POSSIBLE MERGER, ENTREPRENEURSHIP EDUCATION IN TVET ENGINEERING STUDIES: A CASE FOR SOUTH AFRICA

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ABSTRACT

Entrepreneurship education is becoming a necessity globally, including South Africa. This phenomenon is booming as a response to improving economic distress, innovativeness, and youth unemployment. This paper explores the viability of including entrepreneurship education within engineering studies in Technical and Vocational Education and Training (TVET) colleges in South Africa. Moreover, students need to exit the TVET colleges as institutions of higher learning with relevant entrepreneurial skills to improve employability and growth of the economy. Universally, TVET colleges envisage the graduates to acquire skills, values and knowledge that are labour market related in response to economic demands of the countries. It is general knowledge among TVET lecturers that high numbers of graduates are unemployed. Amid COVID-19 pandemic resulting in economic lockdown around the world may exacerbate the unemployment rate of engineering studies TVET graduates.

This inquiry employed a qualitative approach, by reviewing existing literature on the current response of entrepreneurship education within TVET sector to the global economies. Furthermore, interviews with TVET Engineering lecturers to establish the current state the TVET sector in South Africa. Content analysis was employed on reviewed literature and themes that emerged from interviews. Results indicate that European and Asian countries highly promote entrepreneurship education in the TVET sector. In some African countries, entrepreneurship education is included even though it is basic in its composition. While in South Africa entrepreneurship education is not part of engineering studies course design. Inclusion of Entrepreneurship education is recommended to improve employability of engineering TVET graduates.

Keywords: Technical and Vocational Education and Training, Engineering Studies, Entrepreneurship Education, Unemployment, Economic Contribution.

INTRODUCTION

During the apartheid regime (system of racial division) in South Africa (prior to democracy in 1994), technical education adopted a specific role in responding to the requirements of the developing industrialized (industry driven) economy as well as improving social status of most citizens (Alexander & Masoabi, 2017). TVET is viewed as higher learning sector, designed to promote a skilled workforce needed in the industry and to improve the skills base of citizens in a country (Bathmaker, 2013; Alexander & Masoabi, 2017). Moreover, these skills, including software competencies should be aspired by content knowledge and values

Citation Information: Masoabi, C.S., & Alexander, G. (2021). Possible merger, entrepreneurship education in TVET engineering studies: A case for South Africa. *Journal of Entrepreneurship Education, 24*(2).

dictated by continually developing and technologically advancing industry for economic development (UNESCO, 2006). TVET Colleges in South Africa were previously known as Technical Colleges which worked like silos in one city due to racial segregation, with institutions in the city center, having well equipped workshops for skills development, while the ones in black townships were offering only theory without necessary technical skills due to absence of equipped workshops. Later these institutions become known as FET (Further Education and Training) Colleges, which was the amalgamation of several Technical Colleges into one FET College sector with various campuses as a strategy to redress the imbalances of the apartheid era (Wedekind, 2010). The ministerial report on the Old Technical College curriculum known as NATED that began from National Technical Certificate (NTC1 to NTC6) currently referred to as National N Certificates (N1-N6) (DHET, 2009a) argue that the curriculum was developed by industry owners and stakeholders to meet the needs of industry (DHET, 2012). Thus, the graduates' attributes were then defined by industry that is intending to or has employed these students. Admission to N1 required a successful completion of the then Standard 7, now equated to Grade 9. N1 to N3 Engineering curriculum consisted of theory and practice in most colleges depending on the state of practical workshops in terms of resources (Wedekind, 2010), mostly in black communities, only theory would be offered. After N3, work-based training for about 83 weeks was recommended before a student could apply to do a trade test (HRDC, 2014b) to qualify as an artisan - and this route is said to be unaligned to the NQF levels.

This manuscript explores, the inclusion of entrepreneurship in international and intercontinental TVET sector with specific reference to technical and engineering studies - excluding commercial and or business studies.

This assumption is made against the backdrop of high unemployment percentages of young South Africans, up to 38% as stipulated by the Director-General of the Department of Higher Education and Training at the National Artisan Development Consultative Conference (DHET, 2016; Isaacs, et al. 2007). Furthermore, Statistics SA (2017) added that 31.2% of TVET graduates are unemployed, with the majority being black graduates, and perhaps among them are artisans and technicians with engineering qualifications. However, this issue of youth unemployment tends to be affecting Iran in the Middle East (Karimi et al., 2010) and some European countries also, including Austria (OECD, 2010) which had vigorous GDP about ten (10) years ago and low youth unemployment rate. Statistics SA (2019) further indicates employment decrease during the 3rd quarter of the year in sectors of industry relating to technical trade and engineering such as construction, manufacturing, and utility industries. The above further shows the necessity of incorporating entrepreneurship education for students specializing in these sectors at TVET colleges.

HRDC (2014a) report shows that the South African government has been trying to build relationships and collaborations with the private sector as the employer. However, these efforts have been at face value other than improving the quality of TVET curriculum and graduates' attributes responding to current economic needs and societal development.

The latest qualification introduced in the South African TVET sector named the NCV (DHET, 2009b) also aims at equipping TVET students with necessary knowledge, practical skills and values within their designated specializations. While the ultimate intention is to provide academic progression into mainstream universities and universities of technology after students have obtained their NCV (Level 4) qualification. However, during TVET campuses visits, lecturers are concerned about low admission requirements (Grade 9) into NCV Level 2 as

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defeating the purpose by negatively affecting output rate at NCV Level 4. Lecturers' main argument lies on the quality of students enrolling at TVET colleges.

Moreover, the paper seeks to further inspect the inclusion of entrepreneurship education into TVET engineering studies to respond to unemployment of young artisans' and their participation in the country's economic development and transformation. Wedekind (2010) further argued that the Summit on Further Education and Training was intended to explore curriculum that is responsive to the country's demands. Bathmaker (2013) concurs that, the scenario is like the English TVET sector which needs review to meet 'knowledge-driven' economic demands of the 21st century. Beyond the COVID-19 pandemic, it is anticipated that most companies including manufacturing, construction and utility trades may release or retrench employees due to funding, cost and demands of services and products. The researchers, therefore, emphasizes the need to equip current students in these sectors with entrepreneurial skills as a means of advancing the South African economy.

Research Questions

This paper intends to respond to the following research questions.

1. How does literature describe the inclusion of entrepreneurship education in TVET engineering studies regarding the enhancement of graduate employability?
2. How could South African TVET sector be encouraged to introduce entrepreneurship education in engineering studies?

THE CONCEPTUAL FRAMEWORK

This paper draws on the responsive curriculum approach within a transformational theoretical framework, as a concept that guides the arguments thereof. Central to this paper is the responsiveness of the TVET curriculum in the engineering sector towards, economic development, innovativeness, and graduates' unemployment. Thus, TVET curriculum in the engineering departments needs to transform according to changing societal, industrial, and economic requirements and therefore respond adequately to these spheres within the country and the rest of the world. Drawing from (Maringe & Osman, 2016), the researchers believe that transformation could be explained as transfiguration from a societal slavery ('do as the boss says') mindset to inventive (innovative), free-spirited thought patterns which promotes corporate and individual growth. The University of Pretoria (2016) defines transformation broadly as "*moving from one configuration to another, characterized by on-going rethinking and renewal in the pursuit of social and environmental justice*". Lally (n.d.) with support from Ogude et al., (2005), further argue that a responsive curriculum should be planned carefully to accommodate its dynamic nature to adapt to evolving societal, industrial, and economic demands in a specific environment. Therefore, a transforming curriculum aligns to parochial and international contexts, and germane to social, industrial, and economic needs of whom it serves (University of Pretoria, 2016). Moreover, transformative curriculum responding to the societal, industrial, and economic expectations (Council on Higher Education, 2015; Maringe & Osman, 2016) would require appropriate funding to produce good quality TVET engineering graduates. Production of good quality TVET engineering graduates could also be achieved through embracing soft skills needed by technicians and artisans.

As espoused by Department of Higher Education and Training (DHET) in the TVET Teaching and Learning Plan policy, TVET curricula in the South African context should be

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responsive and relevant to current economic and societal needs. We argue that the DHET needs to articulate the rationale for a responsiveness and relevant TVET curriculum, as it is not clearly stipulated in the current policy. Even though HDRC (2014a) states that the vision of DHET is to make TVET colleges the 'first choice' institutions for skills development (Figure 1).

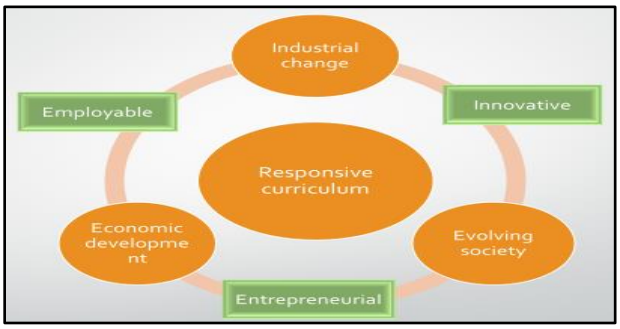

FIGURE 1
TVET RESPONSIVE CURRICULUM FRAMEWORK DEVELOPED (AUTHORS' REPRESENTATION)

THE ROLE OF THE TVET SECTOR

In most European and Asian countries, TVET education is generally purposed to meet the needs of industrial requirements and societal needs, (Field et al., 2014; Hoeckel, 2010; Ibrahim & Bakar, 2015; Ismail et al., 2019) hence the private sector, other stakeholders and the government is part of curricula developing structure and processes. However, from British Further Education (FE) perspective, Orr (2017) regards vocational education as '*neglected middle child*' hard-pressed between basic and tertiary education. The need for transformative restructuring in response to evolving industrial demands is further influenced by computerized workplace and soft skills (Karmel & Maclean, 2007).

Akoojee (2008) & Powell (2012) posit that the primary role of TVET colleges in South Africa should be geared towards the provision of intermediate skills needed for economic growth and moreover developing attitudes and values necessary for employability. Lately, TVET colleges in South Africa are offering dual curricula, the NATED (old curriculum) and the National Certificate Vocational (NCV) which was introduced in 2007. The latter is twofold- it was introduced to equip students with practical skills and provides a reroute for those individuals that left secondary education after Grade 9, to end up at the institutions of higher learning. However, TVET institutions seem to not to reach their target (HDRC, 2014b) by producing graduates with technical skills that are perceived to be misaligned to industry needs and the progression to higher education institution. The NCS remains a preferred qualification for admission.

After her independence, Singapore placed focus on TVET institutions to provide world class skills and knowledge, which in turn attracted investors for manufacturing and the exporting of finished products back to countries that rely on exporting raw materials and mineral resources (Law, 2010). As the economic landscape evolves, so was the TVET approach in aligning its curriculum to meet the needs of changing industrial demands. This position was led by the autonomous Industrial Training Board, later named the Vocational and Industrial Training Board. The Institute of Technical Education and the Economic Development Board which went

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into partnership with dominant foreign companies and investors supported the said position. When the economy became diversified, globalized and driven by entrepreneurship, the TVET curriculum adapted to change and became more innovation focused (Tucker, 2012). As authors of this paper, we endorse the eastern mindset including Malaysian and Singaporean of incorporating entrepreneurship education for all students to produce world class skills in the South African TVET sector.

Current Curriculum Expectations in Engineering Studies

The Pathways report (HRDC, 2014b) alluded on the white paper envisioning of the TVET college sector as the main provider of practical skills for studies, such as engineering. In its current under resourced state (infrastructure, facilities, and workshop equipment), TVET institutions in South Africa seem to find it difficult in responding to the latter imperative. The LMIP Report 22 stated that the TVET sector in South Africa is detached from industry; the employer and trainer, thus creating a misalignment of the offered curriculum and industry expectations (Wedekind & Mutereko, 2016). Researchers, suggest that the private sector (employer), SETA (funder), government (curriculum policy maker) and the TVET colleges (curriculum implementer & labour force producer) collaborate in developing curricula that responds to the industry demands and work-integrated learning (WIL) requirements (Orr, 2017; HRDC, 2014a; HRDC, 2014b). TVET colleges in areas without relevant engineering industries, struggle with WIL and as such opt for theoretical NATED programmes that allow large enrolment quantities at low running costs (HRDC, 2014b) - this practice does not serve the purpose of TVET colleges.

The researchers opinionated that engineering departments at TVET colleges should be accredited by the Engineering Council of South Africa (ECSA) for curriculum quality assurance and institutional accountability (Fisher, 2011) which in turn could support future investments in infrastructure, resources, including teaching and learning. In Asia, it was noted that the quality of skills development among students and teaching and learning (Asian Development Bank, 2009) injecting sufficient finances to keep abreast with evolving demands of the industry. Furthermore, we believe that engineering studies programmes encompassed with entrepreneurial skills, would serve as an ideal platform for graduates to obtain a dual-profession and promote innovation for the enhancement of the economy (UNESCO, 2014).

ENTREPRENEURSHIP EDUCATION

Entrepreneurship is mostly associated with the alleviation of unemployment and contributing towards the socio-economic development of a country through self-employment initiatives and increased productivity. Entrepreneurship further became an influential force for economic development through innovation, development, and the execution of new ideas for future global economic needs (Kuratko, 2005). Therefore, engineering studies as a thriving force behind innovation would be a suitable base for inculcating entrepreneurship education in the South African TVET college sector. According to Sanchez (2011), earlier studies focused on personalities and traits as common variables that influenced the intent of a person to embark on entrepreneurial ventures and as such, didn't investigate if these attributes could be somehow developed, based on the theory of planned behaviour. We therefore believe that entrepreneurship education emanated as a strategy for developing specific personality traits through purposive

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training (Kuratko, 2005) and a tool to improve the intention, knowledge, and skills of students to explore entrepreneurial ventures.

The Necessity of Entrepreneurship Education in TVET Engineering Sector

Entrepreneurship education is regarded as a type of cultural evolution, which is ideologically constructed by government through educational practices and policies (Rae, 2010) in responding to prevailing economic challenges. Although, TVET education was overlooked and regarded as low-class education, latter perceptions view TVET as a contributor to economy and innovation (Chankseliani et al., 2016). Entrepreneurship education for engineering students should be conceptualized in such a manner that it widens students' scope of operation in the companies they serve (Hynes, 1996). Moreover, Bokova (2017) in UNESCO agenda for 2030 suggests that the TVET sector should be equipped to offer youth entrepreneurial skills through entrepreneurship education, as one of the Sustainable Development Goals.

Furthermore, (Isaacs et al., 2007; European Commission, 2009; Nicolaides, 2011; Lekoko et al., 2012; Van Aardt et al., 2014) view the concept of entrepreneurship as a "process of conceptualizing, organizing, launching and through innovation, nurturing a business opportunity into a potentially high growth venture". Unpacking this definition in the context of this paper, TVET engineering studies students need context specific entrepreneurship education to learn how to develop a competitive business vision, which is in line with the purpose and anticipated growth potential of envisaged enterprises (Rasmussen & Sørheim, 2006). A mission statement, serving as a pathway guideline could possibly assist the future entrepreneur with creative thinking solutions in establishing business ventures (Karimi et al., 2010; Nicolaides, 2011). The imbedded vision serves as a driving force to pursue this endeavor even if there are some foreseeable calculated risks on the show of starting or growing a business in a hostile economic environment (Echtner 1995; Murphy et al., 2007). However, in a more broader perspective, engineering students' creativity abilities also need to be triggered and enhanced to bring about a sense of self-reliance towards unlocking initiatives in work places in advancing new developments in their areas of specialization) for the betterment and satisfaction of the society baring-in-mind the environmental impact (Kozlinska, 2011; Lackéus, 2015).

The European Commission (2009) argues that entrepreneurship education should not be mistaken for economic or business studies since its purpose is to encourage innovation, creativity, and self-employment. As authors, we argue that entrepreneurs with clear visions could in the long term acquire the needed business acumen and knowledge in growing his or her enterprise (Raposo & do Paço, 2011; O'Connor, 2012). Perhaps, the context in which entrepreneurship education is employed appears to further contribute to claims that its impact is untraceable as it related to the amelioration of entrepreneurial skills and self-efficacy (O'Connor, 2012). Rasmussen & Sørheim (2006) further argue that some reports perceive entrepreneurship education to be a successful adventure in improving students' intentions in commencing with new enterprises in various parts of Europe, as a means of encouraging skilled self-employment opportunities (Radipere, 2012).

The preliminary results of a pilot study on final year commercial studies student views regarding youth intentions to explore entrepreneurship in South Africa (Musengi-Ajulu, 2009), indicated that most of the students showed to have intentions of venturing into entrepreneurship. However, only 22% of them stated to be informed regarding the practicalities of starting a business. Moreover, cultural perspective has also proven to effect students' views. Only 24% of

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these students' immediate families regarded entrepreneurship to be an invaluable asset to students' employability. A similar recent study done in Malaysian TVET sector on entrepreneurial intents of technical graduates (N=262) at two institutions revealed high percentage (N=235 -89.7%) of moderate to high level social norms (family and culture) influence on their intentions to embark on start-ups after graduation (Ibrahim & Bakar 2015). These findings build to this paper's argument that educational empowerment is necessary and could therefore enable graduates to overrule views of the society based on the skills they have acquired at higher learning institutions. Furthermore, there should be a way of teaching students these skills in a more practical and authentic manner, not just as content knowledge but to develop self-efficacy, pro-activeness and other personal traits, values, attitudes and beliefs (Raposo & Paço, 2011; Sanchez, 2011) and to be possibly self-employed after their studies when embarking on entrepreneurial enterprises as a first preference. Haertel et al., (2016) believe that the fostering of creativity for engineering students to generate ideas that solve current problems, and innovative ideas to be transferred into new business initiatives. Nieman & Niewenhuizen (2019) have indicated twelve entrepreneurial attributes (passion, locus of control, need for independence, need for achievement, risk taking and uncertainty, creativity and innovation, leadership, good human relations, positive attitude, determination and persistence, persistent problem solving and commitment) that students should be skilled for them to gauge in economic opportunities and the establishment of conducive environments and the promotion of self-confidence in initiating and advancing their future businesses.

It would, therefore, be necessary for lecturers in the engineering TVET sector of South Africa to be trained and equipped with entrepreneurial education and skills that will enable them to cultivate skills, more relevant and applicable to engineering students. If the lecturers have developed entrepreneurial conviction and behaviours, they should be in a position of encouraging their students to participate in entrepreneurial ventures, after the completion of their studies (Haolader, 2015). Moreover, these kinds of lecturers would also have the ability to design practical activities, teaching students how to start or run a small business- thereby improving possibilities of more graduates choosing to collaborate and commence with their own small companies. Echtner (1995) contend that the big setback in implementing entrepreneurship education in most developing countries is the lack of qualified and experienced lecturing staff which in turn may lead to countries, such as South Africa outsourcing skilled labour from 1st world countries, is an expensive exercise.

Global Perspectives on Entrepreneurship Education in TVET Colleges

The global view is that TVET colleges are most appropriate to respond to the development of entrepreneurship skills and improve employability of graduate artisans and technicians as a measure of addressing issues of youth unemployment and exclusion in socio-economic development. Moreover, developing countries attempted to curb high unemployment rates amongst young people, by enrolling school leaving students in TVET colleges and equipping them with only theoretical and technical skills (Haolader, 2015). We argue that entrepreneurial capabilities could be a better tool for creating of self-employment opportunities for students after they have completed their engineering studies qualifications.

For over twenty years, Bangladesh has incorporated various entrepreneurship education in all TVET colleges with a value of two credits per programme. This country's National Skills

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Development Policy places more emphasis on the promotion of employability and self-employment skills (Haolader, 2015).

After realizing high unemployment of TVET graduates, the Malaysian government decided to inject funds into the implementation of entrepreneurial education, which commenced from primary school through to tertiary institutions. This action assists the TVET college sector in enticing graduates' in exploring entrepreneurial ventures after their studies (Mansor & Othman, 2011). Moreover, the Malaysian government took upon itself to source the best practices that would yield the intended outcomes. The government made entrepreneurial education a compulsory course for all students, irrespective of the direction of study (Ibrahim & Bakar, 2015). The reason being that TVET colleges offer a variety of skills that students could use to start new businesses ventures after the completion of their studies- the acquisition of entrepreneurial skills enhance graduates' self-efficacy beliefs to commence with new business enterprises. In tstudy (Ibrahim & Bakar, 2015) show that the majority of TVET graduates seem to have intentions of venturing into enterprise. Students' positive attitudes towards entrepreneurship and their levels of high self-efficacy and entrepreneurial knowledge are mostly supported by the society and cultural norms.

Moreover, Oosterbeek et al., (2010) and European Commission (2009) report that in the majority of European countries, 90% to 100% of TVET College students partake in entrepreneurship curricula at a certain level of their study career. In most European countries, such as Austria, Cyprus, Denmark, Estonia and Germany, Czech Republic Hungary, Poland and Norway, Romania, Slovenia, Spain, Netherlands and Slovakia, entrepreneurship education is included in curriculum policies as a strategy of encouraging and increasing self-employment for the betterment of a country's economy. In other countries, such as Sweden, Italy, France and the UK, entrepreneurship education is not yet compulsory but rather optional for those students who may be interested in gaining entrepreneurial skills. Thus, students' mini-company (entrepreneurial) programme is leading and producing observable positive impact among students' intent to become self-employed.

The Iranian unemployment rate for college women and girls increased to 54% in 2002, because of the country's historical background of government as the main employer (Karimi et al., 2010). In this context the higher education sector of Iran is focused on developing future employees for the country. However, this development has evolved through government's injection of finances in research, promoting and encouraging entrepreneurship and innovation - and developing education policies for inclusion of entrepreneurship education. Iran further introduced a science and technology park and business incubator as breeding environment for entrepreneurs with various educational specializations. Furthermore, the concern raised by Karimi et al., (2010) is the minimal impact of entrepreneurship education when higher learning institutions offer it as a standalone rather than being embedded in various course contents.

The State of Entrepreneurship Education in the African TVET Sector

Nigeria as one of the most populous African countries has not yet ventured into developing its TVET college curriculum to the extent where it should have included entrepreneurship skills as some of graduate characteristics in programmes (Maigida et al., 2013) as to respond to the high unemployment of young people in that country. The report of the National Steering Committee (2011) assigned to develop the National Qualification Framework (NQF) for Nigeria listed various aspects which hinder skills development in the country, namely,

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a neglected TVET sector which isn't prioritized and the theoretical approach to teaching and assessment. Like in many other African countries, TVET education is also perceived as a pathway for unintelligent individuals who could not obtain access to the traditional universities (Dike, 2013). Limited response to the industrial needs of Nigeria, associated with a decrease in the number of accredited technical colleges, is an indication of how the quality of training is diminishing. The formal TVET institutions, resorting under the National Board (NBTE) range from technical colleges, mono-technics, and polytechnics. The report further states that entrepreneurial education for TVET sector is incubated in the policy awaiting due implementation. Thus, Nigeria's TVET sector is focused and prioritized on the advancement of the country's socio-economic status (Dike, 2013). Akpoyibo (2015) assets that high unemployment rate of TVET graduates in Nigeria results from inadequate skills provided by these institutions in the country; and further postulates that entrepreneurship education should be included in TVET colleges to transform skills into merchandises and services for the betterment of TVET graduates' participation in the economy. Since the epoch of certification that guaranteed employment has past, Onweh et al., (2013) further attest that, inclusion of entrepreneurship education in TVET sector would be profitable to the country's economic development.

Botswana is one of the African countries that have introduced entrepreneurship education in its TVET college sector on all the qualifications. In the study that was done in Selebi-Phikwe, Setibi & Mapfaria (2014) indicate that the region is still experiencing high youth unemployment with TVET qualifications. The study stipulated various factors that push graduates to seek employment that would give them monthly wages or income, they include bursary contracts that need repayment on regular basis after completion of studies, lack of capital to start-up and entrepreneurial skills are offered at lower level that does not build confidence and competence among graduates to take risks of venturing into small enterprise sector. Moreover, students are only given theory and not exposed to real-world practices such as acquiring mentorship relationship with existing and advancing entrepreneurs. Moreover, according to Jotia & Sithole (2016) resent studies in Botswana indicated that about 49% of TVET graduates are hunting for jobs due to misalignment of skills provided by TVET sector as opposed to industrial requirements.

Furthermore, Ethiopia as one of the African countries that despised entrepreneurship in the past - regarded as anti-social also associated with lower class citizens. But currently entrepreneurship is prioritized as one of the eminent economic drivers in the country (Edem, 2008). Above all, Ethiopia has included entrepreneurship education within its TVET college sector in all the departments for over a decade. The study done in two of the Addis Ababa TVET colleges (Edem, 2008) reflects that teaching methods varied from authentic project based, group discussions, field visits, lecture to simulations presuming most of necessary skills, values and attributes have been properly addressed in the colleges. Students as research participants indicated that entrepreneurship education has played positive role in improving their self-efficacy to start-up new enterprises and majority indicated to opt for self-employment as their first choice after completing their studies. However, in another study by (Tegegne, 2014) in some colleges around Addis Ababa, revealed that the quality of entrepreneurial training offered at the colleges tend to be inadequate to help the graduates start-up their own small enterprises because time allocation was not enough. Another challenge was creating an environment that supports graduates' collaborations to venture into starting their own businesses from the government and private sectors. It could, however, be inferred that Ethiopia may be regarded as

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exemplary to South Africa that entrepreneurship education - when efficiently and effectively implemented in TVET colleges could be a major economic development model.

Like many other developing countries, Kenya also initiated to put more emphasis on academic education which resulted in high unemployment of young people - as TVET education was neglected. About three decades ago, Kenya began to focus its emphasis on technical and vocational education and introduced it as, the Technical, Industrial, Vocational and Entrepreneurship Training (TIVET) sector (Nyerere, 2009), that already included the entrepreneurship training in the naming and categorizing of the TVET sector. Thus, it is therefore evident that entrepreneurship education is one of the main purposes of vocational education in this country. Moreover, the educational framework allows academic progression within the technical education from Technical Secondary Schools, to TIVET College Diploma, to TIVET under-grad and to the highest post-graduate levels and even crossing to the traditional universities.

Furthermore, the Republic of Kenya (2012), states that the country's vision 2030 directed focus on TVET as driving force behind economic growth aimed at producing varied levels of technical expertise. Kenya education system further invested in TVET teacher training to produce expected skills and competencies and, also mobilizing resources and private business sector as benefactors to increase revenue for running TVET institutions. According to Simiyu (2009), alignment of TVET skills training to the industry requirements and the introduction of entrepreneurship education was the best strategy ever. Which has encouraged majority of Kenya TVET graduates to embark on entrepreneurial ventures? Moreover, the TVET sector is working closely with private sector where students get authentic entrepreneurial training. Simiyu (2009) further indicates that, even those trainees who opted for salary paying jobs - in the long run they start their own enterprises. The researchers are of the opinion that South African Department of Higher Education and Training needs to invest on sending researchers and TVET lecturers to countries like Kenya to harness good TVET entrepreneurial skills development strategies.

The State of Entrepreneurship Education in South African TVET Colleges

One of the largest providers to employment is South Africa, is the manufacturing sector which contributes 12% to South Africa's GDP. South Africa demonstrates an unemployment rate of 38.7% and a youth unemployment (15-24 years) rate of 58.1% (Stats SA 2019). Production in the manufacturing sector fell 5.9% year-on-year in December 2029 to its biggest decline since July 2014. In responding to this aspect and the current gloom economic prospect exacerbated by COVID-19 in South Africa, alternatives need to be explored as to have graduates at higher learning institutions, such as TVET colleges could be empowered with entrepreneurial skills. According to Gamede (2019), entrepreneurship education in TVET colleges is regarded as a critical aspect in advancing the knowledge and skill base of citizens in so far as positively contributing to the socio-economic development and technological advancement of a country. In South African context, the government regards entrepreneurship as any form of small enterprise without any creativity or innovation - whether selling fruits at street corner for survival or having political relations to access government tenders "*Tenderpreneur*" from state owned parastatals (Van Aardt et al., 2014). According to Kuratko, (2005), entrepreneurship could not be limited to a mere formation of small enterprises as it is a process driven by creativity, innovation and implementation of new ideas and seizing opportunities with calculated risks.

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According to HRDC (2014b), entrepreneurship training is largely done by independent providers outsourced by SETAs and not necessarily instilling the skills for entrepreneurs but giving theories on how to start a small business. However, on TVET campuses, entrepreneurship modules are only found in management courses. Therefore, engineering students in South African TVET colleges are disadvantaged regarding the acquiring of entrepreneurial skills. The Strategic Framework and Programme of Action for TVE in the SADC Region (2011) refer to the necessity of including entrepreneurship education within the curriculum as a means of responding to the lacking economic and skills development in the region.

In achieving the vision of Accelerated and Shared Growth Initiative of South Africa (ASGISA) it seems it would take time for South Africa to arrive at an acceptable standard in including entrepreneurship education at basic education and at TVET sector level (Nicolaides, 2011). We argue that this delay is because of a narrow-focused definition of entrepreneurship in the South African context. Regarding entrepreneurial activity as solely small business sector or start-up ventures (Museng-Ajulu, 2009) excluding creativity and innovation as major aspects of entrepreneurial skills and training is a setback. Innovation on the other hand is viewed as being inclusive of developing new products, improving quality of products, and advancing new processes of production that respond to current social and environmental needs (Gürol & Atsan, 2006). We further claim that innovativeness is an integral competency of entrepreneurship education as new opportunities evoke profitable change and business growth (Mitchelmore & Rowley, 2010). UNESCO (2014) have identified ten key areas of TVET reform, namely: enhancing responsiveness of TVET provision, changing perceptions of TVET, restructuring qualifications frameworks and building new learning pathways, increasing work-based learning, skills development for TVET lecturer and trainers, improving ICT usage at TVET, cultivating good quality governance and partnerships and establishing sustainable financing models for TVET sector. These key areas of anticipated reform in TVET should include entrepreneurship education to improve responsiveness of the curriculum to youth employability.

Methods of Teaching Entrepreneurship Education

Since entrepreneurship education in South African engineering departments at TVET colleges would be a largely new phenomenon, scholars need to search for more efficient pedagogical approaches and theories of learning that would guide its teaching and learning (Karimi et al., 2010). Lackéus (2015) categorized entrepreneurship education delivery methods as "*teaching about*", "*teaching for*" and "*teaching through*" entrepreneurship. While the first entails content-based which normally gives general knowledge and understanding of the environment? The second method of teaching is giving basic knowledge and skills for start-ups - and he recommends these methods for high school students since they are still young. Thus, "*teaching through*" entrepreneurship is proposed as more relevant for inclusion in core subjects such as engineering division - where students would be given experiential learning to go through the entrepreneurial process (Lackéus, 2015; Rae, 2010). Moreover, Arasti et al., (2012) listed other recommended methods of teaching entrepreneurship education, which include case study, group discussion, individual presentation, individual report writing, group project, formal lectures, guest speakers, action learning, web-based learning, simulation and recorded video. It could thus be argued that teaching students how to look after an existing business and obtaining a managerial position as good and loyal servants, is not instilling entrepreneurial motives, skills and graduate attributes (Aronsson, 2004) and therefore suggests that the active participation of

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students through apprenticeship is perceived to be one the best ways to teach entrepreneurship skills and instill a climate for authentic experiences (Rae, 2010).

Therefore, to obtain these characteristics among TVET Engineering students, relevant methods of teaching should be directed to each of the attributes. It is evident that the world's and South African economies are private sector driven (Maigida et al., 2013) and in turn it needs to be noted that practical and authentic ways of teaching artisans' entrepreneurial skills to stimulate correct attitudes, values and culture are required ((Mwasalwiba, 2010).

Mansor & Othman (2011) listed some the world's best delivery modes for entrepreneurial education, which include aspects such as facilitating and coaching; experiential learning; problem-based learning; students as leaders; people in the community; variety of methods and lifelong learning model. Problem based and experiential learning is highly recommended. Experiential learning by John Dewey, is highly recommended (Malindi, 2014) as one of active learning pedagogies where experiences are reconstructed into tacit knowledge and could be regarded as the underpinning theory behind the other fore mentioned recommended entrepreneurial education delivery modes in obtaining the envisaged graduates' attributes required of Engineering students (Kozlinska, 2011). Honig (2004) further suggests that the inclusion of both content knowledge and soft skills (values, daily experiences, and attitudes) learnt through experiential learning could possibly be an effective way of teaching entrepreneurship education.

METHODOLOGY

The paper is qualitative in nature where primary and secondary sources such as research articles, curriculum policies and research reports, news publications and books were used to draw data for this conceptual paper (Owen, 2013). The researchers attempted this research using credible and authentic sources to ascertain the trends of entrepreneurship education globally, within the African continent and in South Africa. The paper further, seeks to comprehend the impact of entrepreneurship education on economic development and youth employment in places, especially where it is part of artisan training (TVET sector) curriculum. The study employs hermeneutics as a research approach. Thematic goals for content analysis procedures to extract the richness of assertions from various sources were used as a form of data analysis (Mayring, 2014). The researchers opted for document analysis as research method due to readily available information on public sphere to hasten the identification of research gaps in the TVET division. Research papers and policy documents from various parts of the world, European, Middle East, Asian, African and South Africa focusing on perspectives relating to the TVET sector and entrepreneurship education for engineering studies, were consulted. Furthermore, to add on to the literature, the researchers integrated some data gathered via engagements (information sharing session, a group discussion and scheduled visit) with the international office representative at a Polytechnic in Singapore, a mechanical engineering lecturer at a TVET college in the Free State province and NATED and NCV engineering lecturers at a TVET college in Gauteng province South Africa.

Engagements with Participants at TVET Colleges in South Africa

As part of a larger research project on profiling the qualifications of TVET lecturers in South Africa to assist universities develop programmes for TVET lecturer training. Our research team focused on TVET engineering studies lecturers. When delivering the survey to the colleges

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a participatory technique was employed. We sort permission from the college principal and the campus manager to access their institutions and their staff members. Once permission was granted, we would then set an appointment with the campus manager and engineering lecturers. The purpose was to hear some issues which may not be possible to ask on the survey or concerns that may be raised by participants - as well as for introducing the purpose of the study to the participants.

Participatory technique seeks to get more information from the participants by using strategies such as focus groups (Campbell, 2002) which were used for the purpose of this paper. At the TVET College in the Free State the team had a meeting with the campus manager, who then delegated the Mechanical Engineering lecturer to take us through the workshops, where we engaged with other lecturers briefly. It was when we saw the students' projects in his workshop that triggered the issue of entrepreneurship education for engineering students. We asked to have a brief interview with him that was recorded on a phone with the lecturer's permission. As a follow up on the entrepreneurship education we arranged a meeting with the College senior management team which consisted of five members including the Principal. The meeting was also recorded on voice and video camera and took about an hour of which the main purpose was to propose memorandum of understanding between the researchers and the college.

Furthermore, participatory research assists researchers to gain more knowledge regarding the practices of the researched community from the community itself and gives the participants ownership of the knowledge (Tadevosyan & Schoenhunth, n.d; Bergold & Thomas, 2012).

At the Gauteng TVET College a non-probabilistic, convenience sampling procedure was implemented as the intention was to meet as many as possible that would be available at the time. We met around a table with a focus group of fifteen engineering lecturers in the campus manager's boardroom and the manager was part of the proceedings. Six of the engineering lecturers were in the NCV curriculum and the other nine were from the Report 911 known as NATED curriculum. Because of the number of attendees, the meeting took about two hours due to the introduction of the purpose of the study and familiarizing groups, researchers, and participants.

The engineering department lecturers were engaged on the following issues, namely: entrepreneurial skills/entrepreneurship education being included in their programmes and college curriculum-please motivate/expound on your answer and the reasons as to why it would advisable or profitable for students to integrate entrepreneurship education in engineering studies programmes (Table 1).

Table 1
SNIPPETS OF ENGAGEMENTS WITH TVET PARTICIPANTS INTERVIEWS

TVET College	Date of Engagements	Selective Excerpts from Engagements
Free State (Mechanical Engineering lecturer) **Information Sharing Session**	03-04-19	**Researcher** - Do you offer entrepreneurship education to engineering students?
		Lecturer - *We build gas-stove stands considering the markets outside, braai stands and garbage holder-stands. They must be proactive and think of market outside. However, we do not do entrepreneurship as a course because it is not a prescribed part of curriculum for engineering studies. I would say that I do it informally as advice, telling them when they go out of here, they should not wait for someone to hire them, as most of them didn't do well at schools and some have a little bit of disability to go and make a living outside.*
		Researcher -In the townships I see a lot of these trash holders. *Yes, you are right, there is a lot of market out there for them.*

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Free state (Senior Management Team)	08-08-19	**Researcher** - What is your opinion about including entrepreneurship education for engineering studies students?
		Principal - *It is a good idea, but we already have incubators where students can come and learn how to generate ideas for start-ups. Although they are not forced but made aware of its existence. However, the main intention is for those who have completed their studies as well as the other rising entrepreneurs in the city.*
Gauteng (NATED & NCV lecturers) **Group Discussion**	17-10-19	**Researcher** - Do you think including entrepreneurship education in engineering studies will be profitable to the graduates?
		Respondent 1: *It will be difficult with other courses such as instrumentation or fitting & turning as they need companies with their trades. Equipment that they use is too expensive and some machinery are huge for small businesses.*
		Respondent 2: *But for others such as electricians, motor mechanics, and boiler maker could work as they may need start-up tools to start working independently or small scale. They can survive with hand tools for some time before their businesses grow for high demanding tasks that need expensive and heavy machinery.*
		Respondent 3: *It's not part of our curriculum, but I think it's a good idea that can help employability of graduates. But we need to have world class machinery in our NCV workshops. As for NATED curriculum I don't know because they only do theory without practical.*
Singapore Polytechnic (international officer) Study visit	15-03-19	**International Officer** - *You said you are interested in entrepreneurship?*
		Researcher - yes.
		International Officer - *We do have, and this is where it's done, and students spend six months here (showing a place on the campus map). Entrepreneurship education is offered to all the students at the Polytechnic. We also have an incubator where students can go develop and work on their designs and inventions. Entrepreneurship education is compulsory for all tertiary institution students because it instil skills and values that are needed by current industry demands. We have found entrepreneurship increasing employability chances of our graduates.*

Findings from Engagements with Participants from TVET Colleges

Entrepreneurship course: From the two South African colleges, engineering lecturers indicated that entrepreneurship education is not part of the curriculum. However, a mechanical engineering lecturer in a Free State TVET college alluded that he teaches his students informally; to think of and observe societal needs that they could respond to with their skills for monetary gains.

While from the Gauteng TVET College, no lecturer stated to be casually encouraging his or her students to embark on start-ups with their skills. Other than that, lecturers believed entrepreneurship education could work for other engineering courses (electricians, motor mechanics and boiler maker) and not others like instrumentation and fitting and turning. This shows that, if introduced in engineering studies curriculum, entrepreneurial skills for start-ups, including those for training assertive/innovative employees would be crucial.

It could therefore be deduced that lecturers are of the opinion that entrepreneurship education could be beneficial to TVET engineering studies students. However, from the curriculum documents only students in Business Studies benefit by being introduced to entrepreneurship education.

From the discussion meeting with one of Free State TVET College Management Team, it came to our attention that various colleges including this one in the Free State, they have established incubators for entrepreneurial developments. However, it seemed to be more of

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community development project. Not necessarily for TVET college students but the surrounding communities. With our brief visit to the incubator, it was confirmed by the administrator that majority of participants are members of the community already involved in small business establishments.

Emanating from an interview with the International Officer at a polytechnic in Singapore, it is evident that entrepreneurship education is seen as invaluable asset to all students, regardless of their areas of specialization. It thus could be concluded that in Singapore, all students in a polytechnic are encouraged to be entrepreneurial orientated with whatever direction of specialization is followed by students. Moreover, every student is considered a potential entrepreneur and innovator in their area of specialization.

Employability: lecturers from the South African TVET colleges indicated that inclusion of entrepreneurial could enhance employability of engineering studies graduates- this could be enacted through self-employment opportunities through the establishment of small-scale businesses. However, the concern is on the NATED program where engineering graduates s exit the TVET colleges without any hands-on skills other than theory. Furthermore, lecturers confined to the NATED or Report 191 curriculum are of the opinion that their programme should be reviewed to include current information on new technologies in different engineering specialisation fields. During the group engagement with the Free State TVET college campus manager and the engineering lecturers, a concern was raised as to how engineering courses could be offered without workshop experience (practical). Students appear to be frustrated when they are not exposed to a type of 'apprenticeship' in the industry, where profit is the focus. The industry seemingly does not want to take these students to teach them what they should have learnt at the college workshops. Industry is of the opinion that skills and values like safety measures, use of various hand tools is a college responsibility and regards it as waste of production time. Secondly, the central region of South Africa is not as industrialized as regions like Gauteng or places with mining companies around. Students hardly obtain their National Diplomas as qualified artisans.

DISCUSSION

South African TVET sector seems to be continually misplaced, therefore providing substandard quality qualifications with obsolete skills to those required by the post-industry (digital) economy due to inadequately qualified teaching personnel and lecturer understaffing (Maringe & Osman, 2016; Akoojee, 2008). This unpleasant phenomenon within the TVET seems to be prevailing in other regions of the world as well. For example, in countries such as Pakistan, Bangladesh, Afghanistan, India and China, the TVET sector is mostly offered at high school level therefore not meeting the current economic expectations of knowledge and information era that is booming (Agrawal, 2013; Akoojee, 2008). It could also be understood from the history of TVET sector in most of these countries that it has not been the priority of governments to develop this sector to global market levels but was regarded as second-class type of education. In South Africa, innovation and creativity for entrepreneurship could be achieved by synchronising the TVET curriculum progression from NCV (NQF Level 4), Technical School matric with engineering subjects to N4 by increasing the NQF level at N4 to N6 to that of the engineering diplomas (NQF Level 6 with 360 credits) which is offered at universities of technology to produce high skilled labour (technicians). Instead of doing N4 to N6 in almost 30 weeks, each of these levels should be offered in 10 months period. In this manner, subject

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content could be increased, and workshop time could form part of the prescribed TVET curriculum. In turn, universities of technology should then focus on four-year engineering degree programmes.

The above recommendations would possibly curb the issue of TVET colleges in South Africa being regarded as a rebound option for schooling but could become a preferred option for matric students (exit level at grade 12 for students). The admission requirements should be altered to that of diploma pass at matric level. Moreover, educational continuity or progression would be aligned as TVET graduates would be offering diplomas inclusive of practical work. Based on the above assertion, TVET graduates would qualify for a one or two-year programme to complete engineering degrees at universities of technology or any other universities offering engineering studies. At the current state, N6 qualification is not even equated to first-year level of engineering studies at universities of technology, should the student want to pursue a degree qualification. Therefore, the provision in low to medium skilled labour (artisans) in the engineering sector should now be a responsibility of, community training centers, technical high and comprehensive high schools in South Africa.

Moreover, in countries such as Malaysia, Indonesia, Philippines, and Thailand, the TVET sector has been fairly developed to enhance the countries' industrial skills and curb unemployment (Agrawal, 2013). Furthermore, Korea, Japan and Singapore are classified as countries providing reasonably good TVET qualification with world-class institutions evolving with new demands of economy to keep their economies and employment rates flourishing (Agrawal, 2013).

Since the TVET sector in South Africa has been placed under the management of DHET (Department of Higher Education and Training), this calls for TVET colleges to offer higher education standards and world-class engineering studies. As authors of this paper, we believe they could not continue to provide educational knowledge and skills at Further Education and Training (FET) level which is high school standard. At higher education level, graduates should be qualified to be absorbed anywhere in the world not only locally by small factories. Hence, we are of the opinion that inclusion of entrepreneurship education and training among engineering students would increase global competitiveness in terms of socio-economic development and innovation (du Toit & Gaothlobogwe, 2018; Chimucheka, 2014). In this way, the improved curriculum that is globally recognized and provides skills, values and attitudes that are world-class would be responsive to the changing economic demands of the country to alleviate high unemployment rate of TVET engineering graduates and increase chances of being absorbed in the world's economy. According to Dlamini (2014) in his study done in one of the South African TVET colleges mentioned that responses from student support officers, students and local industry (employer) stated that the current TVET system is not responding to the skills need of the industry, hence the high unemployment of TVET College graduates. Moreover, the involvement of bodies, such as the Engineering Council of South Africa and industry in the development of a responsive engineering curriculum in TVET colleges could bring a positive change and improvement towards attaining the afore mentioned variables (Wedekind & Mutereko, 2016). They further highlighted that a close and structured relationship between industry and TVET colleges have a high impact on absorbing trainees into fulltime employment after completing their well-planned and monitored work-integrated learning programme. We also agree that a responsive engineering curriculum should appeal to the employer and thus address the expectations of the industry in the region, obviously not overlooking national and international requirements and the developmental imperatives of the country.

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CONCLUSION

In the rapidly changing industrial context in South Africa and globally, TVET sector in South Africa needs to align with the evolving demands. A responsive curriculum conceptual framework could be adapted in including entrepreneurship education to address current industrial requirements and employability of TVET graduates.

Looking at global trend regarding entrepreneurship education inclusion among faculties that are not commerce related in nature is expanding to produce global competent graduates. In South Africa as well it could be a route to embrace and introduce entrepreneurship education to all post-school students (TVET, universities of technology and traditional universities) and or even to basic education learners envisaging to produce internationally competitive graduates in all sectors including engineering.

This study shed some light on the importance of entrepreneurship education among TVET sectors globally. Majority of literature that was consulted showed positive outcomes pertaining to increase in self-employment because of entrepreneurship education and assertiveness in the industry. It could be deduced that entrepreneurship education is an important vehicle towards enhancing employability of engineering studies TVET graduates. Lastly, literature has revealed that entrepreneurship education can be merged into engineering and technical studies within the TVET sector in South Africa.

LIMITATIONS AND FURTHER RESEARCH

One of the limitations is that entrepreneurship education was not the core business of visitations to the TVET campuses, we could only ask on it when opportunity arises after all other issues of the research have been dealt with. The second limitation would be a small sample which could not allow results to be generalized. Even though TVET curriculum policies are clear that entrepreneurship education is not provided for engineering studies students, it was important to hear the views of the lecturers pertaining entrepreneurship education in engineering studies.

For further research, we are looking at measuring the entrepreneurial intent of engineering studies students even if they are not taught entrepreneurship education and those of commercial subjects' students who are taught entrepreneurship education. We are of the belief that technical skills incorporated with entrepreneurial skills would contribute significantly to socioeconomic status of individual students and the community around them.

Secondly, a pilot study at one of the TVET colleges in the Free State with engineering students exposed to entrepreneurship education during their study period. To assess the difference in entrepreneurial intent with the group that was never exposed to entrepreneurship education.

ACKNOWLEDGEMENT

The authors would like to acknowledge the Department of Higher Education and Training in collaboration with European Union for availing funding for collection of data for this paper.

Citation Information: Masoabi, C.S., & Alexander, G. (2021). Possible merger, entrepreneurship education in TVET engineering studies: A case for South Africa. *Journal of Entrepreneurship Education, 24*(2).

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Citation Information: Masoabi, C.S., & Alexander, G. (2021). Possible merger, entrepreneurship education in TVET engineering studies: A case for South Africa. *Journal of Entrepreneurship Education, 24*(2).