EXPLORING ARTISANSHIP THROUGH WORKPLACE LEARNING AT A SOUTH AFRICAN MINE

by

Noel Patrick Smit
Bachelor of Law
Baccalaureus Educationis (Honours) Training and Development
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Diploma in Education

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Supervisor: **Prof BL Frick**

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DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the owner of the copyright thereof (unless to the extent explicitly otherwise stated) and that I have not previously in its entirety or in part submitted it for obtaining my qualification.

Signature: **NP. Smit**

Date: **December 2017**

ABSTRACT

The workplace provides a fertile learning environment where apprentices can improve and fine-tune their trade to develop from apprentice to artisan. The experience and expertise of a seasoned employee transferred to the novice apprentice in this setting through informal workplace learning could contribute to the development of artisanship. Apprentices apply trade theory to what was learned during formal training and reflect on this learning by trial and error. Workplace learning could be provided in the mining context through different modes that could include formal, non-formal as well as informal learning. Various authors emphasise that the workplace provides a legitimate setting for informal workplace learning, which has received increased prominence over the past years. Also, the literature suggests that employees develop significantly more skills and expertise in the workplace through informal learning, which was identified as a leading mode for learning delivery in that environment. Learnerships offered by a mine in South Africa for the development of artisans as a requirement in its Social and Labour Plan to drive community development and organisation sustainability provide a unique opportunity to focus on informal workplace learning. This study explored artisanship through workplace learning to investigate which organisational factors (if any) influenced artisan development, how informal workplace learning is facilitated, and how it occurs at a mine. Data were collected through 18 semi-structured interviews, which were analysed by way of conventional content analysis. The results indicated that informal workplace learning facilitated the development of artisan apprentices in the mining sector.

KEYWORDS: Informal learning, workplace learning, institutional learning, artisanship, apprenticeship, learnership

OPSOMMING

Die werkplek bied 'n vrugbare leeromgewing waar die vakleerlinge hulle vaardigheid kan verbeter en verfyn om van vakleerling tot vakman te ontwikkel. Die ervaring en kundigheid van 'n ervare werknemer wat oorgedra word aan die beginner-leerder in hierdie konteks deur middel van informele werkplek-leer kan bydra tot die ontwikkeling van vakmanskap. Vakleerlinge pas vakteorie toe op dit wat tydens formele opleiding geleer is en besin proefondervindelik oor hierdie leer. In die mynbou-konteks kan werkplek-leer op verskillende wyses voorsien word; dit kan formele, nie-formele sowel as informele leer insluit. Verskeie skrywers beklemtoon dat die werkplek 'n geldige plek bied vir informele werkplek-leer, wat verhoogde status oor die afgelope jare geniet het. Die literatuur dui ook daarop dat werknemers aansienlik meer vaardighede en kundigheid in die werkplek ontwikkel deur middel van informele leer, wat geïdentifiseer was as 'n voorkeurmetode vir die lewering van leer in daardie konteks. Leerlingskappe wat vir die ontwikkeling van ambagsmanne deur 'n myn in Suid-Afrika aangebied word as 'n vereiste in sy Sosiale en Arbeidsplan om gemeenskapsontwikkeling en organisatoriese volhoubaarheid te dryf, bied 'n unieke geleentheid om op informele werkplek-leer te fokus. Hierdie studie het vakmanskap deur werkplek-leer ondersoek om vas te stel watter organisatoriese faktore (indien enige) vaardigheidsontwikkeling beïnvloed, hoe informele werkplek-leer gefasiliteer word, en hoe dit by 'n myn plaasvind. Data is ingesamel deur 18 semi-gestruktureerde onderhoude te doen wat deur middel van konvensionele inhoudsanalise ontleed is. Die resultate het getoon dat informele werkplek-leer die ontwikkeling van vakmanvakleerlinge in die mynbousektor fasiliteer.

SLEUTELWOORDE: Informele leer, werkplek-leer, institusionele leer, vakmanskap, vakleerlingskap, leerlingskap

DEDICATION

I DEDICATE THIS WORK TO:

My late father, Daniel Smit, who never had the opportunity to attend any school, yet he taught me so much about life, about never giving up. He always believed that you can succeed.

My late father-in-law, Hermanus Saunderson, who taught me what it is to be a loving husband to my wife Sabina (his beautiful daughter) and a parent to our children, Hermann, Courtney, Donwin and Manwell.

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General Mine Manager
Human Resources Manager
Training Manager
Engineering Manager
Senior Training Officer for Engineering Training

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LIST OF ACRONYMS AND ABBREVIATIONS

ADP	Artisan Development Programme
CHE	Council of Higher Education
DHET	Department of Higher Education and Training
DMR	Department of Mineral Resources
ETQA	Education and Training Quality Assurer
FET	Further Education and Training
FETC	Further Education and Training College
HE	Higher Education
HR	Human Resources
LOM	Life of mine
MHSA	Mine Health and Safety Act, No. 29 of 1996
MPRDA	Mineral and Petroleum Resources Development Act, No. 28 of 2002
MQA	Mining Qualifications Authority
MTA	Manpower Training Act, No. 56 of 1981
NAMB	National Artisan Moderation Body
NCV	National Certificate Vocational
NQF	National Qualification Framework
NSDS	National Skills Development Strategy
PLA	Programme-led Apprenticeship
QCTO	Quality Council for Trades and Occupations
SAQA	South African Qualifications Authority
SDA	Skills Development Act, No. 97 of 1998
SDF	Skills Development Fund
SETA	Sector Education and Training Authority
SIVOS	Sishen Vaardigheidsontwikkelingsentrum
SLP	Social and Labour Plan
TVET	Technical Vocational Education and Training
UK	United Kingdom
VET	Vocational Education and Training
WPL	Workplace learning

CHAPTER 1
ORIENTATION TO THE STUDY

1.1 INTRODUCTION

Adults have the ability to learn effectively throughout life (Farrell, 2013:37). Companies capitalise on this ability by not only providing training and development opportunities to employees, but also by using this ability to respond to market conditions, to stay in business and maintain their competitive advantage. The workplace provides an opportunity for all employees to learn and for experienced employees to share their knowledge with novice employees.

Novices acquire knowledge and skills and sometimes obtain qualifications in a specific field of expertise by means of such sharing. Apprentices in particular may benefit from workplace-based opportunities by learning from experienced artisans. Artisan development through practical workplace learning (WPL) gives the apprentice a unique opportunity to learn from experience by trial and error. Artisan apprentices at the mining workplace setting can develop from novice to artisan through situated learning in the workplace. From this premise the study focused on practical WPL, the kind of learning that happens 'perchance'.

Much of this WPL takes place informally, which means that it is often not recognised or measured in the artisan development programme (ADP). We thus understand little about the contribution practical WPL makes in developing artisan competence and expertise. This study therefore focused on artisan development through practical WPL within a particular context – that of an iron ore mine[1] in the Northern Cape in South Africa (referred to as 'the mine' in this study).

A typical training and development path of the artisan in the mine where this study took place would be formal theoretical learning at a technical and vocational training college (TVET college)[2] from N1 to N2,[3] followed by practical training at a skills

[1] The iron ore mine is near Postmasburg in the Northern Cape, a province of South Africa. The mine started in 2009 and ramped up to full iron ore production in 2011 at 9 million tonnes direct shipping ore per annum. The mine has a labour complement of 2 863 people ranging from semi-skilled, skilled, technical and professionally qualified employees.
[2] The nearest TVET College to Postmasburg where the mine was situated is in Kathu, approximately 80 km away. Most of the respondents attended this college to complete their trade theory.
[3] National Certificate in Engineering Studies (N1 to N3)

development centre, after which the apprentice will attend informal on-the-job WPL in the mine. Practical WPL will thus follow after formal theory-based and practical training, which is a combination of coaching by an artisan, master artisan, engineering foreman or general engineering supervisor[4] (later referred to as the coach), fault-finding trial and error actions on mining equipment, repair and maintenance of faulty equipment, and engineering assistance during plant shutdowns. No formal classes are attended and learning happens informally as the work progresses using the trade theory as a reference framework.

During the practical WPL at the mine, the apprentice must be exposed to the entire scope of the trade as pre-determined by the curriculum of the occupational trade qualification to ensure that once qualified, he or she will be competent to become a productive worker in the mining industry, thus increasing the available artisan pool. The practical WPL experience is captured in a logbook indicating what practical exposure an apprentice has undergone. The apprentice can only apply to write the national trade test after 18 months of practical on-the-job WPL and completion of all practical modules. The successful apprentice is issued with an N3 national certificate on National Qualification Framework (NQF) level 5 in the relevant trade by the Quality Council for Trades and Occupations (QCTO) in terms of section 26D (4) read with section 36 of the Skills Development Act, No. 97, 1998 (SDA). This qualification is endorsed by the Mining Qualifications Authority (MQA) and the artisan may be appointed in the suitable vacancy in the industry because the qualification is generally accepted as proof of the competency and skills in a particular trade of the artisan. The apprentice has now developed into an artisan through practical WPL.

1.2 MOTIVATION FOR THE STUDY

Training and development in general, and work-related learning in particular, are vital for employees to be able to respond to the changing work demands imposed by the market and society (Doornbos, Bolhuis & Denessen, 2004:174). There is a need to

[4] In the mine where the study was conducted the HR organisational structure in the Engineering Department is as follows: Maintenance operator → Artisan → Master Artisan → Engineering Foreman → General Engineering Supervisor → Engineering Section Manager → Engineering Manager → General Mine Manager. The apprentice is positioned between the Maintenance Operator and the Artisan and is assigned to a qualified artisan for WPL according to the respective trade.

ensure the continuous upgrading of knowledge and skills of the workforce within the mining sector to ensure industry competiveness and a measurable increase in the intermediate skills pool especially in artisan, technician and related occupations. The call by mining companies for increased practical workplace experiential learning opportunities to artisan apprentices provided by the mining sector seeks not only to increase the pool of artisans, but also to decrease unemployment thereby safeguarding sustainability in the sector.

South Africa is a growing economy in a global market that faces many challenges with regard to people development, including artisan skills in the mining industry (Rasool & Botha, 2011). Rasool and Botha (2011:1) claim that skill shortages in South Africa still exist. This puts a challenge to government and the private sector to promote skills development. The mining sector in South Africa is cognizant of the small pool of intermediate skills, especially artisan skills, which are too low to support national and sector development and growth. Rasool and Botha (2011:1) assert that regardless of a number of educational reforms, like changes to school curricula, South Africa still experiences a considerable shortage of skills. According to the National Skills Development Strategy III (NSDS III) of 2011, the current workforce is not keeping up with the skills needed to remain competitive in an increasingly knowledge-based economy (NSDSIII, 2011).

Various national initiatives provide a support structure to artisan training in the corporate sector. The NSDS III (RSA, 2011) seeks to encourage and support large corporate employers and state-owned enterprises to cooperate with the relevant education and training institutions. This engagement is aimed at providing the required training resources and experienced staff to address specific skills development needs of artisans through focused practical WPL. The mine where this study was completed offered artisan apprentices an 18-month on-the-job practical WPL opportunity before obtaining the national qualification in their trade of choice.

The Sector Education and Training Authority (SETA) in South Africa also plays a prominent role in contributing towards artisan practical WPL and sustainable employment, especially through their discretionary funds that add to the capital investment from mining companies to practical WPL opportunities. In terms of

section 3(1)(b) of the Skills Development Levies Act, No. 9 of 1999 (as amended[5]) (RSA, 1999) every employer has to contribute 1% of the payroll towards a skills development fund (SDF). Revenue created by the SDF will be applied for the training and development of skills within the mining sector, including artisan training promulgated by the SDA.

The MQA is a SETA responsible for the administration of skills development programmes for the mining and minerals sector in South Africa. The MQA was first established under the Mine Health and Safety Act, No. 29, 1996 (MHSA) and later registered as a SETA under the SDA, as amended[6]. The Department of Mineral Resources (DMR) oversees the application of the MHSA as amended, as well as the Mineral and Petroleum Resources Development Act No. 28 of 2002 (MPRDA) as amended[7]. The DMR and the MQA have a keen interest in training and development within the mineral sector. The objective of the MPRDA is to facilitate meaningful development of historically disadvantaged South Africans. This requirement is outlined in the Amendment of the Broad-Based Socio-Economic Empowerment Charter for the South African Mining and Minerals Industry Republic of South Africa, also called the Mining Charter (RSA, 2010). At the time of this study the 2010 Mining Charter is in the process of being reviewed.[8] This legal framework provides for training and development within the mineral sector and is not applicable only to formal learning.

The core business of the mine is the extraction of iron ore and the selling thereof to off-shore clients, not training and development. However, the workplace has to provide an opportunity and setting for WPL that could be formal as well as informal. WPL in general, both formal and informal, is supported by an extensive legal framework in the mining sector in South Africa, including the mine where this study took place. A clear focus on artisan development drives this programme along clear

[5] The Skills Development Levies Act, No. 9 of 1999 was amended by the Skills Develepment Levies Amendment Act, No. 24 of 2010.
[6] Refer to the Skills Development Amendment Act, No. 31 of 2003.
[7] The MPRDA was amended by the Mineral and Petroleum Resources Development Amendment Act, No. 49 of 2008.
[8] The Minister of Mineral Resources, Mosebenzi Joseph Zwane, published the draft Reviewed Broad Based Black Economic Empowerment Charter for the South African Mining and Minerals Industry in the *Government Gazette* No. 39933 of 15 April 2016, to invite interested and affected parties to submit written representations on the draft Reviewed Mining Charter.

skills development targets set out in the Social and Labour Plan (SLP)[9] of the particular company. The SLP is a guiding document developed in terms of Regulation 42(1)(a) of the MPRDA which stipulates that an application for a mining right must be accompanied by an SLP contemplated in Regulation 46, which on approval is valid until a closure certificate in respect of that mine is issued in terms of Regulation 43. The SLP must make provision for skills development within the company and in its feeding employee community.

Different learnership programmes are on offer to the community, of which artisan development is the flagship that forms part of the engineering training programme. These learnerships are combinations of both formal and situated learning, as it is required from incumbents to attend formal classes at the company's HR Training and Development Centre except in the case of engineering apprentices. This formal training is followed by situated learning that consists of practical exposure in the pit where ore extraction occurs, the processing plant where ore is crushed and screened to product specifications, the engineering workshop where maintenance of all mining and plant equipment takes place, or the load-out station where the final product is loaded for offshore shipping.

This study focused on practical WPL in the engineering department of the mine where apprentices were exposed to learning and development opportunities that are different from formal, structured learning offered at a TVET college. Artisan apprentices accepted by the mine are required to take the practical WPL route after attending a formal theory-based programme at a TVET college followed by practical exposure at the Sishen Artisan Development Centre (more often refered to in the Northern Cape region as the *Sishen Vaardigheidsontwikkelingsentrum* (SIVOS))[10] to gain access to the trade test in order to complete their engineering qualification. The Department of Higher Education and Training (DHET) can only provide formal learning opportunities for artisans through its TVET college sector. Apprentices can only qualify as artisans after successful completion of 80 weeks' on-the-job training

[9] The SLP of mining companies is reviewed every five years and has to be approved by the DMR. Companies annually have to report on progress made against the SLP targets.

[10] SIVOS is an artisan development centre that provides practical training to all the Engineering learnerships as part of their apprenticeship training at the TVET College in Kathu. Learners are placed at different mines in the Northern Cape for on-the-job WPL after attending SIVOS. This included the respondents that participated in this study.

under the guidance of and coached by a suitably experienced coach for a prescribed period. Practical WPL is thus an important component of the ADP as it gives access to the trade test, which by its very nature is a practical test based on fault-finding.

With a life of mine (LOM)[11] prediction of 29 years since operations started in 2011, this particular mine had to secure a constant inflow of a skilled workforce including artisans, to sustainably position itself as a global producer of quality iron ore. Developing the expertise needed for skilled performance in the mining industry has become a seamless and ongoing process in a market under continuous pressure to provide the right product on time, in budget and with zero harm to employees. According to Yamnill and McLean, (2001:195), employees are the medium through which an organisation's competitive success can be achieved. The workplace can be recognised as a legitimate environment for learning new skills and knowledge that not only allow employees to participate more effectively in the ever-changing work environment, but will also increase the artisan pool in the mining industry.

The mine also had to position itself as an employer of choice where learning and development opportunities of its workforce took centre stage, and the ADP is one of many development programmes on offer. Coetzer (2007:417) claims that learning has become increasingly important to the continued existence of organisations 'not only for survival, but also because the ability to learn faster than your competitors may be the only sustainable competitive advantage'. Trained artisans are a scarce commodity in South Africa and mining companies offer competitive salaries with company-provided accommodation that results in frequent turnover of human resources in this field. Companies also implement other strategies such as promotions, market-related salaries, development opportunities, production bonuses, scarce skills and shift allowances to retain their artisans longer in their service. Providing skilled artisans to the mine, in an ever increasing scarcity of qualified artisans in South Africa, puts the artisan pool under further pressure. Artisan training and development is an expensive investment for any company and the intake of apprentices is hampered by budget constraints.

[11] LOM is a relevant prediction of the life of the mine based on the availability and future cost of minerals to make it profitable to mine such and stay in business.

The workplace provides a rich environment for learning (Le Clus, 2011:356). As such, practical WPL forms an integral part of vocational programmes. Establishing effective partnerships between education and training systems and employers to provide workplace training ensures that skills have real labour market relevance and that young people gain an early appreciation of and exposure to the world of work (see NSDSIII, 2011).

During practical WPL the occupational knowledge and practical learning assimilated during formal learning are applied in the workplace. The apprentice is exposed to real-life situations within the workplace, including all aspects of the artisan's occupation such as work ethics, discipline, housekeeping (everything in its place), safety, responsibilities and quality performance of work required by the mining industry. In all artisan trades this is the most significant and most difficult of the various learning processes and therefore the apprentice is supported in the workplace by a qualified workplace coach under the guidance of an engineering foreman or general engineering supervisor. These workplace coaches are qualified and experienced artisans and master artisans in the same trade for which the apprentice is registered. The apprentice is also rotated in a section to cover all practical modules of a specific trade. This practical WPL process is known as the 'on-the-job' learning process in the mining sector, allowing an apprentice to progressively and sequentially re-learn what he or she learned in the formal learning process at the TVET college to apply the competence in a real workplace setting through informal learning.

Skule (2004:9) claims that informal learning in the workplace creates the most important means of obtaining and developing the skills and competencies required by the organisation. The ADP was uniquely positioned at this mine where apprentices could acquire the skills needed by the engineering department. Skills transfer from the experienced coach to the novice apprentice happens outside a formalised, structured setting that characterises formal learning in a more undisturbed and open workplace setting with its own unique qualities that can never be similar to a formal learning environment. The engineering supervisor takes the role of a coach towards the novice apprentice and the work-related experience allows the coach to transfer those competencies needed by the apprentices to develop their own competence through trial and error in an informal way of doing

things. This type of skills and knowledge transfer in such a setting does not allow for a formal approach, as in most cases it is learning in the moment.

Competence in any occupation determines whether a person can apply and transfer learning at the workplace or across a variety of workplaces. Therefore, the most critical component of learning in artisan development is practical WPL, which takes place in the workplace through work activities performed by the apprentice. Formal education that the artisan apprentice received prior to his or her placement in the workplace setting in the company 'needs to be backed by IFL to be effective' (Ellström, 2001, cited in Svensson & Ellström, 2004:481).

Svensson and Ellström (2004:480) claim that in most cases the formal education learners receive improves their ability to assimilate informal learning at work. Apprentices will not be able to make the cognitive connection to repair a broken gearbox or other mechanical breakdown, or rewire an electrical distribution board, without the foundational knowledge of a particular trade acquired during formal education at the TVET college. They will struggle to make the connection with the experience of the coach or interact with his or her (the apprentices') peers and other employees on the particular issue, further enhancing their informal learning experience. The coach in the engineering department often does not have the time to explain in detail the complexities of a repair or a breakdown in a production environment that is under constant pressure to reach set production targets.

1.3 PROBLEM FORMULATION

From the discussion in section 1.2 above it can be construed that the practical WPL is a key component in the training and development of artisans within the mining industry, including the mining context where this study was undertaken. Rasool and Botha (2011:1) contend that the endorsement of the SDA created an enabling institutional and regulatory framework for expanding strategic investment in education and training across all economic sectors. The mining sector is one of South Africa's most influential economic sectors where skills development is to a great extent aligned with the provisions of the SDA and the NSDS III of 2011 that promote WPL as one of the strategic objectives of the DHET. These objectives

include practical WPL. The ADP is such an initiative between the DHET and the mining sector where DHET would focus on formal institutionalised learning while the mining industries focus on practical WPL.

The mine at which this study was done is no exception. Its primary focus is not training and development, but providing quality iron ore to its offshore clients. The mine has its own HR training and development centre[12] with a group of dedicated training instructors working under a training manager. Training interventions in the training centre take a more formal approach that includes facilitation of different learning programmes, assessment and moderation thereof. Learning in the mine is also facilitated by means of group discussions, mining equipment simulator training, coaching and coaching activities, practical demonstrations, and business simulation board games. WPL at the mine is a combination of formal and informal learning; however, this study focused on practical WPL during artisan development.

The primary objective of the mine is to produce hematite iron ore as per the conditions set out in the stipulations of its mining licence issued in terms of the MPRDA. Learning and development is not its core enterprise. However, in order to retain its licence to operate, the company has to provide learning and development opportunities to its employees and the feeding community as set out in its SLP. The licence to operate is issued by the DMR and is valid for five years only. The licence must be renewed every five years over the LOM of 29 years. The DMR will only renew the licence to operate if the mine can show compliance with its SLP targets on an annual basis. Artisan development was one of the mine's human resources development targets in the SLP for 2015-2016. The mine has to make financial provision for the implementation of the SLP in terms of the human resources development programme.

The mine is not a formal learning and development centre, but a business venture for high quality iron ore that is shipped to off-shore clients. The learning and development opportunities provided to artisan apprentices by the mine will thus be situated within the context of informal learning, and more so WPL. In this study

[12] The mine's HR Training and Development Centre offers different training programmes, ranging from learnerships for plant and mining operators and Engineering apprentices. Portable skills programmes are also offered to unemployed youth in Bricklaying, Masonry, Cabinet-making, Upholstery and Welding. Furthermore, permanent employees sometimes undergo work-related training in Safety, Induction, and a variety of soft skills programmes.

artisan development was positioned within the context of practical WPL in the mining industry and the factors influencing learning in the engineering department of the mine were highlighted.

When apprentices move from classroom-based instruction at the TVET college to on-the-job training, informal learning takes precedence. Practical WPL and artisan development in the iron ore mining industry is a continuous endeavour for as long as the industry experiences a skills shortage of qualified artisans. Yet research suggests that despite the prevalence of informal learning in the workplace, little is known about how informal learning can best be supported, encouraged, and developed (Marsick & Volpe, 1999:3). The organisation therefore needs to encourage the transfer of knowledge and skills among apprentices in the ADP through WPL, which may be informal in many ways. The limited knowledge of how such informal learning takes place in a specific workplace setting warranted further investigation.

1.4 RESEARCH QUESTION

The following research question was consequently formulated:

How, if at all, does practical WPL in the mining sector facilitate the development of artisan apprentices?

1.4.1 Sub-questions

The following sub-questions were formulated:

- Which organisational factors, if at all, influence artisan development at the specific mine?
- How, if at all, is practical WPL facilitated during the ADP?
- How, if at all, does practical WPL occur during the ADP?

1.5 DEFINITION OF THE KEY CONCEPTS

Training and development occurs in different contexts and through different modes of delivery, i.e. formal, non-formal and informal learning. These concepts, as well as practical WPL, are used throughout the thesis and are explained briefly here. A more detailed analysis of the key concepts follows in Chapter 2 and 3.

1.5.1 Formal learning

Manuti, Pastore, Scardigno, Giancaspro, and Morciano, (2015:4) referring to the work of Marsick and Watkins (1990), define formal learning as structured learning that takes place 'off-the-job' and outside of the working environment, typically in classroom-based formal educational settings. According to the Organisation for Economic Co-operation and Development (OECD), this kind of learning is usually associated with an institution of learning such as an educational facility or an enterprise that offers formal education and training programmes (2005:5). Misko (2008:10) confirms the view of the OECD (2005) and states that formal learning refers to learning in courses or programmes resulting in nationally and internationally recognised qualifications. Hodkinson, (2010:42) further asserts that formal learning is planned and organised and is assessed by teachers and others.

Werquin (2012:267) points out that formal learning is organised in terms of scheduling, financing, learning objectives and structure. Also, that formal learning is intentional and is exemplified by school, university or training organised at the workplace (Werquin, 2012:267). Werquin (2012:267) also notes that with some exceptions formal learning can also take place at the workplace which will target the adult population, as long as it is structured. Formal learning, according to Nisbet, Lincoln and Dunn (2013:469), is generally characterised by a prescribed learning framework that includes a structured learning package or event, the award of a qualification or some type of credit, or the external specification of learning outcomes.

Similarly, the Organisation for Economic Co-operation and Development, defines formal learning as learning that occurs in an educational institution or in the

workplace and is always recognised in a certificate or qualification (OECD, 2005:5). Therefore, it can be assumed that the workplace could be a setting for formal learning as well as informal learning. Accordingly, the European Commission, (2001) refers to formal learning as learning that is typically provided by an education or training institution; it is structured in terms of objectives, learning time or learning support and leads to certification of the learner. Formal learning is thus intentional from the learner's perspective.

1.5.2 Non-formal learning

Non-formal learning, according to Cameron and Harrison, (2012:280) refers to learning that occurs through a programme but it is not usually evaluated and does not lead to certification.

According to Kyndt, Dochy, and Nijs, (2009a:370) non-formal learning consists of all education that takes place outside of the school system and is seen as an individual process where the individual learns out of his/her own will or as a by-product of more organised activities.

Non-formal learning, according to the European Commission (2001:32-33), is learning that is not provided by an education or training institution and typically does not lead to certification. It is, however, structured (in terms of learning objectives, learning time or learning support). Non-formal learning is intentional from the learner's perspective. Livingstone, (2001:22) – in contrast with the EU's view – contends that non-formal education includes a diverse array of further education courses and workshops in many institutionally organized settings, from schools to workplaces and community centres.

However, Billett (2002:57) argues that there is no such thing as non-formal learning. He sees learning as ever-present in human activity (Billet, 2002) and argues that most learning takes place outside formal educational settings, which means that something similar to non-formal learning should be regarded as the standard form, rather than what is left over once formal learning is accounted for. He also has strong objections to the term 'informal', as he sees all learning as taking place within

social organisations or communities that have formalised structures. These formalised structures Billet (2002) refers to may be workplaces, communities and organisations. This argument is supported by Werquin (2012:268), who asserts that there is no consensus on the definition of non-formal learning in the international sphere.

Misko (2008:10) has a different view and contends that the structured programmes for developing skills and knowledge required by formalised social organisations and community structures and individuals can be defined as non-formal learning. Kyndt, Dochy and Nijs (2009:370) further emphasise that non-formal learning consists of all education that takes place outside of the school system, which excludes formal education in the primary and secondary school, as well as at the higher education institutions. Informal learning is discussed in the next section.

1.5.3 Informal learning

Marsick and Volpe, (1999:4) state that informal learning can best be described as learning that is mostly unstructured and experiential in nature and occurs outside a formal learning institution. Marsick and Watkins (2001:25) claim that 'informal learning is usually intentional but not highly structured' and they include examples of self-directed learning, networking, coaching, mentoring, and performance planning. The characteristics of informal learning, according to Watkins and Marsick (1992:287), would be:

- learning that is based on learning from experienced employees;
- rooted in the unique context of the organisation;
- concerned with a focus on action;
- directed by non-routine workplace conditions;
- concerned with implicit dimensions that must be made explicit;
- defined by the nature of the job task, the way in which the problems are framed, and the work capacity of the individual employee undertaking the task; and
- enhanced by proactivity, critical reflectivity and creativity.

From the characteristics above one could assume that the workplace with its unique qualities may be a suitable setting for informal learning, but the workplace may also accommodate other forms of learning from formal, institutionally sponsored learning including training and human resources development initiatives towards informal and incidental learning (Matthews, 1999; Watkins, 1995, cited in Ellinger, 2005:390). The scope of this study is informal learning with a focus on practical WPL in a South African mine.

According to Cofer (2000:1), it is important to note that the research supports the introduction of informal learning not as a replacement for formal activities but as a complement to them. Informal learning should thus not be seen as inferior or of a lesser value to institutional learning. Ellinger (2005:390) further contends that research has suggested that informal learning in the workplace takes precedence over formal learning in a sense that it mostly takes place in the workplace.

Informal learning, in contrast to formal learning, is often conceived as learning that is 'tacit and integrated with work activities' (Marsick, 2003:389). This type of learning results from daily work-related, family or leisure activities. Some (for example Billet, 2004) would argue, against the view held by Ellinger (2005) noted above, that informal learning is inferior to formal learning in *educational institutions*, but Malloch, Cairns, Evans, and Connor (2011:5) argue that '[t]he notion of informal learning is defined as learning that occurs regularly in work as well as in everyday life, but subordinated to other activities (e.g. work practices) in a sense that learning is not their primary goal'.

The assumption is that the workplace provides opportunity for implied learning that is informal in nature. Skule (2004:9) claims that informal learning constitutes the most important way of acquiring and developing the skills required of employees needed at work, which results in contemporary WPL. Manuti, Pastore, Scardigno, Giancaspro and Morciano (2015:5) claim that informal learning occurs in situations that are not usually intended for learning, most notably in the actual work setting. Manuti et al. (2015:5) argue that informal learning, in contrast to formal learning, calls on and requires a blending of individual difference constructs such as intellectual curiosity, self-directedness and self-efficacy.

Informal learning is further defined by Manuti et al. (2015:5) in reference to the work of Dale and Bell (1999:1) as that form of learning that takes place at work and is passed on to employees' work performance related to their employability, which is not recognised by the employer as formal curriculum-based training. Dale and Bell (1999:1) contend that the effort by the employees may be recognised by all the different parties involved and may or may not be encouraged. Informal learning could be perceived as incidental and not a highly conscious activity. This mode of learning relates to work performance where different parties may be involved in the sharing of knowledge and expertise within a particular work context with no formality to it, which renders the learning a 'non-intentional' activity (see Eraut, 2000). In the following section WPL is explored.

1.5.4 Workplace learning

Jacobs and Park, (2009:134) assert that the term workplace learning could be used to refer to 'the multiple ways through which employees learn in organizations'. The literature indicates that employees could engage in formal as well as informal learning in the workplace context. Furthermore, Le Clus (2011:357) acknowledges that, '[i]n the workplace, learning can be described as situated in the context of social practice, in which work setting provides an opportunity for co-workers to acquire knowledge that connects theory to practice in a realistic and efficient way'. WPL includes experience-based, incidental and informal learning (Le Clus, 2011:357). More importantly, for apprentices to succeed in the ADP at the mine, they are thus required to reflect on the theory and practices learned during the formal learning process in an informal way within the context of everyday work.

Rylatt, (1994:10) defines WPL as 'a sustained and high leverage development of employees in the line of organisational business outcomes'. The view of the sustainable development of an organisation is at the centre of this definition. Holliday and Retallick (1995:7) describe WPL as the 'processes' and 'outcomes' of learning undertaken by individual employees and groups of employees with the support of a particular workplace. This description focuses on both the *process* and the *outcomes* of learning in the workplace that relate to the goals and objectives of business. Both

views of WPL are connected to different, but related aspects of learning in the context of the workplace, namely the learning by and development of the employee, as well as the sustainability of the organisation.

According to Le Clus (2011:359), workplace learning construed from the perspective of informal learning is meaningful to the employee, and it denotes everyday learning and participation in work activities. The employee makes sense of the daily learning interventions that occur at the workplace that involve examining embedded knowledge and encouraging learners to be self-directed and reflect on their learning experiences (Le Clus, 2011:359). Learning in the workplace from a novice's perspective may not only provide meaningful, everyday learning and participation in workplace activities, but also allow for an opportunity to engage actively in the development of the novice apprentice's knowledge and skills, that may facilitate individual growth and development (Karakowsky & McBey, 1999:193).

Moreover, on-the-job WPL provides a platform to apprentices to make sense out of their formal trade theory learning by being involved in and exposed to different practical learning opportunities through self-directed learning and reflection among other things. The process of WPL focuses on apprentices' active involvement with their coaches where the outcomes are aimed at the understanding of complex systems, fault-finding, manufacturing, and maintenance of mining equipment.

In a mining context it is a legal requirement to invest in the overall training and development of employees and apprentices and to assure the company's sustainability by retaining its competitive advantage in a country with a shortage of qualified and skilled artisans. Participation in an ADP, as well as other human resources development initiatives, presented considerable benefits to the mine. This investment helped to ensure that apprentices entering its premises as novices took part in WPL under the supervision of a coach where their formal learning theory connects with the practical world of work.

1.5.5 Artisan development and practical WPL

Apprentices in the mine where this study was conducted may be exposed to different modes of learning (including formal, informal, and non-formal learning) during their on-the-job training until being certified as artisans by the QCTO in terms of the SDA. Apprentices were engaged in different learning opportunities in the workplace setting and with experiential guidance from their coaches, by trial and error, reflection and self-directed learning, they acquired the skills and expertise envisioned in the ADP on their way to artisanship. This is a journey that starts with formal learning at the TVET college and ends with practical WPL at the mine.[13]

WPL and the need to integrate learning and work for the good of both employees and organisations have received increased emphasis over the last decade (Ellström, 2001:421). The mining industry benefits from the ADP as it feeds into the talent pipeline for future employment, since most if not all apprentices are appointed after successful completion of the programme.

The ADP in the mine is uniquely positioned to engage the apprentice with practical WPL over a prescribed period that may be extended if needed. The apprentice may access the trade test after the completion of an on-the-job practical WPL period and if successful may be issued with a National Engineering Certificate qualification. If the mine has vacancies in a particular trade it could offer full-time employment to a qualified artisan. Practical WPL thus serves as a vehicle for employment of the apprentice and ensures the sustainability of the mine.

A qualified artisan is employable, which increases the talent pool of the company. Apart from the employability benefit and the competitive advantage to companies, practical WPL has attracted considerable attention in the WPL literature. The next section focuses on the research design and methodology of this study on practical WPL.

These concepts as in section 1.5.1 to 1.5.4 will be discussed in more detail in Chapters 2 and 3.

[13] The mine annually advertises learnerships in its human resources development portfolio as required by its SLP. Grade 12 learners with the relevant entry requirements may apply for the ADP which starts with formal trade theory at the TVET college in Kathu for admission to the National Engineering Certificate programme (N1-N3). Learners then attend practical training at SIVOS before they enter informal on-the job training at the mine for a period of 80 weeks.

1.6 RESEARCH DESIGN AND METHODOLOGY

The research design and methodology employed in this study is discussed in greater depth in Chapter 3. The following sections provide a brief overview of these aspects to orientate the reader to the study.

1.6.1 Research methodology

The study was positioned within the interpretive research paradigm, using a case study methodology. A case study approach was considered most appropriate because according to Pamela and Jack (2008:544, citing Yin, 2003) case studies allow the researcher '[t]o explore individuals or organisations, simply through complex interventions, relationships, communities, or programmes and supports the deconstruction and the subsequent reconstruction of various phenomena'.

Yin, (2009:4) contends that a case study methodology can be use use in many situations, to contribute to our knowledge of individual, group, organizational, social, political, and related phenomena. This study looked at artisan development within the engineering department at the mine where apprenticeship training formed the case (refer to Chapter 3, section 3.4). The study focused on artisan apprentices during different stages of their 80-week practical in the engineering department in a mining setting. The study highlighted apprentices' perceptions of the transfer of knowledge through informal means within their workplace in the organisation. Also, many role players at the mine were involved in the ADP: apprentices, artisans, master artisans, engineering foremen and general engineering supervisors, the TVET college, as well as SIVOS. The artisan, master artisan, engineering foremen and the general engineering supervisors fulfilled a coaching role in the transfer of learning to the apprentice and were included in the study based on this contribution in artisan development. This study highlights practical WPL and the role of the coach in terms of transfer of learning as well as the apprenticeship perception of informal WPL and the organisational factors that influence learning in the mine context.

The mine had 22 engineering learnerships in different stages of the ADP at the time of the study. Some apprentices involved in learnerships were at the TVET college doing their formal trade theory, while others were engaged in practical training at SIVOS. These learners were not considered for the study as they were not actively engaged in practical WPL. Interviews were conducted with six artisan apprentices who had finished their formal trade theory training and were doing their on-the-job training in the engineering department of the mine. The purpose of the semi-structured interviews with open-ended questions was to gain insight into the apprentices' perceptions of practical WPL within the mine and how transfer of knowledge and skills influenced their learning and development towards the successful completion of the ADP.

A total of 18 individual semi-structured interviews were conducted as indicated in Table 1.1 below (see Annexure C). The respondents were made up of six engineering apprentices, three artisans who just finished the ADP after successful completion of the programme, three experienced master artisans and/or artisans, three engineering foremen and three general engineering supervisors. Data from the interviews were recorded and transcribed for further analysis.

Table 1.1: Summary of respondent groups

ORGANISATIONAL LEVEL OF RESPONDENTS	*Total respondents*
Artisan apprentices	6
Artisan apprentices appointed after successful completion of the informal WPL programme	3
Experienced artisans/master artisans	3
Engineering Foremen	3
General Engineering Supervisors	3
TOTAL SEMI-STRUCTURED INTERVIEWS	**18**

Respondents represented the different trades of the artisan development programmes at the mine, i.e. Boilermaker, Fitting, Fitting and Turning, Electrical, Plater and Welder, Diesel Mechanic and Millwright. A selection was done of engineering foremen, general engineering supervisors, experienced artisans and

master artisans among the respondents in their chosen trade, as well as their involvement as coaches in the ADP. Experience levels of coaches differed from one to 30 years' relevant mining engineering experience. Apprentices in the ADP, as well as newly appointed artisans from the talent pool created by the ADP, were also selected. Refer to Chapter 4, section 4.2.1 for a summary of the respondents in this study.

1.7 ETHICAL CONSIDERATIONS

Ethical clearance was obtained from the Human Research (Humanities) Ethics Committee of Stellenbosch University (reference no: DESC/Smit/Nov2014/11, attached as Annexure A). Permission to conduct the study was obtained from the general mine manager, the HR manager, and the training manager of the mine (see memo attached as Annexure B). The general mine manager indicated that I have to obtain approval from the HR manager to have the study published in the public domain. All respondents were also informed of the aim and scope of the study. According to Henning, Van Rensburg and Smit, (2013:73), the suggested code of practice to conduct interviews is to obtain consent from the respondents. I therefore included a consent form as introduction to the interview to ensure that respondents were informed of their rights and that their input would not be exploited (see Annexure D).

All interviews were conducted with full consent of the respondents. None of the respondents were identified in the reporting of the study. Data collected and analysed from the transcripts of the interviews were coded, and names and classified material that might put the company at risk were handled with confidentiality. Confidentiality, as well as anonymity of all respondents, formed an integral part of the study since respondents may have felt that their responses would influence their career opportunities in the organisation. No identifiable reference to any participant is made in the study. All the data collected were securely kept in a locked cabinet in the study at my house.

All the respondents were verbally informed about the aims and objectives of the study and the consent form was completed (see Annexure D). Participation in the semi-structured interview was voluntary and could be carried out in either Afrikaans or English, and respondents were informed that they could leave whenever they felt uncomfortable. They were also informed that the interview would be recorded and transcribed, and that this would be strictly confidential and no third party at the mine would have access to the data. Respondents in the study were referred to by means of pseudonyms to guarantee confidentiality while the recorded interviews were stored in a locked drawer in the study at my house.

Babbie and Mouton (2012:273) contend that the researcher has a central role in the research, that of observer and interpreter, and thus becomes the most important 'instrument' in the research process. This position could easily be compromised as the researcher has to be 'unbiased in his descriptions and interpretations' (Ibid.). Case study research allows the researcher to get close to the respondents and in this particular study using semi-structured interviews was no different. I got close to the respondents as a researcher, but also as a colleague with an insider view of the company 'in order to generate legitimate and truthful "insider" descriptions' (Ibid.) It was, however, important to create a trust relationship between myself and the respondents and obtain truthful and credible data (Ibid.). Trust between the researcher and respondents may create credibility. The trust between the researcher and respondents brings closeness in the relationship that could facilitate access to deeper layers in both the mind of the participant and in the real world that, if not guided by a clear ethical standpoint of the researcher, could lead to transgression or serious danger jeopardising credibility, trustworthiness and rigor.

Taking cognizance of the above authors, my position as researcher in the organisation and the community might have influenced my own authenticity as researcher-colleague. In order to access rich data, I had to be aware of this compromising stance and had to act with due care in my interaction with the respondents. Also, the reality was that any sign of mistrust could negatively influence data integrity if my intentions were not made very clear from the onset of the semi-

structured interviews. This could have compromised the honesty and openness of the respondents and could lead to possible bias and assumptions.

Morse, Barrett, Mayan, Olson, and Spiers, (2002:2) emphasise that without rigor the research is worthless as it becomes fiction, and loses its utility. (Elo, Kääriäinen, Kanste, Pölkki, Utriainen and Kyngäs (2014:2) refer to rigor as validity, reliability and trustworthiness that could be used to assess research validity when working with qualitative data. Lincoln and Guba (1985) use the term 'trustworthiness' and Elo et al., (2014:2) assert that the objective of trustworthiness is to support the argument that the findings of the inquiry are worth paying attention to. This objective, according to Elo et al. (2014:2), could be reached through credibility, dependability, conformability, transferability, and authenticity.

In terms of credibility, the respondents in this study had to be identified and described accurately (see Annexure D). The data that were collected by means of semi-structured interviews should be unchanging over time and under different conditions, which would reflect its dependability (Elo et al., 2014:2). Different respondents took part in the study, each with their own view and inputs on the questions; however, the potential for similarity in their responses was mitigated with probing questions to obtain rich data. This approach improved the accuracy and relevance of the data and contributed to the conformability of the study. The study was undertaken in an iron ore mine situated in a rural town where a number of mines operate in the area. These mines also offer similar engineering learnerships and in terms of transferability it may be possible to draw conclusions between the ADP of this specific mine and other organisations where similar conditions for practical WPL occur, although no generalisations are attempted in this study.

The mine is situated in a small rural community in the Northern Cape and some of the apprentices were my learners when I was an educator at a local primary school before 2009. The possibility of negative influences as a result of my previous status was refuted with a professional approach and by showing the values adopted by the organisation, namely care and respect, integrity and accountability. I was 'sensitive to how one's status, power and relationship may [affect] the study, and planned to

minimise such influence, [which] helped to improve the quality of the study' (Rule & John, 2011:113.

I was a teacher prior to my employment as a Senior Instructor at the mine and some of the respondents were former learners. Respondents were also in the engineering learnership programme offered by the mine supervised by a colleague of mine in the HR training department. This may have compromised the integrity of the study and I was well aware of this limitation. Due to soaring commodity prices, the company went through a restructuring process and on 10 August 2015 I was transferred from HR training to the finance department in a different designation within the mine. This transferral created some space between me and the respondents and I was no longer involved in training and development and my new designation excluded any direct contact with any of the respondents.

1.8 CHAPTER ORGANISATION

1.8.1 Chapter 1: Orientation to the study

This chapter provides the background and problem formulation to the study and the context within which the study was conducted. Also, this chapter focuses on the key concepts informal learning, WPL and artisan development.

1.8.2 Chapter 2: Literature review

This chapter refers to the reason for this study in terms of its importance within the context of current literature. It includes an overview of literature on practical WPL, transfer of learning in organisations that inhibit or facilitate practical WPL, as well as how learning occurs within this setting.

The literature review focuses on practical WPL within the current legal framework in the mining sector in South Africa, including policy, organisational context and transfer of learning and draws on best practices and examples from abroad.

1.8.3 Chapter 3: Research design and methodology

This chapter highlights the research question and sub-questions. This chapter also describes the research methodology that was used in the study. It includes interview instruments used for data collection through the semi-structured interviews with engineering supervisors, foremen, artisans and apprentices. The research methodology and the methods used for data collection and data analysis are discussed. All the assumptions and ethical considerations taken into account during the study are attended to in this chapter.

1.8.4 Chapter 4: Findings

The analysis of the interview responses is used to identify specific factors within the transfer of knowledge in the organisation that may inhibit or facilitate practical WPL for the respondents. The transcripts of the semi-structured interviews were utilised for analysing perceptions about the transfer of learning, the occurrence or not of practical WPL, the facilitation thereof and the influence of organisational factors on WPL.

1.8.5 Chapter 5: Discussions and conclusions from the data

The last chapter provides a discussion and conclusions based on the analysis of data in Chapter 4. The chapter reflects upon possible implications for theory, policy and practice regarding practical WPL at the mine.

1.9 CONCLUSION

Practical WPL provides benefits to the apprentice and is a unique opportunity for formal and informal learning to connect. It provides a platform for the apprentice to apply his or her knowledge in the work setting through self-direction and reflection. This development opportunity also benefits the company because its own survival as well as competitive advantage is achieved through people and their ability to learn. This ability to learn is activated by the workplace, which represents a rich source for learning and development to occur.

Chapter 1 provides an introduction to and orientation of the study by describing the significance of the study and clarifying the research question that guided the study. The next chapter focuses on the literature I studied with relevance to the different aspects of the research.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

Employees' ability to learn is activated in different learning contexts and modes of delivery at the workplace. Billett (2013:126) states that the learning of occupations through work is central, and perhaps the most outstanding element of technical and vocational education and training. Companies capitalise on employees' ability to learn and always strive to be at the forefront of human capital development, information technology, as well as product design and output to maintain their competitive advantage by allowing opportunities for employees to learn, to practise and develop new skills within the work environment. Central to this advantage is its performance as an organisation in a global economy; it is an important element to remaining in business through the competencies of its human resources. The mine where this study was conducted is a subsidiary of an international company with mines in different countries participating globally to extract different mineral resources as part of its portfolio stay in business.

Billett (2013:126) claims that across human history learning through practice has been the single most important process for developing occupational competence of individuals, which had served both the needs of society and employees. According to Ellinger (2005:391), learning is a significant source of sustainable competitive advantage for individuals and organisations. Likewise, the creation of environments that are conducive to learning and development in the organisation can enhance individual and organisational performance.

WPL has become increasingly important to the survival of organisations in a global society, not only for their survival, but also because the ability to learn faster than their competitors may be the only sustainable competitive advantage (Coetzer, 2007:417). Employees are the medium through which an organisation's competitive success can be achieved (see Yamnill & McLean, 2001:195). The workplace can be recognised as a legitimate environment for learning new skills and knowledge, in an informal way, which not only allows employees to participate more effectively in the

ever-changing work environment, but also provides a platform for training and development for new entrants in the labour market.

This chapter considers practical WPL in the context of artisan development. Artisan development at the mine is discussed from the context of practical WPL. The apprentices enter the mine's ADP for workplace learning after time spent in a formal learnership at the TVET college during a period of institutional learning, which they use as a reference point. Learning that happens in this workplace setting is meant to complement the formal learning of the artisan received at the TVET college, and is a necessary part of the qualification of an artisan. This study will refer to formal learning on the one hand and informal learning (practical WPL or situated learning) on the other. These second concepts will be used interchangeably in this study.

The chapter is divided into the following sections specifically organised in such a way to help answer the research question: *'How, if at all, does practical WPL in the mining sector facilitate the development of artisan apprentices?'* Section 2.2 focuses on WPL as an element of formal and informal learning. Formal learning is covered in section 2.3 followed by informal learning in section 2.4.

The sub-questions to the main research question focus on three issues, namely (1) the organisational factors that influence practical WPL; (2) how learning is facilitated; and (3) how learning occurs during artisan development. These issues are discussed in sections 2.5 and 2.6. The central theme of the research is artisan development through practical WPL in the mine. In section 2.7 artisan development is discussed from an international perspective (in the UK, Europe and Finland), as well as how artisan training is approached in the South African context with specific reference to the mining context.

2.2 WORKPLACE LEARNING

2.2.1 Dimensions of workplace learning

The workplace as a learning environment provides opportunities for on-the-job learning. This learning could occur by means of both formal and informal learning

interventions. Malcolm, Hodkinson andColley (2003:1) propose that WPL can be classified as being formal, informal or non-formal (refer to section 1.5.4). Clarke (2005, cited in Jacobs & Park, 2009:140) suggests that the most frequently described dimensions of WPL are planned versus unplanned learning, formal versus informal, non-formal versus incidental, and on-the-job versus off-the-job as a means of differentiating what might constitute WPL. Le Clus (2011:357-358), for instance, asserts that WPL includes experience-based learning, incidental learning and informal learning, self-directed learning as well as formal organisational learning. Formal and informal learning, however, seem to be the most commonly agreed concepts of WPL (see Jacobs & Park, 2009:140). These concepts are highlighted in the following sections.

2.2.2 Workplace learning

Kyndt et al. (2009:369) contend that traditionally the concept of learning was related to formal education in a structured environment. However, currently there is a different view as WPL has become more popular over the years. Researchers took this concept away from its traditional formal position to the ‘workplace’ to explain the notion of ‘workplace learning’. Learning can take place outside of formal structures. According to Jónsdóttir (2007:1), WPL is one of those concepts that are both diffuse and complicated at the same time, and can be defined and understood in various ways.

Hager (2001:352) describes WPL as vague and ambiguous as it is multiplied by being task- and achievement-orientated. According to Matthews (1999:19) any definition of WPL will potentially be constrained by the perception held of the ‘workplace’. Matthews (1999:20) defines and comments on WPL as follows:

> [It is] the process of reasoned learning towards desirable outcomes for the individual and the organisation. These outcomes should foster the sustained development of both the individual and the organisation, within the present and future context of organisational goals and individual career development.

WPL, according to the definition of Matthews (1999) above, is thus concerned with the development of both the employee and the organisation and focuses on the career development of the employee, while emphasising the sustainable development and future sustainability of the organisation. Focusing on career and organisation development, the concept of WPL is explained by Boud and Garrick (1999:5) as follows:

> Workplace learning is concerned not only with immediate work competencies but about future competencies. It is about investment in the general capabilities of employees as well as the specific and technical. And it is about the utilisation of their knowledge and capabilities wherever they might be needed in place and time.

Engeström, (2001:1) indicated that the theories of organisational learning that existed at the time were 'typically weak in spelling out the specific processes or action that makes the learning processes'. Spencer (2002:298) confirmed this view and claimed that much of the rhetoric proclaiming the features of workplace restructuring seldom matches the reality of the workplace. The concept of WPL is somewhat hidden in this description which makes it challenging to define what WPL is (Le Clus, 2011:356).

Learning in the workplace is described as being situated in the context of social practice (Lave & Wagner, 1991) in which the workplace sometimes provides the only or most viable location for initial learning and/or to develop vocational competence, according to Billett (2002:57). WPL is then also the only opportunity for employees to acquire knowledge that connects theory to practice in a realistic and different way beyond what can be provided in the formal training context – taking WPL into the informal mode of learning. Learning at work provides a bridge where formal knowledge meets practical competence, which gives the learner an opportunity to apply his or her formal theoretical knowledge by engaging in on-the-job activities through practical WPL.

Jacobs and Park (2009:134) define WPL as the process used by individuals when engaged in training programmes, education and development courses, or some type of experiential learning activity for the purpose of acquiring competence necessary to meet the current and future requirements of the organisation. The definition assumes

a balance between the needs of the organisation and the development of the individual.

Metso and Kianto (2013:128) note that WPL is also known as on-the-job learning or learning at work; it is described as task-related knowledge building and sharing among employees, and as a tool for lifelong learning in organisations and adult learning development. WPL thus presupposes a learning process in a particular social context (read workplace) where certain learning outcomes are to be reached by the learner in a sustainable way. This brings us to the workplace as a site for learning.

2.2.3 The workplace as a site for learning

The definitions of WPL allow us to conclude that WPL focuses on present and future competencies needed by the employees at the workplace, as well as on future competencies the organisation may need to ensure future sustainable growth and to maintain its competitive advantage. The work competencies of employees are learned at the workplace and according to Scheeres, Solomon, Boud and Rooney (2010:13) we know that learning occurs at work in many different ways and that most workers are involved in learning.

Tynjälä (2013:11) asserts that research focusing on learning at work, through work and for work has increased considerably over the past two decades (also see Malloch, Cairns, Evans, and O'Connor, 2011).This perception is confirmed by Manuti et al. (2015:2) who assert that the interest in WPL has intensified in recent years. Boud and Garrick (1999:6) observed that the workplace has become a site for learning associated with two quite different purposes: the workplace provides firstly for the development of the organisation through contributing to production, effectiveness and innovation, and secondly for the learning and development of individual employees through contribution and knowledge, skills and the capacity to further their own learning both as employees and citizens in the wider society (Boud & Garrick, 1999:6).

Employees are active respondents in their own learning, and the workplace provides the opportunity and context for individual growth on the one hand and the growth and development of the organisation on the other. The workplace offers a rich environment for learning and according to Le Clus (2011:357), this setting provides the potential for continuous learning to occur through formal learning opportunities associated with training initiatives and informal interventions that are embedded in everyday work related activities. Kim and McLean (2014:39) argue that informal learning is the most predominant way of obtaining knowledge or skill in the workplace.

Authors, such as Ellinger (2005), Lohman (2005), Boud and Garrick (1999), and Sambrook (2005), have discussed WPL and its underlying issues at length. Further to these discussions Jacobs and Park (2009:134) remark that it is clear that WPL represents highly complex individual processes and organisational practices. They emphasise that in general, WPL has been described as the relationship between two significant human processes: *working* and *learning*. Apart from these two processes, the practice of learning at work, as well as the context in which learning is taking place, also has to be considered in a model for WPL.

2.2.4 Model for workplace learning

Tynjälä (2013) developed a model to illustrate WPL, taking cues from Biggs, (1987, 1999), as shown below in Figure 2.1. Marsick et al. (2011) developed a similar model. Both Tynjälä's (2013) and Biggs's (1999) 3-P models consist of three main components, namely *presage*, *process* and *product*.

The model developed by Biggs (1999) indicates two presage factors: (1) student-related factors and (2) factors related to the teaching context. Tynjälä's (2013) model also indicates two presage factors: (1) learning factors and (2) learning context. The difference between Biggs's (1999) 3-P model and the model developed by Tynjälä (2013) is the learner's *interpretation* of the learning factors and the learning context.

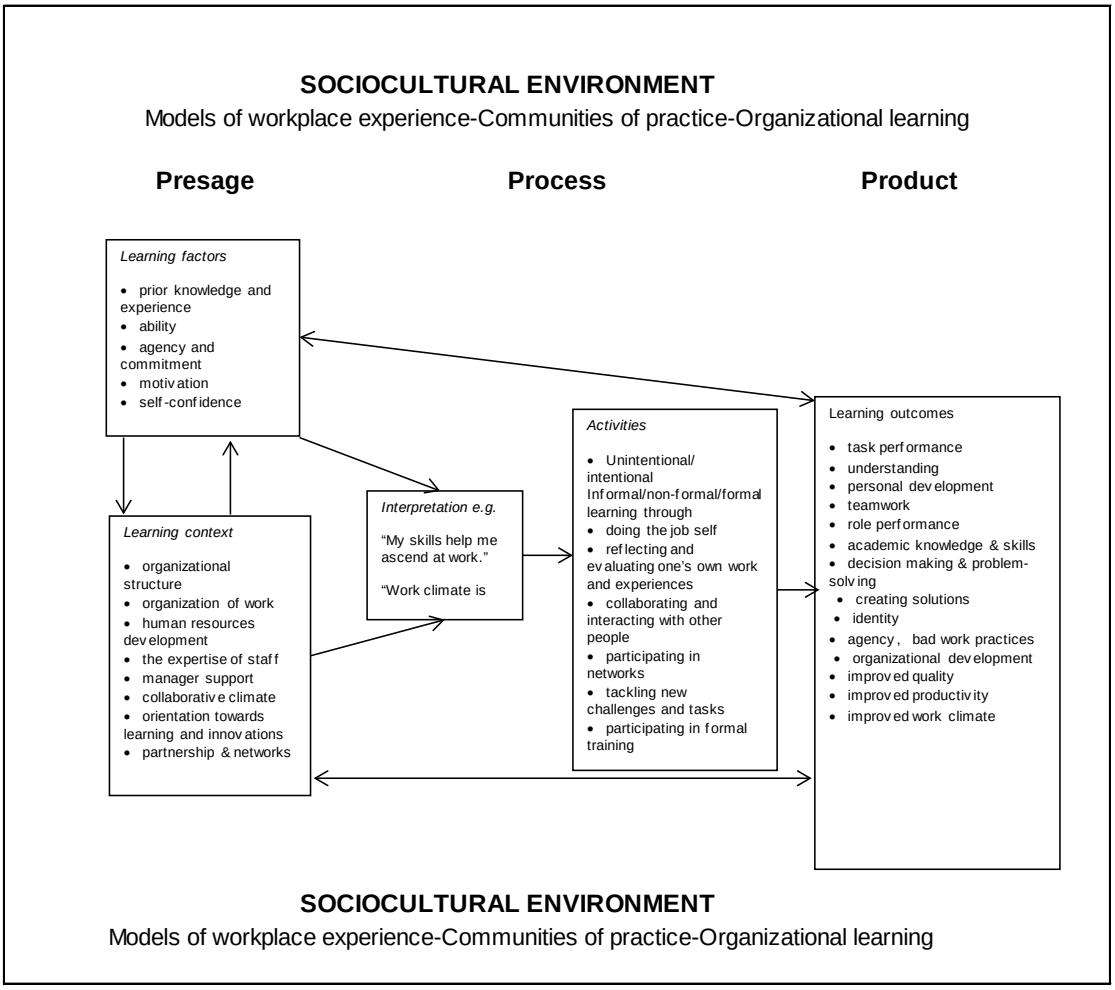

Figure 2.1: The 3-P model on workplace learning
(Tynjälä, 2013:14 as modified from Biggs 1987, 1999)

Tynjälä's three P's in the model above refer to the *presage*, *process* and *product,* which represent the three basic components of a learning phenomenon (see Tynjälä, 2013). Tynjälä (2013:14) names the first element of the WPL model as the presage. The presage represents the *learning factors* in the learner and the *learning context* in the organisation. The organisational context is the part of the presage factors that attaches itself to the surrounding frame of the model. This frame indicates the *sociocultural environment* in which WPL takes place. The learning factors and learning context are defined by the sociocultural environment in which learning occurs.

Kyndt et al. (2009:370) contend that an organisation can facilitate non-formal and informal learning through its culture, policies and specific procedures to create a context favourable to learning and mitigate factors that may negatively affect learning. Billet (2004) claims that the workplace needs to provide an optimal context

for the employees to develop and grow in their jobs. The organisation provides the context for learning and development; however, it is important that the affordances of the organisation match the individual engagement of the employee (Billett, 2001). Tynjälä (2008:141) asserts that while the organisation sets the context and the conditions of learning, it is still the mutual interaction between the individual and the workplace that determines employee learning. These learning conditions are defined by Tjepkema (2003:111) as the features of both the organisation and the individual that enable or impede learning among team members.

The second element of WPL, according to Tynjälä (2013:15), is the *process* of learning, which refers to the learner's *interpretation of presage factors* (Tynjälä, 2013:13). According to Tynjälä's (2013:15) constructivist view of learning, the presage factors do not directly affect the learning process of the employee in the workplace, but rather their interpretation of the learning content and learning context (Von Glasersfeld, 1995; Prosser & Trigwell,1999). Phakathi and Sizwe's (2002:11) view is that the constructivist approach to WPL emphasises the subjective and motivational dimensions of the employee's learning competency. The employee's level of commitment to learning in the workplace and their success with the learning endeavour are dependent on their level of motivation and self-directedness.

Tynjälä (2013:15) argues that the previous knowledge and skills of the learner as such do not determine their learning, but how they see themselves as workers and learners and their interpretation of the workplace as a working environment. Employees will perceive their working environment to present more opportunities for learning if they think that their skills will help them to ascend at work (Tynjälä, 2013). Jeon and Kim (2012:211) state that learning in the workplace is influenced by constraints and/or opportunities present within the organisations' systems, reward processes and cultures that are friendly or unfriendly to learning, as well as the availability of resources, and whether these are limited or unlimited (also see Marsick & Watkins, 1996). Manuti et al. (2015:7) draw on Fuller and Unwin's (2003) research on modern apprenticeships which distinguishes between an 'expansive' and 'restrictive' working environment. According to Fuller and Unwin (2003:412), expansive participation by apprenticeship learners in the workplace is characterised as facilitating 'deeper', more 'investigative' and 'imaginative' learning than that which occurs through restrictive participation.

The third element of Tynjälä's (2013) workplace model is the *product* of learning representing the *outcomes* of learning. These outcomes are often quite diverse as employees can learn different kinds of things at the workplace (Ibid, 2013:16). Eraut (2004) relates these learning outcomes to better task performance by the employee, deepening of the employee's understanding, learning new work roles, and developing problem-solving techniques (also see Ellström, 2012). Tynjälä (2013:16) asserts that learning processes at the workplace may also lead to creative problem solving within the workplace context. Vocational identity or professional development may also be a significant result of WPL.

In some cases the learning outcomes may also create unwanted outcomes as wrong lessons and/or bad habits may also be learned (Manuti et al., 2015:5). Contrary to the view held by Manuti et al. (2015), Bauer and Mulder (2003:1) argue that errors in performance at the workplace is an important way of developing professional competence. Tynjälä (2013:16) also claims that learning outcomes are not confined to the individual development, but also assist the organisation in improving. The 3-P model of Tynjälä indicates a few factors influencing WPL that are highlighted in section 2.5. The next section focuses on formal learning.

2.3 FORMAL LEARNING

Learning in the workplace comprises the entire range of institutional (formal), non-formal and workplace (informal) learning activities of an individual's quest to achieve intellectual growth and development. Marsick and Watkins, (1990) define formal learning as structured off-the-job learning that takes place outside of the working environment. Institutional learning, according to Hodkinson, (2010:42) is planned and organised and assessed by teachers and others. Perulli, (2009:97) asserts that formal learning takes place in education and training institutions, leading to recognised certificates and qualification.

Formal learning, which naturally covers a spectrum of formally institutionalised learning activities, can complement informal learning in everyday life (Malloch, Cairns, Evans & Connor, 2011:5). The apprentices who participated in the study

attended formal training at the TVET college, which would become the reference when they would attend to on-the-job practical WPL at the mine.

Zuboff (1988:395) refers to formal learning as an integral part of productive activity, which in my view does assist apprentices in engaging effectively with the challenges they may face during practical WPL. Institutional learning in organisations such as the mine mostly involves SETA accredited or endorsed programmes offered by the HR Training and Development Centre with specific outcomes that cover a particular knowledge area as required by the organisation in terms of its business strategy. Manuti et al. (2015:4) note that the programmes would normally cover specific needs of an organisation's workforce and are also viewed as a standard paradigm of learning, as is the case, for instance, at the mine's HR Training and Development Centre. The training centre delivers a mode of learning within a traditional 'educational' pedagogical framework of institutional learning, based on didactic interaction between the training instructors and the engineering apprentices (see Becket & Harper, 2002; Hager, 2004a, 2004b). This approach is also the standard archetype at the TVET college during the apprentices' trade theory training.

The assumption is that these learning programmes are facilitated within a context specifically planned for learning and not working, which mostly suggests that learning occurs away from the actual work setting (Manuti et al., 2015:4) in a more formalised environment giving these interventions a unique institutionalised character. This confirms the view of Marsick & Watkins, (2001) who suggest that working and learning are two distinctly different activities. Eraut (2000:114) outlines the characteristics of formal learning at work as follows:

- a prescribed learning framework;
- an organised learning event or package;
- the presence of a designated teacher or trainer;
- the award of a qualification or credit; and
- the external specification of outcomes.

Based on this proposition, learning in the workplace is not always formal in nature as it can also be *informal*. Eraut (2000, 2011) sometimes refers to this practice as non-formal learning. The next section focuses on informal learning in the workplace.

2.4 INFORMAL LEARNING

WPL mostly occurs informally through on-the-job training in the mine where this study was conducted as the learning activities occur while the apprentice is on shift and part of the engineering team in the plant at the mine. It is therefore important to consider the theoretical underpinnings of informal learning as it pertains to practical WPL in order to make sense of the context in which this study took place.

2.4.1 Origin of informal learning

Kim and McLean (2014:41) assert that although the concept of informal learning originated from the theoretical roots of Lewin (1935) and Dewey, (1938) that highlighted individual experiences and the interaction between learning and their environment (also see Conlon, 2003), informal learning was introduced by Knowles, (1950). Cunningham and Hillier, (2013:38) assert that informal learning is 'generally any learning activity related to the pursuit of understanding, knowledge, or skills that is outside the curricula of educational institutions or the courses or workshops offered by educational or training agencies'. Reading from this contention, one could assume that anything that a person does can be understood as informal learning. Carliner (2013:6) points out that during the era before 1960 young people learned from observation. They would observe their parents and master difficult tasks by interacting with experienced adults. It was through this interaction that transfer of learning took place in a spontaneous way.

Psychomotor skills were further enhanced by feedback from adults while community leadership and mentoring would play a role in cognitive development. In the 1960s, in response to studies on adult learning theory that was published at the time, which showed many adults developed job-related skills to make it through normal life as a result of their own initiative or self-direction (Carliner, 2013:7), informal learning was not well known. Carliner (2013:7) further claims that the 1970s and 1980s saw the rise of adult learning theory, human performance technology, computer-based training and free-choice learning which produced a variety of efforts that influenced the current interest in, and understanding of, informal learning.

Ebner, Lienhardt, Rohs and Meyer (2010:93) assert that even though the importance of informal learning has been gaining more attention with the phase of globalisation, the concept of informal learning 'is being absorbed into different pedagogical contexts and is becoming more and more unclear'. Scholars have therefore conceptualised the notion of informal learning as tacit, unstructured, and at times unplanned in nature. Talukder (2015:14) contends that different scholars have defined informal learning from different perspectives. Both Eraut (2004:247-248) and Cunningham and Hillier (2013:38-39, 43) define informal learning in terms of the experiential learning process outside of the formal arrangements or institutions of learning. This assertion, in my view, could position informal learning in the workplace setting as discussed in the next section.

2.4.2 Informal learning in the workplace

The literature review in this section will indicate that self-directed learning is one of the cornerstones of practical WPL. Recent studies by Woojae and Jacobs, (2011) and Reardon, (2010) on informal learning linked to learning at an individual level with WPL in an organisational context. This mode of learning is informal and according to Cunningham and Hillier, (2013:38) people choose to engage in informal learning activities and undertake the activity on their own, either individually or with others and usually where the criteria are not imposed or defined by an external training instructor.

Informal learning in this context significantly contributes to the learning and development of employees. Leslie et al. (1998:12) claim that employees need to keep learning to enhance their performance and that almost 70% of learning in the workplace may be derived from informal learning. Sorohan (1993:53) confirms that as much as 90% of learning takes place on-the-job in an informal way rather than through formal training programmes such as self-study programmes, computer-based education, professional coaching and project teams. Almost a decade later the same scenario exists with Kim and McLean's concurrence (2013:41, citing Marsick & Watkins, 1990) that practical WPL comprises 80% of all learning in organisations.

Tynjälä (2013:13) emphasises that the key phenomenon in research on WPL is *learning*. In the context of the workplace, this learning would normally refer to informal learning that generally occurs outside of formally structured classes arranged for employees (Carliner, 2013:5). Jeon and Kim (2012:210, in reference to the work of Ellstrom, Ekholm & Ellström, 2008), as well as Jacobs and Park (2009), confirm that informal learning is a predominant method of learning in the workplace which is the focus of this study.

Drawing on the research of Paradise (2008), Kim and McLean (2014:39) contend that there is an increased interest in informal learning among corporations and human resources development professionals. This interest focuses on a change in the learning paradigm from traditional instructor-driven interventions to constant knowledge-based acquisition. Moreover, Kim and McLean (2014:39) confirm that several studies have shown that people gain and transfer knowledge more effectively and frequently in informal learning situations as opposed to traditional formal training (Ellinger, 2005; Enos, Kehrhahn, & Bell, 2003; Marsick, 2003). Jacobs and Park (2009:140) indicate that some authors have used the terms ‘informal learning’ and ‘incidental learning’ interchangeably or in ways that make it difficult to distinguish between the two concepts. Marsick and Watkins (2001:25) claim that informal learning includes incidental learning that may occur in institutions but then again it is not always confined to a classroom or seriously structured. Informal learning is learner-centred with the control of learning also resting primarily in the hands of the learner.

For the purposes of this study I preferred the term ’informal learning’ and more specifically ‘practical WPL’ or situated learning. This study was undertaken in a workplace context of a mine where artisan development of engineering apprentices through practical WPL was the focus. In an attempt to quantify the contribution of formal training to overall job knowledge, Dobbs (2000:52) asserts that people learn 70% of what they know about their jobs informally through situated learning from the people they work with. The next section discusses a model for informal learning.

2.4.3 Model for informal learning

In 1990 Marsick and Watkins (2001:28) developed a model (see Figure 2.2 below) for informal and incidental learning that originated in the work of John Dewey (1938), Argyris and Schon (1974, 1978) and Mezirow (1991). In collaboration with Cseh, (in Cseh, Watkins, & Marsick, 1999) they recently modified their model. This model portrays the informal and incidental learning process that complements and contextualises this study as discussed below (Figure 2.2).

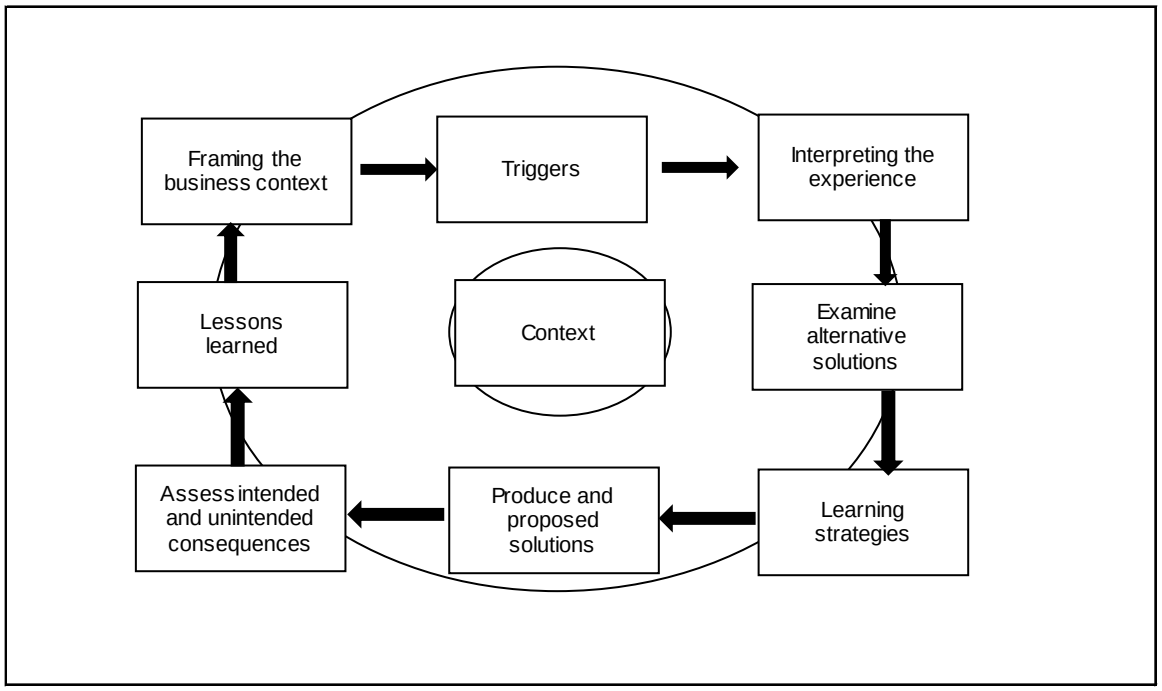

Figure 2.2: Marsick and Watkins's Informal and Incidental Learning Model

(Adapted from Marsick & Watkins, 2001:29)

Interpreting the model on informal and incidental learning developed by Marsick and Watkins (2001) above, the questions would be: How do the apprentices learn informally at the mine? What is practical WPL? This study focused on practical WPL that is a combination of informal learning and WPL. Carliner (2012:5) explains that informal learning in the workplace

> … refers to situations in which some combination of the process, location, purpose, and content of instruction are determined by the worker, who may

> or may not be conscious that an instructional event occurred. Furthermore, the extent to which the worker determines the process, location, purpose, and content of instruction, and is aware that instruction occurred, can vary widely among situations that are labelled as 'informal learning'.

Practical WPL occurs unknowingly, without the intent to learn – it is learning in the moment in a particular context where learning activities are unplanned and unstructured, that is influenced by different organisational factors discussed in the next section. Rusaw (1995:128), referring to Marsick and Watkins, suggests that informal learning is a process of learning that takes place in everyday experiences, often at subconscious levels.

The centre circle in the model of Marsick and Watkins (2001) represents the context in which the learner finds himself or herself. Learning is activated from everyday encounters that influence the work and life of the person. The organisation where this study was conducted went through a restructuring process of the entire organisation in 2015 and 2016 due to a decline in commodity prices. Consequently, some employees took voluntary severance packages while others went on early retirement. A further direct result of weakening commodity prices on the mine was a suspension of all external and new appointments by the company, as well as a decline in new engineering apprenticeships and other learnership intakes for 2016. The executive management of the mine also adopted a new business strategy in 2016, focusing on an organisational operating model of a lean and efficient organisation with increased responsibilities to certain role category employees. One of the consequences of this business strategy was that the engineering department took on more work with fewer resources. As a cost-saving measure, vacant positions were not filled.

The work context in the mine is largely dependent on external and other factors over and above the commodity price index, such as the country's political environment, the Rand-Dollar exchange rate, the unit per ton operating cost of the company and the iron ore share price changing on a daily basis. Employees' learning experiences and approach to learning activities are also often diverse because people are

different. Practical WPL has to operate within such a challenging organisational context.

The outer circle of the model (Figure 2.2) represents the context within which the learning experience occurs. This could be the work environment or the personal, social, business and cultural context for learning, which plays an important role in how people interpret the situation, the choices they make, actions that were taken and the learning that occurs from these experiences. Härnsten and Rosén (2009:231) warn that if the memories, emotions, experiences and everyday knowledge of employees are regarded as irrelevant, if their identities are ignored, then the organisation and learning context would be regarded as inhuman. Factors such as poverty, economic failure and racism also need to be considered as they could have an impact on learning outcomes and learning ability (Ibid., 2009:231). Moreover, in vocational training, like artisan development, the work context may not provide a comprehensive and/or exact content for learning in a particular trade and has to be reinforced by formal training (Beddie & Halliday-Wynes, 2010:241). Even though the trade theory learned at the TVET college is used as a framework for practical WPL by the apprentices it is possible that the workplace context does not exactly match the trade theory.

The arrows in the model refer to the flowing of learning: how people make sense of their situation. They also indicate that the learning experiences do not occur in sequence or in a particular formalised structure, as people go forward and backward through the process of making sense (see Marsick & Watkins, 2001). Marsick and Watkins (2001:29) integrated incidental learning in their model as it was clear to them that learning is always occurring, with or without the learners' conscious awareness. The assumption therefore is that learning can occur both intentionally and unintentionally. Accordingly, Eraut (2000:116) prefers to use the term 'non-formal learning' instead of 'informal learning' which forms an integral part of deliberative activities such as decision making, planning and problem solving.

According to the model of Marsick and Watkins (2001), represented in Figure 2.2 above, informal learning (at the workplace) is started with a trigger and the process proceeds through eight phases:

- triggers;

- interpreting the experience;
- examining alternative solutions to the identified problem;
- developing appropriate learning strategies;
- producing the proposed solutions where the apprentice will implement a chosen strategy;
- assessing intended and unintended consequences;
- lessons learned; and
- framing the business context.

According to Jarvis (2012:30), *triggers* of practical WPL emerge from a situation or an event that provides a disjuncture for the employee involved in learning at work. The organisational restructuring process undertaken by the mine in 2015 and 2016 could also be regarded as a trigger (see Reardon, 2010:288-392). Williams (2003:209-212) states that a trigger starts the process of learning when it is confronted with a routine response to a situation or expected solution in the workplace. The triggers that inform practical WPL could be knowledge gaps, discrepancies, deficiencies, political and developmental issues (Ellinger, 2003:11-12), as well as environmental instability, challenges, opportunities, discontinuities, and disjunctures (Boud & Solomon, 2003:330-331; Jarvis, 2012:173-174; Marsick, 2009:273).

The model pertaining to informal and incidental learning indicates that after the practical WPL process has been activated, the learning process enters the next stage: *interpreting the experience.* During this phase the apprentice describes the problem that prompted the learning experience and evaluates or tries to understand the experience that acted as the trigger. Gola (2009:341-343), Hoekstra, Korthagen, Brekelmans, Beijaard and Imants (2009:289-292) and Jarvis (2012:30) contend that during this phase the individual's interpretation is strongly influenced by their vivid experience, constructed expectations, as well as their perception of the workplace. In the practical WPL context prior experience and individual expectations of employees are the most common aspects of informal learning especially when they come across situations that they have to resolve (see Boud & Solomon, 2003:330-331; Williams, 2003:212-216; Hoekstra et al., 2009:285-288; Ruth-Sahd & Tisdell, 2007).

In the next phase in the informal learning process the apprentice would *examine alternative solutions* to the identified problem. In the ADP the ability of the apprentice to give an 'intuitive' response to a given situation (Ruth-Sahd & Tisdell, 2007) or articulate a problem based on past learning experiences or formal trade theory and informal interaction with peers often results in the development of tentative strategies to solve their problems (Lohman, 2009).

The overall nature of the artisan's job profile in the context of the mine was to find solutions to problems and indeed solve those problems, whether it was a mechanical breakdown, maintenance of plant and mining equipment, or electrical repairs. The apprentices' past trade theory training would have contributed to their valuable intuitive responses to the problems they faced daily at the mine. The mine is a 24/7 operation and breakdowns come in to the engineering section on a continuous basis. The plant stops regularly for overall maintenance on all equipment to ensure continued operation. The intuitive responses of apprentices and artisans needed to attend to these breakdowns and maintenance may have produced unique informal learning experiences that lead to the next phase of the informal learning model: *learning strategies*.

During the phase of learning strategies, the individual learner processes the strategies and considers which of them are necessary to provide a solution to the problem or to understand the problem. Wofford (2011:40) asserts that learners develop strategies to learn how to make adjustments for a problem, or to understand a situation for the purpose of developing further subsequent strategies. This approach was applicable in the context of the mine where apprentices with the guidance of a coach in a production-driven working environment were constantly required to make adjustments when repairing mining equipment where it was needed as a resource to produce iron ore. In situations like these, and to overcome practical experience deficiencies, the apprentice is often supported by choosing collaboration as a strategy to acquire the appropriate skills and knowledge (Talukder, 2015:23).

Teamwork and collaboration are two attributes beneficial to the apprentices in the quest for expertise. Lohman (2009:508) contends that individuals develop their learning strategies by talking with others, collaborating with others, observing others,

sharing materials, and searching the Internet. The mine subscribes to the values of collaboration and innovation which encourages employees to contribute to new ideas on improving productivity, reducing costs and improving safety.

The next phase in the informal and incidental learning model is to *produce proposed solutions.* After the individual has gained the acquired competencies to address a particular problem in the workplace, he or she will go through some form of action, cognitive adjustment, or both, to address the trigger (Jarvis, 2012:152; Wofford, 2011:88-89). Talukder (2015:23) notes that the individual's proposed solution and its implementation to solve the problem goes through the full exposure to the problem by relying on their acquired competencies, and collaboration with others in the workplace. The employee's implementation of the strategy in practical WPL could, according to Wofford, Ellinger and Watkins (2013:89), range from reinforcement and experimentation to trial and error.

The informal learning process now takes the learner to *assessing intended or unintended consequences* after the appropriate strategy has been implemented. During this phase the learner has to evaluate the consequence(s) of particular actions undertaken to have a desired outcome. In the mining context this consequence could be a loss of production or a loss of life. Marsick, Watkins, Callahan and Volpe (2006:796-796) contend that these outcomes include those that the learners had anticipated as well as what they encountered unexpectedly. The apprentices in the mine would in most cases approach a situation in the workplace based on their beliefs that are informed by the trade theory and former experience. This is consistent with the view held by Wofford (2011:41), namely that when individuals evaluate their actions, they often presume a cause and effect relationship based on their assumptions and beliefs. These assumptions and beliefs are not always correct and maybe proven wrong (Jarvis, 2012). In either case, Wofford (2011:41) contends that the wrong and untested assumptions may, upon assessments of the consequences, lead to further learning where the individuals would modify their future learning expectations.

The new learning opportunities from wrong and untested assumptions lead to the next phase in the informal and incidental learning model: *lessons learned.* During this phase the individual will determine whether the consequences in attempting to

solve a particular problem were positive and whether the lessons learned will lead to change in the individuals' behaviour or their prospective actions for future encounters (Wofford, 2011:42). Also, Ellinger (2005:400-401) indicates that individuals attain new insights about themselves that came as a result of the changes in the organisational context affected by their learning and applied competence. Individuals become more confident when they realise that their expectations matched the actual results after an informal learning experience (Star & Conley, cited in Talukder, 2015:24). However, Marsick et al. (2006:799), Marsick (2009:273), and McNally, Blake and Reid (2009:330-331) warn that the outcomes of practical WPL are not easily defined due to its tacit nature, which may be of less value and limited individual development unless it is not applied through a reflective process. Continuous reflection on the informal learning process as the individual progresses is therefore a critical component of one's experience to explicate meanings and benefit from practical WPL (Wofford 2011:43; Marsick, 2009).

Framing the business context is the final phase in the informal learning process where the learning is transformed within the organisational context. Jarvis (2012:20) contends that the final phase creates the basis for further learning, and stimulates individual expectations towards future informal learning. Marsick et al. (2006:797) explain that this phase involves the reflective transformation of the individuals' informal learning to the organisational context (also see Ellinger & Cseh 2007:437).

In the context of the mine, the apprentices could use their personal practical WPL experience with their perceptions of the internal and external work environment of the engineering department in terms of overall maintenance of mining equipment and the plant during operational shutdowns as factors in framing their changing world. The entire informal learning process of the apprentice is based on the context where they work and is influenced by the complex environment in which informal learning takes place – in an open-pit iron ore mine that operates 24/7 against continuous changing operational targets in a competitive economic sector with commodity prices under pressure.

Ellinger and Cseh (2007) assert that the notion of context as framed by the individual is an important aspect that influences the informal learning process. Context is explicitly embedded in the informal and incidental learning model of Marsick and

Watkins (2001), which illustrates its extensive interaction with the entire informal learning process. The next section focuses on organisational factors influencing artisan development.

2.5 ORGANISATIONAL FACTORS INFLUENCING ARTISAN DEVELOPMENT

What and how adults learn informally in the workplace is to a large extent connected to individual factors as well as factors present in the organisation (Van Der Klink, Boon, & Schlusmans, 2012:79). In reference to the sub-research question, Metso (2014:387) identified the following organisational factors, through an empirical study, that enhance vocational students' professional development of skills they need in order to carry out their respective trades:

- an innovative climate that assists apprentices in exploring new approaches to tasks and work processes;
- guidance from an experienced coach to ensure the apprentice develops in the right direction and at the appropriate competency level which ensures continuous improvement of performance;
- interactions with seniors as a channel to acquire and share trade specific knowledge; and
- autonomy to provide opportunity to apply newly acquired skills in varying authentic situations and learn through trial and error.

In addition to the view held by Metso (2014), the literature indicates much research on organisational factors pointing to the significance of feedback and support from co-workers and managers respectively, the learning climate (acceptance and time for experimenting on the job), workload, autonomy in the performance of tasks, and duty (also see Van Der Klink et al., 2012:80; Skule, 2004).

These organisational factors are embedded in the characteristics of the learner, training or learning intervention design and the work environment (Lancaster, Milia & Cameron, 2012:7). MacRae and Skinner (2011:984) note that researchers generally agree to categorise factors influencing training transfer into three broad themes: trainee characteristics, training design, and work environment (see Blume, Ford,

Baldwin & Huang, 2010; Burke & Hutchins, 2007; Clarke, 2002; Yamnill & McLean, 2001). MacRae and Skinner (2011:984) list a number of variables in the three categories that affect the transfer of learning or training in the workplace. The summary in Table 2.1 below gives an overview of these variables:

Table 2.1: Organisational factors influencing workplace learning (MacRae & Skinner, 2011)

Learner characteristics	Training and learning intervention design and delivery	Work environment
▪ Cognitive ability of the learner to undertake the training ▪ Sufficient self-efficacy of the learner ▪ The motivation of the learner ▪ Training and learning perceived as useful or valuable for the role of the learner ▪ Learning or training is perceived to assist in career planning or pathways of the learner ▪ Learner's openness to experience ▪ Perceived organisational commitment to staff learning and development	▪ Learning intervention fulfils the expectation of respondents ▪ Participant is given opportunity to influence programme content ▪ Intervention is related to short- and long-term goals of learner ▪ Content is relevant ▪ There is an opportunity to practise and give feedback ▪ There is positive behaviour modelling ▪ The intervention includes error-based examples	▪ Work climate and managers are receptive to and supportive of learning transfer ▪ There is supervising and peer support ▪ Respondents are given opportunities to perform and test their learning

(Adapted from MacRae & Skinner, 2011)

Burke and Hutchins (2007) also identified different organisational factors in these three dimensions that moderately or strongly affect WPL, as summarised in Table 2.2 below:

Table2.2: Organisational factors influencing workplace learning (Burke & Hutchins, 2007)

Learner characteristics	Intervention design and delivery	Work environment
▪ Cognitive ability ▪ Self-efficacy ▪ Pre-training motivation ▪ Negative affectivity ▪ Perceived utility ▪ Organisational commitment	▪ Prior work on identification of learner needs ▪ Identification of learning goals ▪ Relevance of content ▪ Prominent instructional strategies and methods ▪ Self-management strategies ▪ Instructional media	▪ Strategic linkage of training ▪ Transfer climate ▪ Supervisory and peer support ▪ Opportunity to perform ▪ Accountability

(Adapted from Burke & Hutchins, 2007)

Learner characteristics as the first dimension of factors influencing WPL focus on the learner and underscore his or her cognitive ability to engage actively in the learning effort. Blume et al. (2010:1075) also highlight the cognitive ability of the learner, motivation and personality as important factors influencing training transfer. Besides the learner's personality traits which may strongly or moderately influence transfer of training, are also the locus of control, goal orientation, job involvement, voluntary participation, pre-training, self-efficacy, and motivation to learn or transfer (Ibid., 2010:1075). Lancaster et al. (2012:7) report that learners with high levels of self-efficacy are more motivated to learn than those with lower self-confidence and that higher motivation among learners recorded higher levels of transfer, which in my view results in an increased level of self-directedness.

For practical WPL to be effective the intervention and delivery design needs to fulfil the expectation of the learner, be aligned with identified goals, be relevant, and allow for practice through trial and error exercises (Burke & Hutchins, 2007; MacRae & Skinner, 2011). The intervention has to satisfy the learner's short-term career goals. The case in point would be that the learning opportunity should add to the career development of the apprentice, which could lead to obtaining the relevant qualification or red seal. This will open employment opportunities for the apprentice.

From these three dimensions that influence the transfer of learning, Lancaster et al. (2012:7), drawing on the work of Brown and McCracken, (2009), Burke and Hutchins (2007) and Cheng and Ho (2001) note that the workplace environment has received the least attention. One variable in the work environment dimension is supervisor support. Since the engineering foreman and general engineering supervisor, in addition to the artisan and master artisan, played a significant role in learning transfer and the development of the apprentice in the mine it is important to understand their role in the transfer of training to the apprentice in the work environment. The next section focuses on how workplace learning is facilitated during artisanship.

2.6 HOW LEARNING IS FACILITATED IN AN ARTISAN DEVELOPMENT PROGRAMME

Apprentices do not only learn to acquire the prerequisite skills to be competent enough to pass the trade test, but they must acquire technical expertise in a wide variety of personal, generic and specific skills for the chosen trade (Chan, 2013:370). Positive transfer of learning therefore occurs between the coach and the apprentice with the focus on skills acquisition. In most scenarios the apprentice is a novice in the workplace with theoretical knowledge of a particular trade as the only reference. The apprentices received practical exposure during the formal training programme at the SIVOS to apply their trade theory, but lack the technical expertise. This technical expertise is learned through positive transfer over time from a coach with more experience in the particular trade than the apprentice.

Baldwin and Ford (1988:63) define the positive transfer of training as the degree to which trainees effectively apply the skills, knowledge and attitude gained in a training context back to the job. Apprentices attended a TVET college where theoretical theory content of a particular trade was taught that should now be transferred to the workplace under the guidance and mentorship of an experienced master artisan or supervisor. Baldwin and Ford (1988:63) contend that for learning transfer to occur, the learned behaviour of the individual must be generalised to the job context and maintained over a period of time on the job.

During the time spent in the workplace, the apprentice may come across learning domains that provide the scope and context of practical WPL. The learning domains often encountered by young people in their first year of work were the focus of the research done by Smith (2003:391), who listed 10 domains of WPL, namely:

- technical skills of the specific trade;
- generic competencies;
- knowledge of the trade;
- learning about the chosen occupation;
- learning about the organisation where the trade has to be performed and how the job operates within the wider organisation spectrum;
- learning about the industry to gain appreciation for the organisation;

- learning about job keeping and the attitude appropriate and accepted in the organisation;
- employee and industrial relations and how the company's disciplinary procedures function;
- learning about the self and understanding the importance of work-life balance; and
- learning about learning.

These learning domains map out a typical WPL scope and adding to this Chan (2013:230) notes that apprentices have to learn elements of their trade that are not readily described or easily quantifiable as in a formal learning programme.

In terms of the third sub-question (see Chapter 1, section 1.4.1) it can be assumed that active engagement by apprentices in authentic occupational activities in the workplace while interacting with experienced co-workers generates both situation-specific and more broadly applicable relevant occupational knowledge (Billett, 2013:129). The interaction between the apprentice and coach, and their engagement in authentic work activities in the workplace that is conducive to training and learning are influenced by learner characteristics, learning intervention design and delivery, as well as the work environment (MacRae & Skinner, 2011:984, drawing on the work of Baldwin & Ford, 1988; Ford & Weissbein, 1997; Alvarez, Salas, & Garofano, 2004).

(Billett, 2004) points out that active engagement in work activities, even in routine or familiar work tasks, creates learning as it frees up working memory for the employee. The employees can now focus on other tasks in the workplace. They can then use their cognitive resources selectively and strategically which will allow them to focus on more challenging tasks that are difficult to perform or highly complex and require them to consider a variety of factors. The following section focuses on artisan development within the context of practical WPL.

2.7 INFORMAL WORKPLACE LEARNING AND ARTISAN DEVELOPMENT

The research question has its reference in the 3-P model on WPL developed by Tynjälä (2013), as discussed in section 2.4.3 above. The 3-P model is applied in the analysis of competence acquisition in the learning and development of employees as well as work contexts in technical vocational education and training (TVET) and higher education (HE). Research on artisanship in the context of WPL is positioned within the socio-cultural environment frame of the 3-P model. TVET and HE in different countries have adopted varying models of organising and providing work experience for vocational students[14]. These models may be divided into two basic systems of artisan development, namely the dual system (see Brockmann, 2010; Brockmann, Clarke & Winch, 2010; Gamble, 2004) and the school-based system (see Alet & Bonnal, 2011; Bennell, 1999). Tynjälä (2013:24) points out that students in a dual system enter into an employment relationship as apprentices with an organisation during their vocational training and attend formal school for a certain number of days in a week. Formal schooling can also be alternated with practical WPL on a weekly basis. For learners in the school-based system most of the education and training happens within the formal school environment and students are allowed special practice opportunities in authentic workplaces for the duration of the programme (Tynjälä, 2013:24).

Examples of the dual system are found in Germany (Bennell, 1999; Stanwick, 2009), Austria (Lerman, 2010), Switzerland (Tynjälä, 2013), and the Netherlands (Brockmann, 2010). According to Gamble (2004:135), the dual system in Germany is an effective model to link training and development with WPL. Odora and Naong (2013:4) note that in the dual system vocational qualifications are obtained when the apprentice successfully completes a course developed through negotiation with social partners that sees the integration of theoretical knowledge and WPL. This brings us to artisan development in different countries.

[14] Different countries have different terms for vocational training. In Australia it is Technical and Further Education (TAFE), Further Education (FE) in the UK and community colleges in the USA (Robertson, 2015).

2.7.1 Artisan development in the United Kingdom and Europe

Odora and Naong (2013:4) draw on the research of Rauner, Smith and Hauschildt, (2010) which revealed that the UK and other European countries have adopted a different methodology to artisan development, known as the Programme-led Apprenticeship approach (PLA). The PLA offers an alternative initial full-time vocational education course to students before they are transferred to a more traditional employer-led apprenticeship route where on-the-job training is done. The required competence has to be achieved for the mandatory National Vocational Qualification for young people whochoose to leave the school at the age of 16 (Fuller & Unwin, 2007:449).

Apprentices receive a salary during the apprenticeship and employers are required to cover all other related costs of the training programme. The PLAs in Netherland and Denmark are slightly different and resemble a more school-based approach where students alternate their time between vocational school and WPL (see Odora & Naong, 2013) which has proved to be a more popular approach for both students and employers.

The difference between the PLA and the school-based model is that the latter allows the student to alternate between vocational school and the workplace whereas in the PLA, WPL occurs at the end of full-time formal education. The PLA model is most popular in the South African TVET[15] sector (see Odora & Naong, 2013).

2.7.2 Artisan development in Finland

Metso and Kianto (2013:129) assert that vocational education and training (VET) in Finland makes on-the-job learning a compulsory part of the curriculum for students in this sector. During the students' three-year term at the institution for vocational studies, they conduct a work period of no less than six months at an organisation that matches their career aspiration in order to gain practical insights and development in the skills needed for the chosen trade or profession.

[15] The Minister of Higher Education and Training, Blade Nzimande, announced in the White Paper on Post-School Education and Training on 15 January 2014 that all FET (Further Education and Training) colleges are to be renamed to TVET (Technical Vocational Education and Training) colleges in South Africa.

Metso and Kianto (2014:129) indicate that WPL became a compulsory part of the Finnish VET system after the Minister of Education reformed vocational qualifications from 1999 to 2001. This was done to meet the needs of working life and it supports lifelong learning which was regulated within the framework of the Vocational Education and Training Act and the Vocational Educational and Training Decree. The Education Ministry further adopted an Education and Research Development Plan (2012) for the period 2012 to 2016 which would ensure that the Finish VET system provides solid vocational knowledge and skills to enable students' rapid transition to work life, along with the skills for lifelong learning (see Metso & Kianto, 2014:129).

2.7.3 Artisan development in South Africa

Artisan development in South Africa is administered by the DHET. The DHET launched the Sector Education and Training Authorities (SETAs) in 2009 with Further Education and Training Colleges (FETs) that became part of the legislative competence of DHET as a starting point for artisan development in South Africa. The White Paper for Post-School Education and Training (RSA, 2014), however, announced a move away from the FETC to a TVET college system. The White Paper (RSA, 2014) aims, amongst other things: (a) involving economic sectors and employers in the education system; (b) reviewing current college curricula; (c) renewing efforts to monitor and enhance the quality of education in college; and (d) bettering the alignment between SETAs, TVETs, universities, and other educational systems. According to an article published by Oxbridge Academy in Bizcommunity (2014), the DHET White Paper (RSA, 2014) in effect presents a general strategy to turn post-school education in South Africa into a ‘single, coordinated system’ that will be better able to empower school-leaving South Africans and that will strengthen the South African skilled labour force as a whole. Artisan development in South Africa may benefit from a single regime approach, effective curriculum delivery by the TVET colleges and partnerships between these educational institutions and employers.

Oxbridge Academy (Bizcommunity, 2014) further asserts that unlike FET, which is a term established by the DHET, TVET is an international term. This term originated from the 1999 UNESCO Second International Congress on Technical and Vocational Education in Seoul. The congress went on to establish the UNEVOC-INEVOC International Centre for Technical and Vocational Education and Training, which would drive TVET as a global educational initiative.

According to the Robertson (2015:1), the White Paper (RSA, 2014) envisaged that TVET colleges would be expected to address high unemployment rates in the country by providing relevant education and training. Such training would be aimed at preparing students for the workplace and to upskill people presently in employment or who are considering returning to the job market. These colleges are also expected to change radically in order to meet the social and economic needs of the country by playing a transformative role in education as required by legislation. Further to this the legislation governing human resources development, specifically the MPRDA[16] in the mining sector, has a strong focus on the training and development of unemployed youth and mining sector employees that is directly linked to the company licence to operate.

Skills development, and in particular artisan development, is regulated by a single national policy regime that is based on the primary provisions of the SDA, which falls under the control of the Minister of Higher Education and Training in South Africa. During 2008 the SDA was amended to the Skills Development Amendment Act No. 37 of 2008. The Amendment Act aims to strengthen the national policy that governs artisan development in South Africa. One of the critical outcomes of the Amendment Act was the establishment of a National Artisan Moderation Body (NAMB) in the DHET on 30 November 2010. The function of the NAMB is to coordinate artisan development in the Republic of South Africa. The work of the NAMB falls under the Departmental Strategic Objective to '[p]rovide a dynamic interface between the workplace and learning institutions and to promote quality of learning at work and for work' as reflected in both the Departmental Strategic Plan 2010/11–2014/15 (Chetty, 2010) and the Annual Performance Plan for 2013–2014 (DHET (Department of Higher Education), 2014).

[16] Mineral Petroleum Resources Development Act 28 of 2002

Prior to the promulgation of the SDA as amended, artisan development had been governed by the Manpower Training Act No. 56 of 1981 (MTA). The MTA defines ‘apprentice’ as any person employed in terms of a contract of apprenticeship registered or deemed to be registered in terms of the provisions of section 16(3)(d) or section 18(1)(c) or (3) and, for the purposes of sections 42, 50, 51, 54 and 56, includes any minor employed in terms of the provisions of section 15 (RSA, 1981). The SDA defines ‘apprenticeship’ as a learnership in respect of a listed trade and includes a trade test in respect of that trade. Mukora (1981:219) asserts that a person who successfully completed an apprenticeship is called an artisan. Apprenticeship development includes a period of on-the-job learning at an organisation that closely matches the career aspiration of the student.

According to Mukora (1981:220), the MTA allowed a student to become a certified artisan in two ways as prescribed in sections 13 and 28 of the Act. Section 13 refers to qualified artisans who were formally indentured as an apprentice at a single employer for the duration of the apprenticeship. The apprentices employed by companies under section 13 would complete the National Engineering Certificate (N) to cover their respective trade theory components at public or private TVET colleges They would do their practical training at a SETA or QCTO-accredited skills development provider (either externally or internally with the employer). The tooling company where they were employed would provide the WPL in line with the training schedule or log book of the relevant trade (see Mukora, 1981). After the completion of the prescribed WPL period, apprentices would write a trade test whereupon, if successful, they would be issued with a trade certificate known in the industry as the ‘red seal’.

Section 28 refered to people not indentured under section 13 who would undergo recognition of prior learning. This was meant for people not contracted by the organisation as apprentices but employed as skilled/semi-skilled workers or artisan aids with several years' experience and who could, therefore, write the trade test based on this experience gained over the years in the entire scope of the trade. Once the trade test was passed the same trade certificate would have been issued. It involved providing sufficient, verifiable evidence attesting to work experience.

The establishment of the SETAs changed the MTA framework that guided artisan development in South Africa. The SETA is a body established under the SDA whose main purpose is to contribute to the improvement of skills in South Africa through achieving a more favourable balance between industry demand and supply and ensuring that education and training:

- acknowledges and enhances the skills of the current workforce;
- meets agreed standards within a national framework;
- are provided subject to validation and quality assurance;
- where appropriate, are benchmarked against international standards;
- are accredited by South African Qualifications Authority (SAQA) as Education and Training Quality Assurers (ETQAs) within a particular economic sector; and
- monitor education and training in these sectors.

The National Qualifications Framework Act No. 67 of 2008 (RSA, 2008) replaced the South African Qualifications Authority Act No. 58 of 1995 (RSA, 1995) resulting in three quality councils being established to replace the previous Education and Training Quality Assurance (ETQA) function which was seated with the SETAs. They are the Council for Higher Education (CHE), responsible for higher education and Training; Umalusi, responsible for further education and training; and the QCTO, responsible for trades and occupations.

The purpose of the QCTO is to:

- ensure the availability, relevance and quality of occupational qualifications to meet industry needs;
- ensure occupational training addresses skills needs of the labour market;
- ensure the WPL experience offered to apprentices by employers is structured, appropriate and purposeful; and
- ensure the achievement of occupational qualifications reflects occupational competence.

In the South African context, a mandatory 80 weeks of on-the-job training is prescribed for artisan apprentices. During this period, the apprentice must do the assigned tasks under the supervision of a coach with relevant workplace experience in a similar trade as the apprentice. This principle is also applied in the mining sector.

Various national initiatives provide a support structure to artisan training in the corporate sector. The NSDS III (2011) seeks to encourage and support large corporate employers and state-owned enterprises to cooperate with the relevant education and training institutions by providing the required training resources and experienced staff to address specific skills development needs of artisans through focused WPL. The mine offers artisan apprentices an 18-month on-the-job WPL opportunity before they can obtain the National Engineering Certificate (N3) qualification in their trade of choice. The next section discusses artisan development in the mining industry with specific reference to the mine where this study was completed.

2.7.4 Artisan development in the mining industry

Artisan apprentices may enter the workplace for on-the-job learning from three routes: (1) the traditional apprenticeship route regulated by sections 13 and 18 of the MTA; (2) the learnership route that was established in terms of the SDA divided into section 18.1 learnerships involving employed workers and section 18.2 learnerships provided to unemployed learners; and (3) the N1-N6 qualification route allowing students to enter a TVET college after Grade 12 to pursue artisan studies in a chosen trade (see Mukora, 1981:231). Learners could also enter the TVET College at N1-level after having completed Grade 9 at school. A period of practical WPL is needed by the engineering apprentice as a requirement to complete his or her engineering studies to qualify in a particular trade. In the mining context this practical WPL is facilitated by seasoned experienced artisans in different trades employed by the mine.

The mine accepts artisans through the second and third route as other legislative requirements guide the intake of apprentices. Out of the 22 priority artisanships in the engineering field, according to Mukora (1981:237), the mine gives preference

and WPL opportunities to apprentices in the following disciplines: Plater and Welder, Electrical, Fitters, Fitting and Turning, Millwrights, Boilermakers, Diesel Mechanics as well as Instrumentation and Electronic Technicians. The first group of trades are clustered together in the engineering field of study at a TVET college for which learners attend formal classes in trade theory from N1 to N6 in a post-matric programme. Mukora (1981:238) points out that if these graduates are not offered organisation sponsorship and WPL opportunities they would be unqualified and unemployed as WPL is a requirement to pass the trade test.

WPL is supported by an extensive legal framework in the mining sector in South Africa. In terms of section 3(1) of the Skills Development Levies Act No. 9 of 1999, every employer has to contribute 1% of the payroll towards a skills development fund. Revenue created by the skills development fund will be applied for the training and development of skills within the mining sector, including artisan training promulgated by the SDA. The Mining Charter, (RSA, 2010:3) prescribed that mining companies spend 4.5% of their annual payroll on the development of historically disadvantaged South Africans in 2013, which may include artisan development. In 2014, the expenditure target for historically disadvantaged South Africans was 5% of the annual payroll. A penalty of 1 point for every 0.1% below target is instituted. Compliance with this target also means compliance with section 100(2) of the MPRDA as well as section 9 of the Constitution of the Republic of South Africa Act No. 108 of 1996 (RSA, 1996). MPRDA, among others, seeks to facilitate the meaningful development of historically disadvantaged South Africans. This requirement is also outlined in the Mining Charter (RSA, 2010).

Different learnership programmes are on offer to the community. Of these, artisan development is the flagship that forms part of the engineering training programme. With a life of mine prediction of 29 years since operations started, the mine has to secure a constant inflow of a skilled workforce, including artisans, to position itself sustainably as a global producer of quality iron ore. Developing the expertise needed for skilled performance in the mining industry has become a seamless and ongoing process in a market under continuous pressure to provide the right product on time, within budget and with zero harm to employees.

The mine also has to position itself as an employer of choice where learning and development opportunities of its workforce take centre stage, and the ADP is one of many development programmes in its human resources development portfolio. Artisans are a scarce commodity in South Africa and companies offer high, competitive salaries with company-provided accommodation. Frequent turnovers of human resources in this field are occurring more often. Companies also implement other strategies to keep their artisans longer in their employ, for instance through promotions, market-related salaries, development opportunities, production bonuses, developing of scarce skills and shift allowances. The provision of skilled artisans to the mine amidst an increasing shortage of qualified artisans in South Africa puts the artisan pool under further pressure.

Artisan training and development is an expensive investment for any company and the intake of apprentices is hampered by budget constraints. The DHET can only provide formal learning opportunities for artisans through its FET sector. Apprentices can only qualify as artisans after successful completion of 80-week on-the-job training under the guidance and coaching of a suitably experienced artisan for the prescribed period. Mukora (1981:242) states that companies will conclude a learnership agreement with the apprentice upon which a learning opportunity would be granted. This agreement does not indicate any modules an apprentice has to complete as part of the learning programme, but allows an employer to place an apprentice on a site where his or her on-the-job-learning will closely match the formal training preceding the WPL.

2.8 CONCLUSION

Artisan development through practical WPL follows a combination of an informal and formal approach to learning as the apprentice has to complete practical modules in different sections within the organisation under the guidance of a coach. The interaction between coach and apprentice is sometimes informal and knowledge is transferred on the fly, in the normal execution of the apprentice's duties. Svensson and Ellström (2004:479) hold the view that interaction between apprentice and the

working environment takes place continually and that this forms the basis of the learning process.

The apprentices' exposure to learning opportunities in the workplace should develop their knowledge which would lead to the acquisition of competence. Informal learning that occurs in the course of the daily life of the apprentice at the mine is important but not sufficient for the acquisition of knowledge (Ibid., 2004:479). Svensson and Ellström (2004:479) argue that informal learning needs to be supported by formal learning (also see Ellström, 2001) and therefore the mine only accepts apprentices that have attended a relevant TVET college and have completed all required trade theory modules.

The inexperienced novice apprentice joins the ADP and through practical WPL the mine provides the setting and learning opportunity where the apprentice will be permitted to apply theoretical knowledge, providing the much needed on-the-job training for increased competence to pass the trade test eventually – a route that will take him or her from apprentice to artisan.

CHAPTER 3
RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Babbie and Mouton (2012:72) claim that science is an initiative dedicated to "finding out". I wanted to find out how WPL at the mine facilitates the development of artisan apprentices. The research question was the departure point (Babbie & Mouton, 2012) of this study. In order to answer the research question I followed a plan that directed me during the study, from designing, conducting and concluding the project. This chapter provides the plan (Babbie & Mouton, 2012:74) that directed the study in order to find out whether artisan development is facilitated through WPL at the mine.

This chapter focuses on what Henning et al. (2013:30) call the design type. The design type refers to how research is conceived and executed, and how the researcher eventually puts the findings together. A case study design involving the artisan apprentices of the mine where the study was conducted was selected. Data were collected from semi-structured interviews with apprentices, engineering foreman and general engineering supervisors, experienced artisans and master artisans at the mine. The semi-structured interviews were based on questions that sought to address the research question as discussed in the next section.

3.2 RESEARCH QUESTION

According to Yin, (1994:6), the "how" and "why" type of research questions are more explanatory and like to lead the researcher to use a case study design. The research question of this study was: *'How, if at all, does WPL in the mining sector facilitate the development of artisan apprentices?'* In addition to the main research question, sub-questions were formulated to assist with the analysis of data received from the respondents. The sub-questions of the study were:

- *Which organisational factors, if at all, influence artisan development at the specific mine?*
- *How, if at all, is informal learning facilitated during the ADP?*

- *How, if at all, does learning occur during the ADP?*

The focus of the sub-questions took the research question to three different elements that influenced situated learning within the mine, namely organisational factors, learning facilitation, and the learning itself. Taking an interpretive stance with a case study connected the empirical study to its initial research questions and finally to the answers or conclusions arrived at by the end of the study. The interview schedule used to gather the data in the study also contained standard questions to ensure that all the respondents answered from the perspective of the apprentice in their perception of situated learning and the coach on how practical WPL was facilitated in this context (refer to Annexure C). The basis of the questions for the apprentices and artisans is the same, however the artisan, engineering foremen and the general engineering supervisor will answer from the perspective of the facilitators of practical WPL. The engineering apprentices through their answers showed show how they gained the practical knowledge required to participate in their respective workplace activities, i.e. (refer to Annexure C):

- *Why did you join the artisan development programme?*
- *Why did you choose this artisan development programme?*
- *How does learning occur during the artisan development programme at the company?*
- *How is learning facilitated by the artisan, engineering foreman and general engineering supervisor?*
- *Which factors in the organisation positively influenced your learning during the artisan development programme?*
- *Which factors in the organisation negatively influenced your learning during the artisan development programme?*

The artisans, engineering foremen and general engineering supervisor who acted as facilitators of learning to other apprenticeship respondents highlighted how the transfer knowledge happened in this context in an informal way as opposed to traditional formal training, how organisational factors impacted on the learning transfer (See Annexure C):

- *What were the reasons for you to join the artisan development programme?*

- *How does learning occur during the artisan development programme at the company? How do you transfer your experience to the apprentice?*

- *How do you assist artisans to learn development programme? (Explain in your own words.) What do you do when an artisan experiences learning difficulties to make sure that learning still takes place?*

- *Which factors in the organisation help learning during the artisan development programme? (Explain in your own words.) Explain which learning strategies you put in place to overcome negative factors that may impact on learning.*

- *Which factors in the organisation inhibited your facilitation of learning during the artisan development programme? (Explain in your own words.) How do you overcome these challenges?*

3.3 RESEARCH DESIGN AND METHODOLOGY

The researcher needs to have a plan, as well as a particular view or stance, from which the study is approached. This plan or research design serves as a guide to conduct the study. Nachmias and Nachmias, (1992:77-78) describe research design as a plan that

> '[g]uides the investigator in the process of collecting, analyzing, and interpreting observations. It is a logical model of proof that allows the researcher to draw inferences concerning causal relations among the variables under investigation'.

Yin (2009:24) states that research design is the logic that connects the data collected in the study, and the conclusions to be drawn by the researcher to the initial research question of the study. Babbie and Mouton (2012:72) assert that the purpose of research design is to address the planning of scientific inquiry, that is, designing a strategy for finding out something.

From these assertions, I had to position the study within a particular context or view when executing the plan. Creswell, (2009:6) refers to this view as a worldview, meaning ‘a basic set of beliefs that guide action’. The position or view of the researcher is (according to Creswell, 2009:6) often referred to as a research paradigm.

Guba and Lincoln, (1989:200) define a paradigm as a set of beliefs and assumptions that people have about a specific issue. These beliefs and assumptions of people of their reality are therefore not objective. Thus, the paradigm from this subjective position assumes the existence of multiple, socially constructed realities. The approach of the researcher to best study these constructed realities would be to take a holistic view taking into consideration the context in which the respondents experience these realities to make meaning and create understanding.

Methodology is intimately related to the research paradigm. The paradigm not only guides the actions of the researcher, but also influences the choice he or she makes in terms of the research design, the aim of the study and the application of methodologies to address the research question (see O’Donoghue, 2003). Interpretive research, according to Given, Saumure, Barone, Cheek, Clandinin, Creswell, Denzin, Elsbach, Palys, Preissle, Sandelowski and Seale (2008:464) is a framework and practice within social science research that is invested in philosophical and methodological ways of understanding social reality. Furthermore, both Henning, et al. (2004) and O’ Donoghue (2003) claim that the emphasis of interpretive research design is the social interaction that forms a basis of knowledge.

From this basis the aim of the current study was to gain insights into practical WPL among apprentices at the mine. The study was positioned within the interpretive research paradigm, using a case study methodology ‘[t]hat would presuppose a discursive qualitative approach’ (Henning et al., 2013). The interpretive paradigm allowed me to experience WPL in its natural setting and to engage with apprentices

and coaches by means of semi-structured interviews. Babbie and Mouton (2012:271) maintain that the researcher should attempt to become more than just a participant observer in the natural setting that is being investigated – he or she should always make a deliberate attempt to step into the shoes of the respondents that are being studied. This method will allow the researcher to understand their actions, decisions, behaviour, practices, and rituals from their perspective.

Njie & Asimiran, (2014:53) contend that researchers who use qualitative data study things in their natural settings and by doing this they try to make sense of or interpret phenomena in terms of the meaning people bring to them. I tried to understand the respondents' view on practical WPL, how the organisation facilitates practical WPL, and which organisational factors influence this phenomenon. This approach brought me close to the respondents as they shared their experiences of practical WPL. Yin (2011:14) states that studies emphasising interpretive analysis within research are strongly devoted to capturing the uniqueness of events. Case study research from an interpretive point of view creates a situation where the researcher is close to the study.

The data that emerge from a study using qualitative data are explanatory. That is, data are reported in words (primarily the respondents' words) or pictures, rather than in numbers (Creswell, 2009:195 citing Locke, Spirduso, & Silverman, 2009; Marshall & Rossman, 2006; and Merriam, 1988) The focus of such research is on respondents' perceptions and experiences, and the way they make sense of their lives (Locke, et al., 2009; Merriam, 1988). The aim is therefore to understand not one, but multiple realities (Lincoln & Guba, 1985).

Idiographic interpretation was utilised in this study (Creswell, 2009:195). In other words, attention was paid to particulars, and data were interpreted with regard to the particulars of a case rather than generalisations. Meanings and interpretations were negotiated with human data sources because in such an approach it is the subjects' realities that the researcher attempts to reconstruct (Lincoln & Guba, 1985; Merriam, 1988). This study relied upon research on the utilisation of the respondents' tacit knowledge (intuitive and felt knowledge) because often the nuances of the multiple realities can be appreciated most in this way (Lincoln & Guba, 1985). Therefore, data were not quantifiable in the traditional sense of the word.

Yin, (2009:18) defines a case study as ‘an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident’. This definition links with the view of Rule and John (2011:4) who describe a case study as ‘a systematic and in-depth investigation of a particular *instance in its context* in order to generate knowledge’ (my italics).

A case study design was the preferred choice for my project influenced by Yin (2009). Learning from Yin (2009:11), I understood that I should consider a case study design when the focus of the study was to answer ‘how’ and ‘why’ questions; when I could not manipulate the behaviour of those involved in the study; when I wanted to cover contextual conditions because I believed they were relevant to the phenomenon under study; and when the boundaries between the phenomenon and the context were not clear.

According to Yin (2009:31), a case can be some event or entity and in this study my case was apprenticeship training at the mine, which was informed by (a) legislation, (b) perceptions of artisans-in-training regarding practical WPL and (c) established artisans employed by the company. In order to answer the research question, I had to study the respondents involved in artisan training that formed my units of analyses, i.e. the apprentices, experienced artisans, engineering foremen and general engineering supervisors.

This study was well suited to apply a case study methodology. Yin (1994:15) has presented at least four applications for the case study model:

- to explain complex causal links in real-life interventions;
- to describe the real-life context in which the intervention has occurred;
- to describe the intervention itself; and
- to explore those situations in which the intervention being evaluated has no clear set of outcomes.

Another reason for my choice of a qualitative study is its distinctive features. Yin (2011:7) contends that qualitative research entails the following:

- studying the meaning of people's lives, under real-world conditions;
- representing the views and perspectives of the people *(respondents)* in a study;
- covering the contextual conditions within which people live;
- contributing insights into existing or emerging concepts that may help to *explain* human social behaviour; and
- striving to use *multiple sources of evidence* rather than relying on a single source alone (my italics).

The research question with its sub-questions restricted me to focus on practical WPL in artisan development at the mine and a qualitative study was the ideal choice as the aim of a qualitative study is usually the depth rather than the 'quantity of understanding' (Henning et al., 2013:3). The study was conducted in the workplace setting of the mine that was bound by the theme of the inquiry and confined by the research question. Furthermore, the respondents were bound to express the data that were to be captured by the predetermined instruments (Ibid., 2013:3). The focus of the study was: How does practical WPL, if at all, influence artisan development? Miles and Huberman (1994:25) define a case as a 'phenomenon of some sort occurring in a bounded context. The case is, in effect your unit of analysis.' This was in line with my choice of a case study. I conducted a study at the mine focusing on artisanship through practical WPL.

Rule and John (2011:7) state five reasons why case studies can be conducted. These reasons support my choice of applying this particular methodology:

- Case studies create an understanding of and insight into a particular instance and in doing so, provide a thick, rich description of the case, revealing its relations to its broader contexts. Artisan development within the mine was an important intervention for the company as the successful apprentices increased the talent pool of the organisation to secure a constant flow of qualified artisans into occurring vacancies.
- Case studies can be used to explore a general problem or issue within a limited and focused setting. The mine experienced a constant shortage of suitably qualified artisans, which had an impact on its sustainability and competiveness. The organisation was mitigating this shortage and

consequence on its production output by investing in an effective practical WPL programme for apprentices in various trades.

- Case studies can be used to create theoretical insights, either in the form of grounded theory that is produced by the case study itself, or by developing and testing existing theory applicable to the case. Practical WPL has over the years received increased prominence in the mining industry as legislation informs the practice. The conditions of the company's mining licence also directed the mine to make provision for training and development opportunities for its labour-sending areas, of which artisan development is one such a programme.
- Case studies might also explain other, similar cases and thus provide a level of generalisation or transferability. Mining companies in general benchmarked their successes and found solutions for their challenges from similar organisations. The mine where the study was conducted is a subsidiary of an international company. The findings in this case may be transferable to and generalised in the mine's sister companies in the iron ore group of companies.
- Case studies can also be used for the purpose of teaching to illuminate broader theoretical and/or contextual points where practical WPL occurs in the engineering department of the mine.

I wanted to study apprentices within their real-life working context to gain insight in and understanding of how WPL took the respondents from apprentice to a qualified artisan. WPL was the single theme of my case study, which is consistent with the definition of Bogdan and Biklen (2007:59), namely that a case study is 'a detailed examination of one setting, or one single subject, or one single depository of documents, or one particular event'. Furthermore, my study was limited to how apprentices experience practical WPL within the mine, which in my view represents a study of a bounded system – that of practical WPL of apprentices in the engineering section of a particular mine in a small town in the Northern Cape. Babbie and Mouton (2012:270) contend that qualitative researchers always try to study human action from the viewpoint of the social actors themselves with the primary objective of describing and understanding rather than explaining human behaviour. At the time of the study I was employed by the mine as a Senior Training Instructor

responsible for plant training. Iron ore was processed in the plant to customer-specific standards. The engineering department was responsible for plant maintenance done by artisans under the guidance and management of the engineering foreman (who reported to the general engineering supervisor) who would also coach apprentices through practical WPL. My interest was in describing and understanding the facilitation of practical WPL within this particular setting, using a case study methodology. In answering the research question I was positioned in the organisation to have a holistic view on training and development of the entire plant; however, the case study methodology allowed me to zoom in on artisan development and do an in-depth investigation. My approach was in line with Tellis's view (1997:3) that a case study is an ideal methodology when a holistic, in-depth investigation is needed. This in-depth investigation also allowed me to see artisan development through the eyes of the respondents, which is one of the most distinctive features of qualitative research (Babbie & Mouton, 2012:271).

In line with the five reasons of Rule and John (2011) on why a researcher would choose a case study, taking cognizance of the definitions of a case study and the guidelines from Yin (1994, 2009, 2011) and other authors, I concluded that artisan apprenticeship training at the mine would be a case where it provided on-the-job learning opportunities to apprentices according to its SLP and other legislative requirements. The apprentices could be studied from a holistic perspective within the specific context of their work environment to explore artisanship through WPL. The data collection methods that helped me to draw conclusions are discussed in the next section.

3.4 DATA COLLECTION METHODS

The process of data collection should complement the type of case study as well as the unit of analysis and should be aligned with the chosen research methodology to best answer the research question. Likewise, Rule and John (2011:61) argue that the researcher’s choice of how data will be collected is determined by the purpose of the study, the key research questions, research ethics and resource constraints, among other things. The unit of analysis for this case study was artisanship and how it was facilitated through practical WPL at the mine to the apprentices by the

artisans, master artisans, engineering foremen and general engineering supervisors. A total of 18 individuals from the above-mentioned groups were selected to participate in the semi-structured interview. Race, gender and age of the respondents were not relevant as the respondents were a mixed group of individuals in different stages of the ADP – some of them were learners while others fulfilled the role of a coach. The focus of the study was to explore artisanship through practical WPL in general and not necessarily the influence of race, gender or age on the ADP in general and practical WPL in particular.

Through this study I wanted to gain an understanding of artisan development through WPL in the context of the mine, what organisational factors within the mine influenced WPL, how WPL was facilitated by the engineering coaches, and how learning occurred in the ADP. According to Henning et al. (2013:6), the method of data collection and how the researcher uses the data will provide access to information and opportunities to work with the data in different ways, using different means of analysis. Thus, data gathering was a crucial part of this empirical research and was seen as 'filling the case' (Rule & John, 2011:59). That is, I was collecting the data that would provide the evidence needed for the case study. These data provided the evidence to answer the main research question and the sub-questions.

Laws and Mcleod (2004:12) assert that through the use of structured in-depth interviews the researcher can capitalise on the richness and thickness of qualitative responses (of the respondents), and Babbie and Mouton (2012:288) claim that interviews are one of the most frequently used methods in research to collect the qualitative data. My choice was semi-structured interviews as a data collection method to answer the key research question as well as the sub-questions. The sources of my data were the apprentices in the ADP, as well as the facilitators of WPL in the engineering department at the mine. Using semi-structured interviews in this particular case study helped me to probe and find the relevant answers to the main research question and the set of sub-questions.

The interview guides for the apprentice, artisan and engineering supervisor is attached as Annexure C. In addition to the structured questions, I prompted the respondents with further probing questions like, *Why do you say that?*, *Can you explain your view on this?*, *Can you tell me more about this?*, to elicit rich

descriptions of learning experiences and to prevent interviewer bias. The data collection instrument was used as a guide; however, the respondents' own interpretation of the questions set the course of the interview.

I explained the reason and context of the interviews to every participant and obtained their consent (see Annexure E). Respondents were briefed about the process I followed, and informed that their answers would be treated as confidential, and that none of their responses would be discussed with any third party in the mine. I also explained to all respondents that the interview would take place in either Afrikaans or English as their preferred language, and that the conversation would be recorded to assist me in transcribing them. Interviews conducted in Afrikaans were translated to English to align with the process of data analysis which is reported in English (see Chapter 4).

The respondents were also assured that if they felt uncomfortable with any of the questions they did not have to answer those questions and that they were free to withdraw from the interview at any time should they feel uneasy about the process followed. Interviews were held during normal working hours in an office at the respondents' workplace in the engineering department of the mine. This allowed for a non-threatening environment that encouraged participation by and interaction with respondents during the interviews.

Verbatim transcriptions of the interviews provided the data for this study and allowed the data to be checked and cleaned as I went through the transcripts. Rule and John (2011:77) state that once data have been prepared, checked and cleaned, the researcher can start with the process of analysis. This process is discussed in the next section.

3.5 DATA ANALYSIS

Creswell (2009:183) describes the process of data analysis as the stage where the researcher has to make sense out of text and image data. The researcher has to prepare the data for analysis, move more and more deeply into understanding the data, represent the data, and finally make an interpretation of the larger meaning of the data. Yin (2003:109) notes that data analysis consists of 'examining,

categorising, tabulation, testing, or otherwise recombining both quantitative and qualitative evidence to address the initial proposition of the study'.

I used qualitative content analysis as a qualitative research method. This approach is a systematic and objective means of describing and quantifying phenomena (Elo & Kyngäs, 2008:108) and could be used with either qualitative or quantitative data (Elo & Kyngäs, 2008:109). I obtained qualitative data data through semi-structured interviews. Babbie and Mouton (2012:388) claim that content analysis may be applied to basically any form of communication which is fundamentally a coding exercise. The recorded interviews collected from the respondents were transcribed verbatim; this led to the application of content analysis.

I listened to the raw data collected through the semi-structured interviews from the recorder, and transcribed the data by typing it out in *MS Word*. I did not use any computer software, but rather opted for a non-computerised analysis. The transcripts were printed on A4 paper with large margins and increased line spacing. I added notes and assigned codes to the different sections of the printed text in the transcript. Rule and John (2011:77) advise that the use of different coloured pens, highlighters and/or stickers is valuable during the coding process. I found the use of different colour pens to be useful to highlight certain themes that emerged from the data.

Rule and John (2011:77) assert that codes or labels highlight the different themes or foci within the data, while Yin (2011:178) refers to coding as the disassembling phase of the data analysis process. According to Saldaña (2013:4), a code in qualitative data analysis is a researcher-generated theory which symbolises and therefore attributes interpreted meaning to each individual datum for the purpose of detecting patterns, categorising data, theory building, and other analytical processes. Miles and Huberman (1994:11) prefer to refer to this process as the display of data. Yin (2011:178-205) proposes five phases in data analysis, namely compiling, disassembling, reassembling, interpreting and concluding, whereas Miles and Huberman (1994:12) suggest four nodes of data collection, namely data collection, data display, data reduction and conclusions, as shown in Figure 3.1 below.

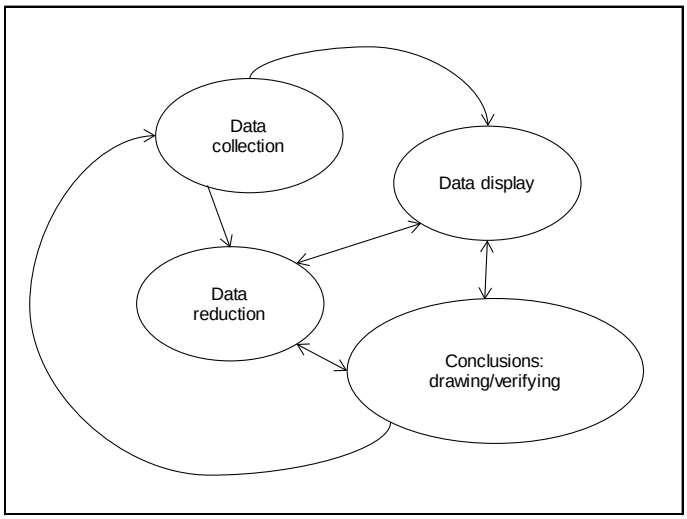

Figure 3.1: Data collection process

(Adapted from Miles & Huberman, 1994:12)

Disassembling the data into smaller parts made it a challenge to work with it and I had to look at what the data told me in an integrated way to answer the key research questions. This approach allowed for an integrated and holistic view of the data. Henning et al. (2004) refer to this technique as 'global analysis' as it also looks for themes and patterns in the data sets.

According to Rule and John (2011:77), the researcher needs to add some code to the data through deductive analysis, but will also allow the data to 'speak' and 'name' additional codes via inductive analysis. Saldaña, (2013:2) cautions that coding of data is just *one* way of analysing qualitative data, it is not *the* way. Thomas (2006:238) contends that general inductive analysis is evident in much qualitative data analysis, often without an explicit label being given to the analysis strategy and is 'a systematic procedure for analysing qualitative data in which the analysis is likely to be guided by specific evaluation objective'.

I understand inductive analysis as the process where the researcher primarily reads the raw data attentively to develop codes, categories and eventually themes from the data. Codes derived from the raw data could be grouped into a category with similar patterns which Rule and John (2011:78) refer to as axial coding, whereas as further analysis of categories in search for patterns and meaning could lead to the generation of themes. Learning from these scholars the following table (Table 3.1)

gives an indication of the data analysis process I followed for this study in reference to the work of Yin (2011:177), as well as that of Miles and Huberman (1994).

Table 3.1: Data analysis process of the researcher
(Adapted from Yin, 2011:177, as well as Milles & Huberman, 1994:12)

Step	Miles and Huberman, 1994	Researcher's data analysis process	Yin, 2011
1	Data collection	Conducting individual semi-structured interviews with respondents	Compiling
2	Data display	Verbatim transcription of interviews from digital recorder and printing same on A4 paper	Disassembling
3	Data reduction		Reassembling
4	Conclusions: drawing/verifying	Generating categories and themes using coloured pens	Interpreting
5		Verification and drawing conclusions from themes and categories	Concluding

The data were interpreted using conventional content analysis, as described by Hsieh and Shannon (2005:1277), to provide knowledge and understanding of the informal learning in the development of artisans within the context of a mine. According to Hsieh and Shannon (2005:1277), researchers regard content analysis as a flexible method to analyse text data. I selected appropriate quotations from the data to convey the core theme or essence of a category (see Thomas, 2006:242). Also, according to Henning et al. (2011:280), using quotations from the respondents is a noble way of 'giving voice' to their 'issues' and 'remains a hallmark of writing qualitative research'.

The coding of the data was organised in themes that related to the research questions as discussed in Chapter 1, section 1.4. The results obtained from the data through semi-structured interviews of the respondents reflected the reasons for their involvement in the ADP, how practical WPL was facilitated at the mine, how it

occurred at the mine, and the factors in the organisation that influenced practical WPL in the particular setting.

3.6 ASSUMPTIONS AND LIMITATIONS

The ADP in this study follows the TVET college curriculum in Engineering Studies at Kathu TVET College, practical placement at SIVOS and practical WPL at the mine. Practical WPL in the ADP results in a national qualification being awarded to the artisan, thus increasing the talent pool for mining and other industries. (Refer to Chapter 2 for a detailed discussion.) WPL in the mine provides a bridge between formal and informal learning in the ADP, with many factors influencing its success or failure. This study was not intended to be an exhaustive assertion of all the variables that influence WPL in the mine and a detailed discussion on its findings is presented in Chapters 5 and 6.

I assumed that all the respondents were literate, numerate and were able to verbalise their learning during the ADP. The mine where this study was conducted only allows learners on an engineering learnership if such a person has passed Grade 12 with mathematics and science as a basic entry requirement. It should be noted that learners could enter the TVET College after Grade 9. As a full-time permanent employee of the company I had free access to the particular context where informal learning took place even if I did not observe any practical WPL activities. The ADP was not only a legal requirement of the mine in terms of its SLP, but practical WPL indeed occurred in this particular setting with experienced artisans transferring their knowledge and expertise to inexperienced and novice engineering apprentices. I further assumed that the respondents would be truthful and open in sharing their experiences and perceptions with me in the knowledge that their responses would not be shared with any third party inside or outside the company. The probing questions were also aimed at obtaining as much information as possible.

Some of the limiting factors that had an impact on this study were my limited time to conduct the interviews with the learners as they were working shifts as opposed to my normal office hours and were rotated between sections in the engineering

departments. Irregular breakdowns and structured plant shutdowns also had an influence on the time spent with a respondent in an interview. The study involved only one mine in a group of companies situated in the Northern Cape and Limpopo. With limited funding to support this study I decided to focus on the mine where I was employed to reduce unnecessary expenses as well as to exclude irrelevant stakeholders such as top management at EXCO[17] level. I obtained approval from the general mine manager, HR manager and training manager to conduct the study and thus did not need EXCO approval. The learners that took part in this study had attended the Kathu TVET College prior to their practical WPL at the mine. However, I limited the number of respondents to exclude the feeder college from my sample as the focus was on informal rather than formal learning.

The small town where the mine is situated has three high schools with the nearest tertiary educational facility about 80 km away in the town of Kathu. In September 2013 the Northern Cape opened its only first fully fledged university, the Sol Plaatje University, with limited programmes in Economic and Management Sciences, Humanities, Education, as well as Natural and Applied Sciences (see www.spu.ac.za).

The mines in the Postmasburg area offered different learnerships, from portable skills training, to mining, plant and engineering programmes. Target groups for these programmes are the school leavers. Permanent employees of the company in certain categories could also enrol for an engineering learnership.

3.7 CONCLUSION

This chapter described the research design and research methodology I used in this study to look at how, if at all, WPL in the mining sector facilitates the development of artisan apprentices. A case study methodology with an interpretive paradigm was used. Data were collected through semi-structured interviews from 18 respondents and I used content analysis to extract meaning from the recorded data and the interviews that were transcribed verbatim.

[17] Executive directors of the company where this study was conducted

Findings and assumptions that resulted from the data analysis are discussed in the next chapter (Chapter 4). Chapter 5 also provides a detailed account of the findings and indicates how, if at all, WPL in the mine facilitates artisan development.

CHAPTER 4
FINDINGS

4.1 INTRODUCTION

This chapter provides a discussion on the results obtained from the data collected from 18 respondents from August 2015 to March 2016. The empirical data generated during semi-structured interviews with these respondents were analysed using content analysis to understand how informal learning in the workplace assisted artisan development in the context of an iron ore mine in the Northern Cape.

The semi-structured interviews were conducted using an interview schedule with specific questions relating to the application of practical WPL in the ADP presented by the mine as part of its employee development initiative and social community investment programme. Engineering apprentices, qualified artisans, master artisans, engineering foremen and general engineering supervisors were asked to describe their involvement in the ADP and provided input regarding organisational factors that influenced learning during the programme.

4.2 POPULATION AND SAMPLE

The population for this study was artisan apprentices in different stages of the ADP, artisans appointed by the mine after successful completion of the programme, artisans/master artisans, engineering foremen and general engineering supervisors. The artisan apprentices took part in practical workplace learning at the mine as a requirement to complete their engineering trade and this learning was facilitated by experienced artisans, master artisans, engineering foremen and the general engineering supervisor at the mine.

Some of the apprentices had successfully completed the ADP and were employed by the mine as qualified artisans in their respective trades. The artisan, master artisan, engineering foremen and general engineering supervisor were employed by the mine and involved in the ADP for different periods, from between 1 to 30 years. I used purposive sampling to select the respondents from this population because I

was interested in employees and apprentices who potentially had the best knowledge regarding the research question; that is, they were part of the ADP, had completed the programme, or acted as coaches. The respondents sample for this study were thus as follows:

Table 4.1: Summary of respondents

Engineering Trades	Designation of Respondents					GRAND TOTAL
	Artisan Apprentices	Qualified inexperienced artisans	Qualified experienced artisans	Engineering foremen	General engineering supervisor	
Diesel Mechanic						0
Electrician					1	1
Fitter & Turner	1	2	1	2	1	7
Plater and Welder		1	1			2
Millwright		1				1
Boilermaker	4		1		1	6
Engineering Technologist				1		1
SUB TOTAL	**5**	**4**	**3**	**3**	**3**	18

For the purpose of the research no demographic information of the respondents was recorded as the focus was on exploring artisanship through practical WPL. The demographic profile of the respondents was not taken into account to answer the main research question. However, years of experience in the mining sector, period in the ADP, and relevant engineering trade were highlighted (refer to Annexure F).

4.2.1 Summary of different groups of respondents

The different groups of respondents as indicated in the table above are summarised in the subsections below.

a) Apprentices:

Engineering apprentices attended the National Certificate in Engineering (N1-3) at the Kathu TVET College in any of the learnership disciplines on offer as a national certificate in engineering studies by the mine in: fitting (including machining/boilermaking), plater and welder, fitting and turning, diesel mechanic, electrical, millwright. The mine's HR Training and Development

centre was accredited by the MQA at the time of the study to offer these and other learning programmes in its training portfolio.

b) Artisans

This group represents qualified artisans permanently employed by the mine where this study was conducted in either of the engineering trades to which an apprentice is assigned during the ADP.

c) Master artisans

The master artisan is more skilled than the artisan with more practical work experience in a particular engineering trade at the mine.

d) Engineering foreman

The team leader at the engineering department of a particular section is called the engineering foreman. This person would supervise a group of either apprentices, artisans and master artisans of that section, i.e. the primary crushing section where iron ore is crushed to different specification levels before it goes to secondary and tertiary crushing.

e) General engineering supervisors

A group of engineering foremen with their subordinates will report to a general engineering supervisor of the crushing sections that entail primary, secondary and tertiary crushing. The crushing section will have one general engineering supervisor, but three engineering foremen (one foreman for each crushing section; that is primary, secondary and tertiary).

4.3 DESCRIPTION OF CATEGORIES OBTAINED FROM THE DATA

Respondents were interviewed one by one in a closed office using the interview guides (refer to Annexure C). For the purpose of triangulation the responses of the artisan apprentices who focused on their perceptions of situated learning at the mine

during their practical WPL whereas the artisans, master artisan, engineering foremen and engineering supervisors were included as coaches in the transfer of WPL.

The data used in this chapter was generated from these interviews with the 18 respondents. The conversations were recorded with permission to allow for transcription of replies of the respondents which assisted with the analysis of the data. Refer to sections 3.4 and 3.5 in Chapter 3. The label descriptors in Table 4.2 below was used to interpret and identify the respondents (see 4.2.1 above) used for this study. Reference to respondent QEAft1 would be a qualified experienced artisan with fitter and turning as the trade. The indication of 1-4 means that there are more than one respondent of that particular trade. The respondents represented a significant spread over the different engineering trades and experienced levels. Diesel mechanics were excluded from the sample because the mine contracted mechanical work of all the heavy mining surface vehicles to the original manufacturer of this equipment.

Table 4.2: Descriptor labels of respondents

Engineering Trades	Label descriptors of Respondents				
	Artisan Apprentices	Qualified inexperienced artisans	Qualified experienced artisans	Engineering foremen	General engineering supervisor
Diesel Mechanic					
Electrician					GESe1
Fitter & Turner	AAft1	QIAft2	QEAft1	EFft1-2	GESft1
Plater and Welder		QIApw1	QEApw1		
Millwright		QEAmr1			
Boilermaker	AAbm1-4		QEAbm1		GESbm1
Engineering Technologist				EFet1	

The various categories derived from the data are described in the subsections below. Abbreviated forms are sometimes used to refer to the respondents indicated in the table below (Refer to Annexure D):

4.3.1 Reasons for joining the programme

The mine where the study was undertaken is situated in a small rural town in the Northern Cape. The mine is a significant source of employment and provides a steady stream of income to the community. Different minerals, like iron ore, copper, zinc, manganese, limestone and diamonds, are mined in and around the town. Lately some organisations in the region have invested in renewable energy plants by harvesting the sun for solar energy in the area.

Such mines are always in need of qualified artisans for their operations to ensure continuous production and sustainable growth and some of these mines have offered learnerships in various trades to post-matric school-leavers. Prospective learners who have passed Grade 12 with mathematics and physical science can choose between different learnerships on offer by the various mining houses, for example in the following disciplines: fitting (including machining/boilermaking), plater and welder, fitting and turning, diesel mechanic, electrical, millwright. The mine has entered into an agreement with a local TVET college to subsidise evening classes for learners who failed mathematics and physical science in Grade 12 or did not study these two subjects in Grade 12 to pursue the NCV programme. A prerequisite for entering engineering studies and be eligible for a learnership by the mine is a pass rate in Mathematics and Science at Grade 12. Learners can enter the TVET college after they have passed Grade 9. The programme is offered in the evenings and successful completion provides learners with entry requirements into the engineering learnership programme. Respondents in the ADP were asked why they chose to become an artisan and specifically the chosen trade.

Firstly, the respondents' artisan career choices had been influenced by family members involved in the line of work. Respondent AAbm1 (a boilermaker apprentice) had been in the programme for 13 months. He indicated that the idea of becoming an artisan had come from watching his father:

> *I always watch my dad. So I've been interested in making something of my own. It was normally stuff like that. (AAbm1)*

Respondent AAbm3 (a boilermaker apprentice) had become aware of the boilermaking trade from what he had learned and observed from his father who was

in a different trade; however, some similarities had occurred. This had created an interest in Respondent AAbm3 to pursue a career in a trade related to his father's:

> *I have a lot of background of boilermaking, because my father was in the trade. He is not a boilermaker, but a moulder, also working with steel. (AAbm3)*

Respondent AAbm2 (a boilermaker apprentice) had also been motivated by a family member in the trade:

> *I was inspired by my uncle by the way he just does things at home like 'tralies' [bars]. (AAbm2)*

Secondly, some respondents saw the learnership as an opportunity to be employed and to improve their socio-economic circumstances. Being a qualified artisan was a key to economic transformation out of poverty as it could provide a vehicle to a prosperous life. Unemployment among the youth is evident in the town and permanent employment opportunities are restricted, as the following quotation indicates:

> *I like how the mechanical parts work, how the gears work together and how it fit as well as how a pump likely work. I can also learn for myself… to improve myself. (AAft1, a fitter apprentice)*

Respondent AAbm2 (a boilermaker apprentice) passed Grade 12 without having mathematics and physical science as subjects, but wanted to enter into the engineering learnership to become a qualified boilermaker. Without mathematics and physical science Respondent AAbm2 had to attend the NCV Level programme first to obtain the minimum entry requirements for the programme.

> *At the moment I have Grade 12 and N2. Before I did my N2 I attended the NCV levels from two until four (in the afternoon). (AAbm2)*

The mine has a career development programme for permanent employees. The purpose of this employee development programme is to give a full scholarship to qualifying employees to undergo the engineering learnership programme with other apprentices from the community. The target group for this programme is the maintenance operators in the engineering department. However, other employees could also be considered if their respective senior management were to provide motivations.

Two such employees on the programme were two mining operators, of which one, Respondent QEAmr1 (a qualified millwright and former mining operator), completed the programme and made a career change from a mining operator to a qualified millwright. Respondent QEAmr1 indicated that the improvement in salary from a mining operator to a millwright was significant with an increase in other employee benefits as well.

> *I earn easily five times my salary that I got that time as mining operator. (QEAmr1)*

Respondent AAbm4 was a mining operator who was offered the opportunity by the mine to develop into a boilermaker through the ADP offered by the mine. He was an apprentice for one year and eight months on the programme, doing practical WPL at the mine as the final requirement of the ADP:

> *I got the opportunity from the mine last year to do my apprenticeship. The senior instructor sent me to SIVOS and after I passed the assessment I was enrolled for the diesel mechanic programme. (AAbm4)*

Respondents QIAft1 and QIAft2 were in the ADP after they had successfully obtained qualifications in other fields. Respondent QIAft1 entered the programme as a mechanical fitter, but was a qualified mechanical draftsman:

> *It goes hand in hand with my mechanical, my previous studies. (QIAft1)*

Also Respondent QIAft2, who was studying to become a fitter, had completed a diploma in Mechanical Engineering and obtained a degree in Community Development at university:

> *There is no employment for me here in this town with my degree. I know the mine will take me once I qualify as a welder. (QIAft2)*

The mining sector in the Northern Cape was perceived to be an employer of choice for most respondents in terms of learning and development as well as employment stability. The mine where this study was conducted provided an opportunity for such learning and development of artisan apprentices through its practical WPL programme.

4.3.2 How informal workplace learning was facilitated at the mine

The research question of this study was aimed at determining just *how* or *whether* practical WPL was facilitated at the mine where the study was conducted as indicated by the following questions in the interview guides:

Interview guide for the artisan apprentices:

- *How does learning occur during the artisan development programme at the company?*

- *How is learning facilitated by the artisan, engineering foreman and general engineering supervisor?*

- *How do you assist artisans to learn development programme? (Explain in your own words.) What do you do when an artisan experiences learning difficulties to make sure that learning still takes place?*

The data that were collected to answer these questions seemed to suggest that practical WPL was facilitated at the mine. Informal learning in a workplace context is initiated with what is referred to as a trigger, as indicated by Marsick and Watkins (2001) in their model on informal learning (see Chapter 2, section 2.4.3).

The data indicated that engineering apprentices at the mine are allocated to artisans during their on-the-job learning. The mine where the study was conducted came into operation in 2009 and reached full production in 2011 as a nine million tons per annum operation. At the time of study the production target was 13 million tons per annum. The permanent artisans in the engineering department were required to take on apprentices as learners in the similar trade as part of their daily work responsibilities. The work experience of artisans, master artisans, engineering foremen and general engineering supervisor varied, resulting in wide-ranging exposure to the apprentice. They were required to take the role of a coach to the apprentice and share their knowledge with the apprentices assigned to them in a very informal way as the apprentices moved from section to section in the mine. The process was guided by a logbook with modules allocated to each trade representing

a task that the apprentice had to perform in a particular section under the direct guidance of his or her coach:

> *You have an artisan that you work with every day. If you are a boilermaker apprentice, then you get a boilermaker artisan. Now he learns you what your work at the mine will be. (QEAbm1, who completed the ADP as a boilermaker)*

> *… because the company gets apprentices in to train that should directly under an artisan. So, an artisan must transfer his expertise to the apprentice so that he (apprentice) could write the trade test. (GESbm1, general engineering supervisor with 30 years' experience)*

When the apprentices entered the mine they would already have attended a practical component of their learnership programme at SIVOS, followed by on-the-job learning as indicated by Respondent QEAmr1 (a qualified millwright who completed the ADP):

> *You do trade theory training at the college as preparation for the practical at SIVOS. At SIVOS you physically work with the machines to make you feel what it would be in the mine … when you work with machinery at the mine. When you finish your training at SIVOS you will go to the mine and then back to SIVOS for the trade test. (QEAmr1)*

The trigger for situated learning to start at the mine would be a coach showing the novice apprentice the operation of the mine, introducing them to mine safety, and determining what they know of a particular trade as pointed out by various respondents:

> *We would start to teach them what the day-to-day tasks a fitter would do and everything concerning that. Sometimes we get apprentices that were never in a mining environment before. They are suddenly in an environment of which they have no idea. We will first make them aware of all the dangers in the mine by explaining what they can and cannot do. (GESft1, an general engineering supervisor and fitter by trade with six years' involvement in the ADP)*

> *I was an 'appie' once and I was dumb. You could do something that can hurt you. From a legal perspective I would explain the section's standard operating procedure. I will take them to places to show where they can't go and where it's dangerous. (GESft1)*

Respondent EFft1 (an engineering foreman and fitter and turner by trade with 11 years' experience in the ADP) had the following to say:

> *First I check where the gap is, because sometimes you find a guy that come and work with me, maybe they have experience of something. I check where the gap is, and if it's possible, I close the gaps. Say for example, only there's equipment that we have, that they lack experience on and I emphasise on that. (EFft1)*

The gap analysis provided the cue for a learning opportunity or a starting point for a conversation between apprentice and coach on what needed to be emphasised. Another approach, according to Respondent GESel1, (a general engineering supervisor and electrician by trade who had been a coach for 21 years), was to allow an apprentice to start a task without receiving any explanation from his or her coach, because it was expected that the apprentice would know how to approach the task and complete it successfully. Respondent GESel1 said:

> *He (apprentice) learns the basics at college and they don't teach him the tricks of the trade. Here I want to see if he can apply the basics. Then I see where the gaps are and what he learned in (trade) theory can be transferred practically. (GESel1)*

Practical WPL took place when the apprentice was allowed to apply the basic trade theory to the problems that occurred in the real world in the engineering plant at the mine. A basic understanding of the possible solution to a problem was therefore needed without long explanations by the coach.

In some cases the coach would show the apprentice what needed to be done and then left the apprentice alone to complete the task. Respondents QEApw1 (a welder and four years a couch) and QEAft1 (a master artisan and 21 years a coach) mentioned that they showed the apprentice how a task had to be done:

> *When he makes a mistake with a task, he must come back and should not feel bad. Maybe I did not explain clearly or maybe he did not understand. So, then he must do those extra steps. When I showed the apprentice once, I must show the others also. It makes it difficult on me, because it takes extra time to help that poor guy. (QEApw1)*

> *… you get many apprentices that catch it very quickly what you learn or show them once and they will do it quick and sometimes even better. (QEApw1)*

> *What is happening … those guys [apprentices] will go with you wherever you go. Whenever you are doing something they look at what you do. And then after shutdown you like explaining to them what you were doing there. I explain to the guys this is what I'm doing … the name of the thing. (QEAft1)*

> *You need to explain and take it step by step. This is how you do it and how you proceed with the job. (EFft1)*

Respondent QEApw1 said that some of the apprentices grasped it very quickly when he showed them something, whereas Respondent EFft1 (an engineering foreman and fitter by trade with four years' coaching experience) followed a logical approach in his transfer of training. The apprentices would then be allowed to perform the task and explain to the coach what they had done and how they had completed the task. This approach seemed to be an affirmation that transfer of learning had taken place as indicated below by Respondent GESel1 (a general engineering supervisor and electrician by trade who had been a coach for 21 years).

> *What I normally do is to give that 'appie' some work to do without giving any explanation. I tell him, 'This is your module, so do this job for me. Make sure everything is safe to work on,' and then I walk away. (GESel1)*

Engineering apprentices have to develop a problem-solving ability to respond to the many challenges in their world of work. Respondents AAbm3, GESbm1 and AAft1 indicated that they learned through problem solving by finding the root cause of a problem. Respondents applied what they knew through a simple fault-finding approach:

> *When there is fault with the machine or so, how can I repair it or what is the cause of the fault? I need to figure it out … the oil on the machine can indicate a fault. Then I must first find the cause to see if I can fix the fault. If I can't find the fault in the crusher, we call in the specialist. (AAft1, a fitter apprentice with 10 months' experience)*

> *They would go early in the morning when we just arrived to the plant to do their inspections. We would see what are probably faulty. Yesterday we left the plant like that and how would it be this morning? We do this every morning. (AAbm3, a boilermaker apprentice with 27 months' experience)*

> *Yes, I don't know what would help us when here (in the plant) is a crisis with a breakdown. The guy must think for him (through) making plans, problem solving identify. (GESbm1, a general engineering supervisor and boilermaker by trade with 30 years' experience)*

Respondents AAbm1, AAbm3, AAft1, QIAft1 and AAbm4 wanted to learn and would ask many questions to their coaches. This approach was encouraged by most of the respondents and created opportunities to share knowledge and experience, remove misunderstanding and confirm assumptions. One of these respondents commented as follows:

> *Every time I would go with X (an artisan to whom the apprentice was allocated). When he comes here he goes to the plant. I went with him, because I am curious, I want to know what is going on in the plant. (AAbm3, a Boilermaker apprentice with twenty-seven months experience).*

Because of extensive working experience in this setting, the experience and expertise of the coach at the mine provided a rich source of practical trade knowledge that underpinned the facilitation of practical WPL from coach to apprentice. Learning occurred on the fly, in the moment, and during the course of work activities as the apprentice completed certain tasks while the coach keep a watchful eye and provided much needed advice to the novice apprentice.

The data confirmed that practical WPL was facilitated in line with the *process* element of the 3-P model on WPL developed by Tynjälä (2013) as discussed in

Chapter 2, section 2.2.4. In the next section the focus is on an important aspect, namely *how* practical WPL occurred at the mine.

4.3.3 How situated learning occurred at the mine

The interview data from this study obtained from the questions in the interview schedule of the artisan, engineering foreman and general engineering supervisor suggests that practical WPL did occur at the mine where this study was conducted.

Interview guide for the facilitators of practical WPL apprentices:

- *How does learning occur during the artisan development programme at the company? How do you transfer your experience to the apprentice?*

- *How do you assist artisans to learn development programme? (Explain in your own words). What do you do when an artisan experiences learning difficulties to make sure that learning still takes place?*

Apprentices enter the mine with formal trade theory as an only reference point and have to make sense and add value to the actual engineering world of work at the mine. It is in this setting where formal trade theory connects with practical WPL activities.

The majority of apprentices who were interviewed indicated that when they entered the mine as novices for their on-the-job WPL it was their first encounter with mining equipment. They had completed the practical component at SIVOS where some of the tasks resembled the learning events at the mine, but these tasks were not real or done in real time. The situated learning in practice was therefore new, confusing and difficult to understand. The trade theory and previous practical training at SIVOS assisted respondents in making the connection between what they knew and the work they had to do. Respondent AAbm2 (an apprentice in boilermaking with two years' experience) indicated that:

> *… some things like those things they use here (in the mine) took long to understand. Things like the liners, they are a bit difficult to understand. (AAbm2)*

The training at SIVOS seemed to be a basis from which respondents could draw when they entered the mine for on-the-job training. This basic training served as a reference point for apprentices to the jobs they had to do as part of their practical WPL at the mine. Respondent QEAmr1 (a millwright who completed the ADP) said:

> *I did the electrical portion of my trade at SIVOS where you physically do the work. Then you also do the basic in hydraulics, mechanics and welding. They also teach you boilermaker stuff. You learn to weld, in basic welding and also fitter … then you go to the mine for training. I know the job. I can do what the mine asks me to do.*
>
> *There is no text book in the mine. All the stuff that you need to check you've already learned at SIVOS. (QWAmr1)*

The data indicated that SIVOS served as a bridge between the institutional formal trade theory learned at the Kathu TVET College and the situated learning at the mine. All the respondents on the ADP were spending time at SIVOS and were involved in basic practical training before entering the mine for on-the-job learning.

Given the risk involved in mining, the mine adopted a strict safety approach to all tasks that were performed during working hours which all employees had to observe. The safe work approach later became second nature, but had to be learned consciously at first. Respondent AAbm4 (a boilermaker apprentice with two years' experience) mentioned that the mine focused seriously on safety, and that safety procedures were integral to practice.

> *The (learning) process that we follow in here starts with safety. We start with safety. You (should) have the right tools for the job and the relationship with the artisan. I like to do things by myself and will ask the artisan when I've made a mistake, or if I have used the right metal and equipment. (AAbm4)*

Practical WPL occurred through continuous practice and also through spending time with certain activities. Respondent EFet1, a foreman engineering technologist who

had been involved in the ADP for two years, mentioned that he was particularly focused on planned task observations and would have his apprentices repeat tasks:

> *I let him continue doing that task over and over again. He can ask questions, I will say something and ask a lot of questions until I know I can let him do advanced work. (EFet1)*

The apprentices benefitted most from shadowing the artisans and watching what they were doing. Respondent QIApw1, a qualified artisan, who had just successfully completed the ADP with an N3 qualification in plating and welding, said:

> *… because every time when he wants to work, I'm there by his side. There even comes a time when he forgot his lunch. You don't even worry about eating, because you are into work. (QIApw1)*

Respondent AAbm3 (a boilermaker apprentice with 27 months' experience) commented as follows:

> *… look, at the moment we are 'appies' who receive training, so we must look at what the artisans are doing … the artisan will teach you. (AAbm3)*

Such time spent on supervised tasks in the workplace contributed to the development of self-confidence and experience, which increased with time as they experienced the success of their completed jobs:

> *With the time you get more experienced and where you normally took longer to do something, the artisan would show you a shorter way. We always pushed to finish a job as quickly as possible and safe, because the machine is needed in production. (QEAmr1)*

Respondent AAbm3 (a boilermaker apprentice with 27 months' experience) was allowed to work with the equipment and do the welding needed because prior exposure and working with his father had helped him to understand the process and show progress better than other apprentices.

> *She (the artisan) gave me more exposure. At the moment I'm doing most of the work, because she allows me to climb in the chute to weld and change the liners. (AAbm3)*

Situated learning in the workplace was thus supplemented with informal prior learning in this particular instance. The same respondent (AAbm3) indicated that the right tactic yielded the correct results which take time and practice to perfect through focus and concentration.

> *So it is more difficult to do a vertical up weld than a horizontal one. So you must have the tactic to weld. You need to adjust your machine, look at the welding rod, is it the right position, look at your speed, and how far is the rod from the material, from the steel plate, all of those. (AAbm3)*

The data presented here thus confirm that workplace learning did take place, but that it was strongly influenced by whether the work environment was conducive to such learning through providing hands-on, scaffolded learning opportunities and coaching by more experienced artisan coaches. According to Metso (2014:384), a process of 'systematic guidance ensures that the students' professional skills develop in the right direction and reach the level required' to benefit both the organisation and the individual. Furthermore, the same author claims that '[g]uidance and support from the organisation, management, and supervisors are considered important for successful learning at work' (Metso, 2014:384). It is therefore also important to consider the influence of organisational factors on artisan development at the mine.

4.3.4 The influence of organisational factors on artisan development at the mine

Workplace learning in the context of the mine where the study was conducted was influenced by different organisational factors that arose in the workplace itself, with the apprentice, the artisan or the coach, and in the facilitation of learning. The literature, as discussed in Chapter 2, section 2.5, indicates that organisational factors that influence practical WPL can be categorised into three areas: (1) training or learner characteristics, (2) training or learning intervention design, and (3) the work environment (see Kink et al, 2012; Burke & Hutchins, 2007; MacRae & Skinner, 2011). Questions specifically related to this were included in the interview schedule as follows:

- *Which factors in the organisation positively influenced your learning during the artisan development programme?*

- *Which factors in the organisation negatively influenced your learning during the artisan development programme?*

- *Which factors in the organisation help learning during the artisan development programme? (Explain in your own words). Explain which learning strategies you put in place to overcome negative factors that may impact on learning.*

- *Which factors in the organisation inhibited your facilitation of learning during the artisan development programme? (Explain in your own words). How do you overcome these challenges?*

The data pointed to some of these factors that may have influenced the learning experience positively as well as negatively. The respondents noted various concerns about the ADP, ranging from personal attitudes to the lack of learning opportunities they experienced because faulty equipment was no longer being repaired.

4.3.4.1 Work environment factors

The data collected during the study suggest that the mine where this study was conducted did not have a central engineering maintenance workshop where faulty parts were being repaired, which may have influenced the artisan development programme as it took valuable learning and practical experience from the apprentices. The mine simply replaced these faulty parts with new ones or sent the faulty part away to an external service provider (according to Respondents AAbm2, AAbm3, GESbm1, and QIAft1).

Therefore, even though practical exposure to the workplace is important for informal learning to occur in this context (as highlighted in the previous section), it appears as if this was not happening optimally in all instances. One of the biggest concerns raised by the respondents was the lack of exposure to practical work. Respondent

GESbm1 (a general engineering supervisor with 30 years' mining-related experience) remarked:

> *Our practical exposure is not 100%, especially at the boilermaking side and the fitting of steel. You can say there are very good things, but there is a need. We don't get repair work. Everything is being sent away. (GESbm1)*

Respondent GESbm1 added:

> *The apprentices don't get practical exposure. They don't get to practise how to do the work. Even the artisans we have appointed do not have much experience as artisans. Eighty per cent of them were former apprentices at SIVOS and do not have the experience. They are new part fitters and they just change the liners. So the guys do not get enough things to build or to repair. (GESbm1)*

Respondents QIApw1, QIAft1 and AAft1 pointed out that they were supposed to fabricate pipes and other parts to engineering drawing specifications needed by the mine, but this did not happen. Respondent QIApw1 (a welder who qualified with an N3 from the ADP) commented as follows:

> *Some of them (artisan coaches) actually want you to gain experience by working. For a boilermaker the only way you should work is not to take samples and measurements. No, we build things. (QIApw1)*

Parts were ordered by the mine and fitted as new on broken plant and mining equipment, resulting in fewer learning opportunities for apprentices to apply their knowledge in a practical and innovative way. This state of affairs also affected the coaches because training transfer to apprentices was limited. Respondent AAbm1 (a boilermaker apprentice with 13 months in the ADP) said:

> *You see, at Z mine (a different mine) there's a place called the central (engineering maintenance workshop); they fabricate all the pipes. It could be steel pipes, stuff like this. So here at X mine (where the study was conducted) we don't have a section … they are not fabricating it (pipes). And they ordered them for us. (AAbm1)*

This respondent was also afraid he might forget what he had been taught at SIVOS if he did not get the opportunity to work physically to repair and create steel pipes. The WPL for boilermaking did not cover fabricating:

> *So far the learning is good. I think our learning programme is not doing the way it is supposed to. Sometimes you can see when I'm working they (the coaches) say a student must be able to fabricate things in the mine and we're not doing that. (AAbm1)*

According to Burke and Hutchins (2007:272), most factors that influence workplace learning and performance stem from the work environment. According to MacRae and Skinner (2011:984), research evidence suggests that there are three factors moderately or strongly associated with the work environment that are associated with the transfer of learning. These are (1) that the work climate and managers are receptive to and supportive of learning transfer, (2) that there is supervisory and peer support, and (3) that participants are given opportunities to perform and test their learning.

It was established through the data that the absence of a central engineering maintenance workshop at the mine where this study was conducted took away opportunities for apprentices to perform and test out their learning. This situation created misalignment between the formal trade theory of the TVET College, the practical exposure at SIVOS and the practical world of work at the mine for respondents. There was clearly a need to look into the influence of training and learning intervention design of the ADP. This aspect is discussed below.

Another organisational element that was indicated by the data in this study indicated that practical WPL in the ADP at the mine was also influenced by training and learning intervention design. Beddie and Halliday-Wynes (2010:241) point out that in vocational training informal learning in the context of the workplace may not provide a comprehensive and exact content for learning (see Chapter 2, section 2.4.3). This was the situation at the mine since there was no central engineering maintenance workshop or logbooks.

The respondents attended institutional trade theory training at the TVET college and the learning expectation was that the mine would have provided practical WPL

opportunities that were not only relevant to the trade theory but also aligned with its outcomes. Some respondents found that they could not perform certain tasks contained in the logbooks while working at the mine because these tasks simply did not exist. Respondent QEAmr1 (a qualified millwright who had successfully completed the ADP) indicated that he could not focus on practical work for his trade because he used a logbook designed for a different trade:

> *The logbook was a problem. There was no logbook for millwrights and we had to use the one for electricians … to do our practical. (QEAmr1)*

Other misalignments between what the respondents were expected to learn and what they actually learned at the mine were also indicated by Respondent QIAft1 (a mechanical fitter who had completed the ADP) and Respondent AAbm3 (a boilermaker apprentice with 27 months' experience):

> *What was applicable on my course I could not do here at the mine. The job was not in my logbook. (QIAft1)*

> *I need to fabricate a chute. This is a big mistake at the mine. The logbook says: 'Fabricate a chute …' There is no such thing at the mine. A boilermaker cannot fabricate any chutes. (AAbm3)*

A millwright respondent also used the logbook for electricians, which created learning inconsistencies between his trade and the one represented by the logbook. This misalignment resulted in apprentices not being adequately prepared for the trade test. Respondent QEAmr1 (a millwright who had successfully completed the ADP) indicated that:

> *… [h]ere is no logbook for millwrights and they used the one for the electrician trade. (QEAmr1)*

Since there was not a correct logbook a millwright apprentice had to do on-the-job WPL that was supposed to be completed by an electrician apprentice. The logbook indicates which practical jobs or modules an apprentice has to complete for his or her particular trade during on-the-job WPL and does not contain any formal trade theory. The assumption was that the apprentice would be able to complete any job in the logbook using trade theory as a reference. The logbook was seen as an indication of progress through the programme and was a requirement to enter the

formal trade test to ultimately qualify as an artisan if properly signed off by an engineering foreman and general engineering supervisor.

The data showed that the training and development of apprentices in particular at the mine thus took second place to production and profit to an extent that learning opportunities in the engineering department were restricted and in some cases non-existent. Completed and signed logbooks not only gave an indication to SIVOS of the progress of each apprentice through the ADP at the mine, but was also an indication of whether the respondents were ready to write the trade test. Respondent AAbm4 (a boilermaker apprentice with 20 months in the ADP) said:

> *When we go back to SIVOS (after completing practical WPL at the mine) we take our logbooks with. We are scored in the logbooks by the engineering foreman on all our completed jobs. A score above 40 indicated a pass and below 40 refer to incomplete jobs or I did not do what was expected from me.*
>
> *We are maybe a group of 12 from different mines at SIVOS. It is apprentices from mine X, Z mine, Y mine, etc. SIVOS will then see who has the highest score in the logbooks. Those apprentices will write the trade test first. If your scores are not good, you will write with the last group. (AAbm4)*

The mine operates on a continuous 24/7 basis throughout the year. Progress of training transfer of respondents was also measured in their rotation between different sections in the engineering department to get exposure to as much practical work experience as possible. Respondent Aabm1 (a boilermaker apprentice with a 13 months' experience) and Respondent AABm4 (a Boilermaker apprentice with 20 months in the ADP) claimed that they did not learn as much as they would have wanted in their sections:

> *There's no opportunity (to learn). It is disturbing the boilermaking department. (AAbm1)*
>
> *What was a bit difficult for me at the tertiary crushing section, my section after I changed to another was that the time I spent there was too short. I*

> *was too long at the first section and I would like to spend more time at the other sections. My time to learn in the mine is almost finished. (AAbm4)*

Respondents have 18 months to complete their on-the-job WPL and complete all the jobs in the logbook, and rotate to different sections in the engineering department between different coaches. However, Respondent AAbm3 (a boilermaker apprentice) was on the programme for 27 months, whereas Respondent AAbm2, also a boilermaker apprentice, spent 24 months in the ADP. Both respondents point out that they had not finished their training.

The data also indicated that respondents found it difficult to apply their trade theory in a practical way as there was no compatible practical work. WPL opportunities at the mine should have been designed to increase learner self-efficacy to produce an increase in training performance (Burke & Hutchins, 2007:266), but in some instances the opposite effect was achieved. Respondent QIAft1 (a mechanical fitter who had completed the ADP) said:

> *I wouldn't say they were good with their training, with the practical aspect. They (the coaches) gave us nothing and I have learned from my college files. We never opened any engine, gearbox or pump (to practise). I could not apply what I've learned in my course (at College) at the mine. It disadvantages you in bad way, because you don't get exposure. (QIAft1)*

Some respondents indicated that the lack of learning opportunities affected their training performance to the extent that they may not pass the trade test. Respondent AAbm1 (a boilermaker apprentice with 13 months in the ADP) said:

> *No learning is taking place here … I'm going to suffer in my trade test, because I'm not busy. I am forgetting the things I've learned at SIVOS. (AAbm1)*

> *… the complaint is that when we go out of the mine (after we complete the training) we don't return. It is not like we just do the course … we're doing things to be qualified artisans. (AAbm1)*

The data further indicated that the machinery used during practical training at SIVOS differed from what was used at the mine where this study was conducted. It therefore remained an open question whether the mine considered training and learning

intervention design of practical WPL in the ADP when purchasing decisions for mining equipment and machinery were made.

Respondent AAbm2 (a boilermaker apprentice with 24 months' WPL experience) said that he could not use a specific machine in the mine because it was different from the one he had used during his practical training:

> *[I] haven't used that (same) machine at SIVOS that they use here in the mine. They say it's a laser machine to cut those big steel sheets. I just don't know how to use it. I see it is a liner, its thick, thick, thick. You don't use a laser machine like that one we use at SIVOS for such thick metals in the mine. (AAbm2)*

Respondent GESel1 (a general engineering supervisor and electrician by trade with 21 years' mining experience) said that although the mine tried to emulate the training apprentices received at SIVOS before placement at the mine, it was sometimes not a clean match:

> *We definitely look at SIVOS, but we also look at Olifantsfontein. These days there is Regent that you put on a motor to test energy resistance to enable us to put that energy back into the system. So a training centre must be able to change with the time. You can't teach an apprentice the basics these days. Basic does not exist anymore. (GESel1)*

Consistent with the two previous respondents' deliberations three other respondents (QIAft1, GESbm1, and QEAbm1) mentioned that some of the jobs they were supposed to learn as indicated in the logbook were even not offered at the mine. The purpose of the practical training at SIVOS was to prepare apprentices for their on-the-job practical WPL at the mine. However, respondents indicated that in some cases the training received at the mine was different and thus not covered in the logbooks. The data indicated that the mine moved faster with technology in their operation, which was not necessarily the case with SIVOS in their training design and delivery.

The relevance of the practical WPL content offered at the mine to complement the practical work at SIVOS seemed in some aspects to be misaligned and not relevant to the outcomes of the ADP. Respondent GESel1 also said that the training for

electrician apprentices at the mine did not cover certain aspects offered by SIVOS. The practical training at SIVOS did not stay abreast with technology for this particular trade.

> *There are aspects that the apprentices just don't touch on. For example, we don't have a housing section where you can do house wiring … that can be a disadvantage … in the sense that they (apprentices) will never understand the dangers around house wiring as this falls into another section. We look at Olifantsfontein; we talked about it this morning. The technology of SIVOS is way behind that of Olifantsfontein (and also the mine). (GESel1)*

The data indicated that the misalignment in training delivery and design between SIVOS and the mine created learning deficiencies. Respondent GESbm1 (a general engineering supervisor and boilermaker by trade with 30 years' mining experience and 25 years a coach) shared Respondent GESel1's sentiment:

> *Let me tell you the training that they (meaning engineering apprentices) get from SIVOS and the practical is different from what they get here. We (meaning the mine) do not always have everything. What they have to do here was not done at SIVOS. There is a need there. Our training (at the mine) is not 100% especially on the boilermaker side and the steel side of fitting. You can say there are many things in place there, but there is still a need. (GESbm1)*

The data presented here confirm that practical WPL in the ADP at the mine was indeed influenced by training and learning intervention design especially where misalignment of learner expectation, learning outcomes and actual training interventions occurred. According to Burke and Hutchins (2007), as well as MacRae and Skinner (2011:984), cited in Chapter 2, section 2.5, the training and learning intervention design and delivery of WPL should fulfil the expectations of the learner, need to be aligned with identified goals, must be relevant and should allow for enough practice by means of trial and error to be effective. The effectiveness of practical WPL at the mine was also influenced by the work experience of the some coaches.

4.3.4.2 Training and learner characteristics factors

The data obtained from the interviews during this study suggest that informal learning in the ADP at the mine was also influenced by factors within the trainer (coach) as well as the learner (apprentice). The data indicated that knowledge transfer from coaches to apprentices in the ADP differed due to lack of experience as some coaches had only been involved in the programme for a short period since the mine became operational in 2009. According to Metso (2014:385), the interactions between students and more experienced employees in the workplace create a feeling of being a member of the team that enhances the students' development of professional skills.

The breakdown of relevant mining experience of the different coaches and the period of their involvement in knowledge transfer at the mine is indicated in Table 4.3 below:

Table 4.3: Experience breakdown of coaches

No	Respondent Code	Trade	Designation	Period employed at the mine	Period involved in artisan development programme as facilitator of non-formal workplace learning
2	QEApw1	Plater & Welder	Artisan	5 years	4 years
3	EFet1	Engineering Technologist	Foreman	8 years	2 years
5	GESft1	Fitter & Turner	General Engineering Supervisor	15 years	6 years
8	GESbm1	Boilermaker	General Engineering Supervisor	30 years	30 years
13	QEAft1	Fitter & Turner	Master Artisan	21 years	21 years
14	EFft1	Fitter & Turner	Foreman	15 years	4 years
15	GESel1	Electrical	General Engineering Supervisor	21 years	21 years
16	EFft2	Fitter & Turner	Foreman	19 years	11 years

Some respondents did not have enough trade experience to impart their knowledge to apprentices as they were still learning the trade themselves, like respondents QEApw1 and EFet1 in Table 4.3. Furthermore, some respondents had more than adequate mining experience, but their involvement as coaches of the ADP was

significantly less than their years' experience (for instance, respondents QEApw1, EFet1, GESft1 and EFft1). The young artisans at the mine also struggled to gain the relevant expertise due to the absence of a central engineering maintenance workshop to enable them to transfer their knowledge to the novice apprentices positively as part of their role as coaches. Respondent GESbm1 (a GES with 30 years' mining experience) commented as follows:

> *The artisans came from SIVOS where they were trained what to do. They don't get exposure at the mine, because their experience only starts the day when they qualified. Not as an apprentice. They just learned how to do things and it stopped, because in here they don't practise … the mine fit new parts. (GESbm1)*

Respondent QEApw1 (a qualified welder with five years' mining experience) indicated that he had only been involved in the ADP for four years said:

> *… we get our 'appies' from the training centre. Our foreman would ask us with whom (meaning apprentice) we want to work. We also find out from the 'appies' with which artisan they want to work and learn. We test their interest in the trade and we then take it from there. (QEApw1)*

This respondent also remarked that he understood that apprentices approached their learning transfer differently from other coaches and that some may take longer to understand than other. Younger coaches with less experience found it difficult to transfer their learning to apprentices. Metso (2014:386) states that experienced employees should be active in guiding the students and providing them with new perspectives to support their autonomy. On the other hand, respondent QEAmr1 (a qualified millwright who had completed the ADP) was allocated to a senior artisan and recorded that transfer of training was inadequate:

> *What you learn physically from your senior is to look at how he does the work. I had an artisan that work in the mine for 20 years but he didn't know how to share what he knows with me and with the apprentices around him that cannot yet do the work. So this then means … that he doesn't know anything [if he cannot share his knowledge]. (QEAmr1)*

For some apprentices the coach had to show, spend more time and explain more than the others. Likewise, the apprentices' lack of experience together with an inexperienced coach created situations where it was difficult to engage in constructive and meaningfully WPL activities. Apprentices were given uninteresting, tedious tasks to pass the time as they were working long 12-hour shifts.

> *Remember what we try to do when an apprentice came to us and he comes fresh from SIVOS without much experience and has never worked with his hands. My principle is to first teach him the technique by giving him a stencil … to paint numbers on equipment.* (GESel1)

Innovation was one of the six values adopted by the organisation, yet for some respondents it was clear that these values were not supported by some of the engineering supervisors. Respondent QIApw1 (a welder who had completed the ADP) designed and built a cigarette dispenser out of boredom, but the design got him into trouble with the general engineering supervisor. This respondent said:

> *It's good, but on the other side it's bad, because I'm not doing the stuff I'm supposed to do. (QIApw1)*

The absence of constructive learning and development engagement between respondent QIApw1 and his coach had resulted in respondent QIApw1 becoming involved in a love relationship with him and the artisan he was assigned to:

> *She (the coach) would come to me and ask to go the shop to get cigarettes and people will like asking me how you can as an 'appie' go out with an artisan. (QIApw1)*

The data also indicated that there seemed to be a natural predisposition away from women artisans as coaches and apprentices. Learning between male and female apprentices was also different as some tasks involving heavy equipment and work that had to be done at heights were more readily performed by male than female apprentices. Most of the coaches were also males with only one female artisan. Respondent AAbm3 (a boilermaker apprentice) preferred a female artisan to be his coach even if the respondent was assigned to a male artisan and said:

> *It is going good at my section, because I now work with a lady, a wonderful person. She is an 'ambagsvrou' (female artisan), the first one appointed by*

> *Mine X. She gives me enough work exposure and is very supportive. Basically, at the moment I'm doing most of the work. She will allow me to climb in the chute, to weld, change liners and do the work. (AAbm3)*

Respondent EFft1 (an engineering foreman with 15 years' experience in the mine) pointed out that some female apprentices struggled with some of the tasks during WPL:

> *There is some heavy stuff that you need to pick up that takes team work. And the oil and grease and all your funny stuff and this sun, and outside there is no office. So she did have this. I asked her, look, in order for you to make it you need to have someone else that you can look after. I've seen some of the ladies, they have quit the trade. They don't have a clue. They didn't have anyone who have actually consulted them and try to prepare them actually.* (EFft1)

Furthermore, the age difference between apprentices and coaches was very small and created tension between learner and facilitator, compromising the apprentices' openness to learning. Beddie and Halliday-Wynes (2010:244) contend that 'we see a trend toward the deliberate integration of learning and work, the employee [read apprentice] is expected to learn from everyday work activities and through guidance from other workers'.

With such a small difference in age between the apprentice and his or her coach, an apparent lack of the appropriate work experience as well as technical expertise, the data indicated that some coaches engaged apprentices in insignificant tasks that were not work-related. Apprentices were used to carry tools around and run errands for the artisans in the plant, like Respondent QEAmr1 (a millwright who had completed the ADP):

> *I was the same age than my artisan. He wanted to treat me like his child. I was married and have a house and felt he can't treat me like that. I am here for my own life. Whatever his problem was, he must solve it himself. (QEAmr1)*

Respondent QEAbm1 (a boilermaker with five years' experience who had completed the ADP) had a similar experience and said:

> *My coach and I were the same age. He just sent me around to bring tools. I was never physically at my job. I could not learn anything from him. There was no opportunity to learn from him. (QEAbm1)*

Virtanen, Tynjälä and Stenström (2008) suggest that guidance, discussions and assessments with the workplace coaches that concentrate on students' development of professional skills are important for successful on-the-job learning and not mere mind-numbing and uninteresting tasks just to pass the time. Eraut (2011:8) contends that support and feedback to the apprentice during WPL were critically important for their confidence, learning, retention and commitment, specifically during their first few months in the workplace when they were best provided by the coach on the spot. Respondent EFft2 (an engineering foreman with 19 years' experience) made the following remark:

> *The best way to learn is to let him take ownership that he at least have a good basis to start. Like if I had to do measurements and so I let the apprentice do the measurements and then I do an over inspection of what he has done. To know, see how he is doing, I will assess his action which is quite a challenge. How does he react to it? Does he get angry, or is he taking a step back, to think, 'Maybe I should do this differently'? (EFft2)*

The mine had clear expectations of how tasks should be performed in the engineering department. A lack of discipline among some apprentices compromised work quality and safety because apprentices were shown how to take short cuts during shutdowns or when the pressure for production increased. Respondent GESel1 (a general engineering supervisor and electrician by trade with 21 years' experience) mentioned that discipline came with practice and created a standard of safe work practices in his line of work, a trade that could experience fatal injuries:

> *To increase his knowledge (I want to see) if he works accurate or messy. He will get tasks like cleaning the tools and the workshop. You know the basic things to get a bit of discipline in him. You can kill people if you cannot follow instructions. (An) electrician is very disciplined and neat. Is the way the trade is? We work with (electrical) wires. (GESel1)*

Respondent GESft1 (an engineering supervisor with 15 years' experience) shared the same sentiment on discipline and noticed how it had changed over the years:

> *Yes, other factors that came in over the years is that the attitude of apprentices has changed. There is not that discipline anymore. If I can use an example: I've started as apprentice in December 1997 and worked for three weekends with no leave, because I had to work. There was no way that you will tell the artisan that you cannot work in December (because of Christmas). Your contract stated you will work. Now, it's different. We have to close the mine, because there are no apprentices and artisans to work (over Christmas). (GESft1)*

Factors affecting the apprentice's commitment to work, to other apprentices, and to their coaches included the quality of their support and feedback, appreciation of the value of their work and their personal sense of importance, which according to Eraut (2011:9), were not necessarily aligned with their organisation's priorities. Most of the respondents mentioned that the personal values of both coach and apprentice were important to achieve the required success envisioned in the programme.

For some respondents the notions of trust, respect, motivation, recognition, honour, fairness, hard work, patience, safety, and courtesy were important indicators in their working relationships. The apprentice had to move from one coach to the next as he or she moved through sections in the plant. A bad relationship with one coach in a particular section influenced the relationship in the next section as the mine was small and management's perceptions played a significant role throughout the ADP. Respondents indicated that some of these values made them feel dignified and appreciated:

> *You see he gave me that chance of me feeling now I'm considered. I must make my own decisions.* (AAbm1, a boilermaker apprentice with 13 months' experience)

> *There was a time when there were four job cards and my artisan told me I must take two and he will take two. The engineering foreman said, 'No, it does not work like that'. The artisan answered that if there would be a mistake, he trust me and he will take it upon him. (QEAbm1, a qualified boilermaker who had completed the ADP)*

> *The reclaimer in the plant gave many problems and a big team was appointed to look at it. To solve the problem and see afterwards that the machine works and give no more problems is one of the good things. They*

> *give you recognition. (QEAmr1, a qualified millwright who had completed the ADP)*
>
> *I mean like there was one thing they should know if I'm struggling with the machine and don't know the difference between the welding rods or don't know that they should have patience. I mean when somebody motivates you, you don't even look on the day, because we enjoy what we do. (QIApw1, a qualified welder who had completed the ADP)*
>
> *Look, Sir I want to know everything. Everything that you know … you must share with me. The previous time I lost the opportunity through my own stupidity … And this made me now to appreciate it more. (AAbm3, a boilermaker apprentice with 27 months on the ADP)*

The feelings of contentment and being dignified were preceded by uncertainty and insecurity when respondents started with the ADP. Respondents were left on their own in the mine and had to find their way in an unknown environment. The coaches mentioned that they would have appreciated more support from the HR Training and Development Centre as indicated by Respondent GESbm1 (a general engineering supervisor and boilermaker by trade with 30 years' experience):

> *I think the structure of the (training) process must be right to work for us. We have the evaluation form what we completed for the apprentice. I would also want them to write a phase test before they leave a section to rotate to a next section. We should test whether they understood the work they were required to do in the section before going on to a next section. (GESbm1)*

Furthermore, Respondent QIAft1 (a qualified mechanical fitter who completed the ADP) felt that someone should have been appointed by the mine's HR Training and Development Centre to assist them during their on-the-job training:

> *They must appoint someone to guide us, how would I say. There were many times that I went to my training officer (for assistance) then he didn't even know which trade I'm doing. He didn't know whether I'm a boilermaker or … (QIAft1)*

The data confirmed the view held by Fuller and Unwin (2007:457) who found that successful apprenticeships in organisations depend heavily on the commitment made by the organisation to guide newcomers. Guidance to respondents during the

ADP will also enhance the view of management support. Research found that managers' support was an important factor for successful workplace learning conditions (Metso & Kianto, 2013:133) in the context of the workplace.

The mine where this study was conducted was selecting apprentices for the programme by using particular criteria. Respondent EFft1 (an engineering foreman) indicated that the criteria used by the organisation to select apprentices were inadequate and 'stronger people' should be screened and carefully chosen:

> *We've got guys here. N3, N4, N5 and they just started here (on a) learnership. But they don't have a clue, actually even the trade that they done at college, what is it all about and all the things (they do here). You can find a guy is good according to the test (to screen the apprentice), but according to me and what you see in the plant, it is two different things. He is struggling. (EFft1)*

The literature suggests that the 'wrong' learners in a particular programme may challenge the incumbents' pre-training motivation. According to Metso (2014:384), a process of 'systematic guidance ensures that the students' professional skills develop in the right direction and reach the level required' to benefit both the organisation and the individual. Metso (2014:384) also claims that '[g]uidance and support from the organisation, management, and supervisors are considered important for successful learning at work'.

The data confirmed that a lack of interest in a specific trade – as indicated by some respondents – influenced learning success in the ADP in an environment where support from both the organisation and management was questionable. Respondent QEAft1 (a master artisan with 21 years' experience) had to coach an apprentice who was not particularly interested in the particular trade and did not show the appropriate interest, whereas another respondent indicated that the apprentice was in the programme just for the qualification or for the money.

> *You find you choosing him a trade that is wrong for him and that he is on the electrical, but he was choosing a fitter side. At some point you will find that he is bored for the job. (QEAft1)*

> *What is happening in mining is that you just need a qualification. You just need your N6 and start working in the mine. We need to bring a type of*

> *awareness … career guidance to them (to make the right choices). (EFft1, an engineering foreman with fifteen years' experience)*
>
> *You get a guy here who is very physical and can do all the stuff and everything, but is here for the money. There isn't any passion you see something that is driving him actually. And things don't work well and then they decided to quit and everything. (EFft1)*
>
> *And I think what actually happens; she did choose the fitter trade because of money actually. Because someone else was a fitter and was having cars and she decided to have that thing. She didn't know what fitting is actually all about. She didn't have a clue, she didn't know they hard work and all that stuff. (EFft1)*

According to Metso and Kianto (2013:132), one factor that has an impact on the development of students' professional competence in practical WPL is associated with the apprentice's self-motivational drive that is derived from the 'students' performance orientation and work-related efficacy beliefs'. An apprentice who is bored with a particular trade and has to spend 80 weeks doing on-the-job learning at the mine on a 12-hour shift basis to acquire the required competence will have a questionable self-motivational drive and will therefore lack work performance.

In the context of practical WPL, Metso and Kianto (2013:133) assert that apprentices need guidance by the organisation during on-the-job learning to develop their professional skills in the right direction and to acquire new perspectives on task accomplishment. Some respondents found it challenging to engage apprentices in meaningful learning as the energy to do some tasks and the interest in the trade was absent. Respondent QEAft1 (a master artisan) said:

> *It makes learning easier because you can identify where this person is strong and if he is strong on the thing that means a person will show a lot of interest. (QEAft1, master artisan)*

The opposite of this was that the apprentice's passion for the trade would have made the learning endeavour more exciting. The data indicated that passion for learning and training transfer improved pre-training motivation, job performance, and self-efficacy of apprentices:

> *… because passion can give birth to say a person would have more interest (in the trade and learning). (QEAft1)*

> *It is more interesting for me to work with apprentices. It is fulfilling to impart my knowledge of the trade to someone else in the trade. (GESel1, a general engineering supervisor)*

Respondent AAbm1 (a boilermaker apprentice who was in the ADP for 13 months) and Respondent EFft1 (an engineering foreman) mentioned that passion for the trade made learning easier:

> *Boilermaking is a thing that is in me, when you have passion for it … so far the learning is good. (RAAbm1)*

The data presented in this section confirm that various factors in the organisation influenced practical WPL in the context of the mine where the study was conducted. Van der Klink et al. (2012:79), Burke and Hutchins (2007), MacRae and Skinner (2011), Metso and Kianto (2013), as well as Metso (2014), have pointed out that individual factors that exist in the employee or learner, training design and delivery, as well as factors present in the organisation, influence how and what adults learn informally at the workplace (see Chapter 2, section 2.5).

4.4 CONCLUSION

The mine opened in 2009 and took a bold decision to offer engineering learnerships to community members and a career development opportunity for its employees without any previous experience of WPL. This was seen as the right thing to do to show compliance to its license conditions to operate in terms of the requirements of the MPRDA. Likewise the mine also had ensure a continuous inflow of qualified artisans into the talent pool and secure sustainability of its operations.

The results presented in this chapter show that the perceptions of the respondents regarding the artisan development programme in the mine often differed, yet in some cases they were very similar. Artisan development at this mine, as indicated by the results of the data generated and analysed in this study, revealed how practical WPL

was being facilitated, how it occurred at the mine and which organisational factors influenced WPL.

The data showed how practical WPL benefited both the individual apprentice and the organisation and how employees' lives took a turn for the better. Apprentices that successfully completed their apprenticeship were employed by the mine in suitable vacancies. These newly appointed qualified artisans will become coaches as their work experience increased to other engineering apprentices entering the ADP. Also the talent pool of the mine was filled by newly qualified but unemployed artisans who may be eligible for employment at other mining companies and other industries in the area. By ensuring that the talent pool was always filled with appropriately skilled unemployed candidates improved the company's operating sustainability and future growth or possible expansion projects. The investment by the mine to the ADP further benefits the community because appointed artisans have access to company-provided housing and are making a valuable economic contribution in the town.

The mine had to ensure its sustainability and since qualified artisans are a scarce commodity in South Africa, a talent pool for these and other skills was created to secure availability of suitably qualified artisanship in the local mining industry. The internal employee development programme of the mine also allowed permanent employees to progress – through the ADP – from mining, maintenance and plant operators to qualified artisans. During the study one respondent (QEAmr1), a mining operator, successfully completed the ADP and became a millwright, while another mining operator (AAbm4) was progressing well towards becoming a boilermaker.

Two other respondents further indicated that they were professionally qualified in two different fields but were unemployed. Respondent QIAft2 completed a diploma in Mechanical Engineering as well as a degree in Community Development. Respondent QIAft1 was a qualified mechanical draftsman. Both respondents joined the mine's ADP and completed it over the prescribed period. They found employment at a sister company of the mine where this study was conducted: respondent QIAft2 as a fitter and turner, and respondent QIAft1 as a mechanical fitter.

The ADP appealed to different apprentices, each with unique qualities and skills and different reasons for being in the programme but with one common goal: to receive a

red seal (trade certificate) which was seen as the key to a better life out of unemployment and poverty. The evidence indicated that each respondent had a different perception of how practical WPL occurred at the mine while they were in the programme.

The data also indicated some of the challenges facing the successful implementation of artisanship through WPL in an organisation. The insights provided by the respondents highlighted critical issues that the respondents wanted to be addressed in order to improve the quality of WPL and to increase the success of the ADP. The implications that the results reported in this section may have for theory, policy and practice are discussed in Chapter 5.

CHAPTER 5
DISCUSSION AND CONCLUSIONS FROM THE DATA

5.1 INTRODUCTION

This chapter focuses on the conclusions acquired from the interviews I had with the 18 respondents at the mine where the study was conducted. The study explored artisanship through workplace learning at a South African mine. The research question that articulated this case study was*: 'How, if at all, does practical WPL in the mining sector facilitate the development of artisan apprentices?'* The research question was further supported by three sub-questions, namely:

- *Which organisational factors, if at all, influence artisan development at the specific mine?*
- *How, if at all, is learning facilitated during the ADP?*
- *How, if at all, does learning occur during the ADP?*

The purpose of the sub-questions was to enrich the main research question by concentrating on three different elements that influenced WPL at the mine, i.e.: organisational factors, learning facilitation and learning. The emphasis on WPL allowed me to take an interpretive qualitative case study approach to collect the data through semi-structured interviews from 18 respondents involved in the ADP at the mine. The collected data were analysed using qualitative content analysis and the findings have been recorded in Chapter 4.

Farrell (2013:37) indicated that adults have the ability to learn throughout life, as pointed out in Chapter 1 of this thesis. It can be assumed that at some point in the life of an adult such a person will attempt to work and earn a living. The learning might continue throughout the working life of the adult. Lifelong learning may therefore happen within the context of the workplace. The orientation to the study was discussed in Chapter 1 in reference to the motivation to the research, and in formulating the problem statement, highlighting the research question and sub-questions, defining the key concepts and considering the ethics of the study.

According to Ellinger (2005:391), learning in an adult world is a significant source of sustainable competitive advantage for companies as well as its employees, as mentioned in Chapter 2, section 2.1. The workplace as a source of learning and development, as well as the adult's ability to learn, could create the ideal situation for continued growth of the organisation and its human resources.

Chapter 2 provided the conceptual framework of WPL by exploring the literature to offer a scholarly overview on concepts such as WPL, and formal, informal and non-formal learning. In supporting the research question Chapter 2 further highlights the organisational factors that influence WPL, how practical WPL is facilitated as well as practical WPL and artisan development. A funnel approach was used in the literature study to focus on artisan development in the mining industry at a South African mine from the perspective of the UK, England, Finland and South Africa.

Chapter 3 concentrated on the research design and methodology with the focus on a qualitative case study approach for data collection. The respondents in the case study were interviewed using a semi-structured questionnaire following the correct protocol to ensure data integrity that supported the trustworthiness and reliability of the data.

A summary of the results obtained from the data was provided in Chapter 4. Chapter 5 attends to the conclusions, challenges experienced by apprentices, limitations and closing comments in relation to WPL at the mine where the study was conducted.

5.2 CONCLUSIONS

The conclusions formulated in this study were derived from the semi-structured interviews with 18 respondents at the mine where the study was conducted. These respondents included engineering apprentices as well as artisans, master artisans, engineering foremen and general engineering supervisors. I used conventional content analysis to make sense from the raw data from which themes emerged that could answer the research question. The respondents were asked the following questions to determine the apprentices perceptions of transfer of learning and how this transfer actually occurred between the coaches and the apprentices in the

context of the mine. Factors within the mine that influenced transfer of learning were also highligted:

- *What were the reasons for you to join the ADP?*
- *Why did you choose the ADP?*
- *How, if at all, did practical WPL occur during the ADP at the company?*
- *How, if at all, was practical WPL facilitated during the ADP?*
- *Which factors in the organisation, if at all, influenced practical WPL learning during the ADP?*

The respondents' responses to these open-ended questions were used In an attempt to answer the research question provided in section 5.1 above.

5.2.1 How, if at all, did informal workplace learning occur at the mine?

Tynjälä (2013) pointed out (see section 2.4.2) that the key phenomenon in research on WPL is the notion of learning. Tynjälä (2013) developed a 3-P model to describe WPL while Marsick and Watkins's (2001) model, as discussed in section 2.4.3, focused on informal and incidental learning. Jeon and Kim (2012:10) assert that informal learning is a leading mode of learning in the context of the workplace. The ADP at the mine was initiated and driven through the mode of practical WPL and the question that remained was how WPL occurred in the ADP at the mine. Marsick and Watkins (2001) claim that learning in the workplace is activated from everyday encounters that influence the work and life of employees (see section 2.4.3).

Apprentices, however, were placed in a situation at the mine where their on-the-job exposure and learning were a necessary phase to complete their engineering learnership and qualify as an artisan in their respective trades. Jarvis (2012:30) explains that a situation or an event, like the one the apprentices found themselves in at the mine, that provides a disjuncture for them may trigger practical WPL (see section 2.4.3). In this regard, Respondents AAbm2 pointed out that being in the learning situation at the mine was different and difficult and it took time to understand and grasp the workings of the plant in an open pit iron ore mine.

Respondents developed their own learning strategies at the mine in the same way as explained by Lohman (2009) (see section 2.4.3) by talking with other apprentices and coaches, collaborating with other employees in the engineering department and the plant, observing other apprentices and artisans, and sharing material, tools and resources. Respondent AAbm2 also indicated that through interpreting (see Marsick & Watkins, 2001, as referred to in section 2.4.3) and collaborating with other artisans and relying on trade theory and former practical training at SIVOS in the mining context, things started to make sense as respondents began to make the connection between their trade and the real world of work at the mine.

The formal trade theory that apprentices completed through institutional learning prior to their on-the-job learning experience allowed the respondents to develop appropriate learning strategies as indicated by Marsick and Watkins (2001) in their model (see section 2.4.3). This happened through continued practice, as Respondents QIApw1 and AAbm3 indicated. Respondent QEAmr1 commented that even if the real-world mining context was challenging to grasp at first the apprentices managed to increase their experience over time as their self-confidence improved. Respondent AAbm3's prior exposure to welding made it possible for him to show progress faster than other apprentices and he was even allowed to work alone on equipment as his skills yielded the required results and appropriate solutions. In seeking to improve his own expertise and technical knowledge Respondent QIAft1 could study his college files when there were no gearboxes or engines at the mine to open and repair.

The mine placed a high priority on safe work practices through the principle of zero harm to employees and simple, non-negotiable rules. Every task had to be performed with this principle in mind and no short cuts were allowed, thereby assessing intended and unintended consequences (see Marsick & Watkins, 2001 referred to in section 2.4.3). The apprentices were aware that any unsafe actions on their part could lead to unwanted events which would affect the company's production targets and cause the organisation to incur financial losses. Respondents completed a task risk assessment prior to every job. This approach was evident from the data: respondents had to examine alternative solutions to critical tasks and were not allowed to compromise on safety, as indicated by the response of Respondent AAbm4.

5.2.2 How, if at all, was informal workplace learning facilitated at the mine?

Apprentices arrived at the mine with theoretical trade theory obtained at the TVET college and some practical exposure at SIVOS as the only reference for their on-the-job learning. Experienced artisans, master artisans, engineering foremen and general engineering supervisors at the mine acted as coaches and facilitators of practical WPL. The novice apprentice learned the required technical skills of his or her relevant trade through positive transfer of learning from their coaches (refer to Baldwin & Ford, cited in section 2.6).

Apprentices were required to spend at least 18 months at the mine and rotated through the different sections in the plant. Respondents were assigned to different coaches over this period. Before any transfer of skills, knowledge and attitude could occur between the coach and apprentice a gap analysis was performed, as suggested by Mellinger (2003:11-12) and discussed in section 2.4.3. The purpose of the gap analysis, as indicated by Respondent EFft2, was to gauge the experience level of the apprentice as well as where the emphasis in the transfer of learning should be. The gap analysis served as a trigger for practical WPL. Often the practical exposure of the apprentices at SIVOS focused only on the basics and during the ADP apprentices learned the ‘tricks of the trade’ (GESel1).

The common approach followed by most coaches (QEApw1, QEAft1, EFft1 and GESel1) was to first explain a particular task to the apprentice and then show him or her how the task was to be performed using a step-by-step approach. Respondent GESel1 indicated that he would normally give an apprentice a job task to do without any explanation in the belief that the apprentice would know what to do and how to apply the mine’s safe work principles.

Apprentices were also required to repeat tasks to increase experience and expertise, and questions raised by apprentices would increase knowledge. Wofford et al. (2013) explain that such a strategy of reinforcement and experimentation through repetition and trial and error may increase the practical WPL experience (see Chapter 2, section 2.4.3). Respondent EFet1 emphasised that the repetitive work by his apprentice was essential before more advanced jobs could be handled. The

more practice apprentices put into a simple task, the more their knowledge and their self-confidence were increased.

The engineering department in the mine is responsible for the maintenance of plant and mining equipment to allow the operation to function non-stop throughout the year. The ability of an artisan to find solutions to a breakdown at the plant in record time was a cornerstone for every successful mining operation at the mine. The mine used the root cause analysis methodology in its engineering section. Three respondents (AAbm3, AAft1, and GESbm1) indicated that practical WPL in the mine focused on fault-finding and problem-solving. Every morning artisans did inspections in the plant to identify faulty equipment and to proactively perform the required maintenance on such equipment to bring down standing time and increase production time. In addition to this, broken heavy mining surface vehicles are also brought in for repairs. These inspections provided fertile opportunity for apprentices to learn the technique of fault-finding and problem-solving they would use throughout their careers. The plant had scheduled breakdowns for planned maintenance on all equipment performed by artisans with assistance from apprentices and maintenance operators.

Tynjälä (2008:141) maintains that employee learning at the workplace is activated by the mutual interaction between the individual employee and the workplace (see Chapter 2, section 2.2.2). Respondents AAbm1, AAbm3, AAft1, QIAft1 and AAbm4 indicated that apprentices could ask as many questions as they wanted emanating from their determination to learn and improve their knowledge of their trade. Respondent AAbm3's curiosity to know more prompted him to accompany the artisan on daily inspections in the plant.

5.2.3 Factors in the organisation that, if at all, influenced informal workplace learning at the mine

The mine where this study was conducted offered on-the-job learning opportunities to engineering apprentices as a requirement for them to enter their trade test to obtain the National Certificate (N3) in Engineering Studies. The data confirmed that factors unique to this workplace setting influenced practical WPL during the ADP at

the mine as discussed in section 4.3.4 in Chapter 4. Jeon and Kim (2012:211) assert that the effectiveness of informal learning is affected by several factors such as organisational environmental influences, the human relationship with co-workers, and the reflection of individuals (also see Van der Klink et al, 2012; Burke & Hutchins, 2007; MacRae & Skinner, 2011). These factors, as indicated by the data obtained from this study, were categorised as work environment factors, training and learning intervention design factors and training and learner characteristics factors, i.e.: the absence of a central engineering workshop at the mine, misalignment in learning and intervention design, difference in logbook and actual practical work, the mine's emphasis on production and profit over training and development, lack of compatible practical work in some trades, difference in machines used at SIVOS during institutional training and the mine during practical WPL, and misalignment in training delivery (see section 4.3.4 in Chapter 4). Learning in organisations can however be improved for individuals and organisations (MacRae & Skinner, 2011, referring to research by Cherniss et al.,1998).

Apprentices learn best by applying their formal trade theory knowledge through trial and error, problem-solving techniques and practical exposure in real work conditions. An ideal setting for this informal learning to occur is the central engineering maintenance workshop where apprentices would not only repair gearboxes, pumps and faulty parts, but also manufacture parts needed by the mine to have their equipment running in the production of iron ore. However, several respondents (AAbm2, AAbm3, GESbm1 and QIAft1) indicated that the mine opted to order new parts and simply replace faulty parts on mining equipment. Respondent AAbm1 (a boilermaker apprentice) said that the mine does not have a central engineering maintenance workshop.

The mine where this study was conducted is a business whose primary focus is to generate an income from iron ore. In the ore-mining process the surface mining equipment breaks down from time to time. Iron ore production at the mine is target-driven and relies on the availability of essential mining equipment on a 24/7 basis in the shortest turnaround time when breakdowns occur. This approach makes it financially viable for the company to replace faulty parts rather than repair them. However, this method seems to have prevented the apprentices from participating in

valuable informal learning opportunities as indicated by Respondents AAbm1, QIApw1, AAft1, and QIAft1 (see Chapter 4, section 4.3.4).

Training and learning intervention design for practical WPL opportunities at the mine had to compensate for the absence of a central engineering maintenance workshop at the mine. Furthermore, the data also confirmed a misalignment between the learning expectations of some respondents and their on-the-job activities within this context. Respondent QEAmr1 (a millwright) pointed out that the logbooks for his trade did not exist, while Respondent AAbm3 (a boilermaker apprentice) said that the mine did not offer the jobs indicated in his logbook. This misalignment had a negative impact on Respondent AAbm4's (a boilermaker apprentice's) preparation for the trade test while Respondent AAbm1 (also a boilermaker apprentice) indicated that opportunities to learn at the mine were limited and that some jobs indicated in the logbook were not even offered by the mine.

Respondent AAbm2 commented that the machinery used at SIVOS during the practical phase of the engineering studies programme differed from the machinery used in the mining operations. The data also indicated that the technological development at the mine in the field of electrician training exceeded the learning interventions at SIVOS, whose training was perceived by Respondent GESel1 (a general engineering supervisor) as basic. Respondent QIAft1 (a mechanical fitter) experienced the same challenge; he never opened a gearbox, engine or pump at the mine during his term in the ADP. Burke and Hutchins (2007:280) assert that trainees report a higher usage of training if they perceive a higher alignment of the training programme with the strategic direction of the organisation and they perceive higher transfer of training when their learning outcomes match trainees' departmental goals.

Some of the coaches were inexperienced (GESel1) and in the same age (QEAmr1, QEAbm1) group as some respondents, which together with the lack of constructive learning opportunities created a transfer climate at the mine where respondents were not prompt to use new skills and did not experience social support from peers and supervisors in the form of incentives and feedback (see Burke & Hutchins, 2007:280). Furthermore, Blume et al. (2010:1075) point out that employees' personality traits, such as job involvement, self-efficacy and motivation to learn or transfer, strongly or moderately influence training transfer (see Chapter 2, section

2.5). The data showed that training transfer from coaches was indeed lessened by apprentices' lack of interest in the trade.

The high unemployment rate in the town where the mine is situated and the learnership opportunity offered by the mine sometimes drew individuals with no interest in artisanship at all. Respondents AAbm1 and EFft1 explained that apprentices with no interest in the trade also lacked a passion for learning. Respondent EFft1 commented that such apprentices showed poor commitment to the ADP, had no interest in learning or in a particular trade and would eventually quit (EFft1).

5.3 CHALLENGES EXPERIENCED BY THE ARTISAN APPRENTICES

The mining sector in South Africa operates in a legal framework that allows them to extract and process minerals and sell the final product within the parameters of its licence conditions. Included in these conditions to operate as a mine is the responsibility to develop the company's human resources and invest in different social investment and development programmes required from the company's SLP as contemplated in section 100 of the MPRDA. One such investment programme of the mine was the ADP with its emphasis on artisanship through practical WPL. The success of the ADP may benefit the mine in particular and the Postmasburg community in general and the company would execute its SLP undertaking, required in terms of the conditions of its licence to mine. The study highlights some possible challenges for the ADP at the mine in terms of policy and practice of practical WPL, as well as future research on the topic.

The ADP of the mine allows an apprentice to qualify in any one of the following engineering trades: diesel mechanic, fitter and turner, plater and welder, millwright, boilermaker and electrician. Such artisans are needed by all the mines in the Northern Cape, as well as the public sector and other industries throughout South Africa. The mine provides much needed skills to the economy and helps to alleviate poverty and unemployment.

The data showed that apprentices joined the ADP for different reasons and some had no interest in or passion for artisan trades, which put unnecessary strain on positive training transfer. Learners could enter the workplace on an engineering apprenticeship through three routes, as explained in Chapter 2, section 2.7.4. The mine has little influence to select the right candidate for an engineering learnership and is also under pressure to adhere to legislative licence requirements. Furthermore, as Mukora (1981:238) highlighted, WPL is needed by apprentices to enter the trade test (see Chapter 2, section 2.7.4). The mine may, however, consider applying a selection mechanism where passionate apprentices are identified that could add value not only to their own development but also to the investment made by the organisation.

This implication echoes Burke and Hutchins's (2007) view on the ideal apprentice for the ADP to be selected by a mine: he or she should be a person with cognitive ability to master the WPL activities, be self-effective in managing his or her own learning, have the necessary pre-training motivation to attend the ADP, show the required negative affectivity to focus on the required outcomes of the programme, have a perceived utility to participate in the WPL activities, and show organisational commitment for the efforts put in by all the role players of the ADP at a mine.

Proactive marketing by the mine's HR department aimed at high school learners to provide them with sufficient information on the requirements and work conditions of an artisan could also be considered to ensure that the right target group for the trade is reached at an early age. It is further recommended that the mine's engineering department should allow high school learners to shadow artisans in the workplace during their school holidays to gain first-hand experience of the type of work associated with a specific trade and how the work is performed in real time conditions.

Cognizance is taken of the fact that the mine is still a young operation. In the past it employed young artisans who had to serve as coaches to apprentices assigned to them. These young artisans lacked the appropriate experience of the trade to effectively transfer learning to the apprentices on a mine without a central engineering maintenance workshop where valuable practical exposure and application of their trade theory were lost. It is recommended is that formal

mentorship and coaching training be offered to artisans to equip them with the basic skills to engage in positive training transfer. Furthermore, the mine could consider investing in acquiring replicas of the equipment used in the mine, such as gearboxes, engines and pumps, among other things, that apprentices and artisans could take apart and re-assemble. In so doing they could practise in a collaborative way that would not only increase the experience and technical knowledge of the young artisans, but would also provide valuable practical WPL opportunities for apprentices.

The misalignment of the workplace where WPL was taking place with the trade theory on offer at the TVET college and practical training at SIVOS may not be easy to address. The TVET college is a public training institution, SIVOS is privately funded, and the mine is a private company. Misalignment between trade theory and practice is therefore likely to happen; however, it is recommended that the mine's HR training department engage with all the relevant role players with a view to aligning apprenticeship programmes and practices as far as possible. This engagement may ensure that the practical WPL delivery and design at the mine will satisfy the apprentices' expectations, are aligned with identified business and individual apprenticeships' goals, are relevant and substantial, and allow for more than adequate practice. Furthermore, the intervention would need to include error-based examples, and apprentices should be given the opportunity to influence the ADP (MacRae & Skinner, 2011; Burke & Hutchins, 2007). In order to enhance practical WPL in the ADP at the mine to further improve on its success, the following four-phased model adapted from Cherniss et al. (1998, cited in MacRae & Skinner, 2011:985) is proposed for the mine where this study was conducted (Table 5.1):

Table 5.1: Model to enhance informal workplace learning in the artisan development programme at the mine

Phase	Actions
1 Preparation	• Prepare the apprentice for change from SIVOS to on-the-job WPL at the mine • Define the needs of the organisation as well as the apprentice • Emphasise the personal choice of the apprentice of his/her particular trade • Link the learning programme in the ADP to individual learning goals of apprentice • Clarify the expectations of the organisation for successful completion of the ADP • Provide support to the apprentice to maximise learning
2 Training	• Foster a positive relationship between the coach and the apprentice • Emphasise the self-directed nature of learning • Set joint goals for both apprentice and organisation • Help the apprentices to understand the impact the training may have on them and provide support where needed • Inform the apprentices about the learning strategies to be followed • Provide opportunities for apprentices to practise their own learning • Provide regular feedback to apprentices on learning progress • Build learning support through alignment of the apprentices' expectations and learning outcomes • Support learners in identifying their relapse prevention by focusing on preferred individual learning styles and needs
3 Transfer and maintenance	• Encourage learners to practise their new-found knowledge and skills • Encourage coach and management support through reinforcement within a culture that promotes learning and development in the mine
4 Evaluation of change	• Recognise continuous improvement of both learning programmes and staff performance at the HR training centre and within the engineering section • Maximise the investment of participants and the organisation to ensure overall success of the ADP

(Adapted from Cherniss et al., 1998, cited in MacRae and Skinner, 2011:985)

The QCTO is responsible for ensuring that the WPL experience the mine offers to artisan apprentices is structured, appropriate to the trade theory and appropriate to both the organisation and the individual. The mine contributed significantly in terms of financial and human resources to service the ADP and in its short existence has shown results in the success of the programme. However, compared to similar WPL initiatives in artisan development in the UK, Europe (Odora & Naong, 2013; Fuller & Unwin, 2007) and Finland (Metso & Kianto, 2013; 2014), much more could be achieved in terms of policy development for artisanship and the practice of practical WPL.

In the context of the mine most respondents started with their artisanship after completing Grade 12 at an academic school in Postmasburg, whereas in the UK and Europe the ADP, which is referred to as a PLA, starts for school leavers at the age of 16. Learners may enter the TVET college after they have passed Grade 9, however the mine where this study was conducted only offer engineering leranerships to learners who have passed Grade 12 with mathematics and science. Some respondents completed university studies before they entered into the ADP. Formal exposure to vocational education prior to an academic Grade 12 qualification for the

respondents in the study may have been beneficial to the apprentices in particular and to the mine at large in the practice of practical WPL. All three high schools in Postmasburg are academic schools. The conversion of one school into a technical school would have benefitted artisanship as learners could be enrolled into vocational programmes from a younger age than the current model of only entering the TVET college after Grade 12. Respondents only attended on-the-job learning at the mine after attending formal trade theory and practice at SIVOS, whereas in the Netherlands and Denmark apprentices rotate between formal vocational schooling and practical WPL.

Almost all the respondents indicated a misalignment between their trade theory, practice and their WPL interventions at the mine that influenced the transfer of learning. The literature suggests that the Minister of Education in Finland adopted an approach in their VET system where practical WPL is aligned and integrated with the needs of the apprentices' working life and where the notion of lifelong learning is established and is regulated within a statutory framework (Metso & Kianto, 2013).

In reference to the findings and conclusions in this chapter, a number of implications are highlighted below. Similarly, the data indicated that the work experience of the general engineering supervisors by far exceeded that of the artisans. This wealth of mining engineering experience served as a source of knowledge and expertise that supported the transfer of learning from the coach to the novice apprentice in the ADP.

As pointed out by Lancaster et al. (2012:7), research has indicated that out of the three dimensions that influence transfer of learning in the context of the workplace the workplace setting has received the least consideration (see Chapter 2, section 2.5). Also, the one meaningful element in the workplace setting was the support from the supervisor in the transfer of learning. The general engineering supervisor at the mine was the section head in the engineering department. I would recommend that further research should consider a comparative study of the impact of the extensive work experience and technical expertise of the general engineering supervisor and the limited experience of an artisan on the success of artisanship through WPL in the context of a South African mine.

5.4 LIMITATIONS OF THE STUDY

The mine where this study was conducted came into operation in 2009 as a Greenfields project and admitted the first group of 20 engineering learnerships on the ADP. The programme was later extended to allow permanent employees as engineering learnerships in terms of section 18.1 of the SDA. The findings in this study cannot be generalised to all the mines in the region who offer a similar ADP. All learnership programmes facilitated in South Africa are managed by the SETAs which were also established in 2009.

The town where this mine is situated has three high schools of which none offers technical subjects to allow learners to enter the TVET college after passing Grade 9. This will not only increase the learnership intake, but may also identify the correct profile of learner to enter engineering studies as indicated by the data. One high school in particular did not offer physical science in Grade 12. Learners from this school may enter the TVET college after Grade 12, but may not necessarily be allowed to pursue engineering studies.

The performance in the administration of training and development in the industry by the SETAs in South Africa is questionable, according to the Green Paper on Post-School Education (RSA, 2012:62).The legislative framework that governs artisanship in South Africa requires the mine to offer WPL and to report to the DMR annually on progress against the SLP. The reporting on human resources development may easily become a numbers game to avoid penalties with huge financial implications in lieu of quality WPL at the mine. The Mining Charter is currently under review; the existing charter expired in 2014 which created policy uncertainty in a sector under pressure because of soaring commodity prices. The replacement of the Minister of Mineral Resources by the President of the Republic of South Africa in 2015 has caused more insecurity in the mineral sector.

Since 2009, when the HR training department at the mine became functional, the section has been managed by three different training managers. The current manager has been appointed in an acting capacity. During this time three different human resources managers were appointed. Each human resources and training manager developed training and development strategies for the company which may

or may not have complimented each other. These management changes at the mine, as well as other educational challenges as well as political and policy uncertainty in South Africa, formed the background for this study. Nevertheless, the mine where this study was conducted is a business with a mining right of which one of the conditions is to implement training and development initiatives in an environment that is affected by constant policy and legislative changes.

5.5 CLOSING COMMENTS

The data showed that the respondents endured many challenges in the ADP at the mine. The research question was: *How, if at all, does practical WPL in the mining sector facilitate the development of artisan apprentices?* Some respondents did indeed complete the programme as qualified artisans, and this confirms that artisanship through WPL in a mining context is possible. The challenges faced by the respondents indicated that some organisation factors did indeed influence practical WPL at the mine, however, the data confirmed that WPL was indeed facilitated by different coaches at the mine in such a way that engineering apprenticces could become qualified artisans through practical WPL.

Qualified artisans that participated in the ADP found employment at the mine and were able to impart their knowledge to the next selection of engineering apprentices through transfer of training, thereby increasing a talent pool. South Africa is a growing economy in a global market that faces many challenges with regard to people development, including artisan skills in the mining industry. The mining sector in South Africa is cognizant of the small pool of intermediate skills, especially artisan skills, which is too small to support national and sector development and growth. The current workforce is not keeping up with the skills needed to remain competitive in an increasingly knowledge-based economy.

Organisational performance is driven – among other things – by its human resources that are constantly developed to respond to the business needs of the organisation. Training and development of employees within an organisation plays a fundamental role in its survival, growth and performance. Torraco (1999:249) asserts that the development of the expertise needed for skilled performance in the workplace

environment has become a seamless and on-going process. The transition of these learning and development opportunities offered to community members from the feeding area of the company further enhances its talent pool of skilled future employees.

Moreover, to ensure an adequate stock of work skills amidst a serious shortage of artisans, organisations are continuously under pressure to increase learning and development opportunities within the mining sector to ensure a continuous availability of employable artisans. The ADP at the mine did not only have a positive influence on individual apprentices, but also on the company, which indicated that practical WPL underscored individual as well as organisational development. The ADP assisted apprentices in obtaining a qualification which held the key to a prosperous future for themselves, their families and the Postmasburg community in particular. The respondents felt uncertain when they entered the programme and found it difficult to understand the complexities of plant and mining equipment. In time they came to terms with the reality of the world of work, but left empowered, confident and ready to pass the final trade test on their way to artisanship.

Respondents who were employees of the company also participated in the ADP to make a career change and improve their lives, while other professionally qualified respondents improved their employability through artisanship. This suggests that adults have the ability to learn throughout life and that organisations can benefit from that ability to ensure their own sustainability, profitability and staying in business. My study showed that practical WPL at the mine provided the vehicle for artisanship: the apprentice received an opportunity to gain knowledge from a coach to make the connection between trade theory and practice in the real work context in a genuine and efficient way. Transfer of learning was influenced by factors within the apprentice, the learning intervention and training design delivery as well as the workplace environment which detracted the respondents in different ways. Moreover, new strategies were developed for practical WPL to occur and to be facilitated.

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7 ANNEXURES

7.1 ANNEXURE A: Ethical clearance form Stellenbosch University

UNIVERSITEIT•STELLENBOSCH•UNIVERSITY
jou kennisvennoot • your knowledge partner

Approval Notice
Stipulated documents/requirements

02-Dec-2014
Smit, Nool NP

Proposal #: DESC/Smit/Nov2014/11
Title: Exploring artisanship through workplace learning at a South African mine.

Dear Mr Nool Smit,

Your Stipulated documents/requirements received on 20-Nov-2014, was reviewed
Sincerely,

Clarissa Graham
REC Coordinator
Research Ethics Committee: Human Research (Humanities)

7.2 ANNEXURE B: Consent of General Mine Manager to conduct the study

[redacted]

IRON ORE

[redacted] IRON ORE LTD

MEMO

To ANDRE MANNEL,
TRAINING MANAGER

LESEGO MATABOGE
HUMAN RESOURCES MANAGER

AART VAN DEN BRINK
GENERAL MINE MANAGER

From Noel Smit

Date 07/07/2014

Subject Permission for M.Phil. research on [redacted] Mine

Purpose
The purpose of this memorandum is to seek permission to conduct research on [redacted] Mine for the completion of my M.Phil. in Training and Development for Lifelong Learning.

Background
I applied to Stellenbosch University in 2013 to study M.Phil. in Training and Development for Lifelong Learning. The structure of my degree will consist of modules and a mini thesis. I've completed all the required modules with the mini thesis outstanding. As a meaningful conclusion to my studies I was advised by my study supervisor, Dr. Liezel Frick to do the research within the organisation where I'm employed.

The proposed title of my research proposal is ***"Artisanship through workplace learning: a case study at [redacted] Mine"***. I will focus on on-the-job training of artisan apprentices with reference on how transfer of learning occurs within the organisation. Privacy and confidentiality of all data will be ensured and no apprentice or any respondent will be identified during the analysis of data collected. The outcome of my research will only be made available to the Stellenbosch University. I've attached a copy of my research proposal for your reference.

Motivation
The thesis is a final requirement for the completion of my studies and approval to conduct the research at [redacted] Mine will he much appreciated. I will conduct a qualitative case study among all apprentices which will include observations, structured interviews with apprentices, Engineering Supervisors and Engineering Instructors. The purpose of the semi-structured interview with open-ended questions will be to gain broad insight into apprentice's perceptions of workplace learning within the organisation and how transfer of knowledge influence their learning and development to successful completion of the artisan development programme. I will take cognisance of all ethical considerations during the research which is outlined in my proposal.

Recommendation
It is recommended that approval be granted to Noel Smit to conduct the research on [redacted] Mine towards the completion of his M.Phil. in Training and Development for Lifelong Learning at Stellenbosch University.

[redacted]

RECOMMENDED/NOT RECOMMENDED

ANDRE MANNEL
TRAINING MANAGER

2014/07/07
DATE

APPROVED/NOT ~~APPROVED~~

LESEGO MATABOGE
MANAGER HUMAN RESOURCES

2014/07/08
DATE

APPROVED/NOT ~~APPROVED~~

* AART VAN DEN BRINK
GENERAL MINE MANAGER

11/7/14
DATE

* [redacted] HR manager to give approval of thesis publication in the public domain

7.3 ANNEXURE C: Interview Guide

Interview Schedule/Onderhoudskedule **APPRENTICE INTERVIEW / VAKLEERLING-ONDERHOUD**

Interviews will be semi-structured and based on the following questions. Questions are phrased in both English and Afrikaans, since the interviews will be conducted in the language preferred by each of the respondents.

Interview no./ Nr. van Onderhoud	
Interview date/ Onderhoudsdatum	
Name/Naam	
Designation/ Posisie	

OPENING QUESTIONS

- What is your current apprenticeship area?
  Wat is u huidige ambagsarea?

a	Diesel mechanic/**Dieselwerktuigkundige**
b	Electric/**Elektries**
c	Welding/**Sweis**
d	Fitting/**Ketelmaker**
e	Fitting & Turning/**Passer en draaier**
f	Plater/**Plaatwerker**
g	Millwright/Masjienmonteur
i	Other/**Ander**: (Specify/**Spesifiseer**)

- What is your highest qualification?
  Wat is u hoogste kwalifikasie?

a	Grade 12/**Graad 12**
b	Grade 12 plus diploma/**Graad 12 plus diploma**
c	Grade 12 plus degree/**Graad 12 plus graad**
d	Other/**Ander**: (Specify/**Spesifiseer**)

- At which business unit are you stationed within the company?
  By watter besigheidseenheid is u geplaas binne die maatskappy?

a	Kolomela
b	Sishen
c	Thabazimbi

- How long have you been part of the apprenticeship development programme?
  Hoe lank neem u al deel aan die vakmanskapontwikkelingsprogram?

a	1–2 years/**jaar**
b	2–3 years/**jaar**

c	More than 3 years/**Meer as 3 jaar**
d	Other/**Ander**: (Specify/**Spesifiseer**)

CORE QUESTIONS

1. Why did you join the artisan development programme?
   Hoekom het u by die vakmanskapontwikkelingsprogram aangesluit?

2. Why did you choose this artisan development programme?
   Waarom het u hierdie vakmanskapontwikkelingsprogram gekies?

3. How does learning occur during the artisan development programme at the company?
   Hoe vind leer plaas in die vakmanskapontwikkelingsprogram by die maatskappy?

4. How is learning facilitated by the engineering supervisor?
   Hoe word leer gefasiliteer deur die ingenieurstoesighouer?

5. Which factors in the organisation positively influenced your learning during the artisan development programme?
   Watter faktore in die organisasie het jou leer positief beïnvloed tydens die vakmanontwikkelingsprogram?

6. Which factors in the organisation negatively influenced your learning during the artisan development programme?
   Watter faktore in die organisasie het jou leerdery negatief beïnvloed tydens die vakmanontwikkelingsprogram?

CLOSING QUESTION

7. Is there anything you would like to add?
   Is daar enigiets wat u wil byvoeg?

Thank you for participating in the interview. **Dankie vir u deelname aan die onderhoud.**

Interview Guide/Onderhoudskedule
ARTISAN/VAKMAN
MASTER ARTISAN/HOOF-VAKMAN
ENGINEERING FOREMAN/INGENIEURSVOORMAN
ENGINEERING SUPERVISOR/INGENIEURSTOESIGHOUER-ONDERHOUD

Interview no./ Nr. van Onderhoud	
Interview date/ Onderhoudsdatum	
Name/ Naam	
Designation/ Posisie	

Interviews will be semi-structured and based on the following questions. Questions are phrased in both English and Afrikaans, since the interviews will be conducted in the language preferred by each of the respondents.

OPENING QUESTIONS

1. In which area is your current apprenticeship?
   In watter area is u huidige ambagskap?

a	Diesel mechanic/**Dieselwerktuigkundige**
b	Electric/**Elektries**
c	Welding/**Sweis**
d	Fitting/**Ketelmaker**
e	Fitting & Turning/**Passer en draaier**
f	Plater/**Plaatwerker**
g	Millwright/Masjienmonteur
h	Other (please specify) / Ander (spesifiseer asb):

2. What are your highest qualification?
   Wat is u hoogste kwalifikasie?

a	Grade 12 (N3)/**Graad 12 (N3)**
b	Grade 12 plus National Diploma (N6)/**Graad 12 plus Nasionale Diploma (N6)**
c	Grade 12 plus degree/**Graad 12 plus graad**
d.	Other (please specify) / Ander (spesifiseer asb.):

3. How many years' experience do you have in the engineering field within the mining work environment?
   Hoeveel jare werksondervinding het u in die ingenieursveld in 'n myn-werksomgewing?

a	5–10 years/**jaar**
b	11–15 years/**jaar**
c	16–20 years/**jaar**
d	21+ years/**jaar**

4. At which business unit are you stationed within the company?
   By watter besigheidseenheid is u geplaas binne die maatskappy?

a	Kolomela
b	Sishen
c	Thabazimbi

5. How long have you been coaching in the apprenticeship development programme? **Hoe lank is u al 'n afrigter in die vakmanskapontwikkelingsprogram?**

a	1–5 years/**jaar**
b	6–10 years/**jaar**
c	11+ years/**jaar**

CORE QUESTIONS

6. What were the reasons for you to join the artisan development programme? **Wat is die redes dat u by die vakmanskapontwikkelingsprogram aangesluit het?**

7. How does learning occur during the artisan development programme at the company? How do you transfer your experience to the apprentice? **Hoe vind leer plaas in die vakmanskapontwikkelingsprogram by die maatskappy? Hoe dra jy jou ervaring oor aan die vakleerling?**

8. How do you assist artisans to learn development programe? (Explain in your own words.) What do you do when an artisan experience learning difficulties to make sure that learning still takes place?
Hoe help u vakmanne leer in die vakmanskapontwikkelingsprogram? (Verduidelik in u eie woorde). Wat doen jy wanneer 'n vakleerling sruikelblokke ervaar tydens leer en steeds seker maak dat leer plaasvind?

9. Which factors in the organisation help learning during the artisan development programme? (Explain in your own words.) Explain which learning strategies you put in place to overcome negative factors that may impact on learning.
Watter faktore in die organisasie bevorder leer tydens die vakmanontwikkelingsprogram? (Verduidelik in u eie woorde.) Verduidelik watter leerstrategiee jy in plek plaas om negatiewe faktore die hoof te bied?

10. Which factors in the organisation inhibited your facilitation of learning during the artisan development programme? (Explain in your own words.) How do you overcome it?
Watter faktore in die organisasie het u leerfasilitering geïnhibeer tydens die vakmanontwikkelingsprogram? (Verduidelik in u eie woorde.) Hoe raak jy die faktore baas?

CLOSING QUESTION

11. Is there anything you would like to add?
Is daar enigiets wat u wil byvoeg?

Thank you for participating in the interview. **Dankie vir jou deelname aan die onderhoud.**

7.4 ANNEXURE D: Details of respondents in the study

No	Respondent Code	Trade	Designation	Period employed at the mine	Period involved in artisan development programme as facilitator of non-formal workplace learning	Period in the artisan development programme as apprentice doing informal workplace learning at the mine	Highest qualifications
1	AAbm1	Boilermaker	Apprentice	0	n/a	13 months; still in training	N2
2	QEApw1	Plater & Welder	Artisan	5 years	4 years	n/a	N3
3	EFet1	Engineering Technologist	Foreman	8 years	2 years	n/a	B Tech Electrical Engineering
4	AAbm2	Boilermaker	Apprentice	0	n/a	24 months; still in training	N2
5	GESft1	Fitter & Turner	General Engineering Supervisor	15 years	6 years	n/a	N6
6	QIApw1	Plater & Welder	Artisan	0	n/a	18 months, completed the programme	N3
7	AAbm3	Boilermaker	Apprentice	0	n/a	27 months; still in training	N2
8	GESbm1	Boilermaker	General Engineering Supervisor	30 years	30 years	n/a	N5 Mechanical Engineering. Studying towards N6
9	AAft1	Fitter & Turner	Apprentice	0	n/a	10 months; still in training	N2
10	QEAmr1	Millwright	Artisan	1 year	n/a	12 months	N4
11	QIAft1	Fitter & Turner	Artisan	1 month	n/a	14 months; completed WPL	N3, Dip: Mechanical Drafting
12	AAbm4	Boilermaker	Apprentice	0	n/a	20 months; still in training	N2
13	QEAft1	Fitter & Turner	Master Artisan	21 years	21 years	n/a	N4 Mechanical Engineering
14	EFft1	Fitter & Turner	Foreman	15 years	4 years	n/a	N5 Mechanical Engineering. Studying towards N6
15	GESel1	Electrical	General Engineering Supervisor	21 years	21 years	n/a	N5 Electrical. Studying towards N6
16	EFft2	Fitter & Turner	Foreman	19 years	11 years	n/a	N6 Mechanical Engineering
17	QEAbm1	Boilermaker	Artisan	5 years	n/a	Completed informal WPL	N2
18	QIAft2	Fitter & Turner	Artisan	1 month	n/a	Completed informal WPL	Dip: Mechanical Engineering. Degree in Community Development

Legend							
AA	Artisan apprentice		Diesel Mechanic	dm		1-3	More than 1 respondent in the same trade
QEA	Qualified experienced artisans		Electrician	el			
QIA	Qualified inexperienced artisans		Fitter & Turner	ft			
EF	Engineering foremen		Plater and Welder	pw		Example of respondent convention	
GES	General engineering supervisor		Millwright	mw		QEAft1	Qualified experience artisan, Fitter & turner by trade
			Boilermaker	bm			
			Engineering Technologist	et			

7.5 ANNEXURE E: Informed consent

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STELLENBOSCH UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Exploring artisanship through workplace learning at a South African mine

You are asked to participate in a research study conducted by Noel Smit, BEd (Hons) LLB, from the Centre for Higher and Adult Education at Stellenbosch University. You were selected as a possible participant in this study because you're

(a) an engineering apprentice in training in Kolomela Mine to become a qualified artisan, or
(b) an engineering artisan/master artisan in Kumba working with engineering learners to acquire a full engineering qualification as an artisan, or
(c) an engineering foreman/general engineering supervisor working in Kolomela Mine and responsible for transfer of learning artisan apprentices.

1. PURPOSE OF THE STUDY

The purpose of the study is to explore artisan development through workplace learning.

2. PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following:

(a) Participate in a semi-structured interview.
(b) Observe in the workplace to get insight into how transfer of learning occurs.

Semi-structured interviews will take place during normal working hours in the office of the engineering senior instructor as well as the engineering supervisor whereas the artisan apprentices will be interviewed at the training centre.

Responses obtained in the interviews will be recorded by the researcher and noted on the interview instrument. Respondents with relevant engineering transfer of learning experience in the mining industry at a South African mine will be selected for the interviews.

3. POTENTIAL RISKS AND DISCOMFORTS

The mining industry is by nature production- and target-driven and participation in the research may have an impact on production targets as participants will be interviewed during normal working hours. Care will thus be taken to keep interviews as short as possible to have the least impact on production targets.

The research project will not pose any significant physical or psychological risks to participants that might cause the researcher to terminate the study.

4. POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

Subjects will not benefit materially from participating in the research; however, the mining industry will do so. The researcher will make final conclusions based on the analysis of the data which may have implications for the mining industry in terms of theory, policy and practice regarding artisan development through workplace learning. Training centres in the mining sector which offer artisan training may implement these recommendations to align current operations with practice abroad.

5. PAYMENT FOR PARTICIPATION

Subjects will not receive any payment for participating in the research.

6. CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of the following:

(a) A confidentiality agreement between the researcher and the organisation where the intellectual property of the organisation will be safeguarded;
(b) Data obtained by the researcher during the interviews and observation will be coded and categorised;
(c) Qualitative data from the interviews will be analysed by means of content analysis through transcription and coding;
(d) The names of the mine(s) and or any employee that participate in this study will not be made public and will only be known to the researcher.

Records of interviews and all data (on external drives/memory sticks) will be stored in a safe by the researcher and no third person will have access to this information. The results of the study will only

be published by the University of Stellenbosch and no reference will be made to Kolomela Mine or its employees participating in the study.

7. PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

8. IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact Noel Smit at cell 071 852 4488 and office no. 053 313 9272 or noel.smit@angloamerican.com or my supervisor of this research project: Dr Liezel Frick, Senior Lecturer, Centre for Higher and Adult Education, Stellenbosch University, South Africa on 021 808 3807; blf@sun.ac.za.

9. RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact Ms Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

The information above was described to [*me/the subject/the participant]* by [*name of relevant person]* in [*Afrikaans/English/Xhosa/other]* and [*I am/the subject is/the participant is]* in command of this language or it was satisfactorily translated to [*me/him/her*]. [*I/the participant/the subject]* was given the opportunity to ask questions and these questions were answered to *[my/his/her]* satisfaction.

[I hereby consent voluntarily to participate in this study/I hereby consent that the subject/participant may participate in this study.] I have been given a copy of this form.

_____

Name of Subject/Participant

_____

Name of Legal Representative (if applicable)

_____ _____

Signature of Subject/Participant or Legal Representative **Date**

SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to _____ [*name of the subject/participant]* and/or [*his/her*] representative _____ [*name of the representative]*. *[He/she*] was encouraged and given ample time to ask me any questions. This conversation was conducted in [*Afrikaans/*English/*Xhosa/*Other*] and [*no translator was used/this conversation was translated into* _____ by _____].

_____ _____

Signature of Investigator **Date**