

## **REFLECTIONS ON THE STATE OF PEDAGOGY AND PERCEIVED RELATED CHALLENGES IN TECHNICAL, VOCATIONAL, EDUCATION AND TRAINING (TVET) ENGINEERING STUDIES OF SOUTH AFRICA**

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### **Abstract**

This aim of this exploratory paper is to reflect on the current pedagogical conditions in the Engineering Studies domain at Technical and Vocational Education and Training (TVET) in South Africa. Since the White paper for TVET colleges envisioned this institutions to equip students with skills, knowledge, attitudes and values (HRDC, 2014) suitable for labour market. Moreover, Field, Musset & Alvarez-Galvan (2014) are concerned about the high unemployment rate amongst young South Africans in particular, and therefore effective TVET programmes are of paramount for the appropriate transition of a productive citizenry into the workplace. The need for the professional development of TVET lecturers and ascertaining the pedagogical skills that are linked to work-based learning also seem to be high on the agenda of policy formulation processes. Another trend is that more experienced lecturers with industrial highly demanded skills are seemingly recruited by the private sector with high salaries. Furthermore, it appears that the South African Department of Higher Education and Training (SADHET) has certain challenges in competing with public sector providers and seems to be unable to match salaries, accordingly. Due to the raised concerns, TVET colleges have resorted to employing their own students as lecturers- these individuals appear to have no to very limited teaching or work-based learning experience. These (student graduates) lecturers are further faced with large numbers of students in classes; hence the assumption can be made that they will lack pedagogical/vocational content knowledge to teach their assigned subject offerings in an effective manner. This paper, as work- in- progress and being part of a larger national collaborative research study, reflects on the current pedagogical/vocational competencies of TVET Engineering Studies' lecturers in South Africa. Via a qualitative document analysis and views expressed by participants at a research planning symposium gathering, we deliberate on the state of pedagogy in Engineering Studies and the perceived related challenges articulated by participants. Preliminary recommendations are given with regards to improving the status quo of Engineering Studies in the TVET sector of South Africa.

**Keywords:** Lecturer professional competencies, teaching training, pedagogical content knowledge, general pedagogical knowledge, resource development, work-integrated learning

## 1. INTRODUCTION

Within the post-Apartheid context of South Africa, the Technical and Vocational, Education and Training (TVET) sector is regarded as a critical government policy mandate in responding to and addressing national imperatives, such as youth unemployment, poverty and social inequities. There is also a surge from both government and the private sector in contributing to economic development catering for skills development opportunities, required to compete in challenging and changing global and national economic contexts (Powell, 2012). In 2009, the unemployment figure was around 25% for the general South African population, whilst in 2017, it is said to be at 27.7%. Furthermore, it was observed in 2015 that around 3 million young South African citizens were non-active in education, employment and training activities, whilst about 2 million of these individuals have not completed grade 12 (Field in Moodley, 2015).

The South Africa TVET domain is therefore tasked by government to respond to the skills needs of the South African economy. The Minister of Higher Education, Blade Nzimande (2017) pronounced the demand for at least 15 trades (Millwrights, toolmakers, boilermakers, fitters and turners, carpenters and joiners, welders, plumbers, motor and petrol mechanics, diesel mechanics, instrument technicians, metal fabricators, sheet metalworkers, air conditioning, refrigeration technicians, auto electricians, riggers and electricians) in the economy of South Africa. It is envisaged that at least 30 000 artisans will be produced by 2030 (National Development Plan, 2012). Furthermore, Nzimande also articulated persistent challenges in the TVET sector, a need for stability, moving colleges from provincial to a national competence, improving the quality of teaching and learning, developing sustainable funding models, addressing the issue of exclusion and eradicating poverty. These imperatives will ultimately have an impact on the way TVET programmes will have to respond to societal needs and addressing economic development.

## 2. TVET IN SOUTH AFRICA

The South African government's intentions for the TVET sector in South Africa was to build a work force for the industry in order to develop the country's economy and improve the social status of the majority of its citizens. However, the society perceives TVET as the lowest educational direction (HRDC, 2014) to be followed by students (those regarded as *gifted* at high school level). The general perceptions amongst South African citizens is that *underachieving* students and those grade 12 school leavers with low achievement scores should be suitable for "handwork" and certain occupations in the technical and vocational field. Therefore, based on these perceptions, only students who could not obtain access to the universities normally consider trying their "luck" by enrolling with TVET colleges. In general it could be deduced that the undermining of TVET sector by our nation, seemingly regard technical skills as an unnecessary output for societal improvements and economic development- this have also now contributed to the high unemployment level amongst young people in South Africa. The researchers are of the belief that the majority of TVET students are there as last resort or choice to further their studies, also thinking it would be a "walk on the park", as it's perceived as an unworthy educational route – although numerous students attend TVET colleges as their first preference.

Due to these misperceptions, TVET colleges also tend to increase their intake to make-up for improved quantity of youth that obtain post-secondary qualification. This has tremendously increased lecturer-student ratios (HRDC, 2014), about 1:55 six years ago, without improving on the infrastructure and human resource needed. It therefore appears that TVET colleges have lost focus of their initial government mandate to produce artisans for the industry and are seemingly becoming predominantly, theory-based institutions due to under-sourced workshops, lack of facilities, etc. We researchers further contend that the rapid increase in students enrolled at TVET colleges may have a negative impact on the college-industry relations, especially in areas where only few industries are able to assist in terms of work-based skills training. Since these companies could not absorb all students, it could be argued that students' competencies, especially technical and practical skills, are under scrutiny, when seeking employment. Moreover, students who are ultimately placed for work-integrated learning programme, might be totally clueless of the kind of tools they will be using, due to under-resourced college workshops or even under-trained human resources at TVET colleges. These aspects could further result in industry and labour market opinion about the TVET sector being irrelevant to their needs and expectations (HRDC, 2014)- these issues further exacerbate the prevailing societal perceptions regarding the social status of TVET students and the role and function of existing TVET colleges in not responding to the socio-economic imperatives of South Africa. It stand to reason that much of the latter said issues, adversely also effect the planning and optimal realisation of TVET curricula, such as observed in the Engineering Studies programme offerings.

### 3. TVET ENGINEERING STUDIES

According to ECSA (2010) there are challenges facing Engineering Studies in general. Although the report focused on university throughput, similar results may be obtained in TVET Colleges' Engineering Studies. The study has shown 54% of university students graduating over a 5 year period and a 17% throughput rate at national diploma level. The report further indicated good teaching with relevant expertise and skills as setback towards producing good quality graduates. Secondly, the report points out an important aspect of curriculum that should evolve and embrace "21<sup>st</sup> century priorities for professionals".

The curriculum of South African Engineering courses at TVET colleges are offered in two streams, namely, NATED and NCV. Under NATED (referred to as N1 to N6 stream), Engineering Studies offerings include, Civil Engineering, Mechanical Engineering, Electrical Engineering and Chemical Engineering. While within the NCV category, TVET Colleges offer, Civil Engineering & Building Construction, Electrical Infrastructure Construction and Engineering related designs.

Pertaining to the lecturing body, Leroy and Huysamer (2012) highlight the misplacement of lecturers – thus the findings of the study revealed that about 43% of lecturers in TVET Colleges of the Free State province are instructing courses they are not qualified to teach. However, the majority of these lecturers showed interest in improving their technical skills to more recent and critical skills, as well as acquiring the needed pedagogical knowledge to appropriately and effectively teach their students.

According to The National Plan for Further Education and Training Colleges (DOE, 2008), TVET colleges are intended to enhance the socio-economic state of society. Therefore, TVET colleges are expected to produce graduates that are labour-market ready, armed with current technical competencies and social skills need by the industry. However, in producing graduates in Engineering Studies who are adequately skilled for industry, lecturers need to possess various type of knowledge, inter alia Professional Knowledge, Content Knowledge, Pedagogical Content knowledge and General Pedagogical Knowledge (Shulman, 1987; Darling Hammond & Bransford, 2005; Kolari & Savander Ranne, 2002 ). These scholars uphold the following views with regard to the mentioned knowledge types, namely:

- *Professional Knowledge*: the information, competencies and skills that are unique to a particular study domain.
- *Content Knowledge*: possessing the basic facts about what is being taught (topic) and the relationship between what the lecturer knows and how he/she teachers.
- *Pedagogical/Vocational Content Knowledge*: an understanding or the ability how to represent topics in ways that make them understandable to students as well as an understanding of what makes specific topics easy or hard to learn. It includes aspects of the subject matter that is most germane to its teachability or the ways of representing and formulating the subject matter in comprehensive components.
- *General Pedagogical/Vocational Knowledge*: involves an understanding of teaching strategies and classroom management that apply to all topics and subject matter. It also involves knowledge of the basic principles of pedagogy and theories of teaching.

Our observation, therefore as researchers of this paper, is that Engineering Studies lecturers need to hold various competencies with regard to the above mentioned and related types of knowledge. They should also how to apply them in moulding their professional and teaching repertoires in becoming expert and effective teachers. The TVET landscape in South Africa is characterised by grades 9-12 school leaving learners and also adult students pursuing post school educational opportunities. The age of students range from 15 to over 40 years- this adversely affects lecturers(predominantly professionally unqualified), who need to teach highly diversified and mixed ability student groups, which requires various pedagogical and vocational teaching approaches and learning strategies (Mgijima, 2014; Alexander 2014). It should also be noted that expert teachers (college lecturers) come forth as individuals who are highly knowledgeable and/or skilled in a specific area (such as teaching) and know how to represent topics in ways that are understandable to all students.

Therefore, Engineering Studies requires lecturers to teach to the acquisition of certain graduate attributes, which includes aspects, such as a knowledge base for engineering, problem analysis, investigation, design, use of engineering tools, individual and teamwork, communication skills, professionalism, impact of engineering on society and the environment, ethics and equity, economics and project management and life long learning (McGill University, 2017). Effective teachers (lecturers) on the other hand should be capable of producing active and meaningful learning opportunities for their students, irrespective of students'

background, socio-economic status and ability (Eggen & Kauchak, 2014). Learning by continuous doing involves various active learning methods which seemingly make students to actively and freely participate in classroom pedagogical and assessment tasks (D'Sousa & Rodrigues, 2015). Active learning methods therefore may be most ideally suited for the modern Engineering classroom- it focus directly on student activities and engagement in the teaching and learning process.

Furthermore, to highlight the importance of professional competence, the Flemish government compels all polytechnic lecturers (TVET college lecturers) to enrol for teacher education programmes. These programmes consist of 35 credit units of formal pedagogical education, construed in the form of an in-service training activity, offered by the five Teacher Education Centres. Finish polytechnic teachers must at least obtained a MSc degree, whilst in the field of Engineering education, their major subject has to be in the subject that they teach. Additionally to the latter said, a minimum of three years of industrial experience is also required (Kolari and Savander-Ranne, 2002). The aim of the Engineering Studies teacher education programme is to provide prospective lecturers with flexible pedagogical competence and to initiate a process where these individuals, advance from teacher trainees to a self-directing professionals.

TVET colleges in South Africa have in the absence of national vocational teacher training programmes offered adapted versions of school-teacher preparatory programmes. Historically, it should also be noted that technical college lecturers were not required to have specific qualifications to teach at these institutions and were appointed on their technical abilities and workplace experience (Papier & McGrath, 2008). Currently, the *Policy on Professional Qualification for Lecturers in Technical and Vocational Education and Training* has been promulgated.

We further contend that various notions of pedagogy and what it entails for Engineering Studies in the TVET sector of South Africa should be interrogated with the sake of building an effective TVET system.

#### **4. RESEARCH METHODOLOGY**

In May 2017, a symposium, facilitated by the TVET Lecturer Qualifications Research Project Steering Committee members (College Lecturer Education Project) was held with TVET experts and academics. In depth discussions on the current state of pedagogy used in Engineering Studies at South African TVET institutions formed part of the symposium agenda. Two project team members further reflected upon the deliberations (pedagogical issues and perceived challenges) at the symposium. These reflections are used as core input for this paper. We also extrapolated our reflections and observations with issues, trends, developments contained in certain source documents, research reports and the views expressed by symposium participants on the TVET sector of South Africa. Short themes were used to reflect upon and outline the qualitative data emanating from these source documents and participants' views, as articulated at the symposium. Some general issues are further contextualised and related to the Engineering Studies field in the public TVET sector of South Africa.

#### **5. DISCUSSION AND ANALYSIS OF RESULTS**

The following themes emerged via the analysis of the various source documents and the views of participants on pedagogy and the perceived related challenges they possibly encounter, namely: *Professional and academic qualification status of lecturers; Issues with programme offerings and student enrolment; Lecturer teaching competencies; Pedagogical content knowledge and vocational education; General pedagogical/vocational knowledge; Work Integrated Learning (WIL); Infrastructure and facilities development and Roles of college leadership and management.*

##### **▪ Professional and academic qualification status of lecturers**

In 2015, a total of 7043 lecturers were employed at TVET colleges in South Africa. Only 703 lecturers (10%) indicated that they are academically and professionally qualified for the TVET sector, whilst 2262 (33.4%) were deemed to be academically and professionally qualified for the schooling sector. A further 1975 lecturers (29.2%) indicated that they are academically qualified, but professionally unqualified, whilst 809 lecturers (11%) indicated that they are academically and professionally unqualified (SADHET, 2015). *In essence, a total of 2784 lecturers (41.1%) require an initial professional qualification (Dip. TVET/B.Ed. TVET) and a capping professional, initial qualification (Adv. Dip TVT), respectively.* These statistics already suggest a huge gap with regards to the professional competencies lecturers don't possess- this aspect therefor also reflects that the majority of lecturers might be struggling with pedagogical subject knowledge and as such raises serious pedagogical concerns about the Engineering Studies programme as well. The professional preparation, continued professional development and in-service training of TVET lecturers should be about creating a balance between educational competencies, skills, graduate attributes and industry/workplace

experiences.

#### ▪ Issues with programme offerings and student enrolment

The South African Minister of Higher Education and Training, Blade Nzimande admits to the existence of a confusing mix of overlapping and competing programmes and qualifications, inadequate developed programmes for adults and limited post-secondary vocational qualifications (Moodley, 2015). TVET colleges need to offer programmes that are highly diversified and specialised as to attract greater industry support. Furthermore, it is envisaged that new programmes need to be more comprehensive, attractive and directly linked to the labour market, employer requirements and work placements. In 2006, the former Minister of Education, Naledi Pandor, approved the NC(V) level 2 to level 4 programmes to be implemented in TVET colleges. In effect, NC(V) level 2 to 4 programme qualifications replaced the dated National Education Department's (NATED) N1 to N3 certificate programmes as listed by the South African Qualifications Authority. The aim with NC(V) programmes were to provide the graduate skills set required from industry and work place providers (DHET, 2006). It should also be noted that access to TVET colleges have increased from 340 000 in 2009 to 800 000 in 2015. Certification rates in Engineering Studies programmes have also improved to 60%. According to Everett, Gershwin, Hayes, Jacobs and Mundhenk (nd) the quality of technical education is portrayed via the curriculum and instructional offerings, hence, the maintenance of high standards in the assessment of programmes is crucial to the education, training, (re) skilling and development needs of students at TVET colleges.

In relation to the above said, one symposium participant remarked on the kind of students that are admitted at the college.

*"Students only apply for admission at the colleges if they could not make it to the university, and even from Grade 9 if they can't pass their academic subjects at school".*

So far it could be deduced that South African schools seemingly do not prepare learners for technical and vocational studies since the majority of students firstly prefer to enrol at the universities. This goes back to the undermining attitude upheld by the community on the status of TVET colleges. Thus in schools, students should be made conscious of TVET colleges and their offerings, especially the requirements for following Engineering Studies. Another symposium participant indicated that the TVET sector allows for the enrolment of students who did Mathematical Literacy at school level into the Engineering Studies programme (students are faced with pure Mathematics when taking Engineering Studies).

*"Another thing, we offer Maths for all our engineering courses but the HODs admit students who did Maths Literacy at high school level into these programmes. Students end up being frustrated for not coping with the demands of the subjects we offer".*

Thus admission requirements for Engineering Studies in TVET Colleges should consider students with a Mathematics background in order to align course needs for prospective students. The need for articulation and portability was also expressed by two symposium participants.

*"For example when our students who have passed N6 in engineering fields apply to further their studies the university of technology, they are not credited any of the subjects they did with us. They start from the beginning like those coming straight from secondary schools".*

*"We think the Department of Higher Education and Training is also not crediting what is done at the TVET Colleges".*

It is clear from the above said that there is a need for various education providers and stakeholder bodies to further engagement on issues pertaining to course requirements, programme design, accreditation, mobility and progression- the need for a more streamlined and aligned Higher Education system is called for.

#### ▪ Lecturer teaching competencies

Teaching competencies may be described as a mix of knowledge, skills, understanding, experiences, traits, qualities, values, attitudes needed for the constructive, effective functioning in a professional TVET context (European Commission, 2013; Amankwah, 2011). The *Policy on Professional Qualification for Lecturers in Technical and Vocational Education and Training* (DHET 2013) requires of lecturers to demonstrate the following competencies, namely: *have sound knowledge of subject specialisation; select, sequence and pace the content; have sound understanding of TVET policies and contextual realities; knowledge of learners diverse socio-economic background, age, culture, learning styles, aspirations and special needs; communicate effectively in the language of learning and teaching; manage teaching and learning environments effectively; assesses students in varied and reliable ways; use assessment results to improve*

*both learning and teaching practices; be computer literate and integrate information and technologies (ICT), effectively in teaching and learning; know the demands of the workplace and equip students to meet these demands; have a positive work ethic, display appropriate values and conduct themselves in a manner that befits the profession; reflect critically with the professional community of colleagues; adapt and improve practices in line with evolving circumstances.*

In the light of the above said we argue that Engineering Studies lecturers are amongst the cohort of TVET educator staff who tends to be ill prepared for and inadequately trained for a transformed South African Higher Education system. Lacking the competencies to teach effectively to the achievement of certain graduate attributes might hamper the quality of the Engineering Studies programmes at TVET colleges. Moreover, two symposium participants alluded on some inadequacies of college management.

*“HODs do not know how to analyse the technical and vocational skills competencies”.*

*“They are academically qualified for the positions but not in the fields they are leading or heading”.*

The above responses suggest that there is a gap between the Head of Department (HOD) and the engineering teaching staff. Most importantly, the HOD as a manager of the Engineering Department is responsible for the oversight of good pedagogical practices in his/her department - this would further require that the HOD has sound content knowledge and a range of competencies. In the event where a HOD does not understand engineering fields, even though he/she is qualified for the position, raises questions to the post requirements needed for middle management positions. We are of the view that the criteria for the appointment of middle managers in Engineering Studies to be reviewed- this is for the purpose of enhancing teaching and learning in the classrooms as well as the developing the quality skills and competencies required of students in college workshops. Moreover, due to disregarding the HOD qualifications to include engineering competencies led to appointing lecturers that do not have required competencies such as teaching qualification and industry exposure (Field, Musset & Alvarez-Galvan, 2014).

#### ▪ **Pedagogical content knowledge and vocational education**

D' Sousa and Rodriques (2015) state that that teaching methods in Engineering Studies seems to be traditional instructor centred and lecturer orientated and they have also been criticized for being too linear, theoretical, dogmatic, systematic and constraining. They further argue that lecturing staff tend to be too focused on covering the contents of the prescribed syllabus, without them rendering adequate attention to the needs, learning styles, learning pace and learning outcomes. Students therefore become passive recipients of knowledge and seem to memorise subject contents for the sake of obtaining good exam grades, without really understanding the learning contents and actually developing the required skills needed for the Engineering profession. The latter sentiment expressed that Engineering Studies is taught in a traditional lecturer-centred that is theory-based has been pointed out by one of the symposium participants.

*“Theory results are the only ones recognised for students to progress one level to another without any practical skills assessed. Only after N6 students are placed at companies for work integrated learning (WIL) for a period of 18 months to obtain TVET Diploma as artisan”.*

D' Sousa and Rodriques (2015) further suggest the adoption of an “Extreme” pedagogy for the implementation in Engineering Studies programmes. An “Extreme” policy shifts focus from teacher centred instruction to student/learner centred instruction, from teaching to learning. This learner centred pedagogy focus on the student, student learning, student’s satisfaction and student motivation. ‘Extreme’ pedagogy is perceived to come forth as being flexible, adaptable and makes provision for the needs of diverse learners. This approach appears to be most appropriate for teaching and learning in Engineering Studies.

#### ▪ **General pedagogical/vocational knowledge**

The teaching of certain graduate attributes for Engineering Studies( knowledge base for engineering, problem analysis, investigation, design, use of engineering tools, individual and teamwork, communication skills, professionalism, impact of engineering on society and the environment, ethics and equity, economics and project management and lifelong learning) necessitate the application of various assessment techniques such as lecture-based classes, small group, long/short –term projects, field placement, studio, seminars, problem based learning and laboratories (McGill University, 2017). TVET colleagues in South Africa are general under resourced. The lack of facilities prohibited the effective teaching of Engineering subject contents. A workshop participant lamented on the severe lack of facilities at his college

*“It is really difficult to teach big classes the practical aspects of Engineering contents without any workshops. Lecturers try the use some educational media to demonstrate the practical aspects of the subject. It doesn’t*

*hold the same experience for students as how it could have been in a workshop situation”*

Felder (2004) also maintains that teaching strategies such as cooperative learning, problem based learning, the assessment of open ended multidisciplinary problems, problem formulation exercises and the use of absolute grading criteria appear to be the most fitting strategies in enhancing student centred learning opportunities in the field of Engineering Studies. There is evidence to suggest that the latter used strategies increase course, test and exam grades.

#### ▪ **Work Integrated Learning (WIL)**

Nzimande is of the view that the South African TVET system needs to be aligned to the labour market, industry and organised business, so that students get exposure to work-place experience which will assist them with the application of what they have learned in the various programmes; prepare them for the world of work and facilitate their transition from college to work (Moodley, 2015). Field in Moodley (2015) also highlights the need for reciprocal interaction between TVET institutions and industry. The exposure of lecturers to industry related work operations and the teaching roles which industry practitioners might take on, could draw much needed specialised knowledge and experience in the TVET system.

Various TVET institutions in South Africa have formal agreement with private and public industries for the placement of Engineering students. However, many challenges persists with the work based placement of Engineering students which includes the following aspects: the deterioration of the apprenticeship system resulting in a shortage of mid-level skills; students' inability to obtain skills competencies in qualifications such as the “N” Diploma and the National Diploma; graduate inability to practice in their professions owing to a lack of access; TVET sector limitations to facilitate the increasing numbers of students and graduates and the distorted relations between TVET institutions and potential private service providers (DHET 2015).

#### ▪ **Infrastructure and facilities development**

Papier (2006) contends that the TVET college sector in South Africa have since 2006 engaged in major restructuring- this process transpired via massive government participation and investment to improve infrastructure, developing facilities, implementation of appropriate, relevant curricula for programmes, re-train and skilling of staff and supporting students financially to access learning programmes. The shortage of facilities such as workshops, laboratories, lacking management skills to manage workshops and overcrowding in the classrooms are observed as aspects which hinder practical sessions with students. Certain lecturers also articulated a need to be skilled as to become eligible for trade tests. Some lecturers with industry experience possess practical skills to facilitate workshop with students, but lack theoretical knowledge for classroom teaching, whereas lecturers from teaching background possess the pedagogical skills for classroom teaching but then lacks the practical experience for workshop training (Mokone, 2011). A symposium participant highlighted the following need:

*“Some colleges received modern equipment but were never trained by DHET on how to use the latest equipment. Workshops are fully equipped with modern resources which are partially used”*

Facilities such as workshop and laboratories make a huge contribution in teaching the subject matter of Engineering Studies syllabi in an effective and practical manner. This then also allows the lecturer to teach to the prescribed lecturer competencies and graduate attributes, stipulated for Engineering Education.

#### ▪ **Roles of college leadership and management**

Initiatives by DHET and other providers to strengthen the leadership roles and management structures of TVET colleges are viewed as an effective strategy in driving improvements in the overall quality of the system (Fields, in Moodley, 2015). College management needs to be proactive in forging closer links with public and private employment providers. Increased participation and stakeholder involvement could ensure the viability and sustainable of Engineering TVET programme offering and also ensure that these offerings are aligned to the latest technological developments and innovations. It's further crucial that leaders entrusted with the management of Engineering Studies at TVET colleges (whether they operate at subject or Departmental level) should understand the responsibilities of his/her duties and should make a concerted effort in providing support and leadership to the subject/ departmental team he/she is serving. During the symposium, some participants alluded to some challenges with regard to their Head of Departments. Two participants expressed their views as follow:

*“HODs do not know how to analyse the technical and vocational skills competencies”.*

*“They are academically qualified for the positions but not in the fields they are leading or heading”.*

*“HODs in our college do not understand the technical or engineering fields”*

For Engineering Studies to come to its full realisation and make a meaningful contribution, especially with regards to STEM science development, staff in management positions needs to understand their roles in supporting their colleagues and developing their competencies in rendering academic leadership in the subject.

Lecturers and Head of Departments should undertake skills audits and identify the training needs for the department and respective academic programme. Academic managers should be in a position to influence and support the development of academic programmes of lecturers at a particular level (Mokone, 2011). Final decisions pertaining to identified academic development programmes, which ought to support lecturer continuous professional development TVET colleges should reside with the human resource department, skills development facilitators and the executive college management.

## 6. RECOMMENDATIONS

This study suggest that various aspects of TVET college functioning in South Africa be improved upon and further explored as to arrive at a holistic understanding and appreciation of the type of pedagogy required for the effective teaching of Engineering Studies. It is also recommended that structured continuous professional development initiatives and formal in-service and training activities be geared towards skilling and equipping Engineering Studies lecturers with the professional and pedagogical competencies needed for the development of highly productive, critical and employable student TVET graduates. The advancement of a specialised teaching qualification for lecturers should further take precedence over less important, yet critical issues in the TVET sector.

## 7. CONCLUSION

The current pedagogical/vocational competencies of Engineering Studies' lecturers need to be interrogated against the current TVET context in South Africa. Certainly, there is also a dire need to further investigate and analyse the effect of perceived related challenges (on the professional and teaching obligations of lecturing staff). The need for a specific pedagogical framework (s), such a *“Extreme” Pedagogy* which focuses on the student, student learning, student's satisfaction and student motivation, might also be used with great effectiveness in the teaching of subject contents of Engineering Studies programmes at TVET colleges. Concepts and practices attached to this pedagogical approach can be easily implemented in classroom teaching in engineering colleges.

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