials like banana fibers and papyrus, and backcloth making need to be done professionally to meet customers' expectation so as to compete on the international market. Efforts to teach Kiswahili as a language should be strengthened to break the communication barriers of Ugandans with other people in the EAC scheme.It has been noted that VET is a costly venture, however, the value of a highly qualified competitive skilled workforce with market-driven technical and social skills can outbalance the training costs. Such a workforce will certainly contribute greatly to the economic development of the nation and make REI a profitable venture.

Conclusion

The paper highlighted the important role that skilled human capital has in the regional economic integration. Therefore, countries like Uganda should promote vocationalization of the education system by effectively implementing the strategies put in place so as to benefit from regional economic integrations they subscribe to.

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The Potential of Vocational Pedagogy in Vocational Education and Training Education

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Abstract

Fifteen masters in Vocational Pedagogy thesis abstracts of researches done were analyzed by collating their purposes and findings. The findings indicated that training methods used in many institutions lacked vocational didactics. Training institutions had established frameworks, but needed to be flexible, adaptable and interact more with diverse skills needed in workplaces. Although, vocational programs for people with special needs equipped learners with survival skills but the attitude and empathy of tutors were essential. Training that required exertion necessitated female trainers as role models for female trainees. The hall marks of indigenous knowledge of doing, interaction with others, actual demonstration and verbal instruction with skills masters were found to be similar to components of vocational didactics and could therefore complement vocational training.

Key words: Indigenous knowledge, skills, Training methods, Vocational didactics and Vocational pedagogy

Introduction

The UNESCO Report (2012) addresses the concerns about the education of youth which requires them to have transferable skills or preparation for the world of work. Employers want to see young people who are applying for jobs having foundation skills, capable of deploying knowledge of solving problems, taking initiatives and communicating with team members rather than just following prescribed routines. These "transferable skills" are not taught from a text book, but can be acquired through good quality education and training.

Prior to independent Africa, Castle (1960) gave a cue on the opportunities and responsibilities arising for the peoples of independent Africa. Castle

(1960) noted the need for children to be helped to cultivate a right attitude to work. He also pointed out that in a healthy community all kinds of work are necessary and should be respected; manual, brainwork, clean and dirty work. He further stressed that teachers must eliminate what he called job 'snobbery' which, he described as a notion that some jobs are nice and clean and therefore worth doing, and some are dirty and therefore not worthy of respect. He advised that the doctrine teachers must preach and practice is that the jobs unworthy of respect and not worth doing are those which bleed society and do not feed it, giving an example of organizing pool. He also pointed out that job snobbery is poison in any community, a destroyer of proper values in community living and a misdirection of the aspirations of the youth. Lastly, he warned that there should be no jobs in the home, school, office or workshop that are not worth doing, and one way for teachers to help is to be willing to perform with their pupils any job clean or dirty, manual or clerical, that has to be done and has value in the community.

Bamutire (2013) studied work life and found that virtues of integrity cultivated right from early age at home and school, flexibility, creativity and patience to start small and grow over time were essential in starting and running a small or medium enterprise. Therefore, there is a requisite work culture for greater productivity. Rwothungeyo (2014) quoted a Ugandan executive as follows, 'We are increasingly seeing people with very good grades on their academic documents, but when it gets to the work place, they are not able to deliver or they have deviant conduct.' Also, the emerging global village is creating a wider challenging context for teachers or training institutions as far as work culture is concern. Too often society picks up the bad practices from across the world and ignoring the good ones. There are many good virtues in the West for example that are ignored, such as meticulous planning, time keeping, hard work, discipline, and saving (Sunday Vision, 2014).

Therefore, there is great need to understand the work dynamics and demands at places of work as they impinge greatly on the content and training approaches or methods in VET programs. Vocational Pedagogy as a field of knowledge oriented towards trades, occupations and professions has the potential not only for producing personnel for VET institutions and VET policy formulation and monitoring, but also for generating knowledge regarding labor markets or work places, labor productivity and training principles. This paper contributes to the perception on training methods for skills acquisition for societal productivity and transformation. The information is based on the findings of the Masters in Vocational Pedagogy researches at Kyambogo University, 2010-2013. Eight themes were identified for these researches.

Pedagogical Approaches in Practice

Ajambo (2013) assessed the impact of pedagogical strategies used by extension service providers on household food security in Karamoja district, Uganda. The results showed that global acute malnutrition (GAM) and severe acute malnutrition (SAM) rated according to weight for–height, z–scores had reduced from 22.5% to 9.5% and from 5.5% to 1.8% respectively within a period of eight years as a result of the training. However, the methods used for training were inadequate and did not bring out the desired outcomes. The tools and materials used during training were inappropriate and greatly affected the implementation of food production activities. The trainers were not competent to deliver crop production content to the households. Thus, Ajambo recommended that communities be empowered through group based learning, establishing health information systems that go up to house hold families (manyatta), empowering women with cross cutting gender issues and incorporating crop production knowledge and practice in training packages for trainers.

Aninge (2013) reviewed pedagogical principles and practices in the health professionals training institutions in Uganda and in particular the vocational didactics used in the institutions and the link between training and work place learning also known as industrial training. The study found that in all institutions the training had all the three components of vocational didactics namely, vocational theory, general education and practical instruction and learning. The practical sessions were performed in real life situations although the time spent in practicum sessions varied significantly across the institutions. Assessment was done at least twice in a semester in all the institutions. However, students were not involved in the assessments of their work. Students worked in groups on the practical work and the supervisors were comparatively fewer than the students. Communication during training instruction was verbal as well as in written forms. Most students found it easier to communicate with their tutors but found it hard to communicate with their mentors at the practical sites of training. Besides, there were no written manuals or instructions to help with the practical tasks. Most institutions had more male than female students in the classes. Aninge recommended more time for practical work to enable students master practical tasks; involvement of students in evaluation of their work; greater motivation of tutors/instructors; further recruitment of tutor to build up supervision capacity and training the tutors in pedagogical approaches. There was also need to reward students adequately for quality performance. The mentors at the practical sites need to be continually trained to meet students' training demands. The institutions need to always consider gender balance in the recruitment of students as well as tutors.

These findings point to the inadequacy of training methods used which do not bring out the desired outcomes. The tools and materials used during training were inadequate and in some cases inappropriate and therefore greatly affected training outcomes. On the other hand, in health training institutions the training had all the components of vocational didactics of vocational theory, practical instruction and general education. The practical sessions were performed in real life situations with students working in groups. However, the supervisors were few compared to the number of students and while students found it easy to communicate with their tutors, they found it hard to communicate with their mentors at the practical sites.

Country Cases

Badinga (2013) examined how Vocational Education (VE) was affected in South Sudan by the civil war from 1983 to 2005. A case study was conducted with the Multi-service Training Center located in Juba and was founded in 1973. The study found that damage to the infrastructure and the after math of the war led to neglect of vocational education and training in the country. Also, there were many gaps in the progress of VET namely, lack of a policy on VET, lack of a national curriculum and lack of motivated instructors. VE was run by non governmental organizations (NGOs) while government mainly coordinated various activities in the field of VE. The study recommended that South Sudan needs to develop a VET policy and a national VE curriculum.

Formal VE and Work Life

Bamutire (2013) studied the interplay between learning and work life experiences, taking a case of job creation by small and medium enterprises (SMEs) in Kampala, Uganda. The study sought to understand the learning experiences among people who have set up SMEs and how such experiences impact on one's ability to create and sustain employment thereby contributing to the reduction of unemployment. The study showed that one does not need to have technical knowledge to be able to start an enterprise but rather, much can be accomplished through cooperation or learning from others. The study further pointed out that some enterprises developed from peoples' hobbies, even without prior initiation to turn them into enterprises. However, creativity and putting into practice the knowledge acquired were very important in creation of employment. Those intending to start enterprises need to start early when they are still young and energetic as starting an enterprise is very demanding. The study also found that education was very important in job creation, even in cases where there are those who use skills acquired from elsewhere other

than from school. Other essential virtues the study highlighted included integrity cultivated right from an early age at home and in school, networking and social skills, paying attention to gifting and hobbies that can reward ones career and flexibility particularly among the educated class, and patience to start small and grow over time. Bamutire recommended that learners should not only be equipped with technical skills, but also with social skills, creativity and critical thinking.

Therefore, according to the study a great deal can be accomplished through cooperation or learning from others. An individual can form an enterprise using his or her hobbies. Creativity and putting into practice the knowledge acquired and essential virtues are very vital in developing and maintaining an enterprise.

VET and the Labor Market

Barnaba (2013) investigated the effectiveness of health care training to the nursing job market in Yei River County, South Sudan. The study focused on the didactics of training, practical and general knowledge, work related learning, experiences of the employed and unemployed nursing graduates of Yei National Health Training Institute. The findings indicated that the training content and methods used by the institute were appropriate and provide nurses with working knowledge and competence. And there were opportunities for the nursing graduates to be employed.

Kikomeko (2013) examined the state of Uganda's formal VE in the field of electrical engineering and the degree to which it meets the prevailing labor market requirements. The findings indicated that the institutions operate in isolation from the world of work and are not well equipped. Thus the training in the institutions is theoretical with negligible hands-on learning. Besides, the curriculum used was outdated and did not adequately match the labor market requirements of an electrician of the day.

Kyahurwa (2013) assessed the mode of vocational education and training in clothing and textiles in relation to the clothing and textiles labor market in Uganda. Findings showed that training involved practical skills, theory and general knowledge. Coverage consisted of 60 percent of vocational practice and vocational theory and 40 percent general knowledge. However the training was found to be out of context with the labor market. The potential employers had little or no stake in the development of the training programs. Consequently the graduates turned into job seekers in spite of the training they had received. Moreover, 40 percent of the graduate respondents in the study were employed outside the clothing and textile industry. The study therefore recommended that although vocational theory and practice were embedded in the training program there is need for the programs to be work-related.

Mugoya (2013) assessed university hospitality curricula ad the skills demanded by the industry. The study found that although the aims and objective of the training programs reflected the competence desired by the hospitality industry in practice there was a mismatch between the training and what the industry desired. While the industry desired graduates with practical skills or hospitality craft skills, universities produced graduates with more of wide knowledge and managerial skills. The study also revealed that contrary to the industrial expectations, theoretical straight lecture methods during the training took 65% of the study time and only 35% of study time was allocated to practical work. Also, the industry regarded attachment period of three months to be too short to provide learners with meaningful industrial experience.

Nakyobe (2013) investigated whether training in middle level hospitality training institutions in Uganda met the needs of the labor market in the hotel sector. The findings indicated that hospitality training institutions lacked adequate facilities to train and equip learners with the knowledge, skills, attitudes and values needed in hotels. Inadequacies were found in the training curricula, tools, equipments, materials and linkages between the training institutions and the hotels. The training methods were more of teacher-centered rather than learner–centered. Where industrial training or attachment was undertaken, it was at the end of the training and for a short period of 3-4 months. The assessment was mainly through examinations with no consideration of the learners' progression in practical activities. Hence, there was need for institutions to strengthen practical aspects of the training and to strengthen their linkages with the industry.

Tusiime (2013) assessed the relevance of knowledge and skills acquired by vocational education and training graduates in the field of art and industrial design at Kyambogo University in relation to the changing requirements of the labor market in Uganda. The findings revealed a mismatch between the knowledge and skills acquired by graduates and those demanded on the labor market. Tusiime concluded that practical skills gained by graduates tend to remain on the level of theoretical learning since the methods employed in teaching and learning do not emphasize the hands-on pedagogical approach of learning in relation to the world of work. Hence, there was need to provide learners in institutions with hands-on training.

These studies corroborate that a mismatch existed between what the students learnt in vocational training institutions and the knowledge and skills demanded in the world of work. These studies also confirm the existence of curricula in the institutions, teaching of vocational theory and giving of practical work, although the practical time given was inadequate. Perhaps, it needs to be noted that training institutions work in set time schedules, human resources, as well as capital resources. However, the call is for flexibility and col-

laboration with the world of work to give knowledge and skills to students that ease their absorption into the world of work. On the other hand Yei National Health Training Institute in South Sudan stands out. At the institute, it was found that the training methods used at the institute were appropriate to provide nurses with working knowledge and competence for the nursing graduates to be employed.

VET and Special Needs Education

Chebet (2013) examined experiences of learners with visual impairment in VET training institutions with regard to special devices used to enhance learning for persons with visual impairment and curriculum offered to learners with visual impairment, pedagogical approaches used and attitudes of teachers and instructors towards learners with visual impairment. The study was carried out in two VET institutions for the blind. The findings revealed that the institutions lacked sufficient special devices that could enhance learning for persons with visual impairment particularly due to limited finances. The curriculum followed at the institutions was basically to equip the learners with skills to enable them live independently. However, the curriculum was outdated and needed review. The teaching/learning activities included vocational theory, vocational practice and general knowledge. The approaches used to train learners were mainly group work as well as individual learning depending on the activity being handled. The teachers were found to have a negative attitude towards learners with visual impairment and lacked the skill to train them.

Draji (2013) investigated the sensitivity of vocational education institutions to the needs of learners with physical disability. The study was carried out at Ocoko Rehabilitation Center in Arua, Uganda. The findings indicated that the vocational education curriculum consisted of training in leather work, tailoring, knitting and weaving, carpentry and joinery and metal work and it was relevant to the needs of the learners with physical disability and the world of work.

The learners were able to learn any one of the subjects in the curriculum depending on their individual choices and abilities. Both vocational theory and practice were taught. However, teaching materials were in short supply across all the subjects and reduced the effectiveness of the curriculum. Also, there were no professionally trained teachers of special needs education at the center which impacted negatively on the learning processing of the learners.

The two studies corroborate on the two curricula offered that the curricula were meant to equip the learners with skills to enable them live independently. In both curricula vocational theory, vocational practice and general knowledge were given. However, the curriculum for the visually impaired was found to be out dated and needed review. The curriculum for learners with physical

disability was relevant to the needs of the learners and the world of work. The two studies also corroborate on the inadequacy of the teaching materials. The inadequacy reduced the infectiveness of the curricula. Besides, there was lack of trained tutors with necessary attitude and empathy towards the learners.

VET and Gender

Turyamwesimira (2013) investigated girls' participation in wild life training in Uganda with a specific focus on Uganda wild life training institute in Kasese. The findings established that the main motivation factor for students on the program of study was their love for wildlife. There was no gender bias by instructors at the institute although there was a large number of male than female students. The study found that female students lacked confidence in practical and science subjects. Also, female students showed weakness in activities that required a lot of muscle exertion such as military training and long distance expeditions. The disparities in participation between male and female students in training activities affected the performance and final awards of female students. Participation in wildlife training programs remained asymmetrical due to the disparities in participation between boys and girls. Lack of female instructors as role models, inadequacy of training materials as well as socio-cultural factors and lack of career guidance from parents or guardians did not favor female students' participation. Thus, there was need to employ more women instructors to act as female role models and provision of scholarships for girls.

The findings of this study established that the main motivation factor for the students on the program was their love for wild life. There was no gender bias by instructors. However, the study found that female students lacked confidence in practical work and science subjects and they showed weakness in activities that required a lot of muscle exertion such as military training and long distance expeditions. The disparities coupled with lack of female instructor role models affected the performance and final awards of female students. The negative social cultural influence on female participation in such programs and lack of career guidance need to be addressed.

Vocational Pedagogy and Adult Community Education

Kulabako (2013) assed the occupational skills training provided by the Department of Adult and Community Education at Kyambogo University. The study examined the possible competence gaps in respect to practical performance of tasks by the graduates, the training curriculum provided by the department and the pedagogical approaches employed by the teaching staff. The findings showed that graduates were not able to perform well during practical tasks ap-

parently because the training was theoretical even on aspects that should have been practical. The courses in the curriculum were relevant although the curriculum lacked ICT which facilitates their performance in workplaces. The main approach used by the teaching staff was the lecture method and to a small extent, group tasks and field placement were used during the recess terms. The study concluded that the training program was relevant to the activities graduates participated in while at work. However, the theoretical mode of teaching had short comings in terms of equipping graduates with relevant skills required by the labor market. On the whole although the program was relevant to the activities the graduates performed at places of work. It was inadequate in vocational didactics that would enhance skills acquisition.

Vocational Pedagogy and Indigenous Knowledge

Ogwang (2013) carried out a study aimed at describing and analyzing the modes of transfer of indigenous fisheries knowledge and skills among the fishing community of Kigungu landing site on Lake Victoria in Uganda. The study also examined how the local knowledge held by the fishes about the ecology of Nile Tilapia and Nile Perch fishes in Victoria compared with the existing ecological scientific literature on fishes. The study also aimed at determining the gender characteristics and roles in fishing, pedagogical principles and modes of learning in the fishing vacation. The findings revealed that the fishers comprised of only males while a few women provided employment and auxiliary services to fishers. Both male fishers and the women were youths. The trainers of the vocation were close relatives and the fishers joined the vocation at early ages ranging from 10 to 30 years of age. Learning was by doing and interaction with others assisted by actual demonstration and verbal instructions from skills masters. Fishers used celestial bodies and land objects to trace their way in the water. Local ecological knowledge held by most fishers were in agreement with available scientific literature about the fish species except in the case of the reproductive biology of Nile perch the fishers had not grasped very well. The study highlights the contribution of indigenous knowledge and pedagogy could make to the formal training of vocational fisheries and in the management of fisheries resources.

The learning in indigenous knowledge as established by the study was by doing and interaction with others assisted by actual demonstration and verbal instruction and discourse from skills masters. Fishers used celestial bodies and land objects to trace their way on the water body. The fishers also had local ecological knowledge about the fishes. These aspects in a way were similar to the components of vocational didactics of vocational theory, vocational practice and general knowledge. Ogwang believes indigenous knowledge and

vocational pedagogy could complement each other in the formal training of vocational fisheries and management of fisheries resources.

Conclusion

On VET and the labor market, there are inadequacies in training methods that do not bring out the desired outcome. The training approaches lack the good mix of vocational didactics components of vocational theory, vocational practice and general knowledge. Besides, the inadequacy of tools and training materials are a great hindrance to achieving the desired products. On the other hand, employing vocational didactics components provide working knowledge and competence. There are virtues that are essential in work life that helps the graduates to relate well with others. In many vocational institutions a mismatch existed between what the students learn and the knowledge and skills demanded in the world of work. Although institutions work in set schedules, human and capital capacities, there is need for flexibility for students to interact with the diversity of skills needed in the world of work. Vocational programs for persons with special needs should equip learners with skills that enable them live independent lives or get paid employment. However, vocational curricula ought to be supported by appropriate training approaches and empathy of tutors or trainers. Gender bias does not feature in vocational training. Nevertheless, vocational training that requires exertion may necessitate female trainers who would be role models for female trainees. Doing and interaction with others assisted by actual demonstration and verbal instruction and discourse from skills masters are the hall marks of indigenous knowledge. These hall marks are similar to the components of vocational didactics namely vocational theory, vocational practice and general knowledge. Therefore, indigenous knowledge and vocational pedagogy could complement each other particularly in community vocational training programs, such as apprentices.

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The Gender Gap in Technical and Vocational Education: Perspectives from South Sudan

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Abstract

This paper presents an overview on access to TVET in South Sudan. The specific objectives of the study were to: 1) take stock of the enrolment of male and female students registered for the training programs in the centre; 2) examine the range of programme options offered at the centre, and 3) establish the key determinants of effective female participation in TVET. The study employed the descriptive research design and collected data using documentary sources and Focus Group Discussions (FGDs). The findings revealed that female students constituted 29% of the total student population at the college. There is need to establish laws, policies, and systems, which focus on expanding the TVET curricular, so as to increase employment opportunities for both men and women.

Key words: Gender stereotypes, Technical and Vocational Education, South Sudan, Globalisation, Social context

Introduction

In most developing countries, the daunting realities of a century characterized by worsening hunger and unemployment among others, have placed humanity at crossroads and created an urgent demand for a new form of skills to meet the social and economic needs of society (UNESCO, 1999). In a recent NEPAD and AU Draft Report on Uganda, for example, it was documented that the youth who constitute a substantial section of Uganda`s workforce lack appropriate knowledge and skills. The report identified skills deficiency as the major drawback for the youth to tap into the opportunities offered by both traditional and emerging sectors on Uganda`s labor market, and concluded that "education and skills development were yet to have meaningful impact on Job Creation"

(Asiimwe, 2014, p.5). This scenario, typical of most African countries has ushered in a renewed emphasis on the role of Technical and Vocational Education and Training (TVET). This is evidenced by the significant involvement of international bodies such as United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Labor Organization (ILO), The World Bank (WB), the European Union (EU), the European Training Foundation (ETF), and various Regional Development Banks, which are funding and supporting the reform and establishment of TVET in developing countries (Volkoff & Perry, 2001).

Technical and Vocational Education and Training has been defined as the educational process which in addition to general education, involves the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge related to occupations in various sectors of the economy (UNESCO & ILO, 2002). It is important to note that in purely Technical Education (TE), the preparation of students tends to mainly focus on jobs involving applied science and modern technology. The understanding of basic principles of science and mathematics are therefore, a prerequisite for enrolment on technically oriented programs. On the other hand, the focus of Vocational Education and Training (VET) is mainly to prepare learners for jobs based in manual and practical activities (Haruna, 2013), notably in the informal sector, where majority of the workforce in developing countries ekes a living. This gives TVET even a broader definition including, but not limited to on-the-job training, and apprenticeship, which can be delivered in both formal and non-formal settings (ibid. 2013).

In line with the broader perspective, TVET has been associated with lifelong learning, responsible citizenship and ultimately accountability. This thinking is widely documented in several UNESCO reports, prominent among them, the Final Report of the Second International Congress on Technical and Vocational Education (TVE) which was held in Seoul, Korea, in April 1999. The Congress observed that the emerging challenges of the twenty- first Century require a new paradigm shift towards human development. The report accordingly positioned TVET as an integral component of lifelong learning and a critical form of education for churning out technical workforce, which is indidpensible for achieving sustainable economic growth and development (UNESCO 1999).

A flashback in the history of most developing countries, as documented by several scholars (Hartl, 2009; Nyerere, 2009; Eichhorst, Rodriguez-Planas, Schmidl & Zimmermann, 2012; Idris et al, 2012) however, shows that TVET which is now being viewed through a 'rose-tint' has been an insignificant subsector that has suffered decades of utter neglect, little attention and budget provision. This has over time resulted in poor infrastructure and facilities, low en-

rolment, and a low status of TVET. Indeed to date, despite the numerous efforts to 'vocationalize' the schooling system, TVET in most developing countries is still seen by many parents and students as 'a second-class education', associated with those who have failed in academics. Nevertheless, with the tremendous reduction of the public sector and the resultant mass of unemployed youth, it is evident that developing countries cannot afford to entertain such negative attitudes towards TVET. However, as many countries turn to TVET as an educational strategy to prepare their young workforce for the ever increasing competitive global market, it is important that governments of developing countries take cognizance of the above historical facts and design sustainable strategies of popularizing TVET. Among other strategies, the quality of the technical and vocational education offered must remain the key focus on the agenda.

Based on the forerunning discussions, the authors contend that developing countries cannot, therefore, talk of sustainable development and poverty alleviation when the majority of their population, namely, the youth and women are either out of school or do not have the requisite skills to participate productively in the economy. This perspective is supported by Hartl (2009), who argued that enhancing the employability of deprived youth and rural poor, in particular women, is a prerequisite for mitigating the risk of further poverty and marginalization. In view of the above facts, as TVET ascends the hierarchy on the agenda of many developing countries, it is important to maintain focus on the major objective of TVET, i.e. to produce competent and innovative citizens, who are able to create their own jobs and contribute effectively to the development of their countries. In this regard, what is being taught in TVET institutions and how the teaching and learning is conducted are critical in achieving this objective.

With regard to gender, whereas the statistics in many developing countries have shown marked improvement in female enrolment in general education, the same studies continue to draw attention to the dismal number of females enrolled in science based programs in secondary schools, universities and other tertiary institutions (Bazikamwe, 1999; Egun & Tibi, 2010; Kwesiga, 2002; Mulemwa, 1999; Okello, 2011). A number of reports focusing on TVET institutions also agree with the above studies. A number of reports focusing on TVET institutions also agree with the above studies. The Uganda Bureau of Statistics (UBOS) for example, reported that out of the 3,250 students registered in the five technical colleges in the country, 2,914 (90%) were males and 336 (10%) were females (UBOS, 2012). The situation in the Republic of South Sudan is even more worrying. According to the UNESCO (2011) Global Monitoring Report Policy paper, the country is projected to have some of the world's worst indicators for education. Statistics on the net enrolment in primary and secondary education placed South Sudan as second-to-bottom and

bottom respectively, in the world ranking. The report identified girls as most vulnerable, as they were less likely to enter school, and more likely to drop out before the last grade of secondary education. As for enrolment in vocational education, the magnitude of the challenge does not appear to be clearly documented (Atari, Abdelnour, Mckague & Wager, 2009). This paper, the authors hope, will render a modest contribution towards filling this gap.

Methodology and Data Sources

The authors used the descriptive study design to take stock of the enrolment of students for the different programs at Don Bosco Vocational Training Center. Don Bosco was chosen because it has a variety of trades and it attracts learners from all the three counties in the Western Bar el Gazal State. In addition, out of the eleven (11) vocational training centers in the State, Don Bosco has a longer history of existence. The researchers therefore, believed that the data obtained from this institution would give a broader picture of what may be happening in the whole State. Sex disaggregated data were collected from documentary sources, that is, records from central registry and class registers. In addition, two separate Focus group Discussions (FGDs) were held with the continuing students, one with the females and the other with the male students. All those interviewed were in their final year, albeit from different program options. Both the numerical data and responses from FGDs were analyzed descriptively using bar graphs and frequencies respectively.

Results

Programs offered and student enrollment

There were a total of seven (7) programs offered at Don Bosco Vocational Training Center. The overall college enrolment was 1255, out of which 892 (71%) were male students and 363 (29%) were females. Figure 1 clearly shows that the most popular program options/trades which registered the highest number of both male and female students were computer and electricity. The least popular subject options among female students were Masonry and Auto Machine, while the male students seemed to shun Printing and Welding. The general enrolment pattern in the specific trades clearly indicated considerable lack of progress for females in traditional technical programs such as, auto machine, wood work, masonry, carpentry, and welding. These options are still largely dominated by males as shown clearly visualized in the figure below:

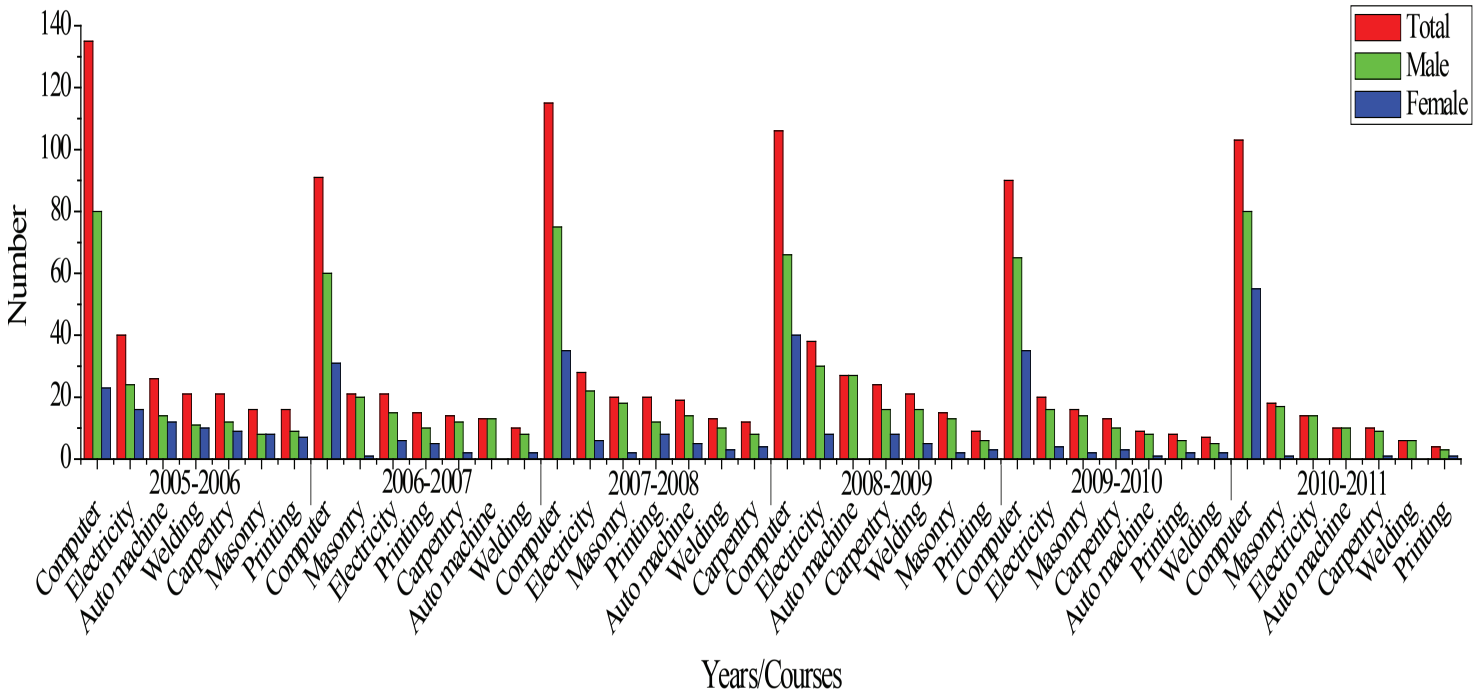

Figure 1. Programs offered and enrollment from 2005 to 2011

Findings from FGDs

In an attempt to establish the factors that influenced the effective participation of females in TVET programs, students were asked to give their views on why there were more male students enrolled in the college. The Table below gives a summary of the findings:

Table 1: Determinants of Effective Female Participation in TVET

Response From Female Students	Response From Male Students
Paying school fees is a problem – boys are favored in families more than girls, especially when it comes to education. Parents prefer to pay for boys and encourage girls to get married.	Generally in our families, girls' education is not considered a priority.
The tools are very old - boys are physically strong so it is easy for them to do the hard work.	Culture and beliefs of the community, which look at TVET as fit for men.
Getting a job is difficult – men think women are weak.	Boys usually get better job opportunities - few men can work with girls in welding or construction sites
Lack of transport to the institutions – the college is far from home and it is hard for girls to walk long distances.	Girls are weak naturally- they cannot manage hard work like building.

Discussion

The overall picture got from the field data as exemplified by Figure 1, seems to concur with the discussions hitherto noted in the literature that female enrolment rates in TVET are generally lower than that of males (Egun & Tibi, 2010; Hartl, 2009; Okello, 2011). Responses from the FGDs, on the other hand, seemed to indicate that students' choice of programs is regulated among others by the labor market and the gender dynamics within the specific social context. A careful analysis of the programs offered at Don Bosco (see Fig.1) further reflects the rigidities in the TVET education system, evidenced by the programs offered in the training institution, majority (71%) of which still represented the traditional occupational patterns. The only program that reflected the new trends in the market was Computer, and the large numbers of both females and males registered for this program clearly points to the need to

identify and incorporate new market driven training programs in TVET institutions. The data therefore, concurs with the debate that gender stereotypical programs tend to restrict females to a limited range of occupations, "thus limiting their employment options, economic returns and longer term career development" (Hartl, p.4).

Similarly, it is imperative that governments, particularly those in developing countries, urgently expand the labor market to include sectors which offer gainful employment for both females and males. The World Bank, FAO, IFAD (2008) for example, argues that women have a high inclination to pursue micro-enterprises and homestead farming activities. All these and other unexploited sectors of the economy like tourism and hospitality offer a rich milieu which TVET institutions can take advantage of.

The data documented in Table 1 further revealed that the social context of the Republic of South Sudan is still typically patriarchal, characterized by wide spread gender stereotypes. Human beings, as argued by the social constructionist theory (Vygotsky, 1978), are social beings, whose interaction with the social, the cultural and historical aspects of a society, are fundamental in understanding the choices of specific people. It follows that girls and women tend to be marginalized and hence live unproductive life in societies where the social context focuses on emphasizing the differences between men and women (Kwesiga, 2002). Whereas it is true that individual families may have the liberty to make choices concerning their children's education, such choices can have strong economic impacts on the country through the resultant "increase in total factor productivity and improved livelihoods" (Hartl, 2009, p.5). The role of government is therefore, fundamental when it comes to the establishment of laws, policies, and systems for critical sectors of the economy, like education. This is an imperative for the Republic of South Sudan, a country characterized by lower levels of literacy (UNESCO, 2011).

Responses from female students during the FGDs also featured poverty and early marriages as some of the challenges holding back progress in girl child/female education. This in essence implies that there is a link between poverty reduction and increased rates in female education. With improved livelihoods, and increased household incomes, parents may not look at marrying off young girls as an immediate option, thus increasing their educational life span. The current thinking is that in terms of economic growth in general and pro-poor growth in particular, women should not be seen as a marginal group of interest but as a priority group for human capital development (World Bank 2000a, b). This is in congruence with the human capital theory which projects a better educated and skilled labour force as having a higher productivity (Atchoarena & Gasperini, 2003). This calls for an aggressive campaign and sensitization of the population, as well as continuous and consistent government support and

investment in TVET and general education.The introduction of parallel support activities in schools and communities as suggested by some scholars (Fawcett & Howden, 1998), may also offer a worthwhile strategy to address barriers to the effective participation of females in both general education and TVET.

Conclusion

A careful analysis of the programs offered at Don Bosco VTC reflects the existing gender disparities, which could in part be attributed to the rigidities in the TVET education system and the patriarchal social context. The study has demonstrated the need to develop new training courses to address the changing market needs and emerging sectors of the economy.This is seen as a strategy that would increase the employment options for women and youth who constitute the largest number of the informal sector workforce in most developing countries, South Sudan inclusive. Given the historical disposition of TVET in most developing countries, the authors conclude by noting that unless there is sincere and consistent commitment by governments to supporting the current initiatives in TVET, the beautiful catch word 'sustainable development' will at best remain a fallacy of generality.

Acknowledgements

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The Relationship Between Cognitive Entry Characteristics and Academic Performance: A Study of Ugandan Technical Diploma Programs

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Abstract

This paper presents results of an investigation into the relationship between cognitive entry characteristics and pass rates in National Diploma in Engineering programmes in Uganda. The August 2012 entrants were divided into two groups: Uganda Advanced Certificate in Education entrants, and Advanced Craft certificate entrants. The pass rates of the groups were compared by frequency analysis. The groups were further divided according to the candidates' entry grades, and the pass rates of the subgroups compared. It has been found that Advanced Craft entrants perform worse that A-level entrants, and that the better the entry grade of an entrant, the less the chances that he will get retakes. It's recommended that the Advanced Craft curricula be modified or the entry qualifications for the group be raised.

Key words: Low pass rates, Cognitive entry characteristics, Advanced Level Certificates, Advanced Craft Certificates, National Diploma in Engineering.

Introduction

Over the last decade, the government of Uganda has prioritized science, technical and vocational education. It is committed to "utilize Technical and Vocational Education and Training (TVET) as an instrument for empowerment of its people through acquisition of appropriate portable skills at all levels of training" (Lugujjo, 2003, p.2). Science students began to enjoy priority in the award of state scholarships in 2004; specialized examination boards for technical and vocational programs were created in 2010; the curricula for the pro-

grams were comprehensive reviewed in 2011; and the BTVET strategic plan, Skilling Uganda, was launched in 2013.The government is determined to increase the number of skilled technicians and craftsmen, a labor category considered "essential for a vibrant innovation system" (Uganda National Council of Science and Technology, 2012).

The public seems to be embracing government's priorities. A 2013 study done in Uganda found that there was a positive attitude to technical and vocational careers and that the people were aware of the potential economic benefits of TVET skills (Okello, 2013). Another indicator of the improving attitude to TVET, and its increasing significance in the national development equation, is the rising number of students enrolling in technical and vocational institutions. National Council for Higher Education records (2003) show that the average enrolment in Uganda Technical College (UTC) Elgon, UTC Kichwamba, UTC Bushenyi and UTC Lira was 265 in October 2003 (cited in Liang, 2004, p.102). Uganda Business and Technical Examinations Board (UBTEB) records show that the same institutions registered an average of 637 candidates in May 2014. The number of students in these UTCs has more than doubled over the last decade. Similar increase in enrollment has been registered in vocational institutions such as Fisheries Training Institute and National Meteorological Training School, where the numbers have, over the same period, grown from 91 to 170 and from 33 to 73 respectively.

The BTVET Strategic Plan notes that the success of BTVET will be measured by, among other things, the pass rates of BTVET completers in national assessments, and envisages pass rates of 90% by 2020 (Ministry of Education and Sports, 2011). But the performance of students in national BTVET examinations has, for a long time, been poor. According to Uganda National Council of Science and Technology (2012), "The Uganda National Examinations Board noted that perpetual failures have been recorded at the ordinary and higher diploma levels of TVET. On average, 40% of the students at these levels fail" (p.20). There was a curriculum review in 2011 and a new assessment body, UBTEB, was formed. The pass rates have, however, remained low. According to the results of the May/June 2013 UBTEB examinations, only 30.4% of the students were on normal progress - 69.6% had retakes.

The low pass rates carry costs for the failing students – besides the fact that they have to pay for the retakes, they may spend an extra year or two on the programs and they get discontinued if they twice fail a retake paper. Students who fail to complete the programs would presumably have acquired some of the skills anticipated by the curricula, but they would have limited opportunities on the job market and would not be able to academically progress. There are also costs to the assessment body which must make special arrangements to accommodate the retake cases. These arrangements have in the recent past

included setting examinations specifically for the "retakers", since some course units have been dropped or shifted across semesters during curricula reviews. Finally, there are costs to the country, whose heavy investment in technical education proves futile when the learners fail to acquire the skills and drop out of the programs in frustration or under the compulsion of the curriculum. It's important to investigate the causes of the retakes and devise means of reducing them without compromising the quality of the examinations or awards.

Literature Review

Several studies have been done on the factors that determine academic performance in schools and tertiary institutions. Farooq, Chaudhry, Shafiq and Berhanu (2011) found that socio-economic status (SES) has a significant effect on students' overall academic achievement (p.1). Farooq, et al (2011) further reveal that demographic factors including age, gender, geographical belongingness, ethnicity, marital status, socioeconomic status (SES), parents' education level, parental profession, language, income and religious affiliations influence performance (p.2). Kyoshaba (2009) observed that students' academic success has a positive correlation with their admission points and depends on the type of school which they previously attended. Miller and Birch (2007), while studying the influence of the high school attended on university performance, observed that outcomes at the university level differ according to the type of high school attended (as cited in Amasuomo, 2014, p.40). On the other hand, the acquisition of vocational skills depends on the availability of learning resources, including textbooks (Jacques, 1990 as cited in Achieng, 2012, p.12). According to Bloom (1981), the rate of learning for a student is determined by the quality of instruction, cognitive entry characteristics (specific knowledge, abilities, and skills), and affective entry characteristics (attitude, self-confidence, and motivation) (as cited in Ajogbeje &Borisade, 2013, p.2). Bloom (1981) found that cognitive entry characteristics typically correlate +0.70 or higher with measures of achievement in a subject (as cited in Ajogbeje &Borisade, 2013, p.2). Durden and Ellis (1995) found that the measurement of the students' prior educational outcomes or performance is the most important indicator or determinant of the students' future academic performance (as cited in Staffolani & Bratti, 2002, p.3).

Uganda National Examinations Board (2007) found that poor performance in the 2006 Uganda Community Polytechnic Examinations was a result of unqualified instructors, "poor quality students" admitted to the programmes, poor attitudes of students and parents to the programmes, and difficult questions that were not fit for the level (p.3). The experts that drafted the 2012 BTVET Strategic Plan attributed the current poor performance to "the fail-

ure of institutions to deliver training at a quality commensurate with required standards" (Ministry of Education and Sports, 2011, p.5). The Plan specifically pinpoints the shortage of appropriately qualified and competent BTVET instructors, and the often appalling state of the training infrastructure (Ministry of Education and Sports, 2012, p.5). A study commissioned by the Uganda National Council for Science and Technology (UNCST) (2012) reads in part: "Technical and vocational education is extremely practical implying that the unit costs are high and prohibitive. Many TVET institutions lack proper infrastructure for conducting practical training. As such, many institutions have to compromise on the quality of teaching, leading to high failure and dropout rates" (p.20). But neither the BTVET Strategic Plan nor the UNCST document identified the subjects with the highest failure rates and found them to be practical in nature.

From the literature, it appears that the factors that determine academic performance can be broadly categorized as: Student characteristics, school characteristics and societal characteristics. The student characteristics include the cognitive entry characteristics, affective entry characteristics, natural ability, and demographic characteristics (such as age, gender and socio-economic background). The school characteristics can be subdivided into the characteristics of previous school(s) and those of present school, but since those of the previous school contribute to the student entry characteristics, we may only consider those of the present school (technical college, in this context) alongside the student characteristics. The school characteristics include things like the availability of learning resources, quality of infrastructure, ability of instructors, and rules and regulations. The societal characteristics in the context of this study include things like culture, attitude to vocational education and language. The student characteristics, specifically the cognitive entry characteristics, are widely considered the predominant factors.

Research Problem

The 2011 curricula for the National Diploma in Engineering programs provides three alternative avenues of entry with the following minimum entry requirements: 1) At least one principal pass in either Physics or Mathematics obtained in the Advanced Level Examinations or its equivalent. 2) At least an Advanced Craft Certificate from a recognized institution 3) A Bachelor's degree in Physical Science disciplines from a recognized institution. But the fraction of candidates joining through the third avenue is negligible.

The cognitive entry characteristics implied by A-level education in Physics and Mathematics are different from those implied by successful completion of Advanced Craft programs. A-level Physics and Mathematics are stronger on

conceptual analysis than on practical skills, whereas Advanced Craft programs are stronger on practical skills than on conceptual analysis. The Craft and Advanced Craft syllabi, against which candidates pursuing the programs are examined, have a heavy workshop component, including externally examined practical tests. The Advanced Level students do practical tests in Physics, but these are not directly applicable in the Engineering field. Moreover, even the students that haven't done physics at Advanced Level, or that have completely failed it, can join the diploma in engineering programs if they have a principal pass in Mathematics, a purely theoretical subject.

The difference in cognitive characteristics between the two categories of entrants is likely to translate into different rates of acquisition of the knowledge and skills anticipated by the curriculum. Some of the modules offered under the diploma curricula require learners to have an appreciation of the practical aspects of Architecture/Engineering, whereas others require them to have developed capacities for conceptual analysis in their prior learning. The Advanced Craft entrants may have an advantage in some modules, and the Advanced Level entrants may have an advantage in others. These differences in rates of learning would be reflected in examination results. If, as previous research has found, there is lack of infrastructure for practical instruction in the institutions, this question arises: are the high failure rates in UBTEB examinations a result of A-Level entrants failing to match the expectations of the curriculum in the course units with practical orientation? The course units with practical orientation are those that involve use of equipment, or the construction/fabrication of products.

The institutions that offer Craft programs are always quite different from those that offer Secondary School education, and this difference, according to the some researchers, bears on their performance at the diploma level. Besides, students admitted from Advanced Craft programs will typically have spent longer in school and even spent some time in the field. This means that they are typically older and in different social circumstances, perhaps with family responsibilities. Their age and responsibilities may affect their performance.

The current technical diploma curricula, whose development started with a survey of the World of Work, "is learner-centered and competence based, updated with current labor market demands and focuses on core tasks and assignments…each semester involves execution of a real life project that makes the technician competent in the trade." Considering the orientation of the current curriculum to practice, and the fact that examinations are expected to heavily test application, and that the final mark aggregates continuous assessment marks with the examination mark, the absence of infrastructure may negatively show in the performance of the candidates without prior exposure to practical work.

Research Questions

- Which course units are most failed in the first semester of the National Diploma in Engineering programs?
- How do the progress statuses of UACE entrants compare with those of Advanced Craft entrants after the first semester?
- How did the performance UACE entrants compare with that of Advanced Craft entrants in the most failed course units?
- How do entry grades correlate with performance?

Research Objectives

- To determine the worst done course units in the first semester of the National Diploma in Engineering programs.
- To compare the progress statuses of UACE entrants with those of Advanced Craft entrants after first semester.
- To compare the performance of UACE entrants with that of Advanced Craft entrants in the worst done papers.
- To relate entry grades with performance.

Method

This study relied on UBTEB registration and performance records of students who enrolled on National Diploma in Architecture and Engineering programs in August 2012. The results considered were for their first semester.

The candidates considered were from the following institutions: Uganda Technical College Elgon, Uganda Technical College Lira, Uganda Technical College Bushenyi and Uganda Technical College Kyema. Altogether, 1024 students, representing 55.3% of the entrants, were considered. The four institutions are government owned, and the school characteristics (infrastructure, instructors, learning resources, rules and regulations) are therefore within the same range. They are very far apart, which hopefully balances the some of the societal characteristics such as culture and language. This means that the sample is expedient for the measurement of the influence of student characteristics.

Entry qualifications and first semester results of the candidates were considered. The candidates were divided into two groups on the basis of their entry qualifications: Advanced level (A-Level) entrants and Advanced Craft entrants. The type of entry is directly indicative of cognitive entry characteristics, but it also reflects the other student characteristics, including the influence of the previous institution.

To achieve the first research objective, the mark sheets were subjected to frequency analysis to determine the number of retakes in each course unit, and hence the course units with the most retakes.

To achieve the second objective, frequency analysis was applied to the mark sheets to determine: 1). numbers of A-Level entrants on probationary progress; 2). number of A-level entrants on normal progress; 3). number of Advanced Craft entrants on probationary progress, and 4).Number of Advanced Craft entrants on normal progress.

To achieve the third objective, frequency analysis was applied to mark sheets to determine the number of the candidates of the alternative entry schemes with retakes in the worst done course units.

To achieve the fourth objective, the two groups were further subdivided according to candidates' entry grades. For Advanced Craft entrants, the subgroups were: Distinction, Credit and Pass. For Advanced Level entrants, there were six subgroups: A, B, C, D, E, and O - a candidate being placed according to his best grade in either Physics or Mathematics. For each of the subgroups, the percentages of the students on the different types of progress were determined, and comparison made to identify the relationship between entry grades and progress status.

Results

Worst Done Course Units

Overall, the five worst performed course units were:

1. NDBCE 113/NDA 113/NDWSE 113: Structural Mechanics
2. NDWSE 118: Fluid Mechanics
3. NDA 117/NDBCE 117/NDWSE 117: Engineering Surveying
4. NDME 111: Engineering Mathematics I
5. NDBCE 112/NDA 112/NDWSE 112: Engineering Mathematics I

Four of these five papers are essentially analytical. They require analytical skills, rather than prior exposure to architectural/engineering practice. For course units with pass rates lower than 90% , see Table 1.

Table 1. Comparison of Performance of Advanced Level Entrants and Advanced Craft Entrants

PAPER CODE	PAPER NAME	NO. OF RETAKES (countrywide)	NO. OF CANDIDATES (countrywide)	FAILURE RATE (%)
NDA 112/ NDBCE 112/ NDWSE 112	ENGINEERING MATHEMATICS	408	1440	28
NDA 113/ NDBCE 113/ NDWSE 113	STRUCTURAL MECHANICS	627	1578	40
NDA 117/ NDBCE 117/ NDWSE 117	ENGINEERING SURVEYING	446	1391	32
NDBCE 115/ NDWSE 115	CIVIL ENGINEERING DRAWING	218	1286	17
NDWSE 118	FLUID MECHANICS	109	286	38
NDEE 112	ENGINEERING DRAWING	49	422	12
NDEE 113	ENGINEERING MATHEMATICS I	81	454	18
NDEE 114	ELECTRICAL ENGINEERING SCIENCE	70	399	18
NDEE 115/ NDME 114	MECHANICAL ENGINEERING SCIENCE	155	811	19
NDEE 117	MECHANICAL WORKSHOP TECHNOLOGY & PRACTICE	57	469	12
NDME 111	ENGINEERING MATHEMATICS I	93	326	29
NDME 115	ENGINEERING DRAWING	65	317	21

The performances of the two groups of candidates are shown in Table 2.

Probationary Progress		Normal Progress		A-Level Entrants		Craft Entrants	
A-level	Craft	A-level	Craft	N.P	P.P	N.P	P.P
90	145	658	131	658	90	131	145
235		789		748		276	
38%	62%	83.4%	16.6%	87.97%	12.03%	47.46%	52.54%
22.95%		77.05%		73.05%		26.95%	

Of the A-level entrants, 87.97% were on normal progress and 12.03% were probationary progress. Of the Craft entrants, 47.46% were on normal progress and 52.54% were on probationary progress.

For candidates on probationary progress, 62% were craft entrants and 38% were A-level entrants. Most of the candidates on normal progress (83.4%) were A-Level entrants while 16.6% were Advanced Craft entrants.

Comparison of Performance of two Groups

In each of the worst done course units, the A-Level entrants performed extremely well, with over 90% pass rate, whereas the craft entrants performed very poorly (see Table 3).

Paper code	NDBCE 112/ NDA 112/ NDWSE 112		NDBCE 113/ NDA 113/ NDWSE 113		NDWSE 118		NDBCE 117/ NDA117/ NDWSE 117		NDME 111	
Entry type	A-level	Craft	A-level	Craft	A-level	Craft	A-level	Craft	A-level	Craft
No. of retakes	7	70	27	51	7	15	15	32	3	15
Total entrants	482	192	482	192	102	42	482	192	124	35
% of total entrants with retakes	1.45%	36.46%	5.60%	26.56%	6.86%	35.71%	3.11%	16.67%	2.42%	42.86%

Relationship Between Entry Grades and Performance

Advanced Craft Entrants and Advanced Level Entrants

The better the Advanced Craft grades a student joins with, the higher the chances that he will pass all his papers. However there is an equal number of Credit and Pass entrants amongst the candidates with retakes. Similarly, the better the A-Level grades a student joins with, the higher the chances that he will pass all his

papers. Table 4 shows the relationship between entry grades of Advanced Craft entrants and their performance.

Entry Grade	Distinction		Credit		Pass	
Progress Status	NP	PP	NP	PP	NP	PP
No. of candidates	4	2	71	68	45	68
Percentage	67%	33%	51%	49%	40%	60%

Table 5 shows the relationship between entry grades of A-level entrants and their performance.

Entry Grade	A		B		C		D		E		O	
Progress Status	N.P	P.P	N.P	P.P	N.P	P.P	N.P	P.P	N.P	P.P	N.P	P.P
No. Of Candidates	35	1	115	11	208	19	214	35	66	13	16	11
Percentage	97%	3%	91%	9%	92%	8%	86%	14%	84%	16%	59%	41%

Conclusions

The worst done course units were those requiring mathematical/analytical rigor, rather than those in which prior exposure to field practice is an advantage. The lack of adequate infrastructure for practical work, which has been noted in other literature, is not reflected in the performance of the candidates. Advanced Craft entrants are more likely to get retakes than Advanced Level entrants. The Advanced Craft entrants perform poorly in the course units with mathematical content. On entry qualifications, the better the grades a candidate joins with, the higher the likelihood that he/she will pass his/her papers.

Recommendations

1. National Curriculum Development Centre should consider raising Diploma entry requirement for the Craft scheme to Credit or reviewing the mathematical content of Craft curricula. Those that score Pass at Advanced Craft level can remain in the field as craftsmen.
2. The possibility of establishing two parallel curricula, one allowing for academic progression and the other limited to certification for employment, should be explored. It may be necessary to design two parallel curricula, one oriented towards the field, and the other bringing together the needs of

the field and those of the subsequent educational levels. This would reduce the number of retakes and increase the number of certified craftsmen and technicians.

3. Research should also be done on the quality of assessment of practical skills on the technical diploma programs since the absence of infrastructure noted in prior research reports is not clearly reflected in the performance.

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The Role of Digital Literacy in Continuous Based Assessment in Technical Instituions in Uganda

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Abstract

Technical and Vocational Education training for multi-skilled is key in Uganda's economy. Performance of students in Ugandan Technical Institutions has always been poor and sometimes close to 72 percent failure. Creation of Uganda Business and Technical Examinations Board (UBTEB) was one such effort to address this problem. As part of the Competence Based Education and Training (CBET), the Board applies Continuous Based Assessment (CBA) to improve performance by candidates. The performance however, continues to show a disappointing picture to-date. This paper makes an attempt to analyze whether digital-based academic strategies bear the potential to produce desired skills in the Continuous Based Assessment mode. A qualitative survey research design was conducted in selected Technical Institutions in Uganda to arrive at the findings.

Key words: Digital Literacy, Continuous Based Assessment, Technical Institutions, Vocational Education

Introduction and Problem Context

This paper is a result of a preliminary survey in selected Technical Institutions in Uganda. The paper discusses management of expectations associated with Continuous Based Assessment (CBA) amidst Digital Literacy proliferation. The motive of the paper is simultaneously theoretical and pragmatic. Theoretically there is a tendency for Instructors to remain doing things the way they have always done them in the past. Pragmatically, various forms of assessments including CBA have been evolving at the same time with an increase in Digital Literacy that could play an important role in both training and assessment of

learners preparing for the job market that is increasingly demanding for better and highly specialized skills. More importantly, concerns have been raised over the various policies and proposals both past and present on whether they are realizing the intended objectives in the technical training sector.

The Business, Technical, Vocational Education and Training (BTVET) Act 2008 and its Strategic Plan of 2010-2020 are one such effort in uplifting technical and vocational education. This Act sits at the crucial crossroads between education and the world of work. It is through this a knowledgeable, socially responsible and sustainable future workforce equipped with the requisite skills for a changing world will be established. The BTVET system is expected to emerge from an educational subsector into a comprehensive system of skills development for employment creation, enhanced productivity and national growth. It needs to be noted that Government of Uganda since 2011 revitalized strongly the issue of addressing youth unemployment through provision of skills.

The greatest challenge however, in meeting the demands of its growing economy is a better skilled and technically qualified workforce as well as providing employable skills to a very large percentage of the youth. This is in line with the need to strengthen quality assurance mechanisms at tertiary level to produce appropriate skilled human resources that match the demands of labor market in the country.

The current status of Technical and Vocational training in Uganda has been influenced by the education policy and legislation enacted in the last five years. The education policy and other relevant laws have, among other things, brought about impressive performance of the education sector as well as the economic sector. Thus the need to acquire technical education has been on the increase especially with the inauguration of both Universal Primary and Secondary Education whose enrolment numbers has increased to over 8 million pupils.

Technical Institutions in Uganda however, are still restricted in both the training and assessment to hard copy materials such as chalkboards, textbooks and paper. The system in general terms of Information and Communication Technology (ICT) is seriously lacking. Nonetheless, with such a rise of ICT some institutions are making attempts to move in that direction thus shifting to the use of Digital Media with its benefits. Digital-based academic strategies bear the potential to produce new skills; and up-to-date educational resources among instructors and learners. As part of ICT, digital devices are recently emerging technologies that need to become integral to the school system (Makewa, 2008).

Thus whereas there has been efforts in the search for more computer education and information literacy and general technical competencies, little ef-

fort, has been focused on Digital Literacy in Technical education training and assessment. The Uganda Business and Technical Examinations Board introduced CBA in the training and assessment of students in Technical Institutions but with limited efforts of incorporating digital literacy. This paper through a preliminary survey in selected Technical Institutions in Uganda has the main purpose of finding out whether Digital Literacy can play a key role in CBA in Technical Institutions in Uganda. Specifically, the project intends to:

i. Identify issues emerging in the utilization of digital technology so as to obtain strategies that Examinations Boards can develop to improve assessment.
ii. Assessing practical ways where Technical Institutions can apply digital technology in CBA

Conceptual Understanding of Digital Literacy

Digital Literacy

Scholars from diverse backgrounds have viewed Digital Literacy from different perspectives. According to Jenkins (2009), Digital Literacy is the ability to effectively and critically navigate, evaluate and create information using a range of digital technologies. In this survey the term Digital Literacy considers the use of all digital devices in the teaching-assessment processes that includes electronic resources created and displayed using computer technology, such as digital audio, digital video and others found online such as internet email messaging. Digital literacy in thus taken to be all embracing including access and knowledge of computer basics, internet and the World Wide Web, computer serenity and privacy, digital lifestyles like use of digital cameras and videos. It thus conceptualized to mean; the ability to use digital technology, communication tools or networks to locate, evaluate, use and create information. Digital Literacy also involves the ability to understand and use information in multiple formats that the computer can deliver. This will help in playing key role for better provision of feedback to the learners and quick processing results of the CBA by the examination boards.

Theoretical Framework: Individual Innovativeness Theory (IIT)

The survey is being based on the Individual Innovativeness Theory (IIT) as advanced by Rogers (1995), which states that individuals who are predisposed to technology will adopt the innovation earlier than those who are less predisposed. In this survey use of Digital technology in Technical Institutions Continuous

Assessment can be an innovation in consideration. The IIT theory observes that human activity can be understood better only when the predisposed tendencies of stakeholders of a given technology are taken into consideration. Technology use and level of familiarity are key variables that have particular significance on stakeholders' acceptance of digital media in the education assessment.

The CBA is thus seen as a relatively formal process of recording marks for class work, or some other summative indicator of daily or frequent performance in the classroom. However, sometimes this leaves out the broader meaning of classroom assessment. Digital Literacy has made time and space less complex and in this age of information explosion, human beings have no choice but to explore the information systems to their most advantage. This implies that, the ability for timely acquisition, utilization, communication and retrieval of relevant and accurate information is becoming an important attribute for better teaching-learning process as Adebayo (2008) argues. In a similar way, Ronelle, (2010) state that ICT is an essential tool in any educational system and can possess the potentials of being used to meet the learning needs of individual students, promote equality of educational opportunities; offer high quality learning materials, increase self-efficacy and independence of learning among students. It can improve Instructors' professional development, efficiency and the general assessment of learners.

In recognition of the importance of CBA in the teaching-learning process for quality assurance, the Technical Education sector needs to undergo further reforms than is currently pertaining to reap the various good expectations in the use of digital literacy in the training of the highly required skilled personnel. Such assessment using ICT related facilities should no doubt form a unique part of this reform. There is need to evolve new, effective and more practical ways of measuring, evaluating and reporting students' progress towards the various targets and learning goals as has been argued by Nzewi and Ibe (2009).

Methodology

A qualitative survey research design was used in purposively selected Technical Institutions in Uganda with the intention to tap particular views for representation and generalization. This was a preliminary survey meant to assist in developing an action research project in the Technical Institutions. Oral interviews were conducted with personnel involved in the processing of examinations results at UBTEB and Instructors teaching in selected Technical Institutions in Uganda so as to elicit reflective responses from them. This was meant to probe into the strategies for incorporating Digital Literacy in the training and assessment processes. In addition qualitative observations schedules were

meant to create direct contact so as to obtain a real picture of the situation. The availability and dependability of digital technology to Technical Institutions was then established by means of observation schedules. It was also meant to establish the degree to which the instructors use the computer as a key tool in Digital Literacy and also express confidence in the use of digital technology.

The research was a preliminary survey and 10 purposively selected Technical Institutes were used selecting 3 Instructors from each of them that totaled to thirty. Ten key informants were also selected from the Technical Institutes. This was meant to obtain adequate data for an action research for future implementation.

Information on Instructor assessment beliefs and practices as well as availability and use of computers as a key tool in the use of digital literacy was obtained through the use of classroom observations, interviews and questionnaires. Key relevant documents from selected Instructors interviewed were also reviewed such as records of assessment, tests and or items developed. The information obtained from the interviews was transcribed and coded, along with the classroom observation data, into a number of categories that reflected Instructor's existing assessment beliefs and practices in the selected institution. Analyses of the data comprised of mainly frequency distributions and employment of a descriptive method to allow easy description on the use of Digital Literacy in CBA by the Instructors in Technical Institutions in Uganda. The aim was to obtain emerging issues on the ground and the practical ways of applying Digital Literacy by Instructors of Technical Institutes and UBTEB as an examination board.

Results and Conceptual Discussion

This section presents survey results on the key objectives of this preliminary survey. This included assessing emerging issues in the utilization of digital technology and identifying some practical ways of applying Digital Literacy in Technical Institutions in Uganda as the proceeding sections indicate.

Emerging issues in the utilization of Digital Technology in Technical Institutions in Uganda

The objective of this survey was meant to identify emerging issues on the ground regarding what is currently pertaining in the area of digital literacy in the Technical Institutions in Uganda. This would help in obtaining strategies that UBTEB as an Examination Board can use to improve the training and assessment of the learners to as to produce the desired graduates. Various issues came out of the survey and are hereby reported.

In Uganda the umbrella body that oversees the overall quality of training and assessment is BTVET. The findings show that there have been several attempts by this sub-sector including coming up with the recent Strategic Plan 2011 – 2020. This builds on considerable progress in the reform of the BTVET system achieved during the last decade or so, notably the BTVET Act of 2008 and the establishment of the Uganda Vocational Qualifications Framework (UVQF).

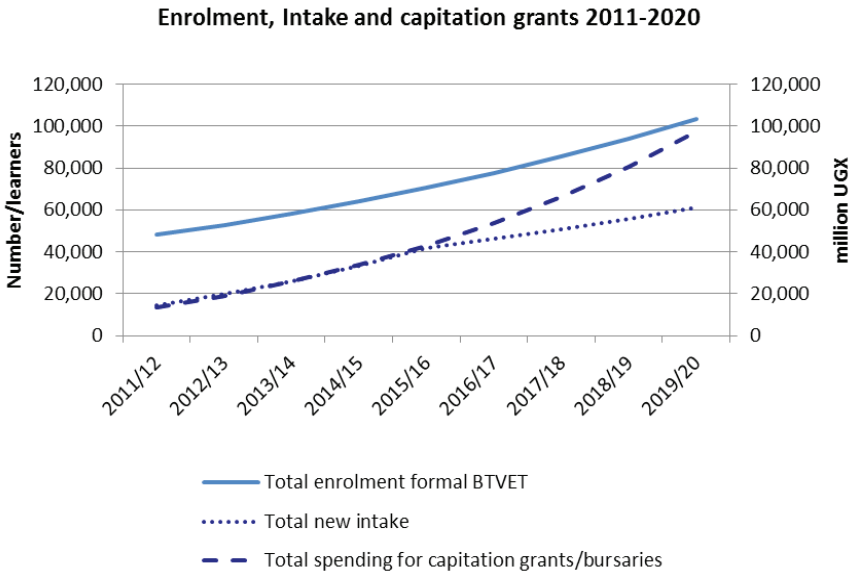
The Government of Uganda, with support from her development partners; the World Bank and Government of Belgium, in 2010 made attempts to improve training in the BTVET Institutions by commissioning a study in this sub-sector that subsequently support the drafting of the Strategic Plan. The analytical and conceptual work included substantial stakeholder consultation and was benchmarked against international experience in the reform of technical and vocational education and training systems. Whereas the Strategic Plan is designed to address the major challenges identified regarding relevance, quality, access and equity, management and financial, the situation on the ground shows a different picture regarding key digital technology.

Preliminary survey shows that until recently, Ugandan employers were by and large passive beneficiaries of the BTVET system. However, private firms show an increasing interest in skills development, and some sectors are planning industry-driven initiatives to skills development. Notable examples include the construction sector and companies in the oil industry. These initiatives seek to support employer-based training initiatives with a favorable regulatory environment, appropriate incentives and specific programs.

In support of the aforementioned argument, the findings show that private training providers, with a strong BTVET segment have more than 1,000 institutions, supported to grow and expand further to foster a market-led expansion of BTVET supply. Nevertheless, an in-depth interaction with key informants showed that these initiatives are not moving at the same rate in terms of digital technology. Digital Literacy highly absent in both the training and assessment making it hard to achieve the government strategic objectives but at the same time provide the ideal training required by the private sector in the face of proliferation of information technology.

The survey findings also indicate that enrolment of students in public BTVET Institutions has been on the increase and projected to increase further as a result of efforts both in the formal and informal sector training. This revelation demands not only creation of new Institutions but also working on the existing digital technology so as to move with the real world of work. The enrolment projections in technical education currently stand as follows.

Table 1: Enrolment Projections in BTVET Institutions



Analysis of the available information and the prospected enrolment increase imply an increase in number of Instructors in the Technical Institutions. The findings however, show that there are limited incentives for skilled technicians that must work according to 21st Century employers' demands in the technology age that require Digital Literacy. Preliminary information show that the current Ugandan Strategic Plan itself and situation in the Technical Institutions seem not support and or is not moving in that direction as it is silent on key ICT or computer facilities, their use and application that could play a key role on Continuous Based Assessment. For instance a critical analysis of the whole Strategic Plan show no planned investment in the digital media/ICT in terms of facilities and training to match the good intentions of promoting access to disadvantaged groups into skills development, improving effectiveness in general technical and vocational education training, creation of more awareness and above all expanding private sector training.

Practical ways of applying digital technology by technical institutions

Basic information was sought on the key areas where Digital Literacy can be applicable so as to be able to identify the gaps in the CBA and generally overcoming implementation challenges by both the training institutions and UBTEB as an Examination Board. Preliminary information was thus mainly

collected on the percentage of computer usage as a key tool in Digital Literacy.

The findings show that Instructors apply digital technology mainly with regard to writing reports, development of class test, keeping examination records, making classroom presentations, processing results and providing feedback to learners. Table 2 below shows the percentage responses of those interviewed in the survey.

Table 2: Percentage distribution on the forms of Computer usage

Computer usage	Respondents	Percentage
Development of test items	19	62
Keeping Records	16	52
Writing Reports	14	47
Processing of Results	11	35
Classroom Presentations	5	17
Internet/use of email messaging	2	5
Providing feedback to learners	2	5

Development of class tests came first in terms of computer usage and this accounted for 62 percent. However, in-depth interaction with some selected key informants show that most of the Instructors do this because this was a requirement by the administration of the institution and hence it is more of a routine condition that can't be done away with than being appreciated in the teaching learning process. Thus appreciation of Digital Literacy only stops at test item development and not applied in the CBA hence limiting the learners regarding feedback mechanisms.

Keeping records came second in computer usage and this was 52 percent. The record keeping however, was general records and did not focus on the usage in the CBA. Whereas the findings from the survey show that CBA was cited to be one the most preferred form of assessment that was being appreciated and not imposed by UBTEB as an imposed by the examination board, not much attention has been given to the form regarding its usage using ICT. Such keeping of records could be used better through Digital Literacy facilities so as to become a key tool in the training and assessment process. Key informants surveyed strongly supported this form of assessment but hastened to add that the key challenge is the cumbersome nature of manually recording marks from the various tasks and assignments given to the learners and the absence of a quick reporting mechanisms to the Examination Board.

Findings from the survey show that the usage of computer in terms of writing reports was ranked third in usage at 47 percent. Close discussion with the

Instructors indicated that it is mainly those with administrative responsibilities that use more the computer in writing administrative reports other than those directly connected to the assessment of learners.

Processing of results through the use of computers had limited coverage. Only 35 percent of the people interviewed indicated that they use computer to process results. The survey however, found out that, there is no easy digital literacy mechanism used to facilitate the transfer of the results of the CBA to UBTEB which is the Centre of assessment. This leads to various challenges in final examination result processing and causes delays in the release of the national examination results of all institutions as some institutions submit CBA results even after final examinations are done. Thus the appreciation and adoption of digital literacy would play a key role to rectify the situation. This could be a software package that allows automatic updates of the results during the continuous assessment period.

The findings of the survey indicated that only a small percentage of the Instructors in the selected Technical Institutions use computers for classroom presentation and this was 17 percent. The implication is that the graduates are likely to be bypassed by the growing advancement in technology. The presentation would be important also as a good feedback mechanism to learners.
The survey results show an attempt to use internet to submit results of the CBA to UBTEB as some institutions send email attachments of the scanned copies of results. This contributes greatly to fast processing of the results from such institutions. However, this is only 5 percent implying that 95 percent of the Instructors cannot be able to utilize the internet facilities for result processing either due to accessibility issues or lack of computer skills or innovation to in the CBA using Digital Literacy.

The survey results show a negligible percent of the use of computer in the provision feed back to the learners and this was only 5 percent. This denies the learners quick acquisition of skills so as to move with the advancement in technology. The Technical Institutions cannot quickly identify the learning gaps appropriately.

The survey also observed that there is limited number of computers in the Technical Institutions that compounds the problem of usage by the Instructors. The few available ones are meant for training of students. The majority of the Instructors however, reported that they did not use computers for any teaching and learning activities other than training students meant to do computer practical examinations. Table 3 below shows multiple responses on facilities that aid accessibility to Digital Literacy.

Table 3: Accessibility to Digital literacy Facilities

Easy Accessibility to digital facilities	Respondents	Percentage
Computer	17	56
Digital camera	8	27
Access to video equipment	3	9
Access to internet	2	8

The survey results show that 56 percent of the College Instructors had easy access to a computer as the easiest accessible type of technology within their means. There is also a relatively high percentage (27 percent) of those that can easily access digital camera, 9 percent for video equipment and only 8 percent indicated easy internet accessibility. Key areas where results and other records could easily be shared using digital literacy for good feedback approaches are conspicuously unattended or the Digital Literacy devices are not necessarily for CBA that would have produced good results. Whereas these preliminary findings show that some Instructors can access some ICT services, the extent of their application in the absence of key supporting services like internet makes the expectations low hence not easily applied in the continuous based assessment.

Conceptual Discussions

The aforementioned presentation of the preliminary survey results show a great need for innovations in the area of Digital Literacy. This should be done using all possible forms of technological devices including computers, CD-Roms, digital cameras, video cameras, and the internet. Technology related assessments need to be interwoven with learning so that pedagogical skills among the Instructors are not left behind in guiding technological innovations as argued by Redecker and Johannssen (2013).

On the issue of access to ICT facilities, the preliminary survey findings indicate internet and email services are almost none-existent in all the selected Institutions. There is limited availability of computers and or lack of required skills by the Instructors to access the internet services. Part of the explanation could be the prioritization amidst competing demands given the limited resources. This calls for a guiding technological innovation alongside the Continuous Based Assessment. This is addition to lack of other facilities including software packages, computer consumables and other ICT equipment like digital camera. This implies that support is not only required in making budget provisions to purchase computers and other ICT facilities but also general Digital Literacy skills to the Instructors.

The findings of the survey on the new and emerging challenges in technologies are supported by arguments of Adebayo and Fagbohun (2013) who states that the traditional process of teaching and learning and the way education is managed require a fundamental change using ICT. Digital technology provides instant access to vast array of data, challenging assimilation and assessment skills including access to ICTs in the home, at work, and in educational establishment, hence making learning a truly lifelong activity- an activity in which the pace of technological change forces constant evaluation of teaching process itself.

Findings of this survey are also strongly supported by studies regarding limited Instructors' competencies, inadequate digital and or other ICT facilities, lack of motivation to adopt information technology that is evolving and increasingly changing to assist assessment of learners as Anekwe and Ofoefuna (2009) argues. The similar arguments have been advanced by Ronelle Vos (2010) that digital technology must be considered within a broad and integral perspective. It should lead to a digital dimension that come bring the king of innovation required in the 21st Century and an improvement in the assessment arena.

Conclusion and Policy Implications

Conclusion

The results from this survey provide additional information on Instructors assessment beliefs and practices as well as use of computers as key tools for teaching, learning and assessment processes. These findings provide critical insights on key factors to address when introducing and implementing a computerized CBA system to assist in training and examination processing by Examinations Boards. This paper argues for a paradigm shift to adopt the use of Digital Literacy in Continuous Based Assessment so as to meet the growing demand for better skills in technical training.

Policy Options

Key policy recommendations:

i. There is need for urgent implementation of technology-related projects so as to tap the benefits of causal-links in real life interventions. Specialized tailor made software can be developed to help in CBA in Technical Institutions in Uganda. Efforts could be made in the use of practical tasks of digital tools like mobile devices, digital cameras and internet services for supporting Digital Literacy usage and awareness.
ii. There is need to carry out a comprehensive needs assessment to document

institutional, societal and personal factors that could affect the success of technology-related projects in Technical Institutions in Uganda.

iii. There is need to go beyond the current practice of Instructors using computers for just recording marks, writing reports and developing test items but to play a key role in the CBA through provision of feedback to learners during training and easy processing of results by the Examination Boards. This could be done by creating tailor made electronic assessment tools that can be developed by the Instructors themselves assisted by technocrats in the field of ICT.

iv. There should be effort for internet connectivity followed by training programs to the Instructors to enhance computer usage in Technical Institutions.

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Learning While Producing Using Low Cost Technology Innovation: The Case of Maize Mill in Uganda

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Abstract

Quality education should prepare learners with competencies required in the world of work (WoW). Technical Vocational Education and Training (TVET) graduates are expected to be fully prepared with no need for re-training. The Ministry of Education and Sports made efforts to institute remedial measures to address the inadequacies in competencies exhibited by the college graduates. Among the reforms was transformation of curriculum to competence based training. Therefore, this paradigm shift in curriculum requires engineering technicians to design, develop and implement stipulated real life projects aimed at learning while producing using available low cost means. This conceptual paper shares the views on the innovations in technology of fabricating a maize mill implemented by Mechanical Engineering TVET trainees in Uganda.

Key words: Learning while producing, Innovations in technology, Real Life projects

Introduction

There have been issues regarding the quality of graduates from the Ugandan Technical Vocational Education and Training (TVET) with the argument that they are not prepared for the world of work. This burdens the employers as they ended up re-training the same graduates in the knowledge and skills relevant to the job market. This environment led to concerted action by Government of Uganda (GoU) through the Ministry of Education and Sports (MoES) to institute reforms aimed at creating skills training suitable for the new global trends. Also, GoU is committed to providing resources such as upgrading of training facilities and infrastructure in public colleges in order to ensure that

TVET graduates are equipped with skills ready to produce while still undergoing training in institutions. The direction of the reforms is to produce a skilled workforce that is able to meet the constantly changing skills needed in the world of work.

There is, therefore, need to create a clear understanding of TVET and skills acquisition. Different authors have defined the two terms differently. For the purpose of our readers the authors adopted UNESCO-UNEVOC TVET definition: The acquisition of knowledge and skills for the world of work to increase opportunities for productive work, sustainable livelihoods, personal empowerment and socioeconomic development for both women and men, in both urban and rural communities (EU Final Report, 2012). On the other hand, Skills development refers to the acquisition of practical competencies, know-how and attitudes necessary to perform a trade or occupation in the labour market (EU Final Report, 2012). In addition, TVET should be affordable and relevant. One of the major reforms in Uganda was the paradigm shift in curriculum which requires engineering diploma technicians to design, develop and implement stipulated real life projects using low cost technologies. Students offering the different engineering disciplines work on projects, for instance, construction of moderate structures of buildings; installation of piped water in domestic houses; architectural design of structures; installation of solar panels and fabrication of maize mills plus.

In this paper the focus has been put on the Maize Mill. The works were done in the mechanical workshops at one of the Technical Colleges. The college administration was responsible for the provision of materials for the project. The trainees worked in groups of ten on the project of fabricating a maize mill under the guidance of their instructors. The assessment of the project was done in two parts. The first part was done by their instructors during the 15 weeks of teaching/implementation of the project. Then in the 15th week external examiners from Uganda Business and Technical Examinations Board (UBTEB) were sent to assess the second part. The two separate scores got were then combined to constitute the final score for each trainee in the project. The main purpose of this conceptual paper is to discuss the innovations of fabricating a maize mill which is a typical project that was implemented by national diploma students of mechanical engineering in technical colleges.

The Problem Context

The low level of skills exhibited by the then TVET graduates compelled the Ministry of Education to review the curriculum to competence based with introduction of real life projects with the aim of strengthening skills development and innovations. The current status of Technical and Vocational training

in Uganda has been to a large extent determined by the education policies and legislation enacted in the last six years. Famous among them is the Business Technical Vocational Education and Training (BTVET) Act of 2008 and eventual BTVET Strategic Plan. The education policy and other relevant laws have, among other things, brought about impressive performance of the education sector as well as the economic sector. The reforms in BTVET were aimed at producing graduates that can be highly demanded in the world and at the same time be able to create self-employment. Most important is that the reforms embrace the concept of competence based learning that emphasizes the learner being at the centre of learning and being able to produce product with a market value while at school. This form of assessment, during learning, has been going on for some years. This conceptual paper with reference to a maize mill is meant to share views on the extent to which this reform is achieving the intended objectives of the advocates of the system.

Justification of the Maize Mill

Maize crop is widely cultivated throughout the country in separate farms or as part of mixed cropping systems. The main net surplus producing districts are Iganga, Mbale, Kapchorwa, Masindi, Kabarole and Kasese (Wandschneider & Hodge, from Kenya and WFP has been driving maize production and the crop is gradually gaining importance 2005). Domestic consumption of maize is also reported to be expanding, particularly in urban areas, as a result of growth in incomes and the lower cost of maize flour (*posho*) vis-á-vis cooked bananas and there is also significant demand as a source of cash. The maize produce is assembled dried and cleaned before milled. The size of milling firms is positively correlated with the size of the locality where they are based. Both rural and urban communities require a mill for turning maize into floor. Therefore, learning while producing taking the case of a maize mill is one of the ways of reducing the cost of acquisition of this vital milling machine to the communities.

General Objective

The main objective of this conceptual paper is to discuss the benefits likely to accrue from the design and fabrication of a maize mill by students of diploma in mechanical engineering in technical colleges.

Specific Objectives

i. To establish the quantities of materials required to fabricate a maize mill.

ii. To examine whether the criteria followed in selection of materials used in the maize mill is of low cost technology.
iii. To discuss the stages in the fabrication of the maize mill.

Selected Literature Review

In this paper, project based learning and real life projects may be assumed to mean the same thing. According to Berger and Brighouse (2012), project-based learning refers to students designing, planning, and carrying out an extended project that produces a publicly-exhibited output such as a product, publication, or presentation. Ana and Ade (2010) assert that with project based learning, the Instructor is no longer the centre of attention as the dispenser of information, but rather plays the role of facilitator, setting project goals and providing guidelines and resources, moving from student to student or group to group, providing suggestions and support for student activity.

Project-based learning is not a new phenomenon for it was popular at the beginning of the 20th century (most notably championed by John Dewey) and again in the 1970s. During the 1970s, it picked up a bad reputation (in some circles) for being unstructured and lacking rigour (rigour or rigor is often used, normally as a term of approval, by advocates of educational reform). However, since then there have been two key shifts that have reignited instructors' interest in project-based learning and helped it to shake off its stigma. Firstly, and most obviously, digital technology makes it easier than ever before for students to conduct serious research, produce high-quality work, keep a record of the entire process, and share their creations with the world. Secondly, we now know much more about how to do good, rigorous project based learning, and we can evaluate its effectiveness. This guide draws upon a substantial (and growing) body of knowledge, bringing together tried and tested strategies and protocols that all teachers can use. Today, teachers around the world are designing projects for their students because they ignite a shared passion for learning in both students and staff; they foster a wide range of skills (such as time management, collaboration, and problem solving) that students will need at college, university, and in the workplace; and they can be tailored to suit students with a wide range of abilities and learning needs.

The potential effectiveness of project-based learning as summarized by Ana and Ade (2010) is that project-based learning can improve various competencies such as academic achievement, higher level thinking and critical thinking skills better, improve problem solving skills, develop creativity, enhance self-reliance, ability to look at the situation from another perspective is better, a deep understanding of learning materials, more positive attitudes toward the

field of study, the relationship is more positive and supportive with his colleagues, improving communication skills in a sociable and increase motivation to learn.

Methods and Materials

This work was a result of a preliminary survey among students' projects examined by Uganda Business and Technical Examinations Board. The purposively selected project was the fabricated Maize Mill by students of Diploma in Mechanical Engineering at one of the five Uganda Technical Colleges. The main methodology was to compile the ingredients used in the process so to generate a conceptual debate on how useful such student projects can help the institutions they study from and the country at large. The sections that follow show the findings and the arguments brought out for sharing.

The stages of production of the maize mill

In this section, we discuss the major processes that are involved in the production of the maize mill i.e. materials estimates and selection plus fabrication. One of the unique features of the competence based approach is that trainees are fully equipped with skills that enable them produce tangible products with real market value while still undergoing training is answered in here.

Estimating the quantities of materials

The trainees made materials estimates for the maize mill components namely: cyclone, shaft, shaft box, and grinding plates. The expected capacity of the mill was one tonne of maize flour per day. It was revealed that the instructors played the facilitators' roles while the students prepared the material estimates. Available information from the visited technical college shows the estimated quantities of materials that were used in the fabrication of the maize mill. Table 1 shows the estimated quantities and unit costs of the materials that were used in the fabrication of the maize mill.

Table 1: Estimated materials and costs of Maize Mill fabrication

S/NO	MATERIALS	QUANTITY	COST (UGX)
1	Angle bar	5mm thick	87,500
2	Round bar	540mm long	16,200
3	3 plates	0.8mm 3mm thick 5mm thick	60,000 85,000 180,000

Table 1 continued

4	Hammer bolts	4 bolts	4000
5	Welding rods	1 packet	25000
6	Tightening bolts	8 bolts	12,000
7	Paint	1 tin	12,000
8	Bearings	1 pair	75,000
9	Pulley	1 pair	50,000
10	Motor	1	1,750,000

Using simple arithmetic the total cost of materials is UGX 2,356,700 only. Other costs were labor and transport which was estimated to be UGX 850,000. In a nutshell the total cost for the venture was estimated at UGX 3,206,700 (approximately USD 1,256). The actual cost may vary depending on the location with Uganda. In comparison, maize milling machine from Lushan Win Tone, machinery Manufacture Company Limited from China costs between USD2100-3000 FOB. Therefore, just from simple observation learning while producing using low cost technology innovation of a maize mill saves the country from spendingUSD1000 on each unit manufactured locally in Uganda.

Selection of Materials

Therefore, the selection was based on finding materials for the components in section above. The trainees revealed that they had participated in the selection of materials. This is a major stride as far as competence based education is concerned because it offered trainees the opportunity to acquire the skills and competencies of selecting suitable materials amidst the volatile market dynamics. It was revealed that there is a wide range of modern materials available on the market. During the interaction with the trainees, it was revealed that they were faced with the task of selecting the most suitable materials for a particular component to perform a specific function. The factors that influenced their choice included loading, service life, machining requirement, manufacturing processes, and properties of materials. Other vital properties of materials that were considered in the selection were: the ability of the material to be permanently deformed in compression without fracture and the ability of a material to be machined with ease.

Fabrication of the Components

The processes involved in the fabrication are discussed based on the interaction with the trainees, instructors and students reports on the real life project. The trainees carried design of the components using numerical approaches. This was

later followed by the fabrication of components in the workshops. The components fabricated included bolts, Shaft, Shaft box, Hammer plates, Square plates and Cyclone. Other parts such motor and bearings were fitted on the main assembly. We noted that TVET graduates after all those operations fabricated a fully functional maize mill.

We note three benefits from this new approach of TVET training. Firstly, the trainees were able to produce a tangible product while learning. This implies that the machine components can be made locally here and cheaply. Secondly, the training institutions are now becoming productive units and therefore learning while producing using low cost technology is strengthening skills development amongst TVET graduates. Also the skills acquired by the graduates make them contribute to the economy.

Expected benefits of a Maize Mill

The trainees of Mechanical Engineering made materials estimates for the Maize Mill components namely: cyclone, shaft, shaft box, and grinding plates. The expected capacity of the mill was one ton of maize flour per day. It is revealed from preliminary findings that the instructors played the facilitators roles while the students prepared the materials estimates. Available information from Technical College shows the estimated quantities of materials that were used in the fabrication of the Maize Mill. The estimated average total cost of the materials that were used in the fabrication of the maize mill approximately USD 1,256. However, a Maize Mill of an equivalent quality from Lushan Win Tone, machinery Manufacture Company Limited from China costs between USD2100-3000 FOB. Therefore, from simple observation, the students' project of a Maize Mill can save the country from spending an extra USD1000. This will make the populace appreciate education through competence Based Education and Training. The figure below shows a fabricated maize mill as one of the students' project

Figure 1: Completed Maize Mill by Students of Mechanical Engineering at Uganda Technical College, Bushenyi 2013

Challenges Faced During the Implementation

There were challenges cited by the trainees while implementing the real life project. One of them was that instructors have the skills but not updated with technology which is fast changing in the industries. This is partly attributed to the teachers' recruitment process to the educational service commission which is based on academia. A study by Murray, Pigulski and Lolov(2008) on best practices on TVET in El Salvador proposed that teachers' recruitment should from those in industry. The only shortcoming with that approach is that instructors coming from the industry need to be trained on instructional skills and classroom management, such an arrangement is more cost effective than having to teach an individual industry technology, which can take as long as two years. Perhaps if Uganda adopted a similar approach of teacher's recruitment, probably the Challenge would be minimized.

Secondly, some of the equipment used during implementation was absolute. Obviously, this a big challenge because the cost of acquisition of equipment is high and technology is fast changing. The authors propose that the most effective way to stay up to date with technology is to foster cooperative arrangement with industries. Murray et al (2008) supports the above argument by asserting that having close partnerships with local industries is an effective method for proper TVET training and real world application while also keeping down costs.

Thirdly, trainees complained of late delivery of project materials, which is probably as result of late disbursement of funds to the colleges from the line ministries. The immediate effect of the delay in delivery of project materials is that there is direct encroachment on training time (reduction on project implementation time). If more resources are allocated resources to BTVET, then government will be investing in human capital. Murray, Pigulski and Lolov (2008) urges is an intangible asset extremely important to the success of an economy. The same argument is further supported by the human capital theory which is based on the understanding that a knowledgeable workforce will attract investment, local and foreign, which will lead to increased job availability and continued training; forming an upward spiral towards economic growth.

Conclusion and Policy Recommendations

Learning by production through implementation of real life projects is turning TVET graduates into skilled workers capable of producing tangible products. Economic improvement is more likely to be visible because TVET training institutions are now producing more skilled graduates which results in an increase of output for the economy. The following policy recommendations are options in addressing the issues

I. In regards to teacher selection, the most cost-effective method of recruitment should be from industry rather than academia.
II. Training institutions should foster cooperative arrangement with industries to share equipment and technology.
III. Timely and Increase Investment in TVET is paramount and funding of the training Institutions and infrastructure development should be increased.
IV. Collaboration with the international community will increase value addition to such students products

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