

**The theory-practice imbalance in the Electrical Engineering subject at a
Technical Vocational Education and Training College: Implications for student
training**

by

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DECLARATION

This is to declare that 'The theory-practice imbalance in the Electrical Engineering subject at a Technical Vocational Education and Training College: Implications for student training' is my own work and that all that all the sources that I have used or quoted have been indicated and acknowledged by means of complete reference.

I also declare that this dissertation was not previously submitted before for a degree at any other University.



Ms G Montwedi

28 December 2021

Date

DEDICATION

I dedicate this dissertation to my late parents, Ms Johanna Montwedi and Mr Abram Tloboro. I thank you for raising me with love and support to be the mother that I am to my son today.

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ABBREVIATIONS AND ACRONYMS

DHET	Department of Higher Education and Training
ECSA	Engineering Council of South Africa
HOD	Head of Department
LSI	Learning Styles Inventory
MSN	Microsoft Network
NATED	National Accredited Technical Education Diploma
NC(V)	National Certificate (Vocational)
SET	Science, Engineering and Technology
SSACI	Swiss-South African Co-operation Initiative
STEM	Science, Technology, Engineering and Mathematics
TVET	Technical and Vocational Education and Training
VET	Vocational Education and Training
QDA	Qualitative Data Analysis
WIL	Work Integrated Learning
WBE	Work-Based Learning

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ABSTRACT

The purpose of this study was to explore the theory-practice imbalance in the TVET College programmes at Moses-Kotane Local Municipality in the North-West Province. The problem faced by the students at the TVET Colleges, especially in the Electrical Engineering programme, is that they find it difficult to comprehend practicals as they cannot relate it to the theory. The problem emanates from the lecturers who are not artisans and therefore find it difficult to conduct practicals.

I interviewed 16 participants, i.e. 10 students, two lecturers, one Head of Department, and three host employers. From this study, it was revealed that some students do not have sufficient Electrical Engineering background, there is lack of resources for balancing theory and practice, and thus problems for students in conducting their practicums. It was discovered that some lecturers, who are not yet artisans and without relevant qualifications to lecture, contribute to the poor academic performance of students.

From the findings, I recommended that all relevant stakeholders should have a sound knowledge and a strategy to balance theory and practice. The College needs to allocate sufficient funds for lecturing and practicum purposes. The lecturers without relevant qualifications need to obtain those qualifications through financial assistance from the College. The Electrical Engineering workshops need to be renovated so that there is sufficient space for students and that there is a free flow of traffic. The lecturers should prepare students thoroughly prior to their placement at workplaces.

Key words: TVET College, theory, practice/practicum, workshops, imbalance/balance, work-based experience.

TSHOBOKANYO

Maikemisetso a thutopatlisiso eno e ne e le go tlhotlhomisa go tlhoka tekatekano ya tiori le tiragatso ya tiro mo mananeong a *Electrical Engineering* kwa Kholetšheng ya TVET kwa Lekgotlatoropong la Selegae la Moses-Kotane kwa Porofenseng ya Bokonebophirima. Bothata jo bo lebaneng baithuti kwa Dikholetšheng tsa TVET, bogolo segolo mo lenaneong la *Electrical Engineering*, ke gore ba fitlhela go le boima go tshaloganya tiragatso ya tiro ka ntlha ya fa ba sa kgone go e amanya le tiori.

Ke botsoloditse bannileseabe ba le 16 dipotso, k.g.r., baithuti ba le 10, batlhatlheledi ba le 2, Tlhogo ya Lefapha e le 1 le bathapi ba ba amogelang baithuti ba le 3. Go tswa mo thutopatlisisong eno, go senogile gore baithuti bangwe ga ba na lemorago le le lekaneng la boenjiniiri jwa motlakase, mme ditlamelo tsa go lepalepanya tiori le tiragatso di a tlhabela; dintlha tseno di bakela baithuti mathata fa ba dira tiragatso ya tiro. Batlhatlheledi bangwe, ba ba iseng ba nne baathisene le ba ba se nang borutegi jo bo maleba go ka tlhatlhelela, ba tshwaela mo tiragatsong e e bokoa ya thuto ya baithuti.

Go tswa mo diphitlhelelong, ke atlenegisa gore baamegi botlhe ba ba maleba ba nne le kitso e e feletseng le togamaano ya go lepalepanya tiori le tiragatso ya tiro. Kholetšhe e tlhoka go rebola matlole a a lekaneng mo mabakeng a botlhatlheledi le tiragatso ya tiro. Batlhatlheledi ba ba se nang borutegi jo bo maleba ba tshwanetse go bona borutegi joo ka thuso ya matlole go tswa mo Kholetšheng. Mafelobodirelo a boenjiniiri jwa motlakase a tlhoka go ntšhwafadiwa gore go nne le sebaka se se lekaneng sa baithuti le gore motsamao o elele bonolo. Batlhatlheledi ba tshwanetse go siamisa baithuti mo go lekaneng pele ga ba isiwa kwa mafelotirong.

Mafoko a botlhokwa: Kholetšhe ya TVET, tiori, tiragatso ya tiro, mafelobodirelo, go tlhoka tekatekano, maitemogelo a mo tirong

KAKARETŠO

Maikemišetšo a nyakišišo ye e be e le go nyakišiša go se lekalekane ga teori le tlhahlo ya mošomo ka gare ga mananeo a Boentšenerere bja Mohlagase Kholetšheng ya Thuto le Tlhahlo ya Sethekniki le Mešomo (TVET) ka Masepaleng wa Selegae wa Moses Kotane ka Profenseng ya Leboa Bodikela. Bothata bjo baithuti ba lebanego le bjona dikholetšheng tša TVET, kudukudu ka lenaneong la Boentšenerere bja Mohlagase, ke gore ga ba kgone go kwešiša diprakethikhale ka ge ba palelwa ke go di amantšha teori.

Ke bile le dipoledišano le batšeakarolo ba 16; e lego baithuti ba 10, bafahloši ba 2, Hlogo ya Lefapha, le benggae ba e lego bengmošomo ba 3. Diphihlelelo tša nyakišišo ye di utulotše gore baithuti ba bangwe ga ba na botsebi bjo bo lekanego bja boentšenerere bja mohlagase, le didirišwa tša go lekanetša teori le tlhahlo ya mošomo di a hlaelela; dintlha tše di hlolela baithuti mathata ge ba dira diprakethikhale tša bona. Bafahloši ba bangwe ga se diathisene ebile ga ba na mangwalo a maleba a dithuto go ka ruta, ba tšea karolo mo go šomeng gampe ga baithuti dithutong tša bona.

Go diphihlelelo tše di fihleletšwego, ke šišinya gore batšeakarolo ka moka ba maleba ba be le tsebo ya go kwagala le leano la go lekalekanya teori le tlhahlo ya mošomo. Kholetšhe e swanetše go fana ka thekgo ya tšhelete ye e lekanego ya thuto le tlhahlo ya mošomo. Bafahloši bao ba se nago mangwalo a maleba a thuto ba swanetše go hwetša mangwalo ao a thuto ka thekgo ya mašelang go tšwa kholetšheng. Diwekešopo tša boentšenerere bja mohlagase di swanetše go mpshafatšwa gore go be le sekgoba se se lekanego sa baithuti le sa go dira mošomo wa bona. Bafahloši ba swanetše go netefatša gore baithuti ba hwetša bokgoni bja maleba pele ba romelwa mafelong a mošomo.

Mantšu a bohlokwa: Kholetšhe ya Thuto le Tlhahlo ya Sethekniki le Mešomo (TVET), teori, tlhahlo ya mošomo, diwekešopo, go se lekalekane/go lekalekana, boitemogelo bjo bo theilwego mošomong

CHAPTER 1: ORIENTATION INTO THE STUDY

1.1 Introduction

This exploratory case study aims to inquire into the theory-practice imbalance for Electrical Engineering students in the National Certificate Vocational (NC(V)) which was introduced in 50 Technical Vocational Education and Training (TVET) Colleges across South Africa in 2007.

NC(V) is meant to give Grade 9 students a pathway to industry-focused learning. The main aim of this initiative was to integrate theory with practice. Before the introduction of the NC(V), 50 Colleges throughout the country had only National Education courses both in engineering and business studies (TVET Colleges, n.d.). There is a huge imbalance between theory and practice, and therefore students have difficulty in securing practical positions in industries and mines. This chapter outlines how TVET Colleges came about having more skilled youth exiting the sector (Kingombe, 2012; Rasool & Mahembe, 2014), thus being ready for the labour markets and being entrepreneurs (Dasmani, 2011:67).

The TVET College that this study targets is one of the three public TVET Colleges found in the North-West Province and it is situated in three different municipalities as it has three campuses, here using pseudonyms Campus M, Campus B, and Campus R for confidentiality purposes. Campus R is at the central office. The Department of Higher Education and Training (DHET) provides money to the TVET Colleges to ensure their proper day-to-day running and there are many learnerships offered at the three sites of the College.

One of the campuses is situated in a rural area, whereas the other two are situated in urban areas. Each campus offers a variety of skills training programmes. The College allocates the various programmes to the three campuses according to their geographical location.

The first section of this orientation into the study highlights the theory-practice imbalance experienced in TVET Colleges in the Electrical Engineering subject and the introduction of NC(V) programmes which focus on theory and practice. Kolb's (1984) experiential learning theory frames this study. It is a four-stage cycle of learning with four separate learning styles. Much of Kolb's (1984) theory is concerned with the learner's internal cognitive processes (as cited by McLeod, 2017). Kolb (1984) states that learning involves the acquisition of abstract concepts that can be applied flexibly in a range of situations. In Kolb's (1984) theory, the impetus for the development of new concepts is provided by new experiences (as cited by McLeod, 2017).

'Learning is the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience' (Kolb, 1984:38). Kolb's (1984) experiential learning theory style is represented in the form of a cycle in which the learner touches all bases (as cited by McLeod, 2017). Thus, according to Kolb (1984:38), effective learning is seen when a person progresses through a cycle of four stages, which are:

- Having a concrete experience followed.
- Observing and reflecting on that experience.
- Forming abstract concepts (analysis) and generalisations (conclusions).
- Abstract concepts and generalisations are then used to test hypothesis in future situations, resulting in new experiences.

Experiential learning theory has been widely accepted as a useful framework for learning-centered educational innovation, including instructional design, curriculum development, and life-long learning (Kolb & Kolb, 2005:8).

The learning style inventory, which was developed by Kolb in 1971 to assess individual learning styles, is not intended for use to predict behaviour for job placement or assigning learners to different educational treatments. An individual's learning style is not to be considered a fixed trait; rather a learning style is a dynamic state arising from an individual's balancing of the two opposing experiences

experiencing/conceptualising and acting/reflecting (Kolb & Kolb, 2005).

1.2 Motivation for the study

The relevance of Technical and Vocational Education and Training (TVET) colleges to the labour market sector is essential for the upliftment of the economy and provision of crucial skills. Moreover, the quality provision of technical vocational education is vital for the development of skills and knowledge to meet the rapid changes of the labour market. Developed countries such as Germany have an advanced vocational education system in line with the rapid advancement of the labour market (Kuczera & Jeon, 2019).

Theory and practice are crucial for engineering students at TVET Colleges. Students are expected to have as much practical knowledge as their theory to increase their chance of employability, and ultimately, to alleviate poverty and youth unemployment in the country. Vocational training is a contentious issue in South Africa, where large percentages (consistently between 20 and 30% during recent years) are regularly cited for unemployment statistics, and in particular for youth and post-school unemployment (Ranchhod, 2019; Jones, 2019). Technical and Vocational Education and Training (TVET) is often seen as one means to address the national socio-economic problems associated with post-school unemployment, with the purpose being “to respond to the human resource needs of the country for personal, social, civic and economic development” (Terblanche, 2017:2).

In TVET Colleges, the balance between theory and practice forms an important and integral part of students' learning and academic progression. The DHET ensures that TVET Colleges integrate theory and practice by subsidising the Colleges with a grant.

The primary mission of a University of Technology (UoT) is to give students the workplace skills and knowledge to meet the needs of industry, business and community (Du Pré, Koorts, Mjoli, Moore & Rensburg, 2001:1).

Workplace skills and knowledge require that students acquire both practice and theory during their academic career at a University of Technology. Lecturers should have a clear understanding and they should be able to contribute to the decision making at TVET Colleges, such as planning and preparing lessons, by ensuring conducive and positive environments for teaching and learning and knowing what teaching methods will best suit their students for individual subjects, based on the NC(V) curriculum (Lucas, Spencer & Claxton, 2012). There are shortcomings in the students' academic achievements, and less equipped students enter the labour market (Psifidou, 2012:117).

South African economic growth relies on skilled artisans produced by the TVET Colleges. This study can help TVET Colleges to relook the theory-practice issue. The students at the target TVET College need to be taught theory, practice, and problem solving. The best method to learn Vocational Education is by putting theory into practice.

1.3 Research problem

Students find it more difficult to comprehend their practicals than the theory in the engineering programme. This problem continues despite the efforts taken to re-orientate the TVET curriculum. This problem is exacerbated by lecturers who find it more difficult to conduct practical work than the theory component as they are not yet qualified artisans. New lecturers are mentored in the posts they fill but mentors are not formally allocated and no reciprocal or systematic mentoring takes place (Van der Bijl 2015:8). Something should be done to bridge this theory-practice imbalance. Hence, this identified gap warrants investigation. Mmako and Schultz (2016:154) maintain that managers should hold regular one-on-one meetings with lecturers, showing genuine care and concern for them, and that constructive, specific feedback should be given to lecturers during their development.

Rose (2011:181) explains that the student's higher education success is impacted for many reasons. A theory-practice gap in this study is the cause of the problem. Students, therefore, need to be exposed to both practice and theory in an

engineering curriculum, especially if they are to develop the right attributes such as problem-solving, investigation skills, and engineering professionalism (Martin, Maytham, Case & Fraser, 2005; Easa, 2013:547).

By taking into consideration the research problem, the main research question that this study addresses is stated thus: How can the theory-practice imbalance of Electrical Engineering students be bridged in the TVET College programmes in the North-West Province?

The sub-questions that emerge from the main questions are:

- What are the obstacles hindering engineering students from excelling in both theory and practice?
- How do these obstacles affect engineering students during their practice?
- What strategies can be used to address the theory-practice imbalance in teaching and learning?

1.4 Research aim and objectives

The aim of this study is to explore ways to bridge the theory-practice imbalance in the Electrical Engineering students in the TVET College programmes in the North-West Province. From this aim, the following objectives are stated:

- To explore the obstacles that hinder engineering students from excelling in both theory and practice.
- To establish how these obstacles affect engineering students during their practicals.
- To suggest the strategies that can address this theory-practice imbalance.

1.5 Overview of research methodology

1.5.1 Research design

This study was conducted as a case study. Yin (2014:16) conceptualises case study research as a form of social science. The purpose of a case study is to secure how cases are treated individually. A case study was used because of the uniqueness of the College, i.e. it falls amongst the best performing Colleges in South Africa. For this case study, I employed both case study methods described below.

Firstly, I visited different sites to conduct direct observations. Then I conducted personal interviews. I intended to determine how students think of the workplace where they were placed for the work-based experience. In pursuing this study, I needed to understand how host employers/companies roll out their real work learning process and how this in turn benefits the students.

1.5.2 Research site and target population

1.5.2.1 Research site

The purpose of this study was to explore the theory-practice imbalance shown by lecturers, students, and host employers in the Electrical Engineering subject at TVET Colleges at different campuses and five different Electrical Engineering companies. Campus M was selected because it is the Campus where I am currently working as a Senior Lecturer in Electrical Engineering. It consisted of 60 Electrical Engineering level 4 students. They were a mixed cultural group, most of whom were black students such as Tswana, Pedi, Xhosa, Venda and Tsonga who come from different parts of South Africa.

There were also foreign nationals from Lesotho and Zimbabwe. The reason why Campus M accommodated students from different situations is that it is a residential campus with student hostels. The hostels are on the campus premises. However, some students were accommodated in the village near the campus. The campus had fully-fledged workshops for Electrical Engineering, Boiler Making, Fitting and

Tuning, an Automotive Repairs and Maintenance workshop, a Centre of Specialisation workshop, and a State-of-the-Art Samsung Engineering Academy.

1.5.2.2 Target population

The target population in research is the total number from which the participants are selected (Shukla, 2010:108). For this study, my target population was 61 academic staff members, a total of 60 students, and five host employers from five different Electrical Engineering companies where students were placed for their work-based experience (WBE) which will be explained later. Work-based experience is practical experience that takes place at industries, institutions or companies. Colleges liaise with employers to host their students for a period of a maximum of three weeks during school holidays (SSACI, 2013:12). This population was for Campus M. The student population consisted of males and females of ages between 16 and 25.

1.5.2.3 Sampling

Sampling is a group of people that will actually take part in research (Neuman, 2006:219). Sampling is divided into two types, namely, probability and non-probability sampling. Probability sampling is again sub-divided into simple random sampling, systematic sampling, stratified sampling, cluster sampling, and random digit dialling sampling (Neuman, 2006:227). Non-probability sampling is when participants are not chosen randomly; not everyone will take part, only a selected few. It is easier and cheaper, not bias free, and it includes accidental sampling, quota sampling, purposive sampling, snowball sampling, deviant case sampling, sequential sampling, and theoretical sampling (Neuman, 2006:220). For this study, due to time constraints and limited resources, I used purposive sampling as one of the types of non-probability sampling.

Purposive sampling is a procedure generally utilised in qualitative research for the recognisable proof and choice of information-rich cases for the best utilisation of restricted assets (Patton, 2002:230). Information-rich cases are those where you can learn much about the issues that are most important to the research objectives. The participants should be sampled according to their theoretical knowledge and

practical experience (Creswell & Plano Clark, 2011). I selected the participants on the basis that I knew them, that I would receive the best information that I required for this study, and for their multiple points of view which helped me in this research study.

Purposive sampling was utilised in this study because the interest was on two Electrical Engineering lecturers (one female and one male), five male and five female students, and three host employers. Purposive sampling was used to identify the relevant participants who had the right information (Creswell, 2013). These participants provided the required answers to suit this study (Kuper, Lingard & Levinson, 2008:337).

The participants in this study were also purposively selected as the two lecturers (one female and one male) were lecturing in Electrical Engineering, five male and five female students were currently studying Electrical Engineering at level 4, HoD and the three host employers at Electrical Engineering companies placed level 4 students during school holidays for work-based experience. Lecturers and students were sampled from Campus M's population. McMillan and Schumacher (2010:137) support that the researcher should identify the participants according to the way in which they know the participants, the participants' ability to answer the research question, and their knowledge about the topic to be researched.

1.5.3 Data collection instruments

I guided the interview sessions according to the questions that I had prepared beforehand (Koekemoer, 2018:9). I used semi-structured interviews to capture the data for the three research questions mentioned in Tables 1.1 and 1.2. The reason why I used the above-mentioned instrument was that I deemed it fit for the data collection and it would answer the research questions. This is explained further in the next sections.

My questions were open-ended to avoid closed answers such as 'yes' or 'no', as closed answers would not give me much information. The desired result of this

qualitative research was to discover as much about my interviewee and their situation as possible. I started with basic questions such as the interviewees' biographical information so that they could acclimatise themselves to the interview session.

1.5.4 Data collection methods

Data gathering is the exact sequencing of the data collection procedures. For the data collection methods, I employed observations and interviews. The empirical phase, which involves the actual collection of data, is followed by the preparation for data analysis (Polit & Hungler, 2004:51). The above methods helped me to collect the primary data. Talbot (1995:472) highlights that 'data collection begins with the researcher deciding from where and from whom data would be collected', which Streubert and Carpenter (2003:18) support and further point out that the 'researcher is the main research tool or primary instrument'. This was done through the methods which are explained briefly.

1.5.4.1 Interviews

Most researchers believe in using qualitative research methods to conduct interviews (Fife, 2005). I chose semi-structured interviews because of their relevancy to this study. They can be used on both individuals and groups of participants and allow insight into the participants' points of view (Cousin, 2009:71). The questions I asked the participants were open-ended and my intentions were to gather their views, feelings, and beliefs about the topic I was researching. I used interviews because of their benefits, such as sufficient time to clarify questions to each participant and to get to know my interviewees better during the one-on-one interviews.

Semi-structured electronic interviews were used. I took three things into cognisance in accordance with the developed interview guide. For this study, I had to change my research method of the selected sample from one-on-one interviews to electronic research interviews because of the risks involved during the Covid-19 pandemic. I was not able to visit the various workshops, classrooms or workplaces. This method can be utilised, like others, to inspect the mentalities, suppositions, convictions, and

encounters of the participants in the study. The interviews were done asynchronously or non-concurrently. Asynchronous interviews are those where the interviewer and interviewee participate in an interview at various times. Emails, online networks, and announcement sheets, or interpersonal organisation locales, are instances of interviews that are asynchronous (Tracy, 2012).

As with Microsoft Network (MSN) messenger interviews, one of the advantages of email interviewing, due to asynchronous interviews, is the extended access to participants compared to face-to-face interviews (Coomber, 1997). Another advantage is that email interviewing enables the interviewer to formulate the questions and the interviewee can answer the questions at his or her own convenience without disturbance due to the independence of place and time. The email interview can be much cheaper than the face-to-face interviews because there are no travelling costs. On the other hand, this method can take up much time.

This does not only lead to the risk that the interviewee will lose interest in the research, but also the risk that the interviewee may forget to reply to the questions (Kivits, 2005). Sending reminders at an appropriate time to the interviewee can reduce this problem.

1.5.4.2 Focus groups interviews

Focus group interviews are designed in a way that does not endanger the participant's perceptions (Grove *et al.*, 2013:274). Interviews are a strong way to find and record the members own words, the person's or the gathering's viewpoints, sentiments, assessments, values, perspectives and standards around their public stories and record roughly their own words (Saldaña *et al.*, 2011:32). Kothari (2004:98) states that focused interviews pay particular attention to the participants' experiences.

Two focus groups were formed; one consisting of all 10 male and female students, and the other group consisted of the two lecturers who were answered the interview questions on the theory-practice imbalance in the Electrical Engineering subject.

The focus group interviews permitted me to explain, test, and observe the non-verbal conduct of the participants during the data collection. By doing qualitative research, I had the option of noticing unobtrusive interchanges on different occasions (Tappen, Worch, Elkins, Hain, Moffa & Sullivan, 2014:307). By gaining credible insight into the participants' experiences (Grove *et al.*, 2013:23), I understood the motivational factors that influenced their way of thinking. Knowledge was revealed in a talk between me and the participants (Polit & Beck, 2012:507).

I was able to get a better understanding of my participants as I ensured trust between myself and participants. The venues used should be welcoming and environmentally friendly for the participants (Perry, 2014:15).

1.5.4.3 Observations

For this study, I reviewed the information that I gathered by looking at the questions that I asked and examined the benefits of looking around the site and the purpose of the visits (De Walt & De Walt, 2002:92). During the lecture period, the students were placed for their work-based experience (WBE). I obtained more data during my observations. Observation, as a qualitative data-gathering technique, enabled me to gain deeper insights and understanding about what would transpire in the lecture rooms and workshops and the three different Electrical Engineering companies.

Henning, Van Rensburg and Smit (2004) describe the structured, standardised observation method as a research tool. For the observation to take place, I needed to be accepted by two lecturers in both their lecture rooms and their workshops. Also, three host employers agreed that I became part of the team that was placed at their companies during the work-based experience programme.

The main reason for my visit to the Electrical Engineering companies was to observe how theory that was taught at the TVET Colleges was being put into practice at three different Electrical Engineering companies. I obtained more data during the observations. Observation as a qualitative data-gathering technique enabled me to gain deeper insight and understanding about what transpired at the campus

workshops and the three different Electrical Engineering companies. I had built a good relationship with all my participants, and hence I conducted my observations with ease. I firstly built a working relationship with the participants, and to maintain this relationship with the participants, I ensured trust between me and them.

1.5.4.4 Field notes

Historically, 'scratch notes' or field notes have been a central component of qualitative research since the early 1900s, originating in the field of ethnographic anthropology (Emerson, Fretz & Shaw, 2011). It is currently understood that qualitative field notes are an essential component of rigorous qualitative research, and they are recommended in qualitative research as a way to capture necessary contextual information and ensure the persistence of rich context beyond the original research (Creswell, 2013; Lofland, Snow, Anderson & Lofland, 2005; Mulhall, 2003; Patton, 2002). I used a journal to take notes of the daily happenings and tasks that took place at the three different Electrical Engineering companies.

The collection of field notes is so widely regarded as essential that standardised criteria for qualitative research reporting encourage researchers to include a statement of the collection of field notes in manuscripts (O'Brien, Harris, Beckman, Reed & Cook, 2014; Tong, Sainsbury & Craig, 2007). I therefore used field notes to augment the data collected through the above methods. During the data collection, I went out into the field and obtained raw data (Marshall & Rossman, 2011) which were based on my own observations and perceptions.

1.5.5 Data analysis

Data analysis is 'a means of making sense of relevant data gathered from sources such as interviews, onsite observations, and documents, and then responsibly presenting what the data reveal' (Caudle, 2004: 417). Data analysis is the process of evaluating data and getting information to reach a conclusion to something (Burns & Grove, 2003:479). It is, however, a challenging but creative process characterised by the researcher's intimate relationship with the participants and the data generated (De Vos, 2002:340). By conducting data analysis and gaining a deeper

understanding of what was being investigated, I looked at how things were being treated differently across the participants' long-term experience.

The analysis of data happens all the while with data collection and is a function of the iterative cycle. Polit and Beck (2012:562) report that qualitative data analysis includes arranging huge, calculated examples from sections. Interviews were conducted in English. The reason for the use of this language is that all interviewees had to be accommodated, so that each interviewee could understand and be confident when providing me with answers. For data analysis I used inductive open coding.

During the data analysis I became part of the day-to-day duties of the participants. I chose a participant observation approach because I wanted to engage in the conversations and have knowledge and experience about the topics being discussed. Also, I had credibility with the College principal and employers because they could see that I was a registered Master's student (Salmons, 2015:152). I gave the participants the results so that they can review them, I also verified using more data sources and looked for possible explanations.

1.6 Definition of key concepts

1.6.1 Work-based experience

This is practical experience that takes place at industries, institutions, or companies. Colleges liaise with employers to host their students for a period of a maximum of three weeks (school holidays). It entails trips, or brief periods of observation, to a particular industry or workplace (SSACI, 2013:12). The goal is to have a deeper grasp of the industry's tasks, technologies, systems, and procedures (SSACI, 2013:12).

1.6.2 TVET

This is an international educational term that is applied to certain post-school

educational institutes. UNESCO explains that technical and vocational education is used as a comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life (cited by Odendaal, 2015). It refers to Technical and Vocational Education and Training institutions in South Africa.

The Department of Higher Education and Training (Strategic Report, 2011-2015) adds that this type of education and training is also referred to as 'post-school', meaning that it refers to education and training that occurs after graduating from high school, even if only with a Grade 9. The main age limit for an individual wishing to learn at the TVET level is that the individual should be 16 years or more. The students are dependable senior teenagers and grown-ups who do not joke around after school but prepare a programme with the end goal of securing attractive job offers. The variety of courses available at public TVET Colleges is extensive. Some Colleges may have up to 300 distinct courses to choose from. Depending on the nature of the course, the length of the course and the entry standards change.

1.6.3 Theory

The concept 'theory' is in line with a view that is often applied in natural scientific and medical research, where theory is related to something that can be tested repeatedly and thereby provides guidance as to how to act at any given time in relation to a specific phenomenon (Laksov, Dornan & Teunissen, 2017:18).

Theory in (university) education, on the other hand, needs to be viewed in a different way. Rather than pressing to find evidence (Brosnan, 2010:645-652), theory in this context is the starting point for participating in a scientific dialogue about different possible explanations of the phenomenon. This is done by means of a special lens or a particular perspective by which the exploration takes place, and it can lead to theory development (Reeves, Albert, Kuper & Hodges, 2008:631-634). It is in this light that student training and research are guided by theoretical work and lenses.

1.7 Overview of chapters

Chapter 1: Introduction to the study: This chapter is the orientation to the study and presents the problem, research questions, and aims. It motivates the study and gives an overview of research methods.

Chapter 2: Theoretical framework and literature review: This chapter discusses and motivates the chosen theory, which is the orientation into the theoretical framework, and presents the reviewed literature in the field of this study.

Chapter 3: Research methodology: This chapter presents, discusses, and justifies the research methodology, paradigm, approach, design, research site, target population, selection of participants, data collection instruments, data collection methods, data analysis, the trustworthiness of the methods, and the ethical protocol.

Chapter 4: Presentation of findings: This chapter presents the findings of the study from the collected data through interviews, and observation.

Chapter 5: Conclusions: This chapter concludes the study and makes relevant recommendations.

CHAPTER 2: THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

This chapter explains the theoretical framework chosen to guide the study and the relevant literature on issues of balance between theory and practice in TVET Colleges. It further discusses and justifies the theoretical framework, the literature review, Engineering as a subject in the TVET sector and job demands, sustainable economic skills, the importance of theory-practice in TVET colleges, integration of theory and practice, outcomes of balancing theory and practice and work-based experience (WBE) and work-integrated learning (WIL). The TVET Colleges lack lecturers who are also qualified as artisans, and students cannot find jobs in industries and mines after completing their studies.

The problem emanates from the insufficient practical skills shown by students after completing their NC(V) programmes. This is despite TVET College being tasked with the responsibility of preparing students for occupational fields and effective participation in the world of work. In addition, they are supposed to prepare students for lifelong learning and responsible citizenship, and they are also supposed to be instruments for promoting environmentally sound, sustainable development and poverty alleviation (UNESCO, 2015).

2.2 Theoretical framework for the study

A theory, according to Saldaña and Omasta (2018:257), distils research into a statement about 'social life that holds transferable applications to other settings, context, populations, and possibly time periods'. These 'big truths' have four properties and an explanatory narrative, i.e. they predict and control action through an 'if-then' logic, account for variation, explain how and why something happens through causation, and provide insights for improving social life (Saldaña & Omasta 2018:257).

There are at least three primary applications of a theory in qualitative research, which are theory of research paradigm and method (Glesne, 2011), theory building as a result of data collection (Jaccard & Jacoby, 2010), and theory as a framework to guide the study (Anfara & Mertz, 2015). All three are crucial and applicable in the current study, i.e. the theory guides the study, especially the methodology.

According to Grant and Osanloo (2014:12), a theoretical framework supports the research study. It gives the reader information about the theory chosen and the theory guiding a specific study. It is the anchor of the research study. Swanson (2013:122) asserts that 'the theoretical framework is the source of reassurance in a study'.

In the light of the explanations of theory given above, the theoretical framework for this study does not summarise my thoughts about research but symbolises a bigger picture of this study and how I used the chosen theory to understand the data. The theoretical framework includes what other researchers say about the balance between theory and practice. Therefore, this research is based on the theory by Kolb (1984), which is known as the experiential learning model and learning styles inventory (LSI).

According to Kolb (1984:41), knowledge results from the combination of grasping and transforming experience. From an epistemological perspective, experiential learning posits that students construct meaning from their experiences (Doolittle & Camp, 1999:26). This suggests that learning a theory in a teaching situation should not be an end in itself but should be put into practice for students to get the practical sense of that they have learnt. This is crucial in the technological subjects, especially in a TVET institutional environment where it is clear that students are being prepared for the career fields which need them to practice what they have learnt.

Kolb's (1984) experiential learning theory is a four-stage cycle of learning and learning styles. Much of Kolb's (1984) theory is concerned with the student's internal cognitive processes (as cited by McLeod, 2017). Kolb (1984) states that learning involves the acquisition of abstract concepts that can be applied flexibly in a range of

situations. In Kolb's (1984) theory, the impetus for the development of new concepts is provided by new experiences (as cited by McLeod, 2017). Figure 2.1 illustrates the LSI, the tool used to evaluate the nature of individual learning styles. It identifies four types of students based on their approach to obtain knowledge, diverger, assimilator, converger, and accommodator.

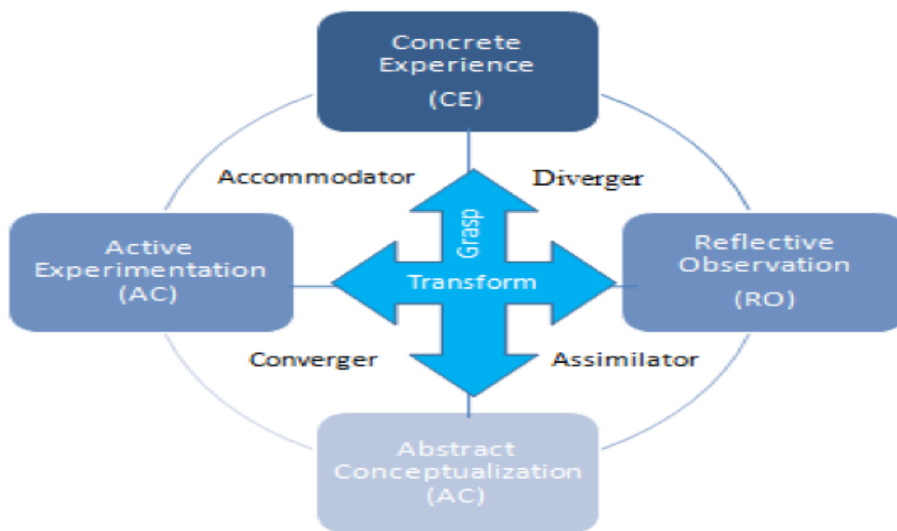


Figure 2-1: Experiential Learning Cycle and Basic Learning Styles (Kolb, 1984)

For effective learning to take place, the student should go through the entire cycle. The four-stage learning model depicts two opposite dimensions of grasping experience – concrete experiences (CE) are those new experiences that a student acquires by being hands-on. They are the first component of an experiential learning experience and abstract conceptualisation (AC). Next are the two opposite dimensions of transforming experience which are reflective observation (RO) and active experimentation (AE). Experiential learning is a process of constructing knowledge that involves creative tension among the four learning abilities (Kolb, 1984).

The student should continually choose a set of learning abilities to use in a specific learning situation. As mentioned, learning is conceived as a four-stage cycle (Figure 2.1) where the student should go through each stage – experiencing, reflecting, thinking and acting. In the grasping experience, the student can perceive new

information through experiencing the concrete, tangible, felt qualities of the world, relying on his/her senses, and immersing him- or herself in concrete reality, or can experience the opposite, abstract conceptualisation. In the transforming experience, reflective observation means to observe others who are involved in the experience and reflect on what happens, while the active experimentation stage favours jumping in and starting to do things. It is important to note that the student can enter the model at any stage (Kolb, 1984).

It is very important for lecturers to recognise that each student prefers different learning styles and techniques. Figure 2.1 indicates four different learning styles, as mentioned by Kolb (1984) when he said, 'Different people naturally prefer a certain single different learning style'. Various factors influence a person's preferred style, for example, the social environment, educational experiences, or the basic cognitive structure of the individual.

This theoretical framework helped me to understand how students grasp what they learnt by means of transforming their knowledge and by changing the way in which they think and learn. Kolb's (1984) experiential learning theory clearly shows that a student should go through four different phases in their learning process and that they have their own learning styles that they feel comfortable with. Without the learning cycle, there is no experiential learning theory.

The experiential learning departs from the customary method of teaching as it introduces students to new ways of learning whereby they appreciate their skills, knowledge, values and attitudes. This new way of learning talks to learnerships, apprenticeships, experiential learning, in-service training, work-based learning, and work-based experiences which are very much needed at the site of enquiry in this study. The experiential learning theory also introduces lecturers to the different learning styles that they can use in their classrooms to accommodate students' preferences.

In a lecture room setting, students are taught how to complete tasks on their own and work as a group. Students are equipped with the needed knowledge in the

workplace. But most importantly, they should be taught the practical side of what they are taught.

2.3 Practical skills

Practical knowledge or practical skills is the one that is learnt or acquired via hands-on experiences. Practical knowledge is of utmost importance because the things that one studies with the assistance of practice, one can know how to apply things. In practical education, we apply whatever we learnt in theoretical education (Muhamad, Cipta & Andino, 2020).

Both practical and theoretical knowledge go hand in hand when it comes to actual life. One is unable to perform well if he just possesses the knowledge and has no idea of how to apply or utilise that knowledge. One cannot expect to achieve perfection if one spends one's entire life being a bookworm just getting bookish knowledge (Muhamad, Cipta & Andino, 2020).

There are substantial and critical gaps in communication and collaboration amongst role players in the South African industry/manufacturing training and employment context, according to the findings of this study and replies from lecturers and students. Improving the collaborative ability and partnerships between workplaces, host employers, and the higher education sector, as the home locations where future industry employees are trained and prepared for employment, is critical.

This stakeholder gap was also emphasised by Naledi Pandor, the former Minister of Higher Education and Training, in August 2018, when she said that, "at the heart of the challenges facing the TVET system is the rupture that occurred between colleges and employers" (Phakati, 2018). Pandor said that the Sector Education and Training Authority's (SETA's), in particular, were significant in repairing this rupture (Phakati, 2018), with the long-term objective being to increase the number of learners that will qualify as artisans, which represent a major scarce/critical skills area in South Africa (Schlechter, Faught & Bussin, 2014; Moalusi, 2018).

The inclusion of practice into theory and vice versa forms a crucial aspect in this study. It is important for all students studying at the TVET Colleges to integrate

theory into practice. All NC(V) students, especially the ones studying Electrical Engineering, need to know and understand their practicals in the same way as they do with theory.

The literature refers to practical work in some cases as field experience, scientific investigation (Ramnarain, 2011), and laboratory investigation (Kibirige & Tsomago, 2013). Practical work is referred to as a '...learning process during which students simulate what they have learned during their theory classes, this can be conducted in simulation rooms, workshops or labs and also be done in real-workplace' (Lunetta, Hofstein & Clough, 2007:393).

Practical work can help students develop certain skills such as scientific and thinking skills. For students to excel in their practical work, it is imperative that lecturers do proper planning of their lessons. For students to remember what they are taught in class, they ought to be permitted to practice skills that they have acquired as these are crucial for their post-school survival (Makgato, 2011), and in the context of this study, to apply the skills in their learning for their careers in Engineering.

The next section discusses Engineering as a subject.

2.4 Engineering as a subject in the TVET College sector and job demands

The following sections discuss Engineering as a subject and its job demands in different TVET colleges around the world, Africa and South Africa.

2.4.1 Engineering as a subject in the TVET College sector and job demands around the world

The American Engineers' Council for Professional Development (1947:456) defines engineering as:

... the creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behavior under specific operating conditions; all as respects an intended function, economics of operation and safety to life and property.

According to Potočnik (2007), European research organisations recognise the importance of science communication. We need scientific minds to address the 'grand challenges' that the world faces.

'The importance of communicating science to the general public cannot be overestimated. Science cannot live isolate from society' (Potočnik, 2007:13).

The United Kingdom needs a growing numbers of future engineers (National Academy of Engineering, 2008). New perceptions and thinking are needed from the non-traditional students. Traditional students are those who enter the higher education institutions upon completing their high school, whereas the non-traditional students are those with financial and life commitments, etc. They are not allowed to directly or immediately register at College after graduating from high school. They should instead look for a job and then register at a College on a low maintenance premise with the goal that they can pay for their tuition fees in time. Some studies have been conducted on these students.

Accordingly, a continent-wide strategy has arisen that is aimed at bringing about a paradigm shift in TVET by developing the idea that TVET prepares young people to become active job creators, rather than job seekers, and thus dispelling the myth that TVET is a refuge for those who have failed in general education. The strategy demonstrates that even the most sophisticated TVET qualifications require prior training, and this falls well within the broader framework of TVET (African Union Commission, 2016).

Malaysia is developing rapidly and is therefore in dire need of Technical and Engineering manpower at the various levels, especially in the Technology and Engineering disciplines. The demand for engineers and engineering assistants kept

increasing from 153,000 in 1994 to 500,000 in 2008 (Nordin, 2008). Malaysia supports the fact that students should proceed straight to a TVET College after completing high school. In 2010 the country, according to Engineering Development, Motivation and Awareness Training (EDMAT) (2002) will need more than 500,000 engineering technicians and engineers. This figure has been increasing each year since. Currently, Malaysia has a workforce of about 12 million, of which only about 28 percent are highly skilled, whilst 60 percent are employed in small and medium-sized enterprises (Malaysia, 2010).

To meet the needs of this manpower, the government has placed much emphasis on TVET to produce more knowledge workers.

The quality of German engineering expertise has long been much vaunted, especially in the field of Electrical and Mechanical Engineering. In Germany and Switzerland, public regulation and the related public preparation authority control the significance, content, and inclusion of apprenticeships. Germany has always been familiar for qualifying young engineers and the production of automobiles. They define a collection of recognised training jobs, as well as a mechanism for setting training standards and training techniques (a share of part-time vocational education at public Colleges), the basis for evaluating and certifying apprentices, as well as eligibility for companies as well as their own workers, to provide instruction (Wolter & Ryan, 2011).

In Sweden, there has been a shortage of Science, Technology, Engineering and Mathematics teachers, as a result this affected the number of engineers produced in the country, with the situation becoming more challenging in recent years (Ahlbom & Alpman 2015; Universitetskanslersämbetet, 2015). To improve this situation, a new type of education offering two degrees, one in engineering and one in education, was introduced in Sweden in 2002 (KTH Annual Report, 2011; Lärarförbundet, 2014).

This was instigated in cooperation with the KTH Royal Institute of Technology and the Stockholm Institute of Education, and supported the government's decision,

offering some financial support. The programme was prolonged by half a year compared with other engineering programmes. KTH is a Swedish name meaning *Kungliga Tekniska Högskolan*. It is a public research university in Stockholm. KTH conducts research and education within engineering and technology and is Sweden's largest technical university.

Currently, KTH consists of five schools with four campuses in and around Stockholm. Today, the study time in other engineering programmes and corresponding teacher-training programmes is the same as for this combined course. This combined programme has become dominant in the field of teacher education in STEM subjects in Sweden (KTH, 2011; Lärarförbundet, 2014). A similar programme was created in 2011 at Chalmers, designed as a master's programme, also leading to degrees in engineering and education.

2.4.2 Engineering as a subject in the TVET College sector and job demands around Africa

In Kenya there is a shortage of tradesman to alleviate the economic hardships of Kenya. With a skills gap, Kenyan economic growth prospects face an uncertain future despite its current huge infrastructure budget and massive ongoing projects. Kenya's future plan is to avail science, engineering and technology (SET) graduates in the country (Karimi, Mkandawire, Salieu, Muvawala, Owuori & Takei, 2012). There is no partnership between the industries, universities and Colleges; therefore, this results in lower skill levels in the country (Awuor, 2013:1). More tradesman, artisans, and partnerships with industries will create better job opportunities in Kenya.

2.4.3 Engineering as a subject in the TVET College sector and job demands around South Africa

The Engineering Council of South Africa (ECSA, 2008) states that engineering training in South Africa is typically provided by the universities, universities of technology, and TVET Colleges (previously Further Education and Training). The

qualifications provided by these institutions must have an ECSA accreditation for the qualification for graduates and diploma holders of these institutions to be registered as Candidate Certificated Engineers, Candidate Engineers, Candidate Engineering Technologists and Candidate Engineering Technicians.

In the South African TVET institutions, the NCV was implemented to ensure a theory-practice balance. Students are in a distinctive position as they are taught Engineering as a subject in the NCV, and it is aimed at integrating both theory and practice. This is a great advantage for the student as it makes it easier for the student to apply their theoretical knowledge in the real-world work situation. This integration is crucial because in many instances students tend to work with these two components in isolation (Chetty, 2017:8).

The maintainable improvement approach underscores the motivation behind TVET as the arrangement of abilities to help financial, social, and ecological manageability. Subsequently, TVET's job is the planning of understudies for reasonable vocations (Tikly, 2013:15). Very much like the human resources approach, advocates of the practical improvement approach, particularly UNESCO, have expanded the idea to incorporate deep rooted learning, reasonable economies with regards to data age and the information economy, training for all, and instruction for human security (UNESCO, 2004; Tikly, 2013).

2.5 Sustainable economic skills

2.5.1 Sustainable development

Sustainability implies a continuous and renewable ability to perform something. Sustainable development is therefore a type of development that is characterised by being self-perpetuating, and it has an inherent generator or dynamo that keeps it recharged and continuously keeps it 'going' (Zaccai, 2012). Engineers were once able to initiate engineering projects and transform real needs into design and material form (Taoussanidis, 2010:429). However, the social responsibility of engineers has become topical and it places high demands on engineering education

in the context of sustainable development.

Higher education bears a significant responsibility for sustainability by virtue of its influence on society and academic freedom to explore ideas (Davis, Edmister, Sullivan, West, 2003). That is why Electrical Engineering has attracted much research effort on the development of student engineers' social responsibility in the context of sustainable development (Davidson, Hendrickson, Matthews, Bridges, Allen, Murphy, Allenby, Crittenden, Austin, 2010). This study demonstrates the shift in Electrical Engineering from the old conventional Electrical Engineering curriculum (Taoussanidis, 2010:429) to the curriculum-centred approach to economic, social and environmental dimensions of life; where students should possess a strong practical ability in engineering. As a consequence, Field, Musset and Alvarez-Galvin (2014) argue that the challenge of unemployment among South African youth might be resolved by implementing effective vocational training programmes which provide practical training as they increase the likelihood of a career.

The World Bank (2010:1) highlights 'skills which are important for individuals to alleviate poverty and maintain a steady economy'. The World Bank (2010) also promotes the hiring of less well-educated lecturers at lower salaries and offers financial incentives to take on the job training aimed at improving their productivity. A goal of reduced educational requirements obviously contradicts the rhetoric about the need to leave no child behind and the need for 'highly qualified lecturers,' the two central tenets of the No Child Left Behind Act. The goal of reducing educational levels and therefore the deskilling of teaching is quite clear in the World Bank's plans for developing countries, but it is not often articulated in the United States. This talks to the fact the most TVET College lecturers are qualified lecturers who are not yet qualified as artisans (Onwu & Stoffels, 2005; Lubben, Sadeck, Scholtz & Braund, 2010; Ramanrain, 2014).

It is no secret that South African youths are facing massive challenges in terms of their education, employment, and career growth. At the third quarter of 2019, the South African unemployment rate increased to 29% as compared with 26.5% in the first quarter of 2017. Youth unemployment has been inordinately high for many years

in South Africa and is one of the country's major socio-economic challenges (Hochfeld & Plagerson, 2019: 2). Cross-country comparisons regularly affirm that South Africa's unemployment rates are among the highest in the world. In 2013, the youth unemployment rate was 63 percent of the youth labour force (3.2 million individuals).

By international comparison, the ratio of youth to adult unemployment is fairly similar for other countries that are economically comparable with South Africa. However, the overall unemployment rate is far higher than in other emerging markets (Cassim & Oosthuisen, 2014). Of the 10.2 million people somewhere in the range of 15 and 24 years, 33% are not in business, instruction, or preparing (Cassim & Oosthuisen, 2014). Education is vital in alleviating the future economy. It is very important for higher institutions to move away from the traditional education to a modern education system (ESD). According to Barth, Michelsen, Rieckmann and Thomas (2015), ESD is expected to create awareness of SD-related problems with the intention of bringing forth innovative contributions to economic, social, and environmental issues. Universities and TVET Colleges play an important role in fostering ESD by providing a link between knowledge generation and knowledge transfer to society.

In addition, Loubser (2015) and Baniasadi, Bazargan, Sadeghi and Zahir (2013) emphasise that lecturer education on environmental, social, and economic issues plays an important role in determining the future of the world and its development. According to Barth *et al.* (2015), many universities all over the world have already initiated activities to address sustainability in their teaching and learning at course level and in their curricula. Uitto, Boeve-de Pauw and Saloranta (2017:54) argue, however, that understanding the different dimensions of sustainability has proven to be a challenge for lectures as they may not feel competent to include sustainability issues in their teaching.

TVET Colleges are mandated specifically:

... to train young school leavers, providing them with the skills, knowledge and attitudes necessary for employment in the labour market and to primarily provide

training for the mid-level skills required to develop the South African economy and tend to concentrate on occupations in the engineering and construction industries (The White Paper, 2013:11).

Hence, the role of these institutions is to provide vocational and occupational education and training for their students. Therefore, their significance in the post-school education and training system is underpinned by the provision of programmes which are intended to produce trained personnel in specific jobs or to prepare students to become entrepreneurs (TVET Colleges South Africa, 2018).

To contribute the needed skills to ensure sustainable development, the theory-balance approach to student learning in the TVET College sector falls under the spotlight.

2.5.2 The importance of theory-practice in TVET Colleges

A conceptual knowledge base may be the new requirement for TVET, but technical, vocational, and professional education always faces 'both ways' (Barnett, 2006); the non-empirical world of ideas and concepts as well as the empirical world of practice and experience. In these educational fields, the curriculum always transmits knowledge-based practice even though this relationship is often obscured by the reduction of all types of knowledge to skills sets. Such reductionism is characteristic of the ideological shifts towards outcomes-based education that are favoured by progressivists in schools, as well as by advocates of National Qualifications Frameworks (Allais, 2006; Muller, 2001). In 'skills' approaches, knowledge becomes invisible and fundamental epistemological issues are ignored. Young (2006) argues that this has happened throughout the history of TVET.

For the students at TVET institutions to be able to comprehend practice as much as they do their theory, it is important that their lecturers become qualified artisans in Electrical Engineering. Debates around teacher competence in TVET indicate trends towards greater professionalisation of the teaching cadre (Cort, Härkönen & Volmari, 2004; Young, 2008). It is argued that TVET lecturing is becoming increasingly

diverse and that workplace or industry experience, whilst a necessary and important criterion for VET teaching, is no longer sufficient on its own. The deepening of the knowledge base on which TVET teaching rests, in terms of both content engagement and pedagogic engagement, is the basis for moves towards increased professionalisation.

Notwithstanding, the wide dreams of the National Development Plan (NPC, 2012), the Economic Development Department Report (EDD) (2011), the Department of Trade and Industry (DTI) (2011), and the Human Resource Development Strategy for South Africa 2010-2030 (HRDC, 2010), all articulate the requirement for the TVET College area to contribute successfully to the public social and monetary objectives of comprehensive development.

UNESCO (2006) defines technical and vocational education and training as a range of learning experiences which are relevant to the world of work, which occur in a variety of learning contexts (formal, non-formal or informal), and which take place in educational institutions or at the workplace. It encompasses both initial skills development undertaken by young people prior to entering the labour market, and continuing vocational training undertaken by adults whilst in work or during periods when they are economically inactive, through various forms of 're-skilling' and 'up-skilling' (UNESCO-UNEVOC, 2006). This approach leans on the SD and economic, equity, and transformative approach advanced by UNESCO (2006).

South Africa lacks qualified tradesmen who are able to combat both theory and practice to alleviate poverty. Ming and Guangjing (2010), Zhengxiang (2008), and Hailin, Binsheng, Aiping and Ge Leton (2008) suggest that because of the wide range of knowledge and strong adaptability of the Electrical Engineering specialty, the TVET College students of this specialty are required to master not only the specialised knowledge and technical skills, but also the basic knowledge and skills of automation and information technology, with the ability of solving wide scope specialised problems.

Ming and Guangjing (2010), Zhengxiang (2008), and Hailin *et al.* (2008) also add

that besides a solid theoretical basis, the NC(V) level 4 graduates of Electrical Engineering should possess strong engineering practical ability. Facing the demand of power industry developments, conducting research and exploration on the engineering ability cultivation of Electrical Engineering students at the lower levels, and looking for feasible methods to improve both Level 2 and Level 3 engineering ability, it is an urgent problem to think over and solve for TVET College's Electrical Engineering subject.

Theoretical knowledge has a distinct meaning different from the meanings of terms for other knowledge types, for example, knowledge-that, and meta-cognitive knowledge, and provides an analysis that characterises theoretical knowledge as distinguished by its indirectness (Klausen & Petersen, 2021: 559).

2.5.3 Integration of theory and practice

In a historical overview of vocational education and training (VET) reforms in Britain, Young (2006) distinguishes between knowledge-based, standards-based, and connective approaches to VET. In the knowledge-based approach that dominated the vocational curriculum in Britain from the late 19th century to the early 1980s, it was assumed that the natural sciences (Physics, Chemistry and Mathematics) provided the appropriate body of reliable, objective, knowledge needed in craft and technical occupations. The curriculum explicitly excluded the application of knowledge in workplaces or any form of 'trade knowledge'. Learning how to apply scientific knowledge in specific workplace contexts was left to apprentices and individual employers with no direct relation between theory and practice. The natural sciences were also seen as a model for non-science-based fields, such as business studies, which expanded dramatically from the 1960s onwards. It is important that the TVET College should possess strong engineering practical ability.

The NCV is intended to equip students with trade and vocational skills to ensure that students can be employed or become self-employed (Accelerated and Shared Growth Initiative for South Africa (AsgiSA) (2008). Most students find it very difficult to combat practicals in the way they do theory, and they are demoralised by the low

uptake in employment in South Africa (Oluwajodu, Blaauw, Greyling & Kleynhans, 2015; De Witte, Rothmann & Jackson, 2012). TVET is one of the elements of the South African education and training system. It has existed, according to Blom (2016:2), in 'many different guises' including technical Colleges and Further Education and Training Colleges. Over the course of the 20th century, TVET has been devised as an alternative to university education; a place for the poor, indigent, and the disabled. The apartheid government used TVET as a tool for the reproduction of its labour policies (Van der Bijl & Lawrence, 2016:342).

On the other hand, the new institutional landscape for TVET Colleges represents a significant and decisive break from the old system of technical/vocational education and training in South Africa in the sense that it promises to respond to the human resources development needs of the country (DoE, 2001:1). This is because of the change which was brought about in the new TVET programmes/qualifications. To explain this, previously, with the then manpower centres, students only did the theoretical component in N-streams. The N-streams, also known as NATED programmes, only equip students with the theoretical component of courses presented to them.

They are now doing N1-N6, and upon completion of their N6, students are required to secure learnerships or apprenticeship at companies or mines so that they can become artisans after three and a half years of practical training, and also apply at Department of Higher Education and Training for their National Diploma. The National N Diploma requires that a student obtains their three and a half years' practical experience even if they are not artisans. However, theory and practice were not linked at the College level, and there was no connection between theory learned and practice provided at workplaces. Hence, the Department of Higher Education and Training saw it fit to introduce the National Certificate Vocational (NC(V)), which should ensure the balance between theory and practice.

With the newly introduced NC(V), students are required to know their theory as much as they do their practicums. Students registered for NC(V) are required to attend classes for their theory, go to College workshops for practicums, and be placed with

companies during school holidays to learn and align themselves with what is required of them in real life workplaces. Each academic year, during the three years of the student learning period, they are taught both theory and practicums. The National Policy, through which National Certificates (Vocational) were introduced in the FET Colleges in 2007, follows this pathway and states that:

The National Certificate (Vocational) at Level 2 on the NQF will give learning opportunities in scenarios that are contextually relevant to the program's vocational field. The National Certificate (Vocational) at level 2 on the NQF will include subjects that will combine academic knowledge and theory with practical skills and values particular to each vocational field (DHET, 2012:1).

The training informed by the hypothesis approach expects the studies to concentrate on speculations before application and common sense experience (Brew & Kottler, 2007). Hypothetical or reasonable information can consequently be applied by the student or potentially rehearsed in the working environment setting. As per Kolb and Kolb (2005:209), establishing a climate where students 'assume responsibility for and obligations regarding their gaining can incredibly improve their capacity to gain for a fact'.

The ability of knowing how to do something is an epistemic capacity in order to know how to do something, and generally requires a combination of propositional knowledge and knowledge by acquaintance (Winch, 2012). Morrow (2007) states that practical knowledge should be learned by understanding, and that propositional and practical knowledge are innately related to each other. When lecturing, lecturers should focus on both academic (propositional) and technical (practical) knowledge. This would be the ideal situation for the student.

Barnett (2006) states that a distinctive feature that tends to be present in any particular curriculum educational program that prompts a professional capability is that it 'turns its face the two different ways', both to the theory or concepts of the discipline and to the practical, real-world context. He states that it requires a combination of information drawn from both non-empirical (conceptual /propositional) knowledge and empirical (everyday life/contextual/practical) knowledge, to ensure

that the curriculum incorporates both knowledge (propositional) progression and occupational (practical) progression (Barnett, 2006).

At one end of the spectrum, it is expected that individuals take part in learning activities such as courses or workshops to gain knowledge that can later be applied in other contexts. There are now several studies (Steinert, Mann, Anderson, Barnett, Centeno, Naismith, Prideaux, Spencer, Tullo, Viggiano & Ward, 2016; Weurlander & Stenfors-Hayes, 2008) that show that lecturer development initiatives generally provide enjoyment and inspiration and sometimes affect teaching practice for individuals, but only occasionally do they impact teaching in a larger environment. According to Billett (2015:29), in the context of practice-based learning:

... there is a more prominent reliance on the understudy as a capable student to connect autonomously and coordinate and deal with their own learning in these conditions. That here and there it is important on the grounds that it is a lot of an understudy rather than teacher driving learning process.

According to Mestre (2002:10), the transfer of learning (often associated with competence) is the 'ability to apply knowledge or procedures learned in one context to a new context', while Barnett (2006) opines that the transfer of learning can only happen when the contexts are similar; hence he questions whether one can really transfer what is learnt. It is argued by Young (2003) and Barnett (2006) that the traditional approaches to learning transfer lack the conceptual tools for theorising the association between formal and informal learning, referred to in the literature as vertical and horizontal knowledge. According to Young (2003), there is a 'disconnect' in the transfer of knowledge and skill from one setting to another owing to flawed or inefficient processes in attempting to effect the transfer of practical knowledge to students.

An additional challenge in bridging the gap between theory and practice is that there is minimal exact exploration regarding how theory learned in the classroom is coordinated into the work environment during the work-based learning experience, and even less is known about the transfer of knowledge and experiences from the

workplace back into the classroom (Coll & Wong, 2001). There are distinct methodologies through which theory and practice might be incorporated, which incorporate the theory that is informed by the practice approach; the practice training that is educated by the theory approach, the concurrent approach, and the scaffolding approach (Brew & Kottler, 2007).

As guided by the research question, it is clear that TVET College students will not qualify as artisans before theory and practice can be balanced, especially for the Electrical Engineering students. If the theory is given priority over the practice, it will be fruitless for students to graduate since both components are vital for the NC(V) curriculum.

In a study of vocational teaching and learning, Stavenga de Jong, Wierstra and Hermanussen (2006:105) found that only 29% of the student preferred learning by doing, with little reflection on prior learning and integration of theory and practice. Guided learning was another preferred method of learning (43%), applying little reflection and conceptualisation, while 28% used reflective learning where learning processes involving high levels of reflection, experimentation, and self-regulation were dominant. Stavenga de Jong *et al.* (2006) conclude that there is a weak relation between learning styles used in vocational schools and in workplaces. The most prevalent relationships are passive learning combined with learning by doing, constructive learning combined with reflective learning, and reproductive learning combined with guided learning.

Fuller and Unwin (2003) note that expansive learning may include the student participating in various workplace settings within different communities of practice so that they reflect on the differences and similarities in these situations. Developmental, or expansive, learning 'fosters innovative performance, changes, and even transformations at work' (Jonsdottir, 2007:6). Engeström (2004:421) takes this idea further by stating:

The object of extensive learning action is the whole movement framework wherein the understudy is locked in. Far reaching learning action delivers socially new examples

of movement. Far reaching learning at work delivers new types of work action. How understudy advance completely relies upon the materials, hardware, and assets that are accessible at universities and Colleges.

The revised curriculum of TVET Colleges states that all students in NC(V) need to be placed during every school holiday so that they are able to integrate theory and practice, other than the practices offered at TVET Colleges (Department of Higher Education and Training (DHET) (2001). According to Moore (2004), learning at work is part of a naturally occurring curriculum, but Billett (2006) explains that the curriculum needs to be goal-oriented and linked to direct guidance from highly trained personnel like workplace mentors and trainers.

Bhyat (2011) concludes that scientific or technical knowledge can be learnt in the workplace to underpin practice, not only in the formal confines of the classroom. Technological problem-solving requires students to understand the nature of the complexities of the problem before extracting information from the appropriate scientific knowledge sources that might be required to solve the problem at hand. Bhyat (2011) and Bronkhorst (2014) add that the everyday experiences of students might not be easily mapped to existing scientific and pedagogical organisations of knowledge.

2.5.4 Outcomes of balancing theory and practice

Students at TVET Colleges can benefit through engagement with concepts in both theory and practical work through 'interactions, hands-on activities, and application in science' (Hampden-Thompson & Bennet, 2013:1340). Several studies point to students' persistent lack of experimentation skills, inadequate resources, lack of lecturers that are qualified as artisans, and not being able to balance theory and practice. It can be inferred that there is no effective change in such classrooms (Onwu & Stoffels, 2005; Lubben, Sadeck, Scholtz & Braund, 2010; Ramanrain, 2014).

However, to improve students' attitudes (Kibirige & Tsamago, 2013) and academic performance, theory and practical work could be used (Kibirige, Osodo & Tlala,

2014). Thus, theory and practical work should be an integral part of teaching and learning, as thus this study is aimed at balancing theory and practice at TVET Colleges, especially for Electrical Engineering as a subject.

Meghnagi (2004) notes that competence may arise from the knowledge and skills acquired through practice. Subsequently, Meghnagi (2004:62) defines competence as, '...an undivided complex of knowledge, abilities, ideas, and ways of doing things that make it possible to carry out an occupation'. According to Billett (2009:34), 'the kinds of work being undertaken, the requirements for work, and how individuals engage in work, shape occupational practice'. To expand on this, Billett (2009) suggests that the competence required for a particular occupational practice, and in a specific workplace, can be elaborated on through categories of work activities and interactions, and those interactions in workplaces are premised on enhanced engagement with tools, artefacts, and others, by stating:

Apprehending what constitutes workplace competence is not so easily undertaken. Rather than being uniform across an occupation or even nationally consistent, competence is shaped by situational factors, emerging technologies, specific occupational requirements and the capacities of those who enact those requirements. Competence has many elements that are acquired in different ways (Billett, 2009:34).

According to Heitman (2005:69), one of the most important factors determining the success or failure of learning is a change in the role of the teacher, as the traditional one-way communication of information from the lecturer to the student does not promote active and self-managed learning. Therefore, lecturers at TVET Colleges need to adapt to new ways of introducing different learning styles since individuals are different and they have different learning styles.

2.5.5 Work-based experience and work-integrated learning

2.5.5.1 Work-integrated learning

Technical and vocational education and training, as a means of achieving sustainable development, employability and improvements to individual capabilities,

continues to receive global attention (Eichorst, Rodriguez-Planas, Schmidl & Zimmerman, 2015). The South African government (2010) has also adopted the global trend, which has led to an intensified focus on vocational education by policymakers (DHET, 2013: xii). The upsurge in interest in vocational education is largely due to the benefits that are deemed to derive from vocational education. The desirability of vocational education has been attributed, specifically, to its impact on skills acquisition by individuals and the benefits it offers to employers to recruit and deploy work-ready individuals within a relatively short time and with minimum capital outlay (Dickson & Ladefoged, 2017).

Work-integrated learning (WIL), as an experiential learning strategy, is one way of achieving the goals of providing lecturers and students with exposure to the world of work and enhancing their learning outcomes by balancing theory and practice offered at both colleges and workplaces (CHE, 2011:4). It is a programme that is divided into work-based experience, work exposure, internship, learnership, and apprenticeships (SSACI, 2015b:5).

With the aim of updating the workplace skills and competencies of practicing TVET lecturers and students in South Africa, between 2014 and 2016, the Education and Training and Development Practices (ETDP) Sector Education and Training Authority (SETA) funded the SSACI with the purpose of implementing the WIL for Lecturers Project. This project involved short placements for TVET lecturers in workplaces related to their areas of specialisation (Smith, 2017:6). In 2016, a conceptualisation of industry-based WIL for TVET lecturers was published (Van der Bijl & Taylor, 2016) using data from the ETDP SETA–SSACI project within frameworks developed from the teacher industry placement programme and other applicable international models.

Measuring and exploring the effectiveness of WIL is well documented by literature. For instance, Whelan (2017:1) measured the perceptions of students, their host supervisors and lecturers on the importance of, and students' skill levels of graduate attributes developed during WIL. Ibrahim and Jaaffar (2017:13) investigated student attributes developed through WIL; however, their work examined “the relationship

between self-management and interpersonal skills, self-confidence, and motivation”.

The absence of an existing practice in specialist workplace placements for TVET lecturer programmes led the DHET, with European Union co-funding, to commission a research and development project to develop a curriculum framework for the industry or specialist workplace WIL component in order to enable the ‘effective delivery of the work-integrated learning (WIL) component of TVET lecturer and student qualification programmes’ (Cape Peninsula University of Technology [CPUT], 2015:2). This project was implemented between 2017 and 2020.

Atkinson, Misko and Stanwick (2015) add that WIL at university aims to intentionally integrate work and educational experiences. WIL integrates the theory of the learning with the practice of work. This is done through a specifically designed curriculum, teaching activities, and student engagement, and it should be purposefully linked to curriculum and assessment. As it is part of the education process, lecturers play a key role in organising and enacting the learning, and their skills and capacities are vital in this process (Atkinson *et al.*, 2015).

WIL, with its emphasis on intentionally integrating students’ experiences in a work setting into their educational programs, has been evolving and growing in prominence. This is evident with the introduction of the National Work Integrated Learning Strategy in 2015, a partnership between universities and industry aimed at expanding work-integrated learning and strengthening engagement with employers. Despite the strong emphasis of work-based learning in post-secondary school education, both VET providers and universities face challenges when it comes to engaging with industry and employers on these educational provisions (Atkinson *et al.*, 2015).

Gamble (2004) agrees that there is a first level distinction between different forms of knowledge; namely those that are tied to a particular context or practical tasks called ‘context-dependent’ meanings, and those that are abstract or de-contextualised. These are often distinguished as ‘theoretical/conceptual knowledge’ and ‘practical knowledge’. Context-dependent knowledge is always tied to the ‘real world’ of

human action. Practical knowledge, it can be argued, has a combination of both process and procedural knowledge. Jonsdottir (2007:5) argues that workplace learning focuses on two aspects; namely, the job itself and on the mastery of the job.

Eraut (2004:202) holds that learning in workplaces predominantly consists of situated action; is often unpredictable in nature, which makes learning unstable. Eraut (2004:202) explains that the key difference between work and academic knowledge is in the purpose of its use and application. He notes that workplace knowledge is primarily used for up-skilling the worker to enhance productivity, innovativeness, and skills to sustain the well-being of the firm, while in the academic world, knowledge is concerned with the mastery of disciplines and their (possible) application in the world. Hatting (2003) suggests that learnerships enable a structured link between education and industry to enhance the student's competence in the labour market.

According to Guile and Griffiths (2001:126),

... host organisations ought to consider how they can provide environments for learning if they are to maximise the learning potential of these activities for themselves and for students'.

Guile and Griffiths (2001:126) note that separating vertical (formal) and horizontal (informal) learning, as education and training systems have traditionally done in separating theory from practice, might not be helpful. In their view, the curriculum should encourage students to make a connection between theory and practice in the workplace.

In their quest for a 'new curriculum framework', Guile and Griffiths (2001) put forward five models of workplace learning; the Traditional Model, the Experimental Model, the Generic Model, the Work Process Model, and the Connective Model. The connective model of workplace learning has resonance for this research because it allows the students not only to develop the capacity to participate within workplace activities and cultures, but they also learn 'how to draw upon their formal learning

and use it to interrogate workplace practice (Guile & Griffiths, 2001:126). The five models of workplace learning are briefly explained (Guile & Griffiths, 2001:113):

- Traditional model: Students are simply launched into the workplace where they have to adjust to the requirements of the job. It is assumed that learning occurs automatically, so there is no need for any special guidance or facilitation.
- Experimental model: In this model, reflection on the work experience has an important role in the learning process.
- Generic model: This model is seen as an opportunity for developing and assessing the generic skills needed in working life. Thus the emphasis is on learning outcomes. It is recognisable in the vocational education and training system used in the UK.
- Work process model: Here the aim is that the students develop a holistic understanding of the process and work context. The idea is that students adjust themselves to the changing context of work through the opportunity to participate in different communities of practice, and in this way develop the capacity to transfer knowledge and skills gained.
- Connective model: This is the relationship between work experience, learning, and knowledge. Work experience means the utilisation of the working environment in a manner which upholds understudy in interfacing various kinds of information, ability, and experience.

2.5.5.2 Work-based experience

DHET's (2019:20) teaching and learning plan states that for a TVET College to be considered amongst the best performing Colleges, most students exiting the College with Level 4 should enter the labour market or become entrepreneurs. Work-based experience (WBE) is meant to give students an added advantage of the skills

required during job hunting. As much as students need to be placed, their lecturers should know real workplace demands.

Work-based experience is referred to as a short time spent gaining real work experience at companies and mines during the school holidays. It takes a minimum of five days and a maximum of 15 days. During this period, students get to experience a real workplace. It gives students more advantages during job-seeking because of the theory and practice learned at companies during WBE placement. It is meant mainly for both NC(V) Level 4 students as well as N4-N6 students (Swiss-South African Co-operation Initiative (SSACI) (2015:a). Billett (2000) also holds that engagement in authentic workplace activities contributes significantly to constructing and learning new work-related knowledge.

Work-based experience forms part of work-integrated learning (WIL). Work-based learning and the inclusion of the world of work into tertiary students' learning lie at the heart of the Australian vocational education and training (VET) system. Traditionally, this has been through apprenticeships and traineeships, which have a strong focus on 'on-the-job' training, but also through 'work-oriented' institutional training. However, an increased emphasis on WIL in TVET College education is emerging (Atkinson *et al.*, 2015).

During the selection of students to be placed at companies, preference is given to the Level 4 students, and if they do not show any interest, then Level 3 students are contacted. If they are not interested, then Level 2 students are placed. It is therefore implied, from the WIL, that students should be exposed to and acquire practical experience of what they have learnt for them to be ready and suitable for the job market.

The mastery of practical skills in the workplace may be acquired through 'practice' as 'the realisation of a set of actions developed by a person that either can or cannot be executed together with artefacts, materials and other people' (Guzman, 2009:13). When an action can be explained by an individual, then explicit procedural knowledge has been applied (Guzman, 2009:13), since explicit procedural

knowledge has rules and goals (Spender, 2005). Eraut (2004) notes that practice is tacit when an individual cannot explain how the action was done. Bronkhorst (2014) explains that propositional knowledge may be used in de-contextualised ways as well as contextualised ways, depending on the degree of difficulty of the problems to be solved, but the workplace should make provision for engagement with disciplinary knowledge and practical knowledge.

Aarkrog (2005:106) notes that students' learning in workplaces happens via legitimate peripheral participation through them observing and listening to experienced colleagues and imitating their behaviour in the workplace. Aarkrog (2005:106) concludes that:

Legitimate peripheral participation requires full participation in vocational schools and workplaces because some knowledge and skills can best be learned in vocational schools (e.g., knowledge of specific products or theoretical models) while other knowledge and skills can be learned more effectively in workplaces, e.g. dealing with angry customers or a high workload.

Guile and Griffiths (2001) create a typology of workplace experience which critiques the notion of workplaces as static and unchanging environments. In addition, workplace learning theorists, such as Piaget and Sheperd, argue for the validity of the workplace as a site of learning, for a focus on the student as being more than the input of learning, for learning as a social practice whether in an institution or at work, and for the importance of understanding these different contexts as bases for learning progression.

Billett (2001:431) critiques the perspective that workplaces are 'informal' learning sites and argues that learning discourses uncritically privilege formal academic education. Learning, according to Billett (2001), needs to be understood as a participatory practice which is an engagement with the social world. Billett (2001:431) posits that social practices, whether in formal education or workplaces, are constituted historically, culturally and situationally. The learning pathways in the workplace are intentionally pedagogical, as they focus on the community of practice for learning (Billett, 2001:432).

During work-based experience, the students need to acclimatise themselves with working standards. By so doing there will be improved productivity and skills growth. Accordingly, students ought to be urged to attempt new things all through their work-based opportunity for self-growth. Thus, students will not just foster a significant characteristic for future profession achievement, but will likewise effectively seek after the dynamic trial and error method of Kolb's hypothesis and in this way improve the instructive nature of their work insight.

Conclusion

This chapter discussed and substantiated the chosen theory for the study, which is the experiential learning theory as a learning style. It is very important for all students studying Electrical Engineering at TVET Colleges to possess strong engineering practical ability. From sustainable economic skills, it is clear that to alleviate poverty, it is important to have more skilled people in South Africa.

TVET Colleges are considered institutions where the youth of South Africa can become skilled and employable. Theory and practice cannot be divorced from each other in student training in the TVET sector, especially for Electrical Engineering students. To ensure a higher number of graduates leaving the sector and entering the labour force, knowledge and skills will be of utmost importance.

This implies that College lecturers should ensure that theory and practice are conducted in their everyday teaching and learning, and again, that their students are able to work as members of a group. TVET Colleges should align themselves to the expectations in the job market, and in accordance with the NC(V) curriculum guidelines that stipulate that all students should undergo work-based experience at real workplaces. The Colleges should forge a relationship between themselves and the host employers to ensure student exposure to the workplace.

CHAPTER 3: METHODODOLOGY AND RESEARCH DESIGN

3.1 Introduction

National Curriculum Vocational education was initially introduced in the TVET sector to close the gap created by the DHET by ensuring that theory and practice are balanced in Colleges, and to also ensure that students are being placed at different companies for real-work experience. This was discussed in Chapter 2. Chapter 3 discusses and justifies the research methodology, paradigm and approach, design, research site, target population, selection of participants, data collection instruments, data collection methods, data analysis, trustworthiness of the methods, and the ethical protocol that I used.

The research methodology describes how an investigation was conducted and what was done to answer the research questions in order to solve the research problem (Brink, Van der Walt & Van Rensburg, 2018:187). Research methodology includes the strategies utilised to organise the study, as well as the methodical manner in which the data were collected and analysed (Polit & Beck, 2012:741). It is 'the study of discovering' (Babbie, 2017:4).

3.2 Research paradigm

According to Terhoeven (2009:45), a paradigm can be defined as a way in which a research study can be conducted, using either positivism or interpretivist approaches. This means that the research paradigm governs the research process of a study (Maluleke, 2014:39). Roller and Lavrakas (2015:2) claim that a 'paradigm' is an underlying belief or orientation that the researcher brings to the study; i.e. the views or 'truth' of the reality. Maykut and Morehouse (2005:5) assert that a paradigm consists of the variety of methods intertwined in it.

Paradigms are thus important because they provide beliefs and dictates, which, for scholars in a particular discipline, influence what they should study, how they should study it, and how they should interpret the findings of the study.

Mason (2002:59) concurs with Creswell (2007) by indicating that in defining one's paradigmatic perspective as a researcher, the interplay between ontological and epistemological assumptions, meta-theoretical underpinnings, research questions, and research methodology becomes prominent. Ontology refers to 'the nature of our beliefs about reality' (Richards, 2003: 33).

Researchers have assumptions (sometimes implicit) about reality, how it exists, and what can be known about it. Ontology refers to 'the nature of our beliefs about reality' (Richards, 2003:33). My ontological belief is that there must be an interplay between theory and practice in learning for students for them to have a better understanding of the subject. Hence, I sought answers to the problem about how a theory-practice balance could be maintained in TVET Colleges and what the participants' views were about this phenomenon (Creswell, 1998).

Epistemology is 'a way of understanding and explaining how we know what we know' (Crotty, 2003:3). I used both my understanding, as well as the participants' understanding, of how theory-practice is imbalanced in TVET Colleges (Ormston, Spencer, Barnard & Snape, 2014). Fayolle, Kyro and Ulijn (2005:136) state the following:

Looking at the concept of ontology and epistemology, we can see that they are some kind of 'rules of the game,' and we have different rules these rules are interconnected within each game. If we assume that knowledge is not one entity but many and it changes, it is reasonable to assume that we have different ways of studying it.

Based on their assertion above, Fayolle *et al.* (2005:137) use a hierarchical order to express the way in which knowledge can be studied and understood, as depicted in the following figure.

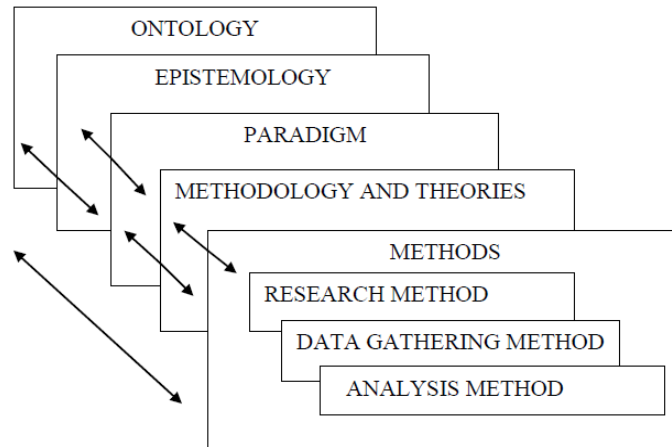


Figure 3-1: Hierarchical order of a paradigm (Adapted from Fayolle *et al.*, 2005:137)

According to Fayolle *et al.* (2005), ontology is the broadest and deepest level, followed by epistemology which is the second level, and may be deduced from ontology. Ontology is concerned with the different ways of attaining knowledge which are referred to as methodology.

In the light of the above description of a paradigm, this study adopted interpretivism. The interpretive paradigm is concerned with understanding the world as it is viewed from the subjective experiences of individuals (Cohen, Manion & Morrison, 2011). Interpretive epistemology is subjective; this implies that reality is subjective and differs from person to person (Guba & Lincoln, 1994).

Interpretive epistemology holds that the world does not exist independently of people's knowledge (Grix, 2004:83). That said, external reality cannot be directly accessible to the observers without being contaminated by their worldviews, concepts, and backgrounds, etc. As Flick, Kardorff and Steinke (2004:89) state, 'perception is seen not as a passive-receptive process of representation, but as an active constructive process of production'.

This study aimed at exploring the theory-practice imbalance in the Electrical Engineering subject at TVET Colleges and to gain an in-depth insight into the lives of the participants. Therefore, the positivist paradigm was not relevant for this study.

All things considered, the aim was to accomplish a more profound comprehension of a social peculiarity that is seen contrastingly by participants in the review, which is portrayed by the interpretive research paradigm (Oates, 2006). The magnitude of this study was controlled by the research paradigm (Maluleke, 2014). Truth and reality are created and learnt, not discovered. It is not possible to know reality as it is always mediated by people's senses. Hence, in this study I was poised to learn from the participants in terms of the theory-practice imbalance in the Electrical Engineering subject at TVET Colleges.

3.3 Research approach

According to Creswell (2010; 2014) and Carey and Curtis (2012a), research approaches are the ways of dealing with research by selecting the research questions and either using primary or secondary research. In the qualitative research approach there are no numbers, it only involves words and images. In addition, Kumar (2011) points out that the methods to be used depend on what the researcher investigates.

There are three types of approach, qualitative, quantitative, and mixed methods research approaches. For this study, I used the qualitative research approach to explore the theory-practice imbalance in TVET Colleges, i.e. how lecturers integrate practice into theory. It was important for me to gather the views of the lecturers about this issue through interviews instead of administering a questionnaire to them. Qualitative studies are open-ended and introduce the reader into real world problems, and they deal mainly with participants' real life issues, experiences, thoughts, and beliefs (Creswell 2014; Carey & Curtis, 2012a; Babbie, 2009). As a result, it is necessary to comprehend and interpret social interactions (Creswell, 2014).

3.4 Research design

A research design is the way of combining the different parts of the study in a structured manner (Grove, Burns & Gray, 2013:195). It addresses the research

problem of the study (Polit & Beck, 2012). According to Rudman (2007:23), this comprehensive scientific study plan covers all procedures from beginning to end.

I conducted this study as a case study. Yin (2014:16) conceptualises case study research as a form of social science. Yin (2014) describes a case study as using a 'realist perspective' which focuses on maintaining objectivity in the methodological processes within the design. The selection of the case study used was informed by the uniqueness of the College, i.e. it falls within the best performing Colleges in South Africa. It is known for its academic achievements and is rated amongst the top 10 performing Colleges in South Africa, when students have self-discipline, it is assumed that they are at an advantage to perform better in their academics (Simba, Agak, & Kabuka, 2016). Some researchers believe that self-discipline is vital for high academic achievement (Simba et al., 2016). Yin (1994) suggests that a case study gives opportunities to find out the reasons about what happens in reality, i.e. a course of life, how things are being taken care of, what others do differently, worldwide relations, and the growth of companies.

According to Yin (2003:2), 'the distinctive need for case studies arises out of the desire to understand complex social phenomena' because 'the case study method allows investigators to retain the holistic and meaningful characteristics of real-life events,' such as 'organizational and managerial processes, for example.' Merriam (1998:19) concurs that a case study design is used to achieve deeper knowledge of set-up and meaning. Yin (2003) and Stake (1995) use different terms to describe case studies. There are seven types of case studies, such as explanatory, exploratory, descriptive, etc. Yin (2003) and Stake (1995) also differentiate between single, holistic case studies, and multiple-case studies. Stake (1995) further identifies case studies as intrinsic, instrumental or collective.

The definitions and published examples of these types of case studies are provided in Table 3.1.

Table 3-1: Definitions and examples of different types of case studies (Stake, 1995:49)

Type	Definition
Explanatory	Answers a question that seeks to explain the presumed causal links in real life interventions that are too complex for the survey or experimental strategies.
Exploratory	Explores situations in which the intervention being evaluated has no clear, single set of outcomes.
Descriptive	Describes an intervention or phenomenon and real life context in which it occurs.
Multiple-case studies	Explores differences within and between cases with a goal to replicate findings across cases. It is imperative that the cases are chosen carefully so that the researcher can predict similar results across cases or predict contrasting results based on a theory.
Intrinsic	Driven by researcher's genuine interest to better understand the case.
Instrumental	Provides insight into an issue or helps to refine a theory. The case is of secondary interest; it plays a supportive role, facilitating understanding of something else.
Collective	Similar in nature and description to multiple case studies.

For this study, I employed the exploratory case study. The reason for my choice was that the exploratory case study is used when there is no single set of outcomes (Seaton & Schwier, 2014); individual participants gave different answers according to their understanding which allowed me to be open-minded about the multiple views.

3.4 Research methods

Research methods are the ways in which specified data are collected and analysed (Polit & Beck, 2012:741). According to Creswell (2009), a research methodology consists of a number of methods to be utilised. In this study, the research methodology includes a depiction of the particular procedures utilised (De Vos, Strydom, Fouché & Delpont, 2011) as well as the research method, research design, method of data gathering, and the type of data analysis utilised

by myself (Silverman, 2011).

The methods chosen for the study are described and motivated in the following sections. These include the sampling and data collection methods. However, it was deemed necessary to describe the research site first.

3.4.1 Population and sample

It is important to first describe the site before the population and sample, as these two issues arise from the site itself.

3.4.1.1 Selection and description of the research site

The purpose of this study was to explore the theory-practice imbalance in the Electrical Engineering subject at a Technical Vocational Education and Training College. Campus M was selected because it is the Campus where I worked as a Senior Lecturer for Electrical Engineering. The total number of Electrical Engineering students was 60, they were the level 4 students at the exit level and this is where I drew my participating students. They were a mixed cultural group, most of whom were Blacks such as Tswana, Pedi, Xhosa, Venda and Tsonga who come from different parts of South Africa.

There were also foreign nationals from Lesotho and Zimbabwe. The reason why Campus M accommodates students from different groups is that it is a residential campus with student hostels. The hostels are on the campus premises. However, some students were accommodated in the village around the campus. The Campus had fully-fledged workshops for Electrical Engineering, Boiler Making, Fitting and Tuning, an Automotive Repairs and Maintenance workshop, a Centre of Specialisation workshop, and a State-of-the-Art Samsung Engineering Academy.

3.4.1.2 Target population

Van Zyl (2014: 95) considers a population in research as a group of potential participants to whom a researcher wants to gather data, analyse and interpret it then

draw findings and recommendations. Additionally, the target population must incorporate an additional set of boundaries that include time and space to anchor and identify the group of individuals who will be asked to participate in the study. The temporal element restricts the timeframe that the participants have exhibited the operationalized inclusion variables, many professional athletes were once collegiate athletes but should not be included in the Gross et al. (2018) example. A difference that distinguishes the two is time. By stating that the potential participant must currently be a member of intercollegiate athletic squad, one establishes the time-based restriction that is necessary to operationalize the sampling frame boundaries. The temporal framing also eliminates individuals who are still in college but no longer play for an intercollegiate team, and who are not currently experiencing the phenomenon being examined.

To determine the target population, I operationalised the unit's characteristics of interest based upon the study variables or the qualitative experience so the results of the study may be accurately inferred or transferred back to the population of interest (Ackerman, Schmid, Rudolph, Seamans, Susukida, Mojtabei & Stuart, 2019:124). Additionally, the target population should incorporate an additional set of boundaries that include time and space to anchor and identify the group of individuals who will be asked to participate in the study (Gross, Moore, Gardner, Wolanin, Pess & Marks, 2018:431).

Every person who met the requirements that I had set for research participation was selected. For this study, my target population comprised 16 academic staff members, a total of 60 students, and five host employers from five different Electrical Engineering companies where students were placed for their work-based experience (WBE). WBE is the practical experience that takes place at industries, institutions, or companies..

One should place spatial restrictions on the target population to accommodate responsible research. The restrictions often take the form of geographical descriptions, such as within the United States, Australia, or United Kingdom, within a specific pre-defined sports conference, or more narrowly, at a specific university, as

was the case with Gross et al. (2018). The spatial boundary of the target population may be as narrow as is necessary provided that the units of analysis within those boundaries are representative of the population of interest and are not unique as compared to the population of interest, and there are sufficient members of the target population to ensure a suitably sized sample frame can be developed.

3.4.1.3 Sampling methods

Sampling is defined as a procedure to select a sample from individual or from a large group of population for certain kind of research purpose. There are different advantages and disadvantages of sampling. We would be thinking sometimes that – Why there is a need of sampling? the answer is as it is too expensive and too time consuming to survey a whole population in a research study, we use sampling (Elfil & Negida, 2017)

Sampling is divided into two types; probability and non-probability sampling. Probability sampling is a sampling technique in which a researcher's sample from a larger population is chosen using a method based on the theory of probability (Patten & Newhart, 2018: 56). In probability sampling, everyone has an equal chance of being selected. The examples of probability sampling include simple random sampling. The latter is sampling in which numbers are assigned to individuals (sample) and they (the latter) are randomly chosen from those numbers through an automated process. This technique works in a big group. Some identified examples of random sampling that are discussed hereunder include the stratified random sampling; cluster stratified random sampling and systematic sampling (Patten & Newhart, 2018: 56).

Non-probability sampling technique refers to random sampling techniques in which each element of the population has equal chances of being selected into the sample (Patten & Newhart, 2018: 89). A non-probability sample is used for generalisation because it seeks the representativeness of the broader population. Non-probability sample deliberately avoids representing the broader population. For this study, I used purposive sampling for the reasons given later in this section.

This study was conducted at one of the TVET colleges in the North-West Province. I am currently working at the college where I conducted the interviews. Five Electrical Engineering male and five Electrical Engineering female students at level 4 were sampled from the total of 60 students at level 4, the reason why I used only level 4 students was that level is an exit level and the students on this particular level are being prepared and ready for the labour force. Two lecturers were sampled from the total of five lecturers lecturing Electrical Engineering at level 4, one Electrical Engineering HoD and three Electrical Engineering host employers which were sampled from the five host employers where the students are normally placed for their WBE during school holidays, the reason for my choice is the geographical location of the workplaces as the sampled workplaces are based in the same area as Campus M.

Purposive sampling was appropriate for my qualitative study because I was looking for individuals who knew the most about the research issue. At the point when I utilised purposeful sampling, choices should have been made about who for sure was sampling, what structure the examining ought to take, and the number of individuals or locales should have been sampled. The participants gave the expected solutions to suit this study. Maree (2014) states that the meaning of purposive sampling means that the participants are selected because of some distinctive characteristics that make them the holders of the data needed for the study.

3.4.2 Methods of data collection

Creswell (2014; 2009) refers to data collection as a way of putting together information from reliable sources to find clarity to the research problem. According to Mohajan and Haradhan (2018: 7), data could be gathered for qualitative research through various ways. Data can be from primary or secondary sources. Data can be collected from interviews, questionnaires, observations, and case studies. I used semi-structured interviews with the participants who volunteered for the study and gave their informed agreement to take part (Neuman, 2011).

Semi-structured interviews assisted me to remain absorbed in the aim and objectives

of the study. For the data collection, I made sure that I understood all policies and procedures that governed TVET Colleges. I ensured that I familiarised myself with the challenges and triumphs the Colleges had gone through. During the interview sessions, I applied interview techniques such as summarising, explanation, and examining, to guarantee a viable interview (Greeff, as cited by De Vos *et al.*, 2005).

The interviews were conducted after the method of the study was defined to every participant. The participants were educated regarding the advantages of partaking in the research, as they could help by giving suggestions that could be applied to guarantee a theory-practice balance in the Electrical Engineering subject (Fox & Bayat, 2013).

The methods I used for data collection in this study were observations, interviews, and focus group interviews. The empirical phase, which involved the actual collection of the data, was followed by the preparation for data analysis (Polit & Hungler, 2004:51). The above methods helped me to collect the primary data. Each of the chosen methods above is explained subsequently.

3.4.2.1 Interviews

Aspers and Corte (2019:139) define qualitative research as an iterative process in which improved understanding to the scientific community is achieved by making new significant distinctions resulting from getting closer to the phenomenon studied. After all, “improved understanding to the scientific community” is what all research aims for, as are findings that are “new” and “significant” (Aspers & Corte ,2019:139).

Merriam and Tisdell (2015) have shown that qualitative design is significantly helpful for the researchers to collect a broader range of data from a diverse population. Practically in the larger populations, thoughts and perspectives are judged through interviews, which is a conventional technique under qualitative research method (Silverman, 2013; Bryman & Bell, 2015).

Brink, Van der Walt and Rensburg (2012:36) state that an interview is a method of

data collection in which the interviewer obtains responses from a participant in a face-to-face encounter, through a telephone call or by electronic means. Since I employed semi-structured interviews as a method of data collection, I asked participants open-ended questions to avoid answers such as 'yes' or 'no'. Furthermore, a qualitative interview occurs when the researcher asks one or more participants general, open-ended questions to ensure that participants can voice their opinions (Creswell, 2014:267).

When the World Health Organization declared COVID-19 a pandemic on 11 March 2020, I had to change my data collection methods from one-on-one interview to email interviews to prevent the spread of COVID-19. For contemporary researchers, a range of different methodological options are available when developing their research design including electronic research methods (Lobe, Morgan, & Hoffman, 2020; Teti, Schatz & Liebenberg, 2020). Electronic research methods have become even more relevant for researchers in the context of the COVID-19 pandemic (Lobe, Morgan, & Hoffman, 2020; Teti, Schatz & Liebenberg, 2020).

Email interviewing is a relatively new research method, which offers great potential for qualitative researchers (Hawkins, 2018:493). The email interviews are divided into two types that is synchronous and asynchronous email interviews. In asynchronous interviews, respondents can receive questions by email or video, which they can reply to at their convenience. In synchronous interviews, both the interviewer and interviewee are online at the same time and questions are posed sequentially in real-time (Gibson, 2017:211).

For this study I employed asynchronous email because it allowed interviews to be conducted at different time intervals and at different locations. I conducted the interviews after the return of students from their WBE placement and it was during their academic year. Firstly, I needed the students to be familiar with both their theoretical and practical lectures. Secondly, I needed the students to have experience of the real-work environment. Lastly, at Campus M the students had access to the internet, and they were able to complete the interview questions as a group, in that way the campus computer lab was very relevant and big enough to

accommodate all ten of them. The portable nature of asynchronous email interviewing also facilitates response rates, as participants can answer research questions from locations with an internet signal (Golding, 2014).

Appropriately, these interviews can be ranged from structured to unstructured interviews. For instance, I was able to send a progression of inquiries through an email to the participants, I was able to send a series of questions through an email to the participants. The development of interview questions were based on literature that was reviewed (Refer to Appendices L and M). The questions were checked and verified by the supervisor.

Asynchronous email interviews can take place over a variety of time intervals (i.e. hours, days, weeks or months), and therefore offer more flexibility than synchronous email approaches (Golding,2014). The participants were allowed five days to complete the interview questions. If I did not stipulate the timeline for the interview, participants would have taken months to reply. By allowing participants adequate opportunity to consider the inquiry prior to forming a strong response, the accuracy of email transcripts may be increased, as participants have time to proofread their responses (Ratislavová & Ratislav,2014:452). The increased response time also gave me the opportunity to further ponder the information already provided and ask appropriate follow-up questions. Additionally, verbal fillers such as “um”, “uh”, and “like” may not be typed out by respondents, potentially increasing the overall quality of the data (Fritz & Vandermause, 2017:1640).

Asynchronous email interviews can reduce the time required to conduct a research study while still generating in-depth data (Ratislavová & Ratislav, 2014:452). Similarly, saving scheduling and travel time, and subsequently reducing research costs (Cheng,2017), such as reduced transportation fees (Ratislavová & Ratislav, 2014:452). It also allowed me to conduct multiple interviews simultaneously (Hawkins, 2018:493) reducing work hours and/or affording time to complete other tasks and improving productivity (Ratislavová & Ratislav, 2014:452). The students were able to complete the interview questions at Campus M without having to travel to internet café and all other participants were able to complete the interview

questions at their workplaces, that was beneficial to me because I did not have to travel, in that way costs were saved. The culmination of cost and time savings can result in larger resource allocations for analysis tasks and/or reap benefits for researchers with limited budgets (Golding, 2014).

Email interviewing also enables involvement from participants who would otherwise face limitations to in-person interviewing, including persons with disabilities or those who are location-bound (Fritz & Vandermause, 2017:1640) with asynchronous email interviewing being particularly mindful of constraints placed on individuals.

Allowing individuals to express their responses regarding a sensitive topic in a written form can also take on a therapeutic role (Golding, 2014).and may promote feelings of safety when disclosing sensitive information (Golding, 2014). Since the participants were not directly in front of me, that increased a sense of anonymity and prevented them from feeling ashamed of their appearance. For especially sensitive topics, researchers should ensure they are properly redirecting participants to supports (Ratislavová & Ratislav, 2014:452).

If a predetermined window for response submission is not established, participants may take months to reply (Cheng,2017) Moreover, responses that are sent sporadically interrupt the flow of discussion and delay data collection (Cheng,2017). This can be particularly true for sensitive subject matter, where respondents may feel emotionally distressed (Ratislavová & Ratislav, 2014:452). It is also important to consider the appropriateness of asynchronous versus synchronous interviewing methods for distressing topics.

Email interviews require researchers to exhibit a high degree of diligence and carefully vet each participant (Ratislavová & Ratislav, 2014:452). Participants may also have reservations about their privacy (Hawkins,2018,493). I made sure that the participants information was kept as confidential as possible. As is common across all forms of data collection, it is important to communicate how precautions are being taken to protect participant privacy. Researchers need to be cautious when constructing emails to avoid forwarding confidential details (Fritz & Vandermause,

2017:1640) or mixing up narratives when responding to participants concurrently (Golding, 2014). This can be prevented through increased organization and scheduling. Colour coding email correspondences and storing conversations from different participants in separate inbox folders can help prevent these occurrences. Similarly, researchers may use a secure emailing portal to manage confidential correspondence and prevent susceptibility to virtual hacking or phishing scams.

While technology has afforded novel interviewing methods, it simultaneously poses challenges. For instance, poor internet connectivity may discourage individuals from participating or delay their responses, and system crashes can result in the elimination of data (Fritz & Vandermause, 2017:1640). During the asynchronous email interviews participants did not come across any technical problems they managed to complete the interview questions successfully.

Many potential participants may also have inactive email accounts or avoid reading research invitations, straining recruitment efforts (Ratislavová & Ratislav, 2014:452). However, these issues are not unique to email interviewing and can be overcome, such as through building connections with gatekeepers at participants' institutions, using recruitment tools, and gaining a thorough understanding of the target population during the study planning stages (Namageyo-Funa, Rimando, Brace, Christiana, Fowles, Davis, Martinez, Sealy, 2014:1). Modifying email subject lines and directly addressing emails to potential participants may also mitigate traditional issues. All individual participants were given 5 days to answer their interview questions. All participants were given their sets of questions: Head of department (HoD) (Refer to Appendix H) and three host employers were given their own questions (Refer to Appendix I). The interviews were decided according to the research questions and objectives of the study.

The participants were informed of the study and its benefits. I told the participants that their participation is not obligatory and free of deceiving accentuation. The semi-structured interviews allowed me to obtain multiple and detailed responses to the set questions (Struwig & Stead, 2001:98). However, this method is time-consuming because of the drawing up of the coding frames involved for content analysis on a

large number of interviews. The development of interview questions were based on literature that was reviewed.

3.4.2.2 Focus group interviews

A focus group can be defined broadly as 'a type of group discussion about a topic under the guidance of a trained group moderator' (Stewart, 2018:687). Focus group interview has appeared as a recognisable element of the qualitative research group of cognitive and scientific research for a specific purpose (Stewart & Shamdasani, 2014). Group interaction is the other advantage creating synergy effect on participants (Stewart & Shamdasani, 2014). Additionally, when there is restricted opportunity for data collection focus group interviews are ideally compared to individual interviews. Dilshad and Latif (2013:191) claimed that a focus group interview has been one of the significant gathering techniques in qualitative research and also, to conduct a number of a particular discussion, focus groups would be a reasonable one for collecting data. Furthermore, everyone should be able to speak and interact (Krueger, 2014).

I gathered ten student participants during their free period on the timetable in one computer lab and two lecturers in one office, for a brief meeting. I made sure that both venues were environmentally friendly. The meeting place was accessible and convenient to all participants, and it was agreed upon in advance. The choice of a place in the center was optimal so that all participants had time to get to it on time and found it without much difficulty. There was no noise in or around the venue. The purpose of the two meetings were to discuss challenges such as technical problems. The focus group interviews took place after WBE and during the year of study. During the focus group interview, which was held at a computer, all COVID-19 protocol regulations were observed, such all students were in their marks, I ensured that sanitizers were also readily available, etc.

This method was used as the researcher wanted to explain a problem or issue at a deeper understanding than a questionnaire method (Prasad & Garcia, 2017). Hence, I made sure that the chosen respondents had sufficient data to talk about the subject

of the discourse. Compared to other data collection techniques such as questionnaires, observations, etc., the group discussions have a valuable resource for exploring the inner opinions and feelings of individuals, interviews with participants was highly suitable for the knowledge required because they focused on feelings and thoughts, perceptions, sensitive issues, experiences and knowledge of members, so a focus group discussion was a useful attempt to have participants with common experiences together to examine a particular subject of interest, and it was known as an effective way to gather knowledge from all kinds of people (i.e. young age children & teens, and elderly adults as well) (Lune & Berg, 2017).

I sought to create a relationship with the participants without distractions, keeping anonymity, and using open and honest communication at all times in order to enrich the participants' experiences. All ten students gathered in one of the computer labs at Campus M and the two lecturers met separately in one office; all with the same mission to complete the interview questions.

3.4.2.3 Observations

Qualitative observation involves observing, inferring, and speculating in a way that generates inferences or hypotheses (Merriam & Tisdell, 2015). For my observation, I visited lecturers during both their practicums and theory. The theory was conducted in lecture rooms and practical was conducted at the workshop. I visited three different workplaces during the academic year when the students were placed for WBE. Primary data was collected during my three different observations.

For this study I employed participant observation during observations. Participant observation, the primary method in ethnographic research, is a method used to study a group of people in social settings such as organizations or communities (Blevins, 2017; Kawulich, 2005; Korbin, 2018; McKechnie, 2008). Participant observation may be used as a data collection method in ethnographic or case study research (Blevins, 2017:1188). Participant observation is special in comparison to other qualitative methods. I utilised the observation tools (Refer to Appendix E) that were decided on, based on the observation, research questions and objectives to conduct

observations at the lecture rooms, workshops and workplaces.

I created a WhatsApp group for the participants. I created this group because I needed to share information at once to all participants and that is a cost-effective method. Guided by the nature of the participants and the study, I disclosed that I was collecting data as a participant in the group.

Field notes are a qualitative approach most often used in ethnography. Field notes are written observations recorded during or immediately following participant observations in the field and are considered critical to understanding phenomena encountered in the field. Field notes are commonly associated with scratch notes, diaries, and journals. They are one way of collecting data that can be combined with interviews and focus groups or stand on their own as a text for analysis. Field notes are a collection of documents from a researcher's observed experience in a specific setting or environment. Documents such as written notes, reports, and materials from the environment, including pictures, videos, and pamphlets, can all be used to help the researcher become immersed in the environment under observation.

Historically, 'scratch notes' or field notes have been a central component of qualitative research since the early 1900s, originating in the field of ethnographic anthropology (Emerson *et al.*, 2011). It is currently understood that qualitative field notes are an essential component of rigorous qualitative research, and they are widely recommended in qualitative research as a way to capture necessary contextual information and ensure the persistence of rich context beyond the original research team (Creswell, 2013; Anderson *et al.*, 2005; Mulhall, 2003; Patton, 2002).

I used a researcher's journal to take notes of daily happenings and tasks that took place at the three Electrical Engineering companies. The collection of field notes is so widely regarded as essential that standardised criteria for qualitative research reporting encourage researchers to include a statement of the collection of field notes in manuscripts (O'Brien *et al.*, 2014; Tong, Sainsbury & Craig, 2007). I therefore used field notes to augment the data collected through the above methods. During the data collection, I went out into the field and obtained raw data (Marshall &

Rossman, 2011) which was based on my own observations and perceptions.

3.4.3 Data collection procedures

Data collection is the exact sequencing of the data collection procedures. In preparation for the data collection, I composed a letter to the College principal notifying him of my study and its goal in advance of the data collection. Permission was requested to conduct the study and observations with sampled individuals at Campus M (refer to Appendix A). I wrote letters to the individual participants (Refer to Appendices C and D), asking them to partake in the study. I explained how the study would benefit them during their period of study in the future, and I also clarified that the data would be collected using electronic interviews and observations which would be conducted in the lecture rooms, workshops, and Electrical Engineering companies.

According to Neuman (2005), before starting research, qualitative researchers need to self-assess and ponder their position in society. When preparing participants for the research, I needed to know my current relationship with them and how this might affect the results (Haynes, 2012:72). Most ethical issues revolving around qualitative research are directly related to initiating, commencing, and ending those relationships. Generally, the ethical issue emerges while preparing for the study. Thus, the ethical conduct of upholding relationships during researches is vital. Maintaining or establishing mutual relations is an ethical conduct often considered a prerequisite for building trust with the research partakers, which in turn is likely to assist the researcher obtain more honest responses from the research partakers and rich findings. Critics of this ethical research conduct claim that the conduct may lead to the manifestation of "fake relationships" (Kondowe & Booyens, 2014:146)

I informed the participants that I was a researcher (Babbie, 2009). Franklin (2012) and Creswell (2009; 2010) state that the researcher should tell the participants of the time and location of the interviews in advance, either in person or by letter or email. I personally visited the participants to tell them about my study, gave them invitation letters (Refer to Appendix C), and asked that they provide their full consent once

they had agreed to participate in the study (Refer to Appendix D).

For this study, I used structured, standardised observation as it is a research tool (Refer to Appendix E). I firstly observed how the lecturers imparted knowledge to their students, and how they ensured that the theory taught in lecture rooms was put into practice at the Electrical Engineering workshops. Secondly, I observed how the 10 students (five males and five females) grasped the theory in their lecture rooms and put it into practice at the Electrical Engineering workshops. Lastly, I visited three Electrical Engineering companies to observe how the theory taught at the TVET College was put into practice at those sites (Refer to Appendix E).

During the observations, I ensured that I did not remedy any problem or challenge that the participants faced at their respective workstations as that is not what the study intended to do, but rather I just collected data. I explored how the theory-practice balance was maintained on a daily basis and how theory was put into practice at the different companies. During observations, I collected primary data that was structured and standardised data; data only becomes information suitable for making decision in some fashion. Gathering data can be accomplished through a primary source (researcher is the first person to obtain the data) or a secondary source (the researcher obtains the data that has already been collected by other sources, such as data disseminated in a scientific journal) (Mesly, 2015). The primary data is the information from first-hand, it is also known as raw data. I used the instrument that I used to collect data is observation tool (Refer to Appendix E), which I designed based on the observations, research questions, and objectives.

These steps were followed during the observations:

- I firstly tried different types of devices that I used during my observations (audiotape).
- Then started with the observations and took notes.

I conducted all the interviews in English so that all participants were accommodated.

Interviews helped me to know my participants and their thoughts. Firstly, I ensured that the interviews were aligned with the theoretical framework. Then data were collected with a view to exploring how the theory-practice imbalance could be bridged in the Electrical Engineering subject at a TVET College. Secondly, I was concerned with how I could generate data accurately. Thirdly, I designed my questions so that they were appropriate for the interviewees (Refer to Appendices F-I).

Data were collected using electronic interviews as a way to observe the Covid-19 lockdown regulations about social distancing. Observations were made in lecture rooms, workshops, and at the Electrical Engineering companies (refer to Appendix E). Since I did not interact with the participants but merely sat and observed, this did not violate the social distancing regulations as I sat at the stipulated distance. According to Neuman (2005), before embarking on a study, qualitative researchers should analyse and consider their social situation. To put it another way, qualitative researchers must value their expertise, experience, prestige, and contribution to society.

Before sending the e-interview questions to the participants, I sent the participants the guidelines regarding the duration of the interview. I explained that they should work through the questions and submit answers within two days; meaning they had to respond within two days. I also agreed with the participants that they would receive their responses within two days so that I could analyse the data on time, as it needed sufficient time to be completed. Upon receipt of the individual participant's responses, a folder was created whereby all emails were copied into that file. It was easy for me to transcribe the asynchronous email interviews.

According to Grove *et al.* (2013:274), the setting ought to be well chosen and should be private, protected, and agreeable. During the focus group interviews, all students and the two lecturers participating in the study gathered in one of the computer labs at the campus. I ensured that all computers were operational and able to print. According to Saldaña *et al.* (2011:32), a few devices ought to be utilised during the data collection, like pens, PCs, voice recorders, and scratch pads. The students and

lecturers used computers to complete the interviews.

3.4.4 Research instruments

I guided the interview sessions according to the questions that I had prepared beforehand (Koekemoer, 2018:9). I used semi-structured interviews to capture the data for the four research questions (see Appendices F-H). My questions were open-ended to avoid closed answers such as 'yes' or 'no', as closed answers would not give me much detailed information. The instruments were also designed to avoid leading questions as far as possible. Creswell's (2013:478) guide in data collection methods and instruments was applied.

The desired result of qualitative research is to learn as much about the interviewees and their situation as possible. I started with basic questions such as the interviewees' biographical information so that they could acclimatise themselves with the interview session, followed by questions to guide the interview.

3.5 Data analysis

In qualitative designs, the data are collected to explore the unit of analysis, which may be a phenomenon, lived experience (Dieumegard, Nogry, Ollagnier-Beldame & Perrin (2019), case, individual, or group (Yin, 2014), depending upon the nature of the research design and of the research problem. Although one must allow for researcher flexibility in determining the unit of analysis based upon the research problem, there are some examples from the literature modeling the use of units of analysis within qualitative research. Recalling that the unit of analysis is the unit about which data are collected, Colorafi and Evans (2016:16) describe the data as being applied toward understanding the phenomenon of interest, while Magilvy and Thomas (2009:298) describe the data analysis for making sense and understanding the phenomenon of the study.

The use of qualitative techniques is becoming more popular and acceptable in the past few decades among researchers (Nazmy, 2016:311). The exploratory research

that depended on the qualitative methods of analysis needed explanation of its deeper meanings and understandings through the subjective views of the respondents (Akinyode, 2017:).

In my own phenomenological research (Belotto, 2017), I found that the semi-structured interview allowed me to ensure that I elicited the same core information from each participant, while also providing me with the flexibility to robe more deeply into the rich descriptions of experiences that participants shared.

In this section, the data gathered accumulated from the research about theory-practice imbalance in the Electrical Engineering as a subject is analysed and changed into unused prove to back the credibility of the research question. Three methods were used to analyse the data, i.e., interviews, focus group interviews and observations. I employed inductive analysis for analysing the interviews and observations and coded the data using open coding. Inductive analysis helped me to make meaning from the data, develop themes and findings, Identify representative data to support findings and explain findings using theory and literature(Bingham & Witkowsky, 2022:133).

I began the investigation interaction with regards to what different specialists depicted as, inundating oneself in the information. This implied persistently perusing the records to find out about the substance. I evaluated the nature of the information, whether reactions were uncertain or disconnected and whether I was getting the data I expected to respond to my exploration questions. I additionally investigated my interview procedure for predisposition, whether inquiries were posed in a nonpartisan way, startling discoveries had arisen, or amazing chances to test all the more profoundly into reactions were missed.

Code goals at lowering the information through the facts transcript into viable and meaningful transcript segments with the resource of coding framework. Data coding in qualitative studies method assigning labels or codes to one-of-a-kind sections of textual content that associated with one-of-a-kind problems. Miles, Huberman & Saldana (2014). Coding in its most basic form is the simple operation of identifying

segments of meaning in your data and labelling them with a code, which can be defined as “a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data” (Saldaña, 2015: 3).

I transcribed the interviews and went through the interview transcripts by reading and re-reading each one of them. At the end of all the interviews, I assessed all the responses with the intention of making sense of the data. I used content analysis to analyse the data. According to Maree (2010), content analysis is a systematic approach to qualitative data analysis that identifies and summarises content. I analysed the interview transcripts as the content.

I used Tesch’s eight step approach for the data analysis (as cited by De Vos, 2002:340). I did the following:

- Carefully read through all the transcriptions and made notes of ideas that came to mind.
- Selected one interview and read it to try to get the meaning in the information and wrote down the thoughts which came to mind.
- Arranged similar topics in groups by forming columns labelled major topics, unique topics, and leftovers.
- Abbreviated the topics as codes and wrote the codes next to the appropriate segment of the text. I then observed the organisation of the data to check if new categories or codes emerged.
- Found the most descriptive wording for the topics and converted them into categories. The aim was to reduce the total list of categories by grouping topics together that related to one another. Lines were drawn between the categories to indicate the interrelationship.
- Made a final decision on the abbreviation of each category and arranged the codes alphabetically.
- Put together the data material belonging to each category in one place and performed a preliminary analysis.

- Recorded the data.

I took the decision to be a participant observer, which related to my position for the topic of this study. I chose the participant observation approach because I wanted to engage in the conversations and have knowledge and experience of the topics being discussed. Also, I had credibility with the College principal and employers because they could see that I was a registered Master's student (Salmons, 2015:152).

Even though the questions asked initially can change throughout the research process, especially in inductive approaches (Charmaz 2014), reconciling the chosen question(s) and answer(s) is ultimately necessary. Moreover, this provides an excellent opportunity to come to terms with confirmatory bias by searching for contradictory evidence in the empirical material.

When analysing the observations, I started by reading the situation as a text, and applied as many critical techniques as possible without violating the ultimate importance of the text. Firstly, I reviewed what I had witnessed at both the College and workplaces. Secondly, I recorded the reviewed data. Lastly, I synthesised the reviewed data with my observations and the words of the participants.

3.6 Trustworthiness

3.6.1 Credibility

Credibility is the true meaning of what is really meant by 'participants' (Graneheim & Lundman, 2004: 105). This is the first criteria to be accepted and it is a crucial item in trustworthiness. I ensured that what was said was believed by selecting the people who participated in the study. I used inductive analysis for the interviews and observations. Inductive analysis is a more emergent strategy, where the researcher reads through the data and allows codes to emerge/names concepts as they emerge. It is more of a "bottom-up" analytic strategy. There are many forms of inductive analysis, but some common practices are open coding (sometimes called initial coding), in vivo coding (codes developed from participants' own words), and

constant comparative analysis (Bingham & Witkowsky, 2022:133).

A more comprehensive meaning is given by Cohen, Manion and Morrison (2007:136), saying 'member checking involves respondent validation to assess intentionality, to correct factual errors, to offer respondents the opportunity to add further information or to put information on record, to provide summaries and to check the adequacy of the analysis'. For this study, the participants were given the opportunity to elaborate, clarify, or confirm aspects of the interview in order to ensure that their views, experiences, and observations were used properly to enhance the credibility of the research.

Creswell (1998:191) stresses that member checking is best done with 'polished' interpreted pieces arising out of the information rather than the initial records. McMillan and Schumacher (2010:331) comment that part checking should likewise be possible inside an interview as reactions are reworded or tested to get more complete and unpretentious shades of importance. I thus used the interview guides and rephrased some of the questions in the interview to enhance validity.

I provided fully-fledged information about the research site, the participants, and the research topic. Credibility is therefore seen as the correspondence between the way in which I interpreted and presented the research findings, and the meanings and perspectives of the research participant (Merriam, 2009:213). However, an effort was made to suspend my judgement to increase the objectivity of the findings.

3.6.2 Dependability

Dependability refers to the lifespan of information during research (Polit & Beck, 2012:585). I recorded, deciphered, and interpreted the discoveries precisely to improve steadfastness. I contrasted my outcomes with the writing to show the review's dependability.

3.6.3 Confirmability

Confirmability, or objectivity, is the likelihood of agreement between two or more

independent people about the data's veracity, relevance, or meaning (Polit & Beck, 2012:585). This was achieved by being as objective as possible. Data should be supported and documented. The information received from the participants was securely saved on a PC. A reflective journal was kept in which my perspectives, insights, and thoughts were kept to improve self-comprehension (Burns, Gray & Grove, 2013:58).

Bracketing was also used to achieve confirmability. According to Tufford and Newman (2012:80), bracketing is a method used in qualitative research to mitigate the potentially deleterious effects of the preconceptions that may taint the research process. In practice, Creswell (2003) identifies bracketing as a way in which the researcher can separate his or her own experiences from what is being studied. Being aware that I worked at the institution of the investigation, I made an effort to hold in abeyance my judgements and subjective thoughts about the phenomenon under investigation. This I did in order not to cloud the information obtained from the participants, and ultimately, the findings.

3.6.4 Transferability

Transferability concerns the aspect of applicability (Lincoln & Guba, 1985). My responsibility as a researcher is to provide a 'thick description' of the participants and the research process, to enable the reader to assess whether my findings are transferable to their own setting. The researcher cannot know the sites that may wish to transfer the findings; however, the researcher is responsible for providing thick descriptions, so that those who seek to transfer the findings to their own site can judge transferability (Lincoln & Guba, 1985).

Transferability refers to the findings' application to similar circumstances or persons rather than broader ones. A "thick description" of the findings from several data collection methods can be used to achieve transferability, such as in the current study in which interviews were augmented by observation.

Transferability is established by providing readers with evidence that the research

study's findings could be applicable to other contexts, situations, times, and populations. It is important to note that the researcher cannot prove that the research study's findings will be applicable. Instead, the researcher's job is to provide the evidence that it could be applicable. This may sound tricky and wish-washy, but Lincoln and Guba (1985:316) said it: "It is, in summary, not the naturalist's task to provide an index of transferability, it is his or her responsibility to provide the data base that makes transferability judgements possible on the part of potential appliers".

I evaluated the data use in terms of contributing to the creation of knowledge about social service interventions. The sample was chosen using a purposeful sampling approach. This study will add to the existing theory and may be compared to investigations conducted by other South African researchers.

3.7 Ethics

Ethical issues are concerns, issues, and clashes that must be reviewed while directing research (Bosman, 2012:107). The standards of regard for people, advantage, and equity ought to be considered (Polit & Beck, 2013:693). I was cognisant of my continuous relationship with the participants and how this may have impacted the results of the study (Haynes, 2012:72). The ethics issues described in the following sub-sections were therefore considered.

I identified myself to the participants firstly as a researcher (Babbie, 2009). In anticipation of the data collection, I composed letters to the College Principal and host employers advising them regarding the study and its motivation (Refer to Appendix A). The College Principal and host employers allowed me to interview the participants (refer to Appendix B). I then wrote individual letters to the participants informing them of the study and how their participation would contribute to the study (Refer to Appendix C). According to Marczyk, DeMatteo and Festinger (2017), ethical research is guided by philosophical and administrative principles which may differ slightly across jurisdictions and disciplines. These principles are:

- *Autonomy and respect for person* refers to the ability of a person to make his or her

own decisions about the kind of research they want to be involved in, as well as requirement for voluntary participation.

- Consent from participants.
- *Beneficence* requires that the benefit of the research to the participants be maximised, while minimizing potential harms and discomforts. In summary, it entails having the interest of research participants in mind.
- *Justice* in research requires that the selection of research participants must follow a fair procedure and that appropriate participants are selected.

3.7.1 Rights of the institution

I applied for ethical clearance to the Research Ethics Committee at the College of Education, University of South Africa (UNISA), before gathering the data (Refer to Appendix M). I also applied to the College Principal requesting permission to interview the targeted College authorities to form part of my study (Refer to Appendix A) .I ensured that I conformed to ethical standards by protecting the participants, ensured that they were all willing to be part of the interview process, and that they felt comfortable about being interviewed.

A letter was written to the College Principal requesting permission to interview the selected participants at the College on the dates that were provided. The participants were informed of the study and all its benefits, however the participants should volunteer to participate.

3.7.2 Informed consent

According to Anderson and Morrow (2011), informed consent can be defined as 'the invisible act of evaluating information and making a decision, and visible act of signifying the decision'. In addition, Rubin and Babbie (2010) contend that the participants must not be coerced into participating in the study, nor offered any inducements. Kumar (2011) advocates that participants should adequately and

accurately be made aware of the type of information the researcher requires of them, why the information is needed, what the purpose of the research is, how the participants are expected to participate in the study, and how the study will affect them directly or indirectly. Consent should be given voluntarily by the participants and there should not be any pressure exerted on them.

I informed the participants well ahead of the time of the planned interviews and observations, and about the devices that I planned to use. I contacted the individual participants and ensured that they signed the consent form emailed to them (Refer to Appendix D). I indicated that the form needed to be printed out, signed, scanned, and emailed back to me.

I highlighted to the participants that their participation in the study was optional, and assured them that the information that they provided would be dealt with confidentially. I required their written consent before conducting the interviews. The research did not harm the people being studied. I guarded against causing embarrassment or danger to participants' 'home lives, friendships, jobs, etc. (Babbie & Mouton, 2004:522).

There are two models of consent concerning focus group interviews: the mental model of consent sees it as the mental state of the person consenting, whereas the performative model sees it as the public act whereby such consent is communicated (Schnüriger, 2018:131). On either interpretation, consent serves to legitimize the researcher's actions. Hence, Walker (Schnüriger, 2018:131) takes consent to be a form of communication whereby 'an act that would have been impermissible for some reason is no longer impermissible for that reason.'

One potentially problematic issue relating to consent in focus groups stems from the degree of disclosure that is possible. In qualitative research generally, the fact that design and methods are to some extent emergent—rather than pre-specified, as they usually are in quantitative research—makes it hard to provide fine-grained detail on what will occur in a study (Wiles, 2013). This applies even more in focus group research, because what takes place in the group depends in part upon other

participants, who may spontaneously raise issues not necessarily intended, or predicted, by the moderator.

As Warr (2005: 203) puts it, 'focus groups can be noisy 'as opinions and anecdotes are shared, challenged, and truncated as participants join in, or drop out of, the discussions taking place.' Furthermore, individual participants have less control than in a one-to-one interview. Although focus group participants can decline to respond to a particular question—probably more easily than in a one-to-one interview—they may not be able to divert the discussion away from a topic that they find uncomfortable. In effect, they may be unable to foreclose a particular topic in a way that is possible in an individual interview, particularly in the presence of more dominant group members.

A withdrawal of consent to the use of quotations presents fewer problems as regards the integrity of a study, as the insights arising from the analysis of the data concerned can still be reported, even though the researcher's choice of evidence to support them may be restricted. However, withdrawing data from a transcript prior to analysis—which is sometimes proposed (Barbour ,2018) can give rise to particular difficulties in focus group research.

3.7.3 Confidentiality

I received information from the participants about what they knew about this study. Neuman (2003: 397) indicates that during this period researchers learn intimate knowledge that the participant gives in confidence. Neuman (2003:397) argues that the researcher has a moral obligation towards the participants with regard to information given. Information received during the interviews was used for this study and no persons had access to it, in that it was concealed and their names will not be revealed.

In this study I ensured that the risk to the respondents was minimised by ensuring that they were all over the age of 18. In this study, I did not talk about the participants' private lives or disclose where they worked (Vollenhoven, 2016:80).

When conducting research on institutions, according to Simons and Usher (2000:5),

Ethical issues have to be taken against a background of institutional complexities, personal responses, and multiple expectations that are often conflicting.

Two points about deductive disclosure bear emphasizing. Firstly, the richer and more detailed the data reported, the greater the likelihood of deductive disclosure (Edwards & Weller, 2016:97). Secondly, it may not be clear to the researcher, as an 'outsider', which information carries a risk of deductive disclosure; some reported details that appear to have no identifying potential may hold such meaning for others within the community or social group in which the research is centred.

A connected issue to inward privacy is that of over-revelation. Inside any type of interview, the affinity that is laid out between the witness and the specialist, and the endeavors of the last option to urge perspectives or encounters to be communicated, may prompt a singular expressing more than the individual could have wished or expected to. Inside the particular setting of a focus group, not exclusively may the steady air that can describe the gathering support such over-divulgence, but the group setting may make it less repairable than in a one-to-one interview. In particular, it is much harder to 'withdraw' a comment in the public context of a focus group than in a one-to-one interview (Carey & Asbury, 2012b)

3.7.4 Right to decline interview invitation

The participants were told about their rights and that they could decline the interview invitation. This right was disclosed to them preceding the interview (Holloway, 2005:292). This right was clearly stated on the consent form (Refer to Appendix D).

Assent is ordinarily viewed as revocable, to such an extent that an individual can pull out from the concentrate any time after at first consenting to participate. A withdrawal of consent to the use of quotations presents fewer problems as regards the integrity of a study, as the insights arising from the analysis of the data concerned can still be reported, even though the researcher's choice of evidence to support them may be restricted. However, withdrawing data from a transcript prior to analysis which is

sometimes proposed (Barbour, 2018) can give rise to particular difficulties in focus group research.

Probably the only way to resolve this problem is to make it explicit in the consent process that whilst a participant can withdraw from the group, and may ask that his or her data are not quoted when the study is reported, withdrawing data prior to analysis is simply not possible. Accordingly, the inability to retract their data in this way is something to which participants will have consented. There might nonetheless be a concern that limiting individuals' ability to withdraw their data goes against the fundamental idea that consent is revocable, and thereby fails to respect their autonomy. So, it might be objected that autonomy implies the right to refuse, and that such refusal can occur at any stage in the research process. Three responses can be made to this objection. First, autonomy does not automatically imply that one may change one's mind.

One can make an autonomous choice that one understands to be binding, such as when making a promise or signing a contract. Such a choice is not a sacrifice of autonomy the commitment that it involves can be seen as an expression of one's autonomy. Secondly, given that other participants are likely to have consented to the focus group on the basis of having their views heard and contributing to what is gained from the subsequent analysis of the data, an attempt to respect one individual's autonomous choice has the consequence of undermining such choice by others.³ Thirdly, the detrimental effect on the analysis of withdrawing data in this way is liable to frustrate the moral obligation of the researcher to maximize the value of the insights gained from the study.

3.7.5 Debriefing of participants

Babbie (2007) proposes that the proper way for issues made by the research experience is for researchers to report back to the participants following the meeting or interview. I informed the participants well ahead of the time of the planned interviews and observations, and about of the devices I would use. I required their written consent before conducting the interviews. Research should not in any way

harm the people being studied. Researchers should always guard against causing embarrassment or danger to participants' 'home lives, friendships, jobs, etc.' (Babbie & Mouton, 2004:522).

A connected issue to interior classification is that of over-divulgence. Inside any type of interview, the compatibility that is laid out between the informant and the researcher, and the endeavors of the last option to urge perspectives or encounters to be communicated, may prompt a singular expressing more than the person in question could have wished or expected to. Inside the particular setting of a focus group, not exclusively may the strong air that can describe the gathering empower such over-exposure, but the group setting may make it less reparable than in a one-to-one interview. In particular, it is much harder to 'withdraw' a comment in the public context of a focus group than in a one-to-one interview (Carey & Asbury, 2012).

As well as giving data ahead of a focus group, researchers ordinarily examine and arrange a bunch of guidelines promptly preceding beginning the conversation especially in the case of sensitive topics. The researcher can emphasise the public nature of a focus group and the need for confidentiality and anonymity, and provide guidance on subjects that might be felt unsuitable to be raised during the discussion, subject to the caveats discussed earlier.

The preparation additionally permits participants assumptions for the gathering to be made due, for instance by bringing up that the gathering tries to examine a specific wellbeing or social issue, not to give an answer for such an issue. Significantly, the aggregate idea of the instructions permits the person to dismiss on their choice to partake in a circumstance that is nearer than the proper agree cycle to the setting of such cooperation.

Moreover, if now a member has reevaluated the choice to partake in the review, the preparation can set out a freedom to pull out less prominently than once the conversation has started. After the focus group has finished, and its content summarised to participants, the moderator can reiterate key messages around confidentiality and anonymity, and clarify or comment upon any potentially sensitive

or problematic issues that were raised during the discussion, where it was not appropriate to do so at the time. Participants can also be invited to discuss their reactions to such issues. The moderator can stay in the room for a while at the end of the focus group, or otherwise make him- or herself available, to give individual participants the opportunity to address any issues or concerns (Sherrif, Gugglberger, Hall & Scholes, 2014:92).

3.7.6 Management of information

According to Merriam (2002), the ethical management of information is firmly connected to secrecy. Creswell (2009; 2014) and Kumar (2011) state that the management of information indicates sorting from one or more sources, as well as the dissemination of that data to one or more audiences. This sometimes involves anyone who has an interest in, or has the right to, that information. The rigour with which the systematic steps were employed gave me confidence in the findings (Klenke, 2016:71).

The fact that some individuals might be concerned about the disclosure of certain information even if they saw no possibility of its being attributed to them or conversely, that they might not wish their identity as a participant to be disclosed even if no other information relating to them were revealed demonstrates that confidentiality and anonymity are not equivalent. Whilst confidentiality and anonymity refer to the use and attribution of information, respectively, privacy has to do with initial access to information, and therefore comes into play before considerations of confidentiality and anonymity arise (Tolich, 2016:33).

3.8 Conclusion

This chapter presented, discussed, and justified the research methodology, paradigm, approach, design, research site, target population, selection of participants, data collection instruments, data collection methods, data analysis, trustworthiness of the methods, and ethical protocol.

I used electronic interviews instead of one-on-one interviews because I avoided getting in contact with the participants and the use of masks due to Covid-19 regulations. The observation method that I had planned to use was changed, and instead I used participation observation.

CHAPTER 4: PRESENTATION OF FINDINGS

4.1 Introduction

This chapter presents the findings of the study from the collected data through semi-structured interviews and observations. This study aimed at exploring the theory-practice imbalance in the TVET College programmes in the North-West Province, establishing how these obstacles affect Electrical Engineering students during their practice, and suggesting the strategies that can address this theory-practice imbalance in the Electrical Engineering subject at a TVET College.

Data analysis was conducted on the data collected through interviews and observations. Data analysis is 'a means of making sense of relevant data gathered from sources such as interviews, onsite observations, and documents and then responsibly presenting what the data reveal' (Caudle, 2004:417). Maxwell and Chemiel (2014) define qualitative data analysis (QDA) as the process of identifying, examining, and interpreting the patterns and the themes in the data, and Graue (2015) supports the definition by saying that QDA is the process of describing, classifying, and interconnecting the facts with the concepts of the researcher.

The data were then clustered according to their datasets for better manageability and inductive open coding, i.e. focus groups with students and two lecturers. Individual interviews with the, HoD, and three host employers. Memoing played a key role for me as well. I memo to keep track of my analysis process and the decisions I made and to make sense of the data I was reading. I also kept a running memo of the themes and findings I started to see, and I had a memo where I kept interesting or generative participant quotes or excerpts from interviews and observations, and any evidence relevant for my themes and findings as they developed (Bingham & Witkowsky, 2022:133).

I started to analyse the observation data by reading the situation as a text, and applied as many critical techniques as possible without violating the ultimate importance of the text, i.e. systematically selecting, watching, listening, and reading.

I reviewed what I had observed both at the College and the workplaces. Lastly, I synthesised the reviewed data with the interview data.

In this chapter, I present the findings on the participants' views about the theory-practice imbalance in Electrical Engineering as a subject.

4.2 Demographical information of participants

I ensured that the names of the participants remained anonymous in accordance with the ethical considerations, as stated in Chapter 3 (section 3.8.3). I assigned the participants codes in alphabetical order. I summarised the 16 participants' biographical information in Table 4.1 below, which includes the participants' codes, race, gender, age, home language, and years of study or experience.

Table 4-1: Biographical data of participants

Students					
Code	Race	Gender	Age	Home language	Years of study
A	African	Male	21	Tswana	3
B	African	Male	21	Tswana	3
C	African	Male	23	Tswana	3
D	African	Male	25	Tswana	3
E	African	Male	28	Zulu	3
F	African	Female	22	Xhosa	3
G	African	Female	22	Tswana	3
H	African	Female	24	Zulu	3
I	Black	Female	22	Tswana	3

J	Black	Female	25	Tswana	3
Lecturers					
Code	Race	Gender	Age	Home language	Electrical Engineering experience in years
M	Black	Female	32	Tswana	2
N	Black	Male	34	Tswana	6
HoD					
O	Black	Male	46	Tswana	5
Host employers					
X	Black	Male	65	Tswana	35
Y	Black	Male	45	Zulu	8
Z	Black	Male	52	Tswana	12

Table 4.1 reveals that I did not use the participant's real names; instead I used the alphabet to identify them. The reason for not using their real names was for confidentiality purposes. I used A-E to represent the five Electrical Engineering male student participants, F-J to represent the five Electrical Engineering female student participants, M-N to represent the two Electrical Engineering lecturer participants, O to represent the Electrical Engineering HoD, and X-Z to represent the three Electrical Engineering host employers. The participants were all black South Africans.

Table 4.1 shows that five student participants were male and the other five were females, one female lecturer and one male lecturer, one male HoD, and three male host employers of Electrical Engineering at three different companies. This shows that there is still a lack of women engineers in South Africa. One basis upon which an occupation is constructed by gender is a biological discourse, which concentrates on women's physical capacities (size, shape, strength) to assert that certain work

tasks are more appropriately performed by males (Messing, Lippel, Demers & Mergler, 2000). The Mining Charter not only prohibits the exclusion of women but also requires companies to actively change the demographic profile of their workforce by setting targets (Botha, 2016).

The younger generation is expected to be conversant with the latest technology. Hence, the fact that many participants ranged between 21 and 28 years suggests that they should be trained towards becoming experts in theory-practice balance so that they can exert themselves well in the world of work. Young people tend to be early adopters of technology, not only in Europe but also in the USA and Japan (InphoMatch, 2001). Increasing the understanding of youth behaviour and attitudes toward technology is therefore not only important from a societal point of view, but identifying the needs of the younger generation will also be critical to understand the new uses of technology in society, which in turn will allow new business opportunities to emerge.

South African millennials too, are inclined to engage with brands online (Azionya, 2015; Oksiutycz & Kunene, 2017). Millennials have shown the propensity to use technology to communicate, connect with others, and to share content (Bolton, Parasurman, Hoefnagels, Migchels, Kabadyi & Gruber, 2013). The mobile apps' usage is to a large extent driven by utilitarian motivations (Verkasalo, Lopez, Molina-Castello & Bouwman, 2010). This has crucial implications for training the youth to master both theory and practice in the TVET College environment. The practical side of the training will satisfy their hunger for working with technology and enrich their technological competencies.

The participants felt comfortable being interviewed in English. Twelve participants were Tswana speakers, three were Zulu, and one was Xhosa. The student participants had three years of study in Electrical Engineering as they had started the subject in 2019. The female lecturer participant had been in Electrical Engineering since 2005, and had worked for several Electrical Engineering companies after qualifying as an Electrical Engineering artisan. She then joined the College as a lecturer in 2019. The male lecturer started working for the College as an Electrical

Engineering lecturer in 2016. The HoD started working for the College as a lecturer in 2001. He was then appointed as a senior lecturer in 2011. He became the HoD in 2017. The first host Electrical Engineering Company was established in 2008, the second in 2011, and the third in 1998.

4.3 Restatement of research aim and objectives

The findings were classified into different divisions that emerged during the data analysis following Tesch's (as cited in De Vos, 2002:340) steps. The themes and sub-themes were decided based on the research questions and the objectives of this study. Those research questions and objectives were as follows:

Main research question: How can the theory-practice imbalance of engineering students be bridged in the TVET College programmes in the North-West Province?

Sub-questions:

- What are the obstacles hindering engineering students from excelling both in theory and practice?
- How do these obstacles affect engineering students during their practice?
- What are the strategies that can address this theory-practice imbalance?

Research objectives:

- To explore the obstacles that hinder engineering students from excelling in both theory and practice.
- To establish how these obstacles affect engineering students during their practice.
- To suggest strategies that can address this theory-practice imbalance.

4.4 Findings from observations

The observation data revealed critical aspects which yielded various categories. In analysing the data, I reviewed what I had witnessed and recorded, and synthesised it with the observations I had made. I began by reading a situation as a text, without violating the sanctity of the text. According to De Vos, Strydom, Fouché & Delport (2003:347), upon selection of a phenomena in data, ideas are classified into various divisions. The following categories were decided on, based on the observations, research questions, and objectives:

- Presentation of lessons in the lecture rooms when balancing theory and practice.
- How practice was conducted in workshops to put theory into practice.
- Balancing theory and practice in the workplace.

Emerging issues from observations

4.4.1 Presentation of lessons to balance theory and practice in lecture rooms

I observed the female lecturer who is an artisan, and how she was able to relate theory to practice in a way that made it understandable to her students. When the lecturer delivered the lesson, she referred to practical examples, such as the difference between electronic appliances (TV sets, etc.) and electrical appliances (kettles, etc.) which indicated to me that the lecturer had subject knowledge.

One of the lecturers did not have any industrial practical experience, and therefore he was not able to relate theory to practice. The professionally qualified TVET lecturers are required to have expertise in at least three domains, namely academic or subject matter knowledge, pedagogy, and workplace qualifications and experience (Lloyd, 2008; McBride, Papier & Needham, 2009; Smith & Grace, 2014:204).

The lecturer implemented the four learning styles during their lesson. She used the diverging and assimilating experimentation learning styles when presenting her lesson. The following are the observations that I made during lesson presentations:

Diverging

Students who used the divergent learning style had a unique viewpoint on things. They preferred to observe rather than participate, and they had a powerful imagination. These students loved to work in groups and had diverse interests in cultures and people. They concentrated on concrete learning and introspective observation, preferred to examine and assessed the issue first.

Assimilating

During this learning style the students received straightforward information. These students favored abstracts and notions to people, and they experimented with analytic models. In the experiential learning approach, these students concentrated on abstract thinking and reflective observation.

The lecturers had a shortage of resources during the lesson, such as data projectors to display Electrical Engineering practical examples.

4.4.2 How practicums were conducted in the workshops to put theory into practice

In the Electrical Engineering workshop, I observed the female lecturer practicing what she was lecturing theoretically. She demonstrated the difference between electrical and electronic appliances, and how voltage is stepped down on electronic appliances so that the television sets can be watched at home. The students were told to open both appliances so that they could see how voltage travels in real life, and also to witness what the textbooks did not show but only described.

Biggs (2003) states that students must first obtain a sufficient base of theoretical knowledge before they can start to apply it in a practical environment. They were

able to apply what they were taught theoretically. Meghnagi (2004:62) holds that competence may arise out of knowledge and skill acquired through practice, and thus defines competence as 'an undivided complex of knowledge, abilities, ideas and ways of doing things that make it possible to carry out an occupation'.

The NCV curriculum consists of knowledge and skills in specific subject areas that are taught by lecturers and learned by students (Dijkstra & Seel, 2004). Also, the literature highlights that Electrical Engineering study programmes should be designed to provide students with basic theoretical knowledge and practical skills (Kilić, Puljak & Begušić, 2007; Nisbet, Entwistle, McQuillin & Robinson, 2005).

All students were dressed fully in their boots and work suits. Students were provided with the subject workbooks, which contained all the practical projects to be mastered for the year. Some students were unable to complete practical tasks they were given due to insufficient time allocated. During their practicals, the students employed converging and accommodating learning styles. They converged to solving difficulties. They liked technical activities and applied what they had learnt to the real-world problems. They also recognised experimenting with new ideas, and their education emphasised abstract conception and active experimentation; for accommodating, the students preferred practicality. They thrived on new challenges and relied on their intuition to solve difficulties. When learning their practicals, these students used real learning and active experimentation.

4.1.1.1 How workplaces ensure balance between theory and practice

On a daily basis, the students were required to report to the company's lecture room so that the host employer could start with theory before they started their daily tasks, such as house wiring, testing of electrical appliances, installation testing, and stepping down of voltage. The students made sure that they completed their logbooks at the end of each day. The logbooks noted the students' daily tasks. There was a space where the artisan needed to comment, as well as a space where the host employer signed, and daily attendance registers for the placement duration.

Research shows that 80% of work-related learning occurs informally, and this includes self-directed learning, networking, coaching and mentoring (Yeo, 2008:318). Therefore, workplace learning can include formal elements, but is predominantly informal in nature, and is often incorporated into workplace social interactions and everyday practices.

4.5 Findings from interviews

The below themes and sub-themes were decided according to the research questions and objectives of the study. Themes were identified to substantiate each sub-theme and verbatim quote (De Vos *et al.*, 2005:344). I used Tesch's eight steps of data analysis (as cited in De Vos, 2002:340). Thus, I:

- Carefully read through all the transcriptions and made notes of ideas that came to mind.
- Selected one interview and read it to try to get the meaning in the information and wrote down the thoughts which came to mind.
- Arranged similar topics in groups by forming columns, and labelled them themes, sub-themes and verbatim quotes.
- Abbreviated the themes as codes and wrote the codes next to the appropriate segment of the text. I then observed the organisation of data to check if new categories or codes had emerged.
- Found the most descriptive wording for the themes and converted them into categories. The aim was to reduce the total list of categories by grouping themes together that related to each other. Lines were drawn between the categories to indicate their interrelationship.
- Made a final decision on the abbreviation of each category and arranged the codes alphabetically.
- Put together the data material belonging to each category in one place and performed preliminary analysis.

- Recorded the data.

An overview of how the themes and sub-themes were developed, and examples of the verbatim quotes, is shown in Table 4.2 below.

Table 4-2: Themes, sub-themes and verbatim quotes

Themes	Sub-themes	Verbatim quotes
Theme 1: Theory-practice imbalance in the Electrical Engineering subject	Importance of theory-practice	'Every theoretical work requires practice, striking a balance between the two is important. This requires capacitance in both worlds. It is important that people know how to work with their hands'.
Theme 2: Students' struggles during Electrical Engineering practice both at the College and workplaces.	Factors contributing to the Electrical Engineering students' challenges during their practicums	'Not having enough engineering background and lack of resources, such as practicum manuals'.

The themes and sub-themes that were used to present the findings are stated as follows:

- **Theme 1:** Theory-practice imbalance in the Electrical Engineering subject

Sub- theme 1: Importance of theory-practice.

Sub-theme 2: Obstacles that the students encounter in balancing theory and practice.

Sub-theme 3: Obstacles that interrupt the lecturers from balancing theory and practice.

- **Theme 2:** Students' struggle during Electrical Engineering practice

Sub-theme 1: Participants' descriptions of obstacles which contribute towards students' challenges during practicums at Campus M.

Sub-theme 2: Participants' descriptions of the challenges experienced by students at the workplaces during their WBE placement.

- **Theme 3:** Strategies of balancing theory and practice in the Electrical Engineering subject

Sub-theme 1: Participants ideas on how to implement practicums in the Electrical Engineering workshops and host companies.

Sub-theme 2: The participants' ideas about the plans to balance theory and practice.

Sub-theme 3: The participants' descriptions about how to ensure that the tools and materials used are the correct ones.

The word-for-word answers from the participants were directly coded because I did not want to tamper with the participants' responses (Lincoln & Guba, 1985, as cited in De Vos, 2005:345; Whittemore, Chase & Mandle, 2001; Krefting, 1991).

Theme 1: Theory-practice imbalance in the Electrical Engineering subject

The sub-themes under this main theme highlight the participants' views about the importance of theory-practice balance in the Electrical Engineering subject. Each category of participants gave their ideas according to the way they had experienced them.

4.1.1.2 Sub-theme 1: Importance of theory-practice

The students realised the importance of a balance between theory and practice for their training. They mentioned that for them to be ready for the labour market, they need to have developed Electrical Engineering skills, and were able to balance theory and practice. The participants stated briefly about theory-practice:

My understanding of the importance of theory-practice is that what we learn in class is what we practice in workshops and we should be able to make both a priority (A). E also stated that 'practical is where we prove the theory'.

Theory-practice help students to be able to put theory into practice at the workplace, it also improves their skills when they do practicums and to be able to fit in and align with the requirements of their job description (M).

The newly implemented NCV programme requires that theory and practice be treated equally. It is therefore the responsibility of the College to ensure a balance between theory and practice. Both theory and practice contribute to the students' academic achievement at the end of the year. As demonstrated by this analogy, if the students fail the practical examination and pass the theory examination, they will be deemed incompetent at the end of the year. X and Z supported the views of the other participants about the importance of theory-practice by adding that:

Every theoretical work requires practice, striking a balance between the two is important. This requires capacitance in both worlds. It is important that people know how to work with their hands (X). It is important for theory-practice because it is not easy to do practice without theory, they need both. Theory and practice play a vital role for Electrical Engineering students (Z).

Theory and practice cannot be divorced from one another. Being able to apply engineering 'hands-on' is just as important as an understanding of its theoretical aspects (Anido, Fernandez & Llamas, 2001). It is crucial for TVET Colleges to ensure the integration of theory and practice. Students, therefore, need to be exposed to both practice and theory in an engineering curriculum, especially if they are to develop the right graduate attributes such as problem solving, investigation

skills, and engineering professionalism (Case *et al.*, 2005; Easa, 2013; ECSA, 2012).

Also, it is crucial for the workplace that students are deemed competent in knowledge and skills while still studying at TVET College so that they can enter the labour market (Case *et al.*, 2005; Easa, 2013; ECSA, 2012).

4.1.1.3 Sub-theme 2: Obstacles that the students encounter in balancing theory and practice

While there is undisputed truth about the importance of theory and practice in the engineering course, it should also be noticed that there are certain obstacles in the way of such a balance. It is in this light that the participants reported that during their theory in lecture rooms, they experience a lack of resources in order to combat the challenges they encounter in both their lecture rooms and workshops; hence, the imbalance between theory and practice. The various challenges mentioned by the participants were the following:

We as students need to be given enough time to complete our practical tasks, just like as we do with our theory periods (A).

We do not have enough engineering background; hence the huge gap between theory and practice (C).

The machines and tools that are used at TVET Colleges are not what we are currently using (Y).

Yes, the obstacles we encounter towards theory-practice balancing are lack of material, absenteeism due to COVID-19 and lockdown that was extended. We are also encountering poor performance of students who left high school with grade 9 and came to register at the College (M).

Some students are not good with theory; you find that they are good in practice, others are very good in theory but not in practice. We should assist them to ensure balance between the two (Z).

In addition, engineers need to be able to function as effective members of teams and have strong communication and problem-solving skills [National Academy of Engineering (NAE, 2004)]. Many TVET Colleges' programmes, such as National Accredited Technical Education Diploma (NATED) programmes, are still using the traditional lecturing practice (Kober, 2015). The traditional lecturing practice is a method whereby the students just sit and listen while their lecturers do all the talking (Stehlik, 2018), whereas the new NCV programmes require that lecturers use both theory and practice when lecturing. Therefore, all NCV lecturers need to be in a position to offer both theoretical and practical components.

The NATED programme consists of N1-N6. Each level takes a period of 10 weeks. It only offers theory throughout the period of study, and therefore on completion of the programme the students will not be ready for the job market, nor will they be self-employable. The new job market requires that a student studying at a TVET College is equipped theory and practice, and that they have the relevant skills required for Electrical Engineering.

4.1.1.4 Sub-theme 3: Obstacles that interrupt the lecturers from balancing theory and practice

From Table 4.1 and the observations, it is indicated that the male lecturer participant's profile shows that he is not yet a qualified artisan. However, he is only able to lecture theory without putting it into practice since he has never worked for an Electrical Engineering company. The participants were asked various questions according to their roles at College O and three different workplaces, such as what are the obstacles that interrupt the lecturers from balancing theory and practice? Their responses were as follows:

Our male lecturer is not yet an artisan, he does not have workplace experience, on that note he is unable to provide us with relevant tools and materials to do the job, he does not even know time that should be allocated per task (E).

Having an inexperienced, the lecturer poses a serious challenge to us as students, the lecturer cannot even organise excursions for us as students so that we can learn see

what other companies do at different Electrical Engineering companies. Lecturer is unfamiliar with the requirements of workplaces; hence he cannot relate theory to practice when lecturing (H).

The challenge is one of my lecturers lack practical and industrial experience which in turn affects the students' performance in both theory and practice (O).

This finding tends to support the study regarding lecturers in the Western Cape Province (McBride *et al.*, 2009) which found that only 6% of TVET lecturers had expertise in all three domains; namely, an academic qualification, a teaching qualification, and workplace experience.

A significant number of lecturers have therefore entered, and continue to enter, the South African TVET college sector without an official teaching qualification. The absence of a formal teaching qualification for lecturers implies that college lecturers have to develop their teaching competencies elsewhere (Van der Bijl 2015:4–5). Wedekind (2016:22) therefore agrees that a significant number of lecturers need to undertake relevant studies to upgrade their qualifications. A year earlier an argument was noted that substantial component of academic staff within the South African TVET college system work without a professional teaching qualification that meets the national minimum requirements (Van der Bijl, 2015, 2).

The under-qualified lecturers in TVET Colleges result in the poor performance of students. The major causes of this poor performance are outlined as the lecturers' lack of subject expertise and their inability to meet administrative requirements to undertake practical work. African countries, including South Africa, acknowledge the official requirements to lecture in higher institutions of learning, and in this spirit, have declared their intention to institute appropriate reforms (Allais, 2011; DHET, 2013; Field, Musset & Álvarez-Galván, 2014; Hailemichael, 2016). South Africa, therefore, it is mandated that all lecturers employed by TVET Colleges should be professionally qualified to lecture and they should also have subject expertise. Lecturers' knowledge of what is demanded from students during WBE will assist the students with the practical knowledge required for the workplace.

Considering the above, it is the responsibility of TVET Colleges to ensure that all lecturers without the relevant qualifications and practical experience receive relevant training that will equip them to lecture as required by the NCV curriculum.

Theme 2: Students' struggle during Electrical Engineering practice at both the College and the workplace

The sub-themes under this main theme focus on the obstacles leading to students' challenges related to the theory-practice balance during practicums. Different responses were gathered from the students and lecturers.

4.1.1.5 Sub-theme 1: Participants' description of obstacles which contribute to students' challenges during practicums at Campus M

The students experience challenges differently during their practicums when they are at the TVET College and when they are at the workplace. They mentioned that it is not easy for them to carry out their practicums because of insufficient equipment available. The students stated that when working in a group of more than three, it is not easy for them to learn as some will be spectators due to insufficient tools and materials, and the lack of training equipment. The participants highlighted the following views:

Our College does not procure enough resources for practice, yes, we receive the overalls and safety boots, but we lack a lot of resources to do our practice (D).

For the theory, we give textbooks for all subjects to students, but when it comes to practice, we lack things such as cables, Vero boards and circuit breakers. There is a problem of students sharing tools, which results in some tools becoming damaged and stolen. Our workshops lack of measuring instruments and some components are old (N).

Lack of panel boards in the workshops results in about six students sharing one board which poses a serious danger to students' lives due to COVID-19 (M).

The participants mentioned that the Electrical Engineering workshop at Campus M is too small to accommodate all the students. A lack of physical space (Abrahams,

1997) such as workshops, rendered the curriculum development by lecturers ineffective, particularly the practical component of the curriculum. There is insufficient time allocated for practicums at the TVET College because students were expected to complete a task that was allocated eight hours of time within four hours.

Yet another obstacle related to the industries being doubtful of the new NCV programme and the practicals offered at TVET Colleges. Rogers (2003) adds that the introduction of the new curriculum is unpopular due to insufficient communicability with industries, a lack of familiarity with the new programme, and scepticism of the type of human capital that it would yield; all leading to the loss of confidence in the skills training provided by TVET Colleges.

4.1.1.6 Sub-theme 2: Participants' challenges experienced by students at the workplace during their WBE placement

In the light of the challenges faced by the students during practical tasks at the workplace, the host employers were asked to elucidate the challenges the students experienced. A few challenges were presented by the host employers:

Material that is outdated, insufficient practice offered at provided at College O, specifically at Campus M (Y).

The late coming issue does not benefit the students themselves as it defeats the purpose of theory-practice balance. Moreover, students need to adjust before the process can be effective (X).

The students have to learn to adjust to working hours as per the company policies, as they need to do more practice at the company. My take is they did most of the theory at school (Z).

The students lack enough practicum knowledge from Campus M (Y).

It has come to the attention of the management of Campus M that lecturers do not follow the proper implementation of practicums as prescribed by the curriculum. Students are not given sufficient time to spend at the workplace; their time is always limited. Therefore, they end up not learning anything at the workplace due to time

constraints.

Theme 3: Strategies of balancing theory and practice in the Electrical Engineering subject

The participants' made several suggestions about the need to balance theory and practice.

4.1.1.7 Sub-theme 1: Participants ideas about practicums in the Electrical Engineering workshops

The participants offered their views about the practicums in the workshops. Other participants made a few suggestions about the conduct of practicals in the workplace. The lecturer participants mentioned that when the students practice something, it becomes easier for them to grasp. Some suggestions made were as follows:

Lecturers should ensure that 60% practical is offered, and 40% theory offered; visual learning is easy. The practical should be 50% and the theory should be 50%. The theory becomes easy after practical. In a week, there should be 2 days of theory and 2 days of practical, then Friday for short practical or theory test (J).

I will ensure that my students are allocated four periods on a daily basis for two days per week (N).

As Campus M we plan in advance (O).

I will ensure that during their placement, students are given a new task on a daily basis, obviously under the guidance of the artisans. Establish a good working relationship with Campus to ensure that the campus aligns itself with what is required at the workplace (X).

I can advise Campus M to stick to our operating and tasks and be informed of our overall operations. In simplicity I would request hosted campus to align themselves with our operations (Z).

Upon the inception of the NCV in 2007, the focus shifted from apprenticeships to

learnerships. A learnership, according to the Department of Labour (DoL, 2002:2), is a training programme that combines theory with the relevant practice on the job. These qualifications were designed to provide both theory and practical training. The practical component of study is offered in a real workplace, or in a simulated workplace environment, to provide students with an opportunity to experience the work situation during the period of study (FET Act, 2006).

The Further Education and Training (FET) Act of 2006 states that TVET Colleges should strive to provide high-quality education and training to help students equip themselves with a qualification and the skills they need to start on a chosen career path and allow access to Higher Education (NQF Level 5 and upwards) (DoE, 2006).

4.1.1.8 Sub-theme 2: Participants' ideas about the plans to balance theory and practice

The findings revealed that in pursuit of balancing theory and practice, a few ideas were provided by the participants. They stated that during balancing theory and practice, the students should be allocated sufficient time in the workshops. They mentioned that during theoretical lectures they need more tutorial multimedia to support their lessons. The participants also mentioned that the students need more exposure to Electrical Engineering, and that it can be obtained through educational tours to companies.

Some views were shared about ensuring the balance of theory and practice were as follows: D suggested enough time to be allocated for practical work. N mentioned that in pursuit of balancing theory and practice, the students should be given practical tasks such as house wiring and wiring of switches, lights, etc. as part of their practical tasks. M added that she would show students how to wire energy meters. O supported the lecturers and said that the campus timetable was structured in such a way that they (lecturers) would be able to conduct both theory and practice. Y said that they would liaise with the HoD and lecturers regarding the curriculum needs in balancing theory and practice. Furthermore, Z made the following suggestion:

In our company we mostly focus on practical. I will design a workbook that addresses theory in relation to the practical to be offered to ensure balance of theory-practice.

TVET Colleges should also work closely with players and stakeholders from various industries to help fulfil the great need that exists for students through customised education and training programmes (DoE, 2001; McGrath, 2003; Unwin, 2003).

4.1.1.9 Sub-theme 3: The participants' descriptions about how to ensure that the tools and materials used are the correct ones

The participants provided their views on the tools and materials being correctly used in the Electrical Engineering subject. They also emphasised that when working with electricity, all tools need to be insulated to avoid electrical shocks and accidents. They provided the following safety precautions with regards to tools and materials used especially for Electrical Engineering:

As lecturers we always ensure that correct tools and materials are always used in our workshops (M).

Students are provided with appropriate training and guidelines on how to use tools correctly (X).

Electrical Engineering students need to be provided with insulated tools to protect them from electrical shock (O).

The DHET provides the TVET Colleges with lecturer and student guides that highlight relevant tools and materials to be used during the practicals for the Electrical Engineering programme. Therefore, host employers are required to request the two guides from the TVET Colleges to ensure relevant tools and materials are procured and used.

The students are always advised to be on a look-out for any incidents and accidents while busy with their practicums in the workshops. Such accidents and incidents should be reported to the lecturer immediately. The students are again advised to report any faulty tools and materials to their lecturer.

Conclusion

This chapter presented the findings of the study from the data collected through individual and focus group email interviews and observations. The three themes: Theory-practice imbalance in the Electrical Engineering subject, students' struggle during Electrical Engineering practice at both the College and the workplace, the participants' ideas about how to balance theory and practice in the Electrical Engineering subject and the eight sub-themes were decoded according to the research questions and objectives of the study. The participants answers were presented verbatim. The next chapter (Chapter Five) concludes this study and makes relevant recommendations.

CHAPTER 5: SUMMARY, RECOMMENDATIONS AND CONCLUSION

Introduction

This concluding chapter presents the summary of the study, key findings, recommendations, and the limitations of the study. To recap, the main aim of the study was to explore the theory-practice imbalance in the Electrical Engineering subject at a Technical Vocational Education and Training College. The main questions, sub-questions, and objectives that informed the study were as follows:

Main question:

How can the theory-practice imbalance of the Electrical Engineering students be bridged in the TVET College programmes in the North-West Province?

Sub-questions:

- What are the obstacles hindering Electrical Engineering students from excelling in both theory and practice?
- How do these obstacles affect Electrical Engineering students during their practice?
- What are the strategies that can address this theory-practice imbalance?

Objectives:

- To explore the obstacles that hinder Electrical Engineering students from excelling in both theory and practice.
- To establish how these obstacles affect Electrical Engineering students during their practice.

- To suggest the strategies that can address this theory-practice imbalance.

Summary of chapters

Chapter 1 presented the orientation to the study, and most importantly, the research problem. The chapter also presented the motivation for the study, the aims and objectives which led to conducting the interviews, the research methodology which covered and motivated for the research site and participants, the data collection instruments, the data collection methods, and the data analysis.

In Chapter 2, the theory of experiential learning model and learning styles inventory was chosen and discussed as it was deemed relevant to frame the study. It was motivated and an account was given about its application in the study. This theoretical framework helped me to understand how students grasp what they learn by means of transforming their knowledge and by changing the way in which they think and learn. The chapter proceeded by presenting the review of the relevant literature about the problem. This chapter also gave a detailed discussion of sustainable economic skills, the importance of the theory-practice in the TVET Colleges, the integration of theory and practice, and the outcomes of balancing theory, practice and work-based experience.

Chapter 3 described and justified the research methodology, paradigm, approach, design, research site and selection of participants, data collection instruments, data collection methods, data analysis, trustworthiness of the methods and ethical protocol. In this chapter, I gave an account of the use of qualitative research in the study. I conducted semi-structured interviews to collect the data from 16 participants. I interviewed the participants using email interviews by means of the interview guide that I designed. I used Tesch's eight proposed steps in analysing the data collected from the focus group interviews and individual interviews. I transcribed the interviews and read and re-read the transcripts until I had completed the analysis.

In Chapter 4, the findings from the interviews and observations were presented. This was by means of themes and sub-themes which were decided in line with the

aim and objectives of the study. The participants' verbatim responses were used to substantiate the narration of the findings.

The journey travelled through the above chapters resulted in Chapter 5, which is the concluding chapter.

Summary of key findings

The following sub-sections summarise the key findings from the interviews and observations which were conducted and analysed.

Summary of findings from interviews

5.1.1.1 Theory-practice imbalance in the Electrical Engineering subject

This theme was based on the aim and objectives in Chapter 1, Chapter 2 and Chapter 4. Interviews and observations were analysed in chapter three and the findings thereof were discussed in chapter four. From findings it was evident that the students are not able to ensure balance between the theory and practice. The lecturers need to be capacitated on practice offered at industries. Based on the study conducted, all participants agree that practice is as much important as the theory.

The participants gave their views about the importance of theory and practice. It came to the attention of the students that for them to graduate and be ready for the labour market they need to ensure that they are able to balance theory and practice.

5.1.1.2 Students' struggles during Electrical Engineering practice

In Chapter 1, the problem was introduced, and in Chapter 2, literature review was conducted. According to the findings of the study in Chapter 4, it is noticeable that the students experience obstacles during their practical. The college does not procure materials and equipment. The HoD alluded that the type of students that we register for Electrical Engineering subject are not from technical schools hence the imbalance.

The students highlighted that the college does not purchase sufficient materials, tools and equipment needed for their training. The lecturers revealed that the college purchases books for all students but fails to purchase training material required by students for their practice. The students' learning is compromised due to lack of material and outdated equipment.

The host employers indicated that the students lack discipline, they do not report for duty on time. The students do not show any competencies when doing their practicals during placements at the workplace.

5.1.1.3 Strategies of balancing theory and practice in the Electrical Engineering subject

This goal was reached by the suggestions from the findings and discussions of the theory and practice imbalance. The research focused on finding strategies highlighted by the students, lecturers, HoD, and host employer on balancing theory and practice, thereby there is a need for host employers to readdress the workplace's rules and regulations to students.

Summary of findings from observations

5.1.1.4 Presentation of lessons in the lecture rooms when balancing theory and practice

During the observation I made, it was evident that the lecturers were able to combat theory in their lecture rooms. It came to my attention that one of the lecturers lacked practical skills, therefore he is not qualified artisans. Students mentioned that they received all their textbooks for all subjects. I observed that the two learning styles were used that are concrete and abstract. For concrete the students are engaged in a task and all students demonstrated their involvement in the task. During abstract learning style the students were using their knowledge from their previous level. They were working on their own without the assistance of their lecturers.

5.1.1.5 How practice was conducted during workshops

In Chapter 1, the problem was introduced, and in Chapter 2 literature study was conducted. In Chapter 4 the findings of the study it is apparent that the students are able to relate practice to the theory that was learnt in lecture rooms. The students mentioned that it was easy for them to grasp the theory taught in lecture rooms through the practice that was offered in the workshop. The students implemented active and reflective learning styles, they put theory into practice and they even made several discoveries, they reflected on their tasks and some students sought for clarity from other students.

In chapter one and chapter three literature study was conducted

5.1.1.3 Balancing theory and practice in the workplace

From the study conducted the host employer demonstrated their ability to ensure balance between theory and practice. I observed that the students complete their logbooks daily, noting each task given to them on a daily basis. The host employer together demonstrated how the labour market ensures that the students become employable in the future. From the findings it is evident that some students do not report for duty on time as according to the workplace rules and regulations

Recommendations

The following recommendations are made:

Theory-practice imbalance in the Electrical Engineering subject

- Students need sufficient time in the lecture rooms and workshops so that they can be conversant with the programme of study.
- The Electrical Engineering HoD should allocate equal periods on the timetable for both theory and practicals.

- The College should allocate sufficient funds for procuring the necessary resources for lectures and practicals so that the students can balance theory and practice.
- Campus M should procure tools and materials that compare well with those used at workplaces.
- Lecturers should adequately prepare the students prior to their placement at the workplace.
- The students should be provided with sufficient practicals so that they are ready for the workplace.
- Electrical Engineering workshops should be renovated so that there is enough space in the workshop and the entire group can be accommodated.

Students' struggles during Electrical Engineering practice

- The lecturers at Campus M need sufficient training and relevant qualifications to be able to deliver the theory and practice needed to reduce the challenges of the theory-practice imbalance.
- Lecturers and the HoD should make sure that the students are placed at least every term for two full weeks during school holidays.
- The HoD should ensure that both theory and practice are equally accommodated on the timetable for the academic year.
- Lecturers at Campus M should regularly visit the workplaces for insight into best practices.
- It is recommended that the lecturers be trained sufficiently so that they are able to train the students by balancing theory and practice. The College leadership should review the policy on the appointment of new staff and not appoint lecturers without the relevant qualifications needed to offer the NCV programmes. The College needs to ensure that lecturers who are already at the College obtain the relevant qualifications and training.

Strategies of balancing theory and practice in the Electrical Engineering subject

- The students should be given practical tests to assess whether they have grasped what they are taught.
- Lecturers should be able to apply different learning styles to different types of students as part of their lecturing.
- The HoD, together with the lecturers, should forge a good working relationship with Electrical Engineering host employers to ensure that students are placed at workplaces more often.
- The students should spend more time at the workshops for practice for them to get good merits in their theory for Electrical Engineering subject. Students will benefit a lot from spending time in the workshops.
- Lecturers and the HoD should also be familiar with the workplace demands and be able to use the Electrical Engineering curriculum to equip students for the workplace.
- The host employers should also be able to balance theory and practice by not only offering practice throughout the placement.
- Campus M should avail more multimedia resources for lecturers in pursuit of balancing theory and practice so that the Lecturers are able to prepare training videos for with the models they want their students to do as part of their practicals.
- The College should avail enough funds for educational tours to different Electrical Engineering companies for exposure.
- With regards to the required tools, lecturers should compare the curriculum requirements with workplace requirements to be able to procure the correct, relevant, and up-to-date tools and materials.

Limitations of the study

This study addressed the imbalance of theory and practice in Electrical Engineering

as a subject in the TVET Colleges in the North-West province. This study was conducted at Campus M only as one of the campuses of College O. I minimised bias in this study because I knew what information I was looking for from the students, lecturers and HoD. I managed the information from the mentioned participants. The nature of the inquiries I posed to participants were of good quality with perfect timing and I remained mindful of the bias.

In the light of this, further studies on this topic could be conducted by researchers who are not affiliated to their sites of investigation. Coverage of more than one College could also be considered in future research.

Conclusion

This study concludes that balancing theory and practice is serious challenge at campus M. The above recommendations need energy, devotion, responsibility and interest from the college management, HoD, lecturers, students and host employers. This study highlights the ways to balance theory and practice at Campus M and workplaces. It is trusted that this study will achieve change towards accomplishing the objectives of the study.

REFLECTION ON THE STUDY

Visualisation, belief, and action are the three factors that kept me going through my research journey.

For me to be successful academically, I knew I had to visualise holding a Master's degree as an addition to my qualifications. I set goals for myself to complete this Master's dissertation within three years. I kept on working hard every step of the way, even when it was not easy.

The next factor is belief, which made me achieve my goal. I believed that I could make it.

Last is action. This factor helped me to put what I visualised and believed into action.

My journey started back in 2018 after completing my second Honour's degree. I always knew that I needed to further my studies, but I never believed in myself. I had to motivate myself intrinsically that I could get a Master's degree. My fear was how and where to I start. I acknowledged the fact that fear and anxiety can stand in the way of students' motivation and active participation.

I searched the UNISA website for all the Master's degree qualifications on offer. I came across UNISA's research focus areas and the Department of Curriculum Studies. I went through a list of supervisors, and noticed Professor MT Gumbo's name and his office contact number appearing on the list as a Technology Education specialist. I contacted him for more information and discussed with him what I was intending to study. He gave me the advice I needed. He then asked me about a supervisor. I replied by asking him, 'Will you please be my supervisor?' and he replied 'Yes', and that is how my journey with Professor Gumbo started.

I submitted my research outline to him so that he could advise me before I attached it to my application. Through the journey of my degree, I learnt to be hard-working. Professor Gumbo motivated me throughout this journey. Sometimes on receipt of

feedback from him I would be demotivated and wanted to quit, but after my call to him I kept on pushing because of how he motivated me over the phone. The road has not been easy. I had sleepless nights trying to correct every feedback that the Professor gave me. On some resubmissions the feedback I received from him would be like, 'The previous draft was better than the current draft', yet I thought I was on the right track.

When I was about to start with my methodology chapter, COVID-19 struck globally. I had to change my methodology to adhere to COVID-19 regulations. My plan was to conduct face-to-face interviews, and unfortunately that changed to email-based interviews. I had to contact Professor Gumbo to discuss my plans with him and he offered me some advice as usual. His advice helped me to move on with my study.

Here I am today, at the end of my academic journey. My journey does not end here, and I have applied for a PhD, and again I requested Professor Gumbo to supervise me and he has agreed.

'Winners embrace hard work. They love the discipline of it, the trade-off they're making to win. Losers, on the other hand, see it as punishment. And that's the difference' – Lou Holtz.

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APPENDICES

Appendix A: Request permission to conduct interviews



Request for permission to conduct research at ORBIT TVET COLLEGE-MANKWE CAMPUS

Title of the title of your research: **The theory-practice imbalance in the Electrical Engineering subject at a Technical Vocational Education and Training College: Implications for student training.**

Date: 16 August 2021

Name of the person to who you address the request: Mr D Mokoena

Department of the person: College Principal

Contact details of the person: 014 592 7014

email address: dmokoena@orbitCollege.co.za

Dear Mr D Mokoena,

I, Gontse Montwedi am doing research under supervision of Professor MT Gumbo an M&D Coordinator in the College of Education towards an M Ed at the University of South Africa. We have funding from ORBIT TVET COLLEGE for tuition fee. We are inviting you to participate in a study entitled: **The theory-practice imbalance in the Electrical Engineering subject at a Technical Vocational Education and Training College: Implications for student training.**

The aim of the study is exploring the theory-practice imbalance in the TVET College programmes at Moses-Kotane Local Municipality in the North-West

Province. Your College has been selected because of its relevancy to my study. The study will entail me visiting both Electrical Engineering lecture rooms and workshops and visiting five different Electrical Engineering companies where the students will be placed for their work-based experience (WBE).

The benefits of this study are College improved academic performance and both lecturers and students will be able to balance theory and practice. Potential risks that might be experienced are psychological, physical and economic harm. There will be no reimbursement or any incentives for participation in the research. Feedback procedure will entail a seminar where I will share the findings, publish the findings, provide them with the link to access my study.

Yours sincerely



Gontse Montwedi
Researcher

Appendix B: Approval from DHET to conduct interviews

14 No. 39583

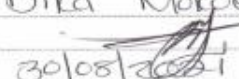
GOVERNMENT GAZETTE, 8 JANUARY 2016

DHET 004: APPENDIX 1: APPLICATION FORM FOR STUDENTS TO CONDUCT RESEARCH IN PUBLIC COLLEGES

FOR OFFICIAL USE

DECISION BY HEAD OF COLLEGE

Please tick relevant decision and provide conditions/reasons where applicable

Decision		<i>Please tick relevant option below</i>
1	Application approved	<input checked="" type="checkbox"/>
2	Application approved subject to certain conditions. <i>Specify conditions below</i>	<input type="checkbox"/>
3	Application not approved. <i>Provide reasons for non-approval below</i>	<input type="checkbox"/>
NAME OF COLLEGE		
ORBIT TVET College		
NAME AND SURNAME OF HEAD OF COLLEGE		
Oika Mokoena		
SIGNATURE		
		
DATE		
30/08/2016		



Appendix C: Participant information sheet

Date: 30 AUGUST 2021

Title: The theory-practice imbalance in the Electrical Engineering subject at a Technical Vocational Education and Training College: Implications for student training

DEAR PROSPECTIVE PARTICIPANT

My name is Gontse Montwedi, and I am doing research under the supervision of Professor MT Gumbo (insert supervisor's name), an M&D Coordinator in the College of Education towards a M ed at the University of South Africa. We have funding from ORBIT TVET COLLEGE of Funding Body if applicable) for tuition. We are inviting you to participate in a study entitled the theory-practice imbalance in the Electrical Engineering subject at a Technical Vocational Education and Training College: Implications for student training.

WHAT IS THE PURPOSE OF THE STUDY?

This study is expected to collect important information that could benefit the lecturers and students in balancing theory and practice and companies to align themselves with the College curriculum and outputs expected by the end of the student's placement.

WHY AM I BEING INVITED TO PARTICIPATE?

You are invited because you are lecturing level 4 students. I obtained your contact details from the College principal Mr D Mokoena. The total number of participants is twenty-nine.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

Describe the participant's actual role in the study. The study involves semi-structured interviews. You will be expected to part-take in the research activities as follows: one day for observation and another one day to complete an email interview which will take you 30 minutes to complete.

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason, however once you have submitted a questionnaire be advised that it will not be possible to withdraw.

ARE THERE ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

The following risks may occur:

- Psychological risk can put participants in situations that may make them feel uncomfortable in order to learn about their reaction to a situation. Economic risk can manifest in multiple ways depending on the study. I should consider any costs participants would have to bear in order to participate in the study such as travel, childcare, food, etc.

Physical risk for example, if I ask my participant to exert themselves beyond their resting state and/or there is a possibility for injury as the result of participating in the study, this risk should be described in the consent form and information should be provided as to what care the participant has access to, they should become injured.

However, should the above happen, below are the measures that will be taken:

- It is important that I develop an appropriate consent process which involves not only informing the participant at the beginning of the study but continuing to monitor their progress, allowing for withdrawal at any

point, and an informative debriefing period after the study.

- Payment will have to be made to compensate for time and other expenses that the participant may incur.
- Should a need arise; I may have to exclude participants whose health conditions increase the likelihood of injury.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this research (*this measure refers to confidentiality*) OR Your name will not be recorded anywhere, and no one will be able to connect you to the answers you give (this measure refers to anonymity). Your answers will be given a code number, or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings (*this measure refers to confidentiality*).

There will be no risks involved in participating in the study, as all the information gathered during this research will remain confidential and will be disclosed only in a scientific form without any identifiable names. You will not be exploited in any way by participating in the discussions, nor will you be placed at an advantage or a disadvantage or exposed to situations that you are not prepared for.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

Hard copies of your answers will be stored by me for a period of five years in a locked cupboard/filing cabinet in my office for future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Indicate how information will be

destroyed if necessary (*e.g. hard copies will be shredded and/or electronic copies will be permanently deleted from the hard drive of the computer using a relevant software programme*).

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

There will be no remuneration. No financial losses will be incurred due to the study.

HAS THE STUDY RECEIVED ETHICS APPROVAL?

This study has received written approval from the Research Ethics Review Committee of the, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

If you would like to be informed of the final research findings, please contact Gontse Montwedi on 072 762 6972 or email montwedigontse@yahoo.com. The findings are accessible for _____ (insert time frame).

Should you require any further information or want to contact me about any aspect of this study, please contact me at 072 762 6972; work number: 014 555 2924 email address: montwedigontse@yahoo.com

Should you have concerns about the way in which the research has been conducted, you may contact Professor M Gumbo; Tel: 012 429 3339; Email: gumbomt@unisa.ac.za

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

A handwritten signature in black ink, appearing to be 'G.M.' or similar, written in a cursive style.

(insert signature)

Gontse Montwedi

Appendix D: Consent to participate in this study

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and am prepared to participate in the study. I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the _____ (insert specific data collection method).

I have received a signed copy of the informed consent agreement.

Participant Name & Surname (please print)

Participant Signature

Date

Researcher's Name & Surname (please print) GONTSE MONTWEDI



Researcher's signature

30 AUGUST 2021

Date

Appendix E: Observation tool

	Yes	No	Comments
Lecture rooms			
1. Do students understand theory and practice in Electrical Engineering programme?	X		Students were participating fully during the lesson.
2. Are the lecturers ensuring that theory-practice is balanced?	X		Lecturers were giving practical examples.
3. Were there any obstacles encountered at campus M during balancing theory and practice?	X		There is shortage of material and poor attendance due to COVID-19.
4. Can obstacles be avoided?	X		
Workshops			
5. Were the students given the relevant personal protective equipment relevant for Electrical Engineering?	X		All students were in their PPE's
6. Were there any workbooks for Electrical Engineering subject given to students?	X		The senior lecturer designed the workbooks that were given to students.

7. Was the time allocated for practicums sufficient?		X	The time allocated was very insufficient.
8. Was there any schedule of lecturer's daily and weekly plans?	X		Both lecturers were in possession of their subject files.
9. Were there any safety signs displayed?	X		
10. Were machineries safe for use?	X		
11. Is the any evacuation door?	X		
Electrical Engineering companies			
12. Were the students given orientation on their first day?	X		The host employer inducted the students on their first day at the workplace.
13. Was safety a priority?	X		Safety is always a priority.
14. Does the employer understand both theory and practice?	X		The host employer always relates practice to theory that was given at College.
15. Is there any plan in place to ensure that theory and practice are balanced?	X		The lecturers provide students with logbooks prior to their placement at a company.

Appendix F: Students interview guide

Interview guide for students

Biographical details:

1. Name:
2. Gender:
3. Programme and level:

Questions to guide the interview

1. What is your understanding of theory and practice in your programme?
2. What creates the imbalance between theory and practice?
3. What causes obstacles that prevent you as students from excelling in both and theory and practice?
4. How can more practice projects assist in preventing obstacles that hinder you to balance between theory and practice?
5. Briefly, explain factors that affect you during your Electrical Engineering practicums.
6. What role can your lecturers play to ensure that theory and practice are balanced?
7. In your view, state the maximum time that should be allocated for both your theory in lecture rooms and for practicums in workshops. Explain why?
8. In your view, how important is practice in your programme?
9. What do you think your lecturer(s) can do better so that you can excel in both theory and practice?
10. What changes need to be made in your programme to ensure a theory-practice balance?
11. What are the practical strategies that can be applied to ensure this theory-practice?

Appendix G: Lecturers interview guide

Interview guide for lecturers

Biographical details:

1. Name:
2. Company name:
3. Qualifications:
4. Years of service:

Questions to guide the interview

1. Please tell me about the importance of a theory-practice balance in the Electrical Engineering programme.
2. Are there any obstacles that you encounter in the programme towards theory-practice balance and if so, please mention and explain them?
3. In your opinion, how do these obstacles affect the theory-practice balance in the Electrical Engineering programme?
4. What practical activities do you plan for the training of students in the programme?
5. How do you plan these practical activities for the training of students in the programme?
6. How long, according to your subject guidelines, should students spend time in the workshop compared to theory?
7. How do the Electrical Engineering students experience the obstacles that you have just mentioned?
8. Mention a few obstacles affecting your students during their practicums.
9. How do you ensure that students are given sufficient time in workshops during their practicums?
10. In your view, how important is practice in Electrical Engineering programme?
11. What can you do to ensure that your students can excel in both theory and practice?
12. How can the programme be designed so that it addresses the theory-practice balance problems?

Appendix H: HoD interview guide

Interview guide for Head of Department

Biographical details:

1. Name:
2. Qualifications:
3. Number of years as an HoD:

Questions to guide the interview

1. How does your College approach the theory-practice balance in teaching-learning activities?
2. In your opinion, how do these obstacles affect the theory-practice balance in the Electrical Engineering programme?
3. Mention obstacles that affect students in implementing practice in their respective workshops.
4. Mention a few obstacles affecting your students during their practicums.
5. How do you ensure that student's workshops are conducive for learning Electrical Engineering practicums?
6. How do you ensure that the tools and materials used in the workshop are the ones used in Electrical Engineering companies?
7. In your view, how important is practice in Electrical Engineering programme?
8. What plan do you have in place to ensure that theory and practice is balanced?
9. What can you do differently in your department to ensure that theory and practice are balanced?

Appendix I: Interview guide for host employers

Interview guide for host employers

Biographical details:

1. Name:
2. Duration of company:
3. Company registration number:

Questions to guide the interview

1. Please tell me about the importance of a theory-practice balance in the Electrical Engineering workplace.
2. Are there any obstacles that the students encounter in their workplace experience towards theory-practice balance and if so, please mention and explain them?
3. Mention obstacles that affect students in implementing practice during their work-based experience.
4. In your opinion, how do these obstacles affect the students in combating theory-practice balance in the Electrical Engineering workplace?
5. Mention a few obstacles affecting students during their work-based experience.
6. In your view, how important is practice in Electrical Engineering programme?
7. What plan do you have in place to ensure that students practice what they learnt at College during work-based experience?
8. What can you do differently in your company to ensure that theory and practice are balanced?

Samples of interview transcripts

Appendix J: Interview transcript of students

Biographical details:

1. Name:
2. Gender:
3. Programme and level:

Questions in the interview guide

1. What is your understanding of theory and practice in your programme?

What we learn in class, is what we practice in workshops. My understanding of the importance of theory-practice is that what we learn in class is what we practice in workshops and we should be able to make both a priority. Practical is where we prove the theory. Practical is where we prove the theory.

2. What creates the imbalance between theory and practice?

Practical's must be given enough time as theories. We as students need to be given enough time to complete our practical tasks, just like as we do with our theory periods. We do not have enough engineering background, hence the huge gap between theory and practice. Not having enough engineering background. Lack of resources.

3. What causes obstacles that prevent you as students from excelling in both and theory and practice?

Insufficient time allocated on periods. Our male lecturer is not yet an artisan, he does not have workplace experience, on that note he is unable to provide us with relevant tools and materials to do the job, he does not even know time that should be allocated per task. Having an inexperienced, the lecturer poses a serious challenge to us as students, the lecturer cannot even organise excursions for us as students so

that we can learn see what other companies do at different Electrical Engineering companies. Lecturer is unfamiliar with the requirements of workplaces; hence he cannot relate theory to practice when lecturing. Some students understand practicals more than theory. We do not have enough engineering background; hence the huge gap between theory and practice.

4. How can more practice projects assist in preventing obstacles that hinder you to balance between theory and practice?

Better theory and practical knowledge. Gaining more skills and practical experience.

5. Briefly, explain factors that affect you during your Electrical Engineering practicums.

Working in groups, suggests that a group should have at least 2 or 3 members. Lack of equipment. Our College does not procure enough resources for practice, yes, we receive the overalls and safety boots, but we lack a lot of resources to do our practice. For the theory, we are given textbooks for all our subjects, but when it comes to practice, we lack things such as cables, Vero boards and circuit breakers.

6. What role can your lecturers play to ensure that theory and practice are balanced?

Provide relevant tools and materials to do the job. Ensure that more practical periods are allocated in the timetable. Excursion. Extra classes for theories. Peer Academic Leaders.

7. In your view, state the maximum time that should be allocated for both your theory in lecture rooms and for practicums in workshops. Explain why?

Lecturers should ensure that 60% practical is offered, and 40% theory offered; visual learning is easy. The practical should be 50% and the theory should be 50%. The theory becomes easy after practical. In a week, there should be 2 days of theory and 2 days of practical, then Friday for short practical or theory test. In a week, there should be 2 days of theory and 2 days of practical, then

Friday for short practical or theory test.

8. In your view, how important is practice in your programme?

It helps us to gain knowledge in the in the real workplace. Since we will be doing more practical, we will acquire more skills.

9. What do you think your lecturer(s) can do better so that you can excel in both theory and practice?

Provide us with extra classes. We need more practical and theory. We need to go on excursions more often.

10. What changes need to be made in your programme to ensure a theory-practice balance?

Lecturers to give us tests for practical and theory. Fewer members in a group when doing practical.

11. What are the practical strategies that can be applied to ensure this theory-practice?

Sufficient time at the workplace. At least 3 excursions in a year for exposure. More video tutorials. Skills competitions with other campuses or institution.

Appendix K: Interview transcript of lecturers

Biographical details:

1. Name:
2. Company name:
3. Qualifications
4. Years of service:

Questions in the interview guide

1. Please tell me about the importance of a theory-practice balance in the Electrical Engineering programme.

Theory-practice help students to be able to apply the knowledge in the work environment, it also improves their skills when they do practicums and to be able to fit in and align with the requirements of their job description. Theory-practice help students to be able to put theory into practice at the workplace, it also improves their skills when they do practicums and to be able to fit in and align with the requirements of their job description.

2. Are there any obstacles that you encounter in the programme towards theory-practice balance and if so, please mention and explain them?

Yes, the obstacles we encounter towards theory-practice balancing are lack of material, absenteeism due to COVID-19 and lockdown that was extended. We are also encountering poor performance of students who left high school with grade 9 and came to register at the College. Lack of motivation from students due to lockdown that was extended, and they only attend one week in and one week off, they lose focus and we hardly complete the curriculum because of time constraints.

3. In your opinion, how do these obstacles affect the theory-practice balance in

the Electrical Engineering programme?

The method of lecturing towards students is creating more challenges as they do not have sufficient material to practice with and also lecturers should be remunerated for extra classes so that they can complete curriculum. For students to be motivated, they need to form study groups. Lack of panel boards in the workshops results in about six students sharing one board which poses a serious danger to students' lives due to COVID-19.

4. What practical activities do you plan for the training of students in the programme?

House wiring. Students are given a panel to wire lights, switches, stoves, distribution board and three pin plugs. Students are required to wire energy meter and perform fault-finding. I will ensure that my students are allocated four periods on a daily basis for two days per week.

5. How do you plan these practical activities for the training of students in the programme?

Students should be allocated four periods on a daily basis two days per week.

6. How long, according to your subject guidelines, should students spend time in the workshop compared to theory?

The students need to spend 60% of the academic year for practicums and 40% for theory.

7. How do the Electrical Engineering students experience the obstacles that you have just mentioned?

When the absent students come the next day, I have to repeat what was lectured the previous day, that becomes a challenge to the students that were present.

8. Mention a few obstacles affecting your students during their practicums.

For the theory, we give textbooks for all subjects to students, but when it comes

to practice, we lack things such as cables, Vero boards and circuit breakers. There is a problem of students sharing tools, which results in some tools becoming damaged and stolen. Our workshops lack measuring instruments and some components are old.

9. How do you ensure that students are given sufficient time in workshops during their practicums?

I arrange with other lecturers to give me their periods so that I can complete practicums.

10. In your view, how important is practice in Electrical Engineering programme? Students find it easy when they enter the labour market.

11. What can you do to ensure that your students can excel in both theory and practice?

Enforce attendance policy, in that way I will have less students being absent, therefore students will be able to do practical and theory as and when they are required to do it, in that way they will excel in both theory and practice due to less absenteeism. As lecturers we always ensure that correct tools and materials are always used in our workshops.

12. How can the programme be designed so that it addresses the theory-practice balance problems?

Material needs to be procured on time. Sufficient time to be allocated on the timetable.

Appendix L: Interview transcript of head of department

Biographical details:

1. Name:
2. Qualifications:
3. Number of years as an HoD:

Questions in the interview guide

1. How does your College approach the theory-practice balance in teaching-learning activities?

The timetable is structured to have both theory and practical.

2. What hinders your lecturers from ensuring that theory and practice are balanced?

The challenge is one of my lecturers lack practical and industrial experience which in turn affects the students' performance in both theory and practice.

3. In your opinion, how do these obstacles affect the theory-practice balance in the Electrical Engineering programme?

Lecturer might only concentrate on theory then leaving practicals due to lack of knowledge.

4. Mention obstacles that affect students in implementing practice in their respective workshops.

Lack of tools, and components.

5. Mention a few obstacles affecting your students during their practicums.

Sharing of limited resources like tools.

6. How do you ensure that student's workshops are conducive for learning Electrical Engineering practicums?

We ensure that the workshops are conducive for learning, by making sure that the workshop is cleaned on a daily basis and that each student has a workbook.

7. How do you ensure that the tools and materials used in the workshop are used correctly?

Electrical Engineering students need to be provided with insulated tools to protect them from electrical shock and the lecturers monitor students during the use of tools.

8. In your view, how important is practice in Electrical Engineering programme?

It prepares the students for the labour market and to become entrepreneurs.

9. What plan do you have in place to ensure that theory and practice is balanced?

As Campus M we plan in advance.

10. What can you do differently in your department to ensure that theory and practice are balanced?

Training individual lecturers that are not familiar with the practical.

Appendix M: Interview transcript of host employer

Biographical details:

1. Name:
2. Duration of company:
3. Company registration number:

Questions in the interview guide

1. Please tell me about the importance of a theory-practice balance in the Electrical Engineering workplace.

It is important for theory-practice to be balanced because it is not easy to do practice without theory, they need both. Therefore, it is important for students to have knowledge and skills. Every theoretical work requires practice, striking a balance between the two is important. This requires capacitance in both worlds. It is important that people know how to work with their hands. It is important for theory-practice because it is not easy to do practice without theory, they need both. Theory and practice play a vital role for Electrical Engineering students.

2. Are there any obstacles that the students encounter in their workplace experience towards theory-practice balance and if so, please mention and explain them?

Some students are not good with theory; you find that they are good in practice, others are very good in theory but not in practice. We should assist them to ensure balance between the two.

3. Mention obstacles that affect students in implementing practice during their work-based experience.

The students have to learn to adjust to working hours as per the company

policies, as they need to do more practice at the company. My take is they did most of theory at the College.

4. In your opinion, how do these obstacles affect the students in combating theory-practice balance in the Electrical Engineering workplace?

The late coming issue does not benefit the students themselves as it defeats the purpose of theory-practice balance. Moreover, students need to adjust to the workplace policies before the process can be effective.

5. Mention a few obstacles affecting students during their work-based experience.

The students lack enough practicum knowledge from Campus M. The machines and tools that are used at TVET Colleges are not what we are currently using. Material that is outdated, insufficient practice offered at provided at College O, specifically at Campus. The machines and tools that are used at TVET Colleges are not what we are currently using.

6. In your view, how important is practice in Electrical Engineering programme?

It exposes students to the world of industry. Capacitates the students within the skills.

7. What plan do you have in place to ensure that students practice what they learnt at College during work-based experience?

In our company we mostly focus on practical. I will design a workbook that addresses theory in relation to the practical to be offered to ensure balance of theory-practice. Students are provided with appropriate training and guidelines on how to use tools correctly.

8. What can you do differently in your company to ensure that theory and practice are balanced?

Most companies are concerned with the delivery of work, I would make sure that the very same work be theorised in the form of booklets where learning

programmes can be conducted making sure that there is a balance between the learning of work and the actual doing of it. I will ensure that during their placement, students are given a new task on a daily basis, obviously under the guidance of the artisans. Establish a good working relationship with Campus to ensure that the campus aligns itself with what is required at the workplace. "I can advise Campus M to stick to our operating and tasks and be informed of our overall operations. In simplicity I would request hosted campus to align themselves with our operations.

Appendix N: Ethical clearance certificate



UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2021/08/11

Ref: **2021/08/11/56007574/38/AM**

Dear Ms G Montwedi

Name: Ms G Montwedi

Student No.:56007574

Decision: Ethics Approval from
2021/08/11 to 2024/08/11

Researcher(s): Name: Ms G Montwedi
E-mail address: 56007574@mylife.unisa.ac.za
Telephone: 072 762 6972

Supervisor(s): Name: Prof M.T. Gumbo
E-mail address: gumbomt@unisa.ac.za
Telephone: 012 429 3339

Title of research:

The theory-practice imbalance in the Electrical Engineering subject at a Technical Vocational Education and Training College: Implications for student training

Qualification: MEd Technology Education

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2021/08/11 to 2024/08/11.

*The **low risk** application was reviewed by the Ethics Review Committee on 2021/08/11 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.
2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.



University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.
4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.
6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
8. No field work activities may continue after the expiry date **2024/08/11**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2021/08/11/56007574/38/AM** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Kind regards,



Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
motlhat@unisa.ac.za



Prof PM Sebate
EXECUTIVE DEAN
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Appendix O: The language editing certificate



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February 2022

To whom it may concern:

This is to certify that I have professionally edited and formatted the following thesis:

The theory-practice imbalance in the Electrical Engineering subject at a Technical Vocational Education and Training College: Implications for student training

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