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THE EMBEDDEDNESS OF ENTREPRENEURSHIP EDUCATION IN THE CURRICULA OF NON-BUSINESS UNIVERSITY PROGRAMMES: PRELIMINARY EVIDENCE FROM SOUTH AFRICAN UNIVERSITIES OF TECHNOLOGY

*Ukorenjenost preduzetničkog obrazovanja u programima
neposlovnih univerziteta: Preliminarni dokazi sa Južnoafričkih
tehnoloških univerziteta[§]*

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Abstract

The total early stage entrepreneurial activity (TEA) in South Africa is said to be extremely low compared to those of other sub-Saharan countries. This is despite the concerted efforts of the government to establish, develop and nurture entrepreneurship at all levels, especially among the youths. This calls for concern given the current state of the economy and the challenges faced by South Africa's future generation. This paper is anchored on two theoretical frameworks to substantiate our argument for the inclusion of entrepreneurship education in the curricula of non-business programmes at universities of technology. The theoretical frameworks are the contingency organizational theory and the magnet versus radiant model. The study adopted an exploratory cross sectional research

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design which allowed us to collect data from a cross-section of a population: the universities of technology in South Africa. The findings suggest that only fifteen (out of the 46) of the programmes showed visible evidence of entrepreneurship/business studies in their content. Such finding implies that there is a need for entrepreneurship to be integrated into the curricula of all non-business departments if not for the sake of its perceived employment generation attributes, but for its other attributes such as innovation, and more importantly employability.

Keywords: *Entrepreneurship education, Enterprise education, Non-business disciplines, Curriculum development, South African Universities*

1. Introduction

If a consensus were to be reached, many researchers would concur that most of the social ills confronting African countries in general and South Africa, in particular, today are rooted in the high levels of unemployment (Chimucheka, 2014). Entrepreneurship is, however, considered to have the potential to improve this. The level of entrepreneurship differs substantially across nations for various reasons. In some cases, entrepreneurship is hampered by a number of sociocultural and demographic factors, while in some others, economic and geographic factors. These factors essentially reduce the level of entrepreneurial activity in each case. Whereas the causes and consequences of entrepreneurship are a matter of significant and extensive debate among scientists, policy makers and governments, both practitioners and scholars are of the view that entrepreneurship should play a high level role in economic and social development. This is primarily because a high level of entrepreneurial activity is presumed and shown to enhance innovation, competition, economic growth, job creation and well-being of a country's citizens (HRDC, 2013). In fact, in the United States and Europe, policy makers are of the view that more entrepreneurship (engagement in entrepreneurial activity) is essential to attain higher levels of innovation and economic growth (Oosterbeek, Van Praag & Ijsselstein, 2010).

The likes of North (2002), Isaacs et al (2007) and Nnandi (2013) insist that much more entrepreneurial activity is achievable through the uptake of entrepreneurship education. The European Commission (2008) is of the view that programmes and modules in entrepreneurship education should cover the necessary tools (such as business skills and entrepreneurship skills) for the development of creative thinking, problem solving, and analytical abilities, which enable the development and implementation of business ideas. The HRDC (2013) agrees by arguing that both business skills, and entrepreneurship skills are crucial to becoming a successful entrepreneur.

According to the European Commission (2013), the support for entrepreneurship has never been more important than it is now. Thus reinforcing entrepreneurship education in schools, vocational or professional education institutions and universities will have a positive impact on the entrepreneurial dynamism of most economies (HRDC, 2013). Certainly, besides being instrumental to the generation of social enterprise and business start-ups, entrepreneurship education will make learners more employable and more 'intrapreneurial' within existing organisations (Streeter & Jaquette, 2004; Keogh & Galloway, 2004; European Commission, 2013). In line with this, there has been renewed interest and growth in entrepreneurship education programs over the last decades (Streeter & Jaquette, 2004; Kuratko, 2005) with entrepreneurship

courses being taught at universities, secondary, and primary schools. At the university level, programmes are being developed with recent examples being Master and Doctorate degrees in Entrepreneurship, a bulk of which are offered in the United States.

In line with other nations, South Africa has made concerted efforts in the past years to establish, develop and nurture the entrepreneurial spirit of youths (North, 2002). This notwithstanding, the current state of the South African economy warrants concern for the future generations. North (2002) asserts that challenges not limited to unemployment, corruption, crime, mismanagement persist with youth unemployment being a cause for alarm. While a current GEM study (GEM, 2013) puts the unemployment rate amongst the youths in South Africa to be around 40% (expanded definition), sadly business start-ups that are relied upon to provide succour to the unemployment crisis are not being created fast enough. It is not surprising, therefore that entrepreneurship has emerged as the vehicle through which employment and economic revitalisation can be achieved in South Africa (Co & Mitchell, 2006). As Kuratko (2005) concurs, business start-ups let millions of people, not limited to minorities, women, and immigrants, to access the pursuit of economic success. Yet, the majority of South Africans grew up with little home experience of business innovation or entrepreneurship and hence do not view themselves to possess the ability to pursue an entrepreneurial activity (Co & Mitchell, 2006). This is evident in the low total early-stage entrepreneurial activity index for South Africa. Noting that the established rates are typically lower than early stage entrepreneurial rates in factor driven economies, GEM (2013) emphasis that South Africa's rate of 2.9% is extremely low when compared to other Sub Saharan African countries rate of 13%.

Institutions of higher learning have acknowledged that they have a vital role to play in promoting entrepreneurship, although it is yet clear how efficiently they can play that role. Beyond this, it has been contended that a substantial number of business start-ups arise from non-business disciplines, suggesting that entrepreneurship is an interdisciplinary undertaking. Brizek and Poorani (2006) agree. According to them one can be entrepreneurial in any discipline. This is perhaps the reason why the demand for interdisciplinary and cross campus courses has increased significantly in recent years, resulting in increased program offerings and adjustments to existing ones in universities around the world (Roberts, 2013).

The scope of this study was limited to the universities of technology (UoT's) in South Africa.

2. Background and problem statement

Globally, unemployment has risen uncontrollably in the last decades and African countries have conventionally been at the forefront of the crisis. This is evident in the fact that millions of Africans continue to live in abject poverty. Concerted efforts have been made by the global community to highlight the need to eradicate poverty. This is particularly true as documented in the Millennium Development Goals. As the 2015 deadline elapses, it is imminent that the millennium development targets will not be realised as far as eradication of poverty is concerned.

Still in line with eradicating poverty, many studies have noted the importance of education, as it was believed to improve employability. North (2002) posits that for young people to escape from the vicious circle of poverty, entrepreneurial education should be part of their training. Conversely, one may argue that getting a university degree today does not necessarily guarantee a job. Granted the foregoing, self-

employment presents the most likely option for escaping from poverty. Disappointingly, as GEM (2012) notes, the likelihood of a successful business venture is hampered by the graduates' lack of the necessary skills to capitalise on business opportunities. For business related qualifications, the transition to self-employment is made easy and feasible by the entrepreneurial skills taught in these courses. Nevertheless, the same is not true for non-business disciplines. While there is no empirical proof at this stage, it is likely that the variance in unemployment rates for graduates of different universities (departments and disciplines) can be attributed to real and perceived differences in the quality of their qualifications (CDE, 2013). However, Ndedi (2009) argues that opportunity recognition is not a privilege for entrepreneurship/business orientated students only, but students from other disciplines as well.

Mindful that a notable proportion of graduates do not find employment, proactive universities encourage self-employment by providing the entrepreneurial skills necessary to successfully run own business. These universities have made concerted efforts to provide these skills to non-business-related students who have depended on "paid employment." This is particularly important given that graduates of the non-business-related disciplines find it more difficult to make the transition from paid employment to self-employment due to limited business skills. Proactive universities have therefore provided these skills to non-business students by carefully integrating business studies/skills into the curricula.

Given the foregoing, one may argue that there is a direct relationship between entrepreneurship education and employability, especially self-employment. Isaacs et al (2007), note that one of South Africa's greatest limitations to economic development can be ascribed to its lack of entrepreneurs. Considering the high unemployment among the South African youths, Nieuwenhuizen and Groenewald (2008) acknowledge that young people need entrepreneurship education to overcome this challenge. Thus, it is hoped that entrepreneurship education will encourage these youths to become job-creators instead of job-seekers once they leave the educational system.

Despite the perceived positive impact of entrepreneurship education on innovation and the employability of university graduates, one finds that a notable proportion of African universities continue to play a passive role as far as the provision of business skills to non-business students is concerned. This is particularly contrary to the emerging proactive approach in developed countries. Despite having a significant proportion of the world's unemployed graduates, most developing countries lag behind their developed counterparts in making this transition. The question that drives this study relates to the extent to which South African higher education institutions have integrated entrepreneurship education into non-business-related discipline curricula. Contextualising the issue of embedding entrepreneurship, this paper, furthermore, is informed by repeated calls for the inclusion of entrepreneurship into the curricula of schools (Human Resource Development Council, 2013; Chimucheka, 2014) in South Africa.

The primary objective of this study was to explore the extent to which entrepreneurship is embedded in the curricula of Engineering programs at South African universities of technology.

3. Literature review

3.1. Definition of concepts

3.1.1. Entrepreneurship

Entrepreneurship has emerged over the past three decades, as perhaps the most compelling economic force that the world has ever seen (Sarasvathy & Venkatraman, 2011). As a force to be reckoned with, entrepreneurship has been perceived by many to be outstanding in lowering the level of unemployment. Current literature suggests that there are connections between education, business start-up and entrepreneurial outcome, as well as between entrepreneurial education and entrepreneurial activity (Raposo & Do Paço, 2011).

Several definitions of entrepreneurship abound. In fact, the concept and discipline of entrepreneurship has been approached by many scholars from different perspectives; with some describing it as one of the most interesting concepts, yet difficult to capture its real meaning. According to the European Commission (2008), entrepreneurship relates to an individual's capacity to turn ideas into action. One notes that this definition substantiates the often overlooked essence of the entrepreneur in socioeconomic development.

Education and curriculum experts have been involved since 1990 in various projects and programs for introducing entrepreneurship into the school curriculum (North, 2002). Gouws (2002) affirms that the main aim of entrepreneurship education in South Africa ought to be to develop a cadre of entrepreneurs who will boost economic growth and create employment to meet the rising economic expectations of all South Africans. Teachers should then be trained to fulfill the primary aim of entrepreneurship education.

In this paper, the term entrepreneurship is defined within the context of the concepts and philosophies of business management incorporating opportunity identification, feasibility study/analysis and business planning and setting up.

3.1.2. Entrepreneurship education

Just as the interest in entrepreneurship has grown considerably since the seventies, both in academic and political circles, so too has entrepreneurship education in recent years. Although entrepreneurship is fast becoming an academic discipline and a field of study in its own rights, until this day there is no consensus as to what constitutes a model curriculum for an entrepreneurship program. In fact, there have also been issues with the way the teaching of entrepreneurship should be conducted.

Isaacs et al. (2007) hold that entrepreneurship education is the meaningful intervention by an educator in the life of the learner, to provide entrepreneurial qualities and skills to enable the learner to start-up and operate a business. It is apparent from the foregoing definition that entrepreneurship, or certain features of it, can be taught dispelling the myth that entrepreneurs are born, not made (Kuratko, 2005).

Nieuwenhuizen and Groenewald (2008), as well as the European Commission (2008) are in agreement that the essence of entrepreneurship education is to encourage creativity, innovation and self-employment, and may include the development of personal attributes and skills that form the basis of an entrepreneurial mindset and behaviour (not limited to leadership, creativity, initiative-taking, risk-taking, self-confidence and team spirit); exposing students to the possibility of self-employment and entrepreneurship as a career option; working on real-life enterprise projects; providing

specific business skills and knowledge of how to start-up and run a business successfully.

3.2. Employability, general education, and entrepreneurship education

The concept of employability refers to a set of skills, knowledge and personal attributes that make an individual more likely to secure and be successful in a chosen career to the benefit of himself, the workforce, the community and the economy (Moreland, 2006). This definition supports the widely held view that education enhances a learner's chances of being employed. In fact, as the CDE (2013) notes, unemployment reduces progressively as one goes up the educational scale while any post-school qualification increases one's job prospects.

The perception that education directly translates into paid employment has been challenged in recent years. This has been partly due to the expansion of higher education from the late 1980s, accompanied by an increase in the number of higher education institutions resulting in a massive increase in the supply of graduates in the labour market (Rae, 2007). Tertiary institutions are therefore, under pressure to provide appropriate education that can enable graduates to seek self-employment. In fact, it is speculated that the shrinking size of most public services that traditionally provided employment opportunities is testimony to the call for tertiary institutions to provide both business/entrepreneurship skills.

The gap between education and the world of work has widened over time. In the past, formal education was the key to employment, but this is not true today given that a significant proportion of the unemployed are university graduates (Rae, 2007). As Co and Mitchell (2006) note, the previous economic structure in South Africa was well served by higher education institutions in that they provided a resource pool for large organisations, thus favoring paid employment as opposed to self employment. Although many would argue that the number of university graduates seeking employment in South Africa today is on the rise, the Centre for Development and Enterprise (CDE) (2013) believes that the numbers are often exaggerated.

Given the growing consensus that entrepreneurship, through small, medium enterprises (SME's), contribute significantly to job creation and income generation, it goes without saying that the introduction of entrepreneurship education would add to the empowerment of South African graduates (Ndedi, 2009).

Without overemphasising the importance of entrepreneurship education in a technical setting, the European Commission (2008) urges universities and technical institutions (e.g. Polytechnics and Technikons) to integrate entrepreneurial skills as an important part of the curriculum, dispersed across different subjects, and encouraging students to take entrepreneurship courses. It is believed that a methodical inclusion of entrepreneurship training into scientific and technical studies will improve spin-offs, innovative start-ups, as well as develop researchers entrepreneurial skills.

Reinforcing the importance of entrepreneurship education to non-business disciplines, Jones and Jones (2014) noted that in disciplines such as arts, design, sports management and engineering a business start-up entrepreneurial career is highly complimentary to the student's core subject skills.

3.3. Challenges with embedding of entrepreneurship as a discipline

Iqbal et al. (2012) contend that entrepreneurship education and training have grabbed the attention of many universities in the world, including those in African countries, as it is part of their curriculum. Within Engineering disciplines it is expected that students will gain the knowledge, tools and attributes that are required to identify opportunities and to act on them. Students who enroll in entrepreneurship programs therefore acquire knowledge that is not available in conventional engineering education such as critical thinking, effective communication, understanding and designing for end users, working in and managing teams, understanding business basics and solving problems (Byers et al, 2013). Earlier, in 2011, Omoniyi and Osakinle argued for a horizontal dispensation of entrepreneurship education across all fields of study even against the structure of universities (as in faculties and schools) which do not allow for multidisciplinary engagements (India Trust, 2014), as well as a lack of resources including competently trained professors (Koegh & Galloway, 2004).

The European Commission (2008) asserts that the lack of relevant skills and experience to teach entrepreneurship can be overcome or minimised by: establishing professional networks for the regular sharing of teaching practices and methodologies; short-term exchanges of entrepreneurship teachers between institutions of higher education in order to disseminate best practice and teaching methods and short-term internships of teachers in businesses.

3.4. Vocational, business and entrepreneurial skills development

Vocational or professional skills are practically focused skills gained in a specific discipline such as artwork, gardening and carpentry. Vocational or skills-based education is becoming more important today, with many employers expecting new employees to have all the practical skills needed to be fully functional immediately upon employment. With this in mind, vocational courses tend to be more practical and skills-based than academic degrees and are often taught at colleges, universities and technical institutes (such as the UoT's in South Africa). According to Nnandi (2013) combining vocational training and entrepreneurship in today's curriculum is beneficial on two accounts. Firstly, the student is taught a skill or a set of skills which he can fall back on to start a business. These relevant business skills that will support learners in this case will include venture opportunity identification and selection, feasibility study, bookkeeping and so on. Secondly, the learner is introduced into the world of work, which allows him to use his hands and tools to produce products.

The education system plays an important role in developing entrepreneurial skills and shaping attitudes towards entrepreneurship. Depending on the grade level and subject choices effective schooling should develop awareness and skills in areas more specifically related to business, such as Entrepreneurship, Economics and Accounting (Horn, 2006: 120).

3.5 Creating the entrepreneurial generation: the role of the curriculum

The perception that education is a panacea to all human problems has always given impetus to development and curriculum review in any society (CDE, 2013; Nnandi, 2013). Curriculum development as an on-going process is informed by the challenges and opportunities confronting the society (ACE Initiative, 2009; Gibb, et al,

2012). Education is not an end to itself, but a means to an end (UNESCO, 2006), hence a vital tool for our future challenges.

With growing unemployment in the world at large, creating a nation of entrepreneurs would be a dream come true for most proactive nations as this will mean the virtual end to unemployment and its associated problems. According to Nnandi (2013), for this to happen there needs to be:

- A significant integration of entrepreneurship studies into the curricula at all levels of schooling;
- Graduates need to be empowered, irrespective of their areas of specialization, with skills that will enable them to engage in self-employment activities, if they are unable to secure paid jobs; and
- A significant mind-shift, from the “take-a-job mentality” to the “create-a-job mentality.”

It is worth noting therefore that the foregoing boosters of entrepreneurial intentions will only materialize and be sustainable if there is pre and post business start-up support for all entrepreneurs, regardless of their class (Tengeh, 2013; Choto, Tengeh & Iwu, 2014).

Contextualising the need to create a nation of entrepreneurs can not be more true for South Africa where unemployment has progressively been in double digits in the last decade. In a country where youth unemployment is currently hovering around 29.8% and 40% (GEM, 2013) generating sustainable jobs should become the prerogative of every active youth. Despite improvements in throughput rates and graduate numbers, unemployment persists as these graduates can not capitalise on business opportunities. It is believed that those who spot and successfully turn business opportunities into flourishing businesses are perceived to possess entrepreneurial capabilities. GEM (2012) notes that the rate at which the South Africa youth can perceive and capitalise on business opportunities is only 39%, the lowest of the Sub Saharan African countries that participated in a GEM study. An updated report by GEM (2013) noted that the level of youth entrepreneurship in South Africa is substantiably below the average for sub-Saharan Africa (60%). Although other reasons may contribute to the high average rate of 70% noted for the African countries concerned, one would generally look in the direction of entrepreneurship education - which tends to take the form of informal education. In fact, suggestions are that entrepreneurial education improves entrepreneurial capability and a nation’s ability to spot and capitalise on entrepreneurial opportunities. Essentially, a major approach to achieving the aforementioned is to increase the entrepreneurial intentions and capabilities of university students (irrespective of their discipline).

3.6. Perceived opportunities, capabilities and entrepreneurship education

According to the GEM (2012, 2013), entrepreneurship can only be brought to fruition if potential entrepreneurs can perceive good opportunities and believe that they have the necessary skills to start a business and are willing to take action after expressing their intentions. According GEM (2012) opportunities originate as perceptions of what individuals believe can be done to earn a profit and the source of such opportunity may be through individual and/or collective effort. This suggests that as individuals, we create some of the opportunities, while others are presented by our society. Furthermore, GEM notes that the “discovery of opportunities” involves an

active and passive search as well as fortuitous discovery, since all three regard opportunities as already existing “out there”.

Perceived capabilities, according to GEM (2013) reflect the percentage of individuals who believe they have the necessary skills, knowledge and experience to start a new business. GEM has noted that individuals who are confident that they possess the skills to start a business are four to six times more likely to be engaged in entrepreneurial activity. The rates of perceived capabilities in South Africa are slightly higher than the rates of perceived opportunities, implying that more South Africans believe that they are capable of becoming entrepreneurs than those who see opportunities to do so. The foregoing may suggest that there is a need to create enough entrepreneurial opportunities and for this to develop requires deliberate efforts such as integrating entrepreneurial education into non-business disciplines in higher institutions of learning. Isaacs et al. (2007: 623) agree that the key to the success of establishing a culture of entrepreneurship in South Africa is education and that this depends on all stakeholders including the state, educators and learners themselves.

3.7. Theoretical framework

This paper is anchored on two theoretical frameworks. On the one hand, the contingency organizational theory supports the rationale for the inclusion of entrepreneurship education into the curricula of non-business university students. On the other hand, the magnet versus radiant model proposes a structural means of providing entrepreneurship education to non-business students in the context of a university.

The contingency organizational theory demands that institutions are designed around the specific nature of their task environment and thereafter flexibly adjust in response to change in the environment (ACE Initiative, 2009; Gibb, Haskins, Hannon & Robertson, 2012). As a university, the contingency theory calls for an alignment of university’s offerings to meet the demands of its stakeholders. Notable among these is the pressure on universities to contribute to economic growth, improvement of employment levels through entrepreneurship and job creation.

The magnet or centralized model as suggested by Streeter and Jaquette (2004) ensures that classes in entrepreneurship are offered by a single entity (for instance, the school of business) but attended by students from all over the university. The radiant or decentralized model, unlike the magnet model proposes that entrepreneurship courses be diffused throughout the university (Streeter & Jaquette, 2004)

4. Research Methods

UoT’s are a new phenomenon in South Africa. They form part of the public university system. Public universities in South Africa are split into three broad categories: conventional universities, which offer theoretically-focussed university degrees; universities of technology (Previously Technikons), which offer vocationally driven diplomas and degrees; and comprehensive universities, which offer a mix of both types of qualification. UoT’s offer practice based learning in the fields of technology, engineering, and business. South Africa faces an acute shortage of skills in these areas thus UoT’s have a fundamental role to play in closing this gap.

For this study, the population was limited to the six UoT’s in South Africa because they provide an avenue for us to compare “apples with apples”. Furthermore,

coming from a traditionally technikon (polytechnic) orientation, these universities have been challenged to adopt the status of a university; a challenge that only very few have fared well in.

The study adopted an exploratory cross sectional research design. Cross-sectional research design allows one to collect data from a cross-section of a population at one point in time (Olsen & St. George, 2004). Among the six UoT's that served as the population, the Faculty of Engineering was identified as a constant across all the universities i.e. in all the UoT's in South Africa, there is a faculty of engineering. Therefore, considering this, the faculty of engineering was chosen as the unit of analysis.

Having identified the faculty of engineering as the unit of analysis, the study went further to investigate the programs on offer to identify business related subjects. This exercise identified business management, professional practice, business studies and entrepreneurship. Only programs offered over a three year period were investigated.

As Stephens (2013) notes, the role of engineers in the society is indispensable as far as product innovation, design, efficiency, safety and consumer satisfaction is concerned. Although universities and most importantly UoT's in South Africa produce technically skilled graduates that should have the ability to understand, apply and demonstrate engineering concepts, they seldom possess the people skills that allow them to fully meet customer needs and even reach their full potential. Besides technical proficiency, engineering graduates today, need to be creative, communicate effectively, work in teams and create products that fully align to customer needs. Industry, society, and engineering schools can and should collaborate to ensure that there are enough qualified and capable engineers to meet industry and society needs (Stephens, 2013).

Following Brizek and Poorani (2006), information on the integration of business studies in non-business discipline curricula was obtained from universities' websites and faculty handbooks. Every program was then assessed by scanning their electronic undergraduate and graduate catalogues to evaluate current course listings and course descriptions. When a course containing entrepreneurship or small business management techniques was listed or discussed within the body of the course description, that program was noted as an offering. Programs were then listed with the documented course offering and description. This listing was used as the basis to evaluate the overall supply of courses involving entrepreneurship and small business management within the engineering programs. Where a subject was suspected to be business related despite its name, a follow up email was sent to the course coordinators to ascertain this. The foregoing is in line with Co and Mitchell (2006) who made use of the contact information (email addresses) on the university's website and catalogues to further their investigation.

In the next section, the results are discussed. The sampled universities are ascribed the labels UoT 1 to UoT 6.

5. Results and discussions

The results are presented and analysed on a case-by-case basis.

5.1. UoT 1

UoT 1 has nine departments offering nine mainstream programs, ranging from Architecture to Mechanical Engineering. With the exception of Electrical Power Engineering, all the other programs do not any evidence of entrepreneurship or business

studies offered within them. In Electrical Power Engineering, entrepreneurship offering is only limited to Bachelor of Technology (BTech) students. The unanswered question remains: what happens to the thousands of students who exit at the national diploma level (ND) without entrepreneurial skills?

5.2. UoT 2

This UoT's Faculty of Engineering offers over 11 programs in the associated departments. Of the 11 programs offered, ranging from Building to Civil Engineering, only Clothing Management, Construction and Surveying Management show evidence of entrepreneurship offered within these programs. Within the Clothing Management program, entrepreneurship is offered at the ND level, unlike Construction Management that addresses entrepreneurial skills only at the BTech (higher) level raising yet another question with regard to those who exist at the ND level. Although entrepreneurship skills are not properly accommodated in most of the programs, associated skills such as management skills are noted in a range of these programs.

5.3. UoT 3

Its faculty of technology boasts eight programs. The programs include, Geomatics, Architecture, Building Science, Civil, Electrical, Industrial, Chemical and Mechanical Engineering. With the exception of Geomatics, all the programs have entrepreneurship embedded in them. Although entrepreneurship is included in most of their offerings (for instance, Architecture, Building Science, Geomatics, Chemical, Civil, Electrical, Industrial and Mechanical Engineering), one finds that entrepreneurship is pitched at a higher level (BTech).

5.4. UoT 4

The UoT's engineering faculty offers six programs. The program offerings range from built environment to mechanical engineering. With the exception of Built Environment, all the other programs lack evidence of entrepreneurship as a subject in them.

5.5. UoT 5

The UoT's Faculty of Engineering offers Building, Chemical, Civil, Electrical and Mechanical Engineering. None of the five programs listed has entrepreneurship embedded in them.

5.6. UoT 6

The engineering faculty at UOT6 offers seven programs ranging from Chemical to Electrical Engineering. With the exception of Mechanical Engineering that offers entrepreneurship at the fourth year level, all the others do not.

5.7. Comparative analysis of South African Universities of Technology

There are six UoT's in South Africa. These universities of technology combined, offer over forty six programs in the six faculties of engineering. Only 15 out of the 46 programs (33%) showed visible evidence of entrepreneurship/business studies included in them (see Table – 1).

Table – 1. Embeddedness of Entrepreneurship in Engineering programs

University	No of programs	Evidence of entrepreneurship/business subjects	Percentage	Ranking in terms of embeddedness entrepreneurship
UoT 1	9	2	22.2%	4
UoT 2	11	3	27.3	2
UoT 3	8	7	87.5	1
UoT 4	6	1	16.7	5
UoT 5	5	0	0	6
UoT 6	7	2	28.6	3
Total	46	15		

Source: compiled by the authors

6. Discussion

Mindful that a significant proportion of graduates do not find employment, proactive universities encourage self-employment by providing the entrepreneurial skills necessary to successfully run own business. These universities have made concerted efforts to provide these skills to non-business related students who have traditionally been dependent on “paid employment”. This is particularly important given that the non-business related discipline graduates find it more difficult to make the transition from paid employment to self-employment due to limited business skills. Proactive universities have therefore made concerted efforts to provide these skills to non-business students by carefully integrating business studies/skills into the curricula.

The study reveals that the faculty of engineering, which is just one of the numerous faculties that offer non-business related courses, have over forty six of such programs across the six universities of technology studied. This indicates that only thirty three percent of these programs had evidence of the embeddedness of entrepreneurship/business studies in them. Bawuah, Buame and Hinson, (2006) advanced that the much needed general education in entrepreneurship be provided to embrace all students regardless of their majors.

At higher education level, the main purpose of entrepreneurship education should be to develop entrepreneurial capacities and mind sets. One way of achieving this is by teaching students about new sources of self-employment and to convince them that being a business person is one way of entering the labour market. Business start-up is therefore one of a range of possible outcomes. Customarily, entrepreneurship has been associated with small businesses and hence viewed as a less attractive career option for dynamic university graduates. A shift in attitudes among students can be fostered by introducing and promoting the dynamic, innovative and ambitious face of entrepreneurship (European Commission, 2008).

Embedding entrepreneurship into the formal education system at all levels requires a strong commitment from the government in terms of policy and resources, since most schools, universities and training programs are overseen by the government.

7. Conclusion

At a general level, and assuming that one of the purposes of education is to meet the challenges of preparing learners for self-employment and optimum work

performance, it goes without saying that adequately infusing entrepreneurship education into all levels of schooling becomes a necessity. In the context of South Africa, the focus of the educational system should be on the long term rather the short term, and this entails engaging in long-term training that culminates in education for life. Entrepreneurship education should be seen in this light. In view of the foregoing, entrepreneurship should be included in non-business disciplines at all institutions of learning.

In order to garner support and generate an evidence base to facilitate progress, further research is vital and ideally commissioned by the department of higher education and training or a similar body. At a discipline-specific level, one would expect that the integration of entrepreneurship into engineering education will require a shift in thinking and willingness to indulge by the relevant stakeholders. Furthermore, a concoction of approaches to entrepreneurship education is necessary to create the experiences and knowledge that lead to innovative entrepreneurial graduates.

A major worrying implication of our finding is that noting the likelihood of not accessing paid employment on graduation, university graduates may not even perform effectively if they set up their own businesses. Therefore, we strongly recommend that entrepreneurship be integrated into the curricula of all non-business departments if not for the sake of its perceived employment generation attributes, but for its other attributes such as innovation, and more importantly employability. The advancement that the United States experiences in entrepreneurship is ascribed to the plethora of training centres and higher-education institutions, which offer entrepreneurship courses.

8. Limitation and scope for further research

The study was limited to public or government-funded institutions. It would be interesting to conduct an expanded study that takes account of the privately owned higher institutions of learning. The study was also limited to undergraduate programs that include national diplomas and three-year degree programs. The underlying assumption made here was that most students exited these institutions at this level.

Having noted that the embeddness of entrepreneurship education into the non-business curriculum involves two phases: the first phase being the inclusion while the second phase has to do with aligning the content and teaching method to that of the non-business disciplines, it suffices to say that this study is further limited to the “face value” integration of entrepreneurship and does not report on what and how entrepreneurship is taught. A follow-up study needs to be done in this regard.

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Apstrakt

Može se reći da je rana faza preduzetničke aktivnosti u Južnoj Africi (TEA) izuzetno niska u poređenju sa onima u drugim Sub-saharskim zemljama uprkos zajedničkim naporima Vlade za uspostavljanje, razvoj i negovanje preduzetništva na svim nivoima a posebno među mladima. To predstavlja poziv za zabrinutost imajući u vidu trenutno stanje privrede i izazove sa kojima se suočavaju buduće generacije u Južnoj Africi. Ovaj rad se naslanja na dva teorijska okvira kako bi potkrepio argumente za uspostavljanje preduzetničkog obrazovanja u nastavne planove i programe ne poslovnih univerziteta. Usvojena je studija međusektorskog istraživanja koja je omogućila prikupljanje podataka sa tehnoloških univerziteta iz Južne Afrike. Nalazi studije pokazuju da samo petnaest (od 46) programa sadrži vidljive dokaze preduzetničkih/poslovnih studija u svom sadržaju. Takav zaključak implicira potrebu da preduzetništvo bude integrisano u nastavne planove i programe svih ne poslovnih odeljenja ne samo zbog atributa novih radnih mesta već i zbog drugih atributa kao što su inovacije i još važnije zaposlenost.

Ključne reči: *preduzetničko obrazovanje, privredno obrazovanje, neposlovna disciplina, razvoj programa, Južnoafrički univerziteti*