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TVET Lecturer Work-Integrated Learning: Opportunities and Challenges

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Abstract. There is a widening gap between industry expectations and what Technical and Vocational Education and Training (TVET) lecturers teach to students. In South Africa, work-integrated learning (WIL) equips lecturers with industry skills and experience necessary for effective teaching and learning. Most TVET lecturers in South Africa lack industry experience. There is a lacuna of research as lecturers' industry opportunities and challenges are not much researched. This study aims to explore the opportunities gained by lecturers through WIL and reflect on the challenges encountered in industry. The qualitative study adopted an interpretive paradigm and employed face-to-face semi-structured interviews to generate data from twenty-seven participants (18 lecturers and 9 industry personnel) in KwaZulu-Natal province, South Africa. Purposive sampling focused on characteristics of the lecturer population of interest, which was considered information-rich to answer the research questions. Mechanical industry personnel hosted lecturers and were considered information-rich. This study employed Kolb's experiential learning theory, which was complemented by Shulman's framework on domains of teacher knowledge. Data were analysed thematically from transcriptions, identifying patterns, coding, developing themes, juxtaposing the relationships amongst the different themes, and developing an interpretation of meaning. Findings revealed that lecturers acquired industry experience through exposure to the latest machines, technology processes and practices, and networking with artisans. Challenges included a lack of supervision and support from industry personnel and college, a lack of hands-on engagement with expensive machinery and weak industry induction processes. This study recommends an embedded WIL component in the training of TVET lecturers to ensure their competency. Some crucial issues are highlighted in this study which can improve TVET delivery and the livelihood of citizens.

Keywords: Work-integrated learning; lecturer; industry; opportunities; challenges

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1. Introduction

Industrial attachment has become common in seeking practical industry experience and seeing how theoretical college work could be applied. Experiential learning theory suggests that learning is most effective when individuals actively engage in learning through concrete experiences, reflection, abstract conceptualisation, and active experimentation (Kolb & Kolb, 2018). In the work-integrated learning (WIL) context, the theory implies that hands-on experience in a professional setting enhances the understanding and application of theoretical concepts. This experiential process allows lecturers to better apply and transfer theoretical knowledge to real-world challenges and scenarios. Findings from employers confirmed that even Technical and Vocational Education and Training (TVET) college students had theoretical knowledge in their expertise but lacked work exposure and job-specific skills (Papier, 2017). Often, participants in WIL are assumed to acquire valuable professional experience during attachment. Most African countries have documented huge gaps between the demand and supply of skilled labour (Allais, 2022; UNESCO, 2013). Thus, the skills gap could be overcome by having an effective industrial attachment in reputable and advanced industries with the latest technology. Effective lecturers should be multi-faceted practitioners with two qualifications - a vocational trade and a professional teaching qualification (Schmidt, 2019).

Currently, lecturers in the TVET sector lack industry exposure. Hence, they engage in WIL to acquire industry experience. During WIL exposure, lecturers gain practical skills, on the one side, and face challenges, on the other side. This study attempts to reveal the opportunities and challenges experienced during WIL. The TVET lecturer's ability to guide hands-on projects for students depends critically on practical exposure and supervised learning experiences in industrial settings. In addition, WIL offers practical exposure to TVET lecturers in line with industry demands and TVET college curricula. TVET lecturers were guided by logbooks containing fundamental practical skills (Mesuwini & Thaba-Nkadimene, 2021). Mesuwini et al. (2023) perceive that WIL would help improve the teaching standard. Industry attachment played a significant role in students' academic achievement since they acquired necessary practical skills through exposure. TVET lecturers engage in continuous industry placement for two years, enabling them to acquire the industry's practical processes.

Lecturers are pivotal in shaping students' learning experiences and benefit significantly from incorporating WIL into their teaching methods. By incorporating real-world experiences through WIL, lecturers can provide their students with relevant and practical knowledge (Kilag et al., 2023). WIL makes the learning process more engaging and interactive. Lecturers can use WIL to demonstrate complex concepts, illustrate best practices, and assist students in understanding how to apply gained knowledge in real-life situations. WIL allows lecturers to stay connected with industry trends and innovations (Havenga & Swart, 2022). By maintaining close ties with industry professionals, lecturers update their knowledge regularly, ensuring they deliver up-to-date and industry-relevant content. Engaging in WIL allows lecturers to expand their expertise and develop new skills. They gain insights into workplace dynamics, challenges faced by professionals, and effective problem-solving strategies. This engagement can positively impact their teaching methods and overall career development. Theory

demonstrates that intertwining WIL and theoretical knowledge enriches the learning experience and produces well-rounded, industry-conscious lecturers. It promotes a symbiotic relationship between lecturers and the industry, contributing to their continuous growth and improvement.

The success of WIL programmes for lecturers relies on the qualifications and competencies of industry personnel and their understanding of WIL integration across the curriculum, enabling the bridge of the theory-practice gap. WIL assignments for TVET lecturers allow them to work with seasoned industry professionals, engage in real-world practice, fortify industry networks, and preserve the relevance of current industry operations (Ferns et al., 2014). The effective usage of logbooks becomes a reality when lecturers get support from all stakeholders. McLennan and Keating (2008) present WIL challenges, including securing appropriate WIL placements; aligning and partnering with industry; embedding WIL in courses; communication and coordination; and resource intensiveness of WIL. In light of these and many other challenges, this study explored opportunities and challenges experienced by TVET lecturers during WIL.

2. Problem statement

This study explored what opportunities and challenges TVET lecturers experienced through WIL in the industry. Opportunities gained included practical skills and getting acquaintances, while resistance and lacking support from role players were possible challenges. The study explores how the opportunities and challenges experienced during WIL influence teaching and learning.

3. Purpose of the study

This study sought to establish what opportunities and challenges were experienced by South African TVET lecturers during WIL. Lecturers engaged in different relevant industries where they were placed for industry exposure. The study attempts to answer the following question: What opportunities and challenges are experienced by TVET lecturers during WIL, and how do they influence teaching and learning?

4. Literature review

Schmidt (2019) in Australia reported that vocational education teachers (VET) focused on developing pedagogical knowledge and skills in industry while industry managers ensured that teachers gained technological skills and knowledge. Through WIL, lecturers receive valuable feedback from industry experts about the best practices and procedures. This information can help lecturers adapt their teaching methods and curricula to better align with the needs and expectations of the job market. Findings indicated that it was great to have industry currency that improved their experience. There is a need to balance industry, educational currency, and current teaching pedagogies to ensure that VET teachers acquire the skills to be effective (Schmidt, 2019). Since VET teachers were supposed to volunteer their industry placement time, they experienced difficulty managing their full-time responsibilities with their industry placement. Schmidt's study showed a gap where vocational teachers in Australia were not

given official time off to focus on industry currency. An Australian study recommended providing study leave to academics to engage meaningfully with industry to gain current knowledge and improve their understanding of the practical aspects (Martin & Rees, 2018). Smith and Yasukawa (2017) summarised that VET teachers were viewed to demystify and simplify the technical jargon, giving examples of their recent work experiences and acting with technical authority.

Still in Australia, Bergami and Schuller (2011) showed that some participants could not pursue industry placement because they were contracted and the conditions did not permit training and development opportunities. A majority of participants were unaware of the placement conditions. According to Bergami and Schuller's research, academics believed that WIL was essential for advancing their knowledge since it allowed them to develop professionally, learn about current business practices, advance their careers, connect theory to practice, and build networks with other professionals. Without WIL, TVET lecturers might become detached from real-world practices and industry developments (Oviawe & Ehirheme, 2020). This could lead to dated teaching methods and content, limiting the students' exposure to current industry trends and practices. Devoid of WIL experiences, lecturers might struggle to demonstrate the real-life applications of the theories they teach. Concomitantly, students might find it challenging to understand the significance of the knowledge they acquire.

Martin and Rees (2018) in New Zealand showed that students developed self-management, effective communication, soft skills and a community of practice. Students believed completing a successful practical experience could impact their confidence and current, relevant, and built competencies. The academic supervisors gathered great support throughout the practicum experience, good relationships and industry networks. Building networks during WIL is emphasised to maximise career and skills development. Students on WIL perform activities that frame the workplace experience and guide them towards acquiring insights into their identity and role as artisans (Paterson et al., 2017). The absence of practical examples and real-world experiences could make lectures less engaging and dynamic, potentially reducing student interest and motivation. Students appreciated the WIL opportunity because it bridged the gap between theory and practice. Research demonstrates a significant disconnect between classroom instruction and real-life application (Anjum, 2020).

According to a Malaysian study by Omar et al. (2020), all TVET teachers were proficient in their areas of specialisation and could handle tools in the workplace. They also learned how to execute safety procedures in the workshop. TVET instructors were skilled at implementing demonstration-based teaching techniques in a scenario-based learning setting. In Malaysia, Chua and Jamil (2012) showed that experiential learning exposed the lecturers to new technology and refreshed TVET instructors regarding their subject matter. On the contrary, Pirzada (2021) reported some teachers on WIL in Pakistan who lacked motivation and avoided challenging learning environments requiring more hands-on and production-oriented skills. The absence of practical examples and real-world experiences could make lectures less engaging and dynamic, potentially reducing student interest and motivation (Chukwuedo & Ementa, 2022). Muchemi et al.

(2013) confirm that the utilisation of the most recent equipment, systems, tools, and technology by lecturers contributed to their product knowledge, which is essential for clarifying concepts during teaching. The study stated that TVET instructors who frequently used technology through practical training could master technological knowledge that improved classroom management. Teachers gained curriculum and pedagogical knowledge, which were determinants of their teaching effectiveness.

In Papua New Guinea, a few students experienced difficulties and reported that industry personnel did not cooperate during industry exposure (Subbiah et al., 2017). Subbiah et al. (2017, p. 74) reported that "*workmen with the lack of formal education thought that the trainees would replace them right after completing their study*". Similarly, Australian studies showed a lack of employer support for WIL due to administrative and supervisory concerns and a lack of buy-in from company management (Jackson, 2016, 2018). There appeared to be some industry personnel who were not keen to support WIL participants.

Mulenga and Chileshe (2020) in Zambia showed that TVET institutions had many challenges ranging from a lack of appropriate and modern workshop equipment to ineffective industrial attachment. In Nigeria, the universities implemented WIL to a low extent and lacked policy and curriculum provisions for WIL (Ugwoke et al., 2016). Contrarily, some students were placed in fully equipped industries, mentored and supervised in the workplace by trained personnel. Policies and procedures were effectively communicated between the TVET institutions and employers during the WIL programme (Ugwoke et al., 2016).

Oosthuizen and van der Bijl (2019) disclosed that Hospitality lecturers gained subject knowledge from work, while Tourism lecturers drew their initial subject knowledge from work. The Hospitality lecturers confirmed keeping their subject knowledge updated during WIL and maintaining the hospitality course's hands-on nature. WIL often involves building relationships with employers and industry professionals. Therefore, lecturers may use WIL exposure to customise their courses based on the industry's demands and job market trends.

A Malaysian study confirmed that internships developed many skills through hands-on industry practical experience (Pusiran et al., 2020). Karunaratne and Perera (2019) support that students perceive industrial internships as offering specialised training.

Zinn et al. (2019) explored TVET lecturers in South African public colleges and showed that one in five TVET lecturers in South Africa could not satisfy the minimum requirements for basic TVET lecturer qualifications. Lecturers identified the education management system as unsupportive, ineffective and discriminatory because the mentorship programme and further training opportunities were unclear. Many college learners exited the National Certificate Vocational course without practical experience or industry exposure (Mabunda, 2019). Lecturers were not enthusiastic about WIL and saw it as the obligation of the college management and WIL facilitators. Current literature highlights the technical hitches experienced in WIL implementation and the lack of proper implementation models, possibly supporting why WIL students are unprepared (Van der Bijl, 2021). Work placements are unstructured because they do not

contribute to the qualification outcome (Mutereko & Wedekind, 2017). If stakeholders collaborate and propose a well-structured WIL programme, it will likely lead to enhanced educational experiences for lecturers, improved industry-academia partnerships, and better preparation of graduates for the job market. Therefore, stakeholders should collaborate and propose a well-structured WIL programme (Mesuwini, 2022; Pirzada, 2021).

Sewell et al. (2015) indicated that Small, Medium and Micro Enterprises (SMMEs) did not have adequate time to coach or mentor students effectively. Some SMME managers vented their unwillingness to host students for WIL, citing time challenges for the SMME workplace and quality assurance of learning. Chukwuedo (2011) in Benin found that students suggested more time allocated to industry placement to intensify their skills and concretise their learning from their experience. Poor task allocation and insufficient orientation result in underprepared students and inadequately integrated practical learning experiences. (Duncan, 2017). Building networks and contacts were supported where interpersonal, listening and communication skills were vital.

Lecturer WIL is important to enrich the teaching experience, ensure industry relevance, foster industry partnerships, and promote personal and professional growth. Without WIL, lecturers may be limited in providing practical knowledge, staying connected with industry developments, and delivering effective and engaging learning experiences to students. Literature reveals that lecturer WIL leads to the development of practical industry experience and technical knowledge; increased lecturer confidence and motivation; improved teaching; development of industry-relevant learning material, and the formation of industry links (Chukwuedo & Ementa, 2022; Van der Bijl, 2021). Therefore, it is crucial to explore opportunities and challenges faced by lecturers during WIL so that the benefits can be sustained.

From the studies, WIL participants gained successful practicum placement, significantly influencing current, relevant and valid skills and building confidence for employment in large and reputable companies. Lecturers also gained self-esteem, confidence and pedagogical skills and communicated and established good relationships through WIL. All the students surveyed viewed workplace experience improved their skills and preferred WIL in a large and reputable business. There was a consensus that WIL was valued for practical skills development and exposure.

5. Problem statement

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6. Purpose of the study

This study sought to establish what opportunities and challenges were experienced by South African TVET lecturers during WIL. Lecturers engaged in

different relevant industries where they were placed for industry exposure. The study attempts to answer the following question: What opportunities and challenges are experienced by TVET lecturers during WIL, and how do they influence teaching and learning?

7. Theoretical Framework

Kolb (1984) Experiential Learning Theory (ELT) provided a valuable tool to unpack and explain the TVET lecturer WIL experiences in industry. Kolb's theory was used because it remains the most influential experiential learning model. The theory was used to guide the study and interpretation of results. This study discussed the practical implications of the results based on the theory and suggested potential directions for future research. McCarthy (2016) suggests that Kolb's theory accommodates all learners, regardless of their learning priority or background. Through completion of the cycle, lecturers conceptualised the knowledge and put it into practice in real-world situations.

Kolb's Experiential Learning Theory (ELT) background

Kolb's theory was derived from Dewey (1938), Lewin (1946) and Rogers (1985). The philosophy underlying experiential learning is grounded on Dewey's theory, where active, practical engagement and communication with the context help to gain applied rather than abstract knowledge. Dewey (1938) proposed that experience has a continuous nature and that the cycle of experiential learning is essential for the education and development of adults. Lewin focused on incorporating theory into practice in leadership styles and collaborative peer working. In this study, lecturers teamed up with artisans and other workmates to execute their tasks and integrated theory learnt in college with practical work. Lewin developed a four-stage cycle involving planning, observation, reflection and action. Rogers (1985) differentiated between cognitive learning (academic knowledge) and experiential learning (applied knowledge) and believed that everyone could achieve their intended goals leading to self-actualisation.

Kolb's Theory

Building from the above theories, Kolb explored the perception of concrete experiences and associated learning styles, which led to ELT development, as shown in Source: Kolb (1984, p. 38).

Figure 1. Experiential learning involves learning from actual industry experience. Kolb established ELT, which portrays learning as appearing in a four-stage cycle: concrete experiencing, reflective observation, abstract thinking, and active experimentation (Kolb & Kolb, 2009). Dewey also views experience and reflection as the key experiential learning elements, while Lewin considered reflection, planning, observation and action. Kolb's four-step experiential learning cycle, which one goes through to transform an experience into learning, is discussed.

By applying Kolb's ELT, TVET institutions could create dynamic and engaging learning environments that nurture technical competencies, critical thinking, and problem-solving skills. This approach better prepares students for the demands of the workforce and helps them become lifelong learners who can adapt to new challenges and experiences in their careers. Kolb's theory emphasises the importance of linking concrete experiences with abstract conceptualisation (Kolb

& Kolb, 2018). TVET programs can achieve this by incorporating theoretical learning alongside practical training.

Source: Kolb (1984, p. 38).

Figure 1: Kolb's experiential learning cycle

Source: Kolb (1984, p. 38).
Figure 1 shows Kolb's experiential learning cycle. Further details of each stage and their application in this study are amplified in subsequent segments.

Kolb's Cycle-Concrete Experience
Concrete experience is the first stage in Kolb's cycle, referring to actual performance from experience. Experiencing handling a machine for the first time through touching and doing would probably offer learning opportunities during WIL. A person passes through stages repeatedly, learning from specific experiences or actions, relating to people, and being sensitive to their feelings in a way that helps them learn (Jenkins & Clarke, 2017).

Reflective Observation
Reflective observation refers to returning to the task's starting point and reviewing what was done (Kolb, 1984). Lecturers from this context thought about the experience, re-played the use of machines, critically analysed it, and asked questions like what happened, why things happened that way, and what contributed to it (Kolb & Kolb, 2009). Reflection helps teachers develop learning theories under professional guidance (Korthagen, 2016).

Abstract Conceptualisation
Abstract conceptualisation is about learning emerging from reflecting on the experience. Learning is from reflection on the experience, not simply from the experience itself (Korthagen, 2016). In order to better the situation or maintain their performance in subsequent engagements, lecturers often pose questions like what could have been done differently (Mesuwini & Thaba-Nkadimene, 2021). Answering this question tested new learning in the next stage of active experimentation.

Active Experimentation
Active experimentation involves planning and trying out another concrete experience based on what was learnt during the previous practical experience and applying it to another situation or task. Lecturers planned and tried a new

concrete experience based on what they discovered and how they could have done it better or differently (Shulman, 1987). Shulman's domains of teacher knowledge complement Kolb's theory.

Shulman's (1987) domains of teacher knowledge

Domains of teacher professional knowledge for teaching were initially advanced by Shulman (1987) as pedagogical content knowledge, general pedagogical knowledge, content knowledge, curriculum knowledge, knowledge of educational contexts, knowledge of learners and their characteristics, knowledge of educational ends, purposes and values, and their philosophical and historical grounds. The frameworks on domains of teacher knowledge were used to understand the kinds of knowledge gained by lecturers in industry during WIL.

8. Methods

The methodology established opportunities and challenges experienced through what and how TVET lecturers learnt during WIL. Lecturers learning through WIL in three TVET colleges in KwaZulu-Natal, South Africa, were investigated. The interpretive paradigm, which combined a convenience sample strategy and a qualitative method, was employed in this study. This study used the interpretive paradigm, which adopted a qualitative approach and convenience sampling design. According to Denzin and Lincoln (2018), qualitative researchers observe events in their natural settings and interpret them in light of the meanings and experiences of individuals. The selection of participants was based on available and accessible TVET lecturers and company personnel who were near the researcher. Cohen et al. (2017) describe how the interpretative paradigm seeks to comprehend the world through people's subjective experiences and enables the researcher to view subjects from within. While researcher bias cannot be avoided easily, researchers need to make a judgment about each case and ensure neutrality (Ruslin et al., 2022).

Sampling Methods

A non-probability design was used as a sampling technique for this study. It employed purposive and convenience sampling, identifying available participants (TVET lecturers and company personnel) according to the researcher's assessment. Since their sampling is deliberate, qualitative researchers purposefully avoid using random data sources (Leedy & Ormrod, 2015). Convenience sampling is non-random or non-probability sampling in which participants from the target population are selected for research if they meet specific requirements (Cohen et al., 2017). The selection criteria included geographic proximity, availability at a specific time, ease of access, or interest in participating in the study are all possible factors. Available and willing participants were considered for this study.

Table 1: The study participants

	Lecturers who completed WIL			**Industry personnel**		
	Civil	Electrical	Mechanical	Training Manager	Foreman	Training Officer
Participants per category	6	6	6	3	3	3
Total Participants				27		

Notes: The entire number of research participants (lecturers and company professionals) and their areas of expertise are listed in **Table 1** above. Twenty-seven participants (18 TVET lecturers and 9 industry professionals) participated in the study.

Data Gathering Instruments

Face to face semi-structured interviews were used and voice-recorded. Semi-structured interviews are generally used in qualitative research to explore participant experiences and provide the flexibility to probe their responses (Kakilla, 2021; Ruslin et al., 2022). Theoretical triangulation was used to interpret data and provide a more comprehensive analysis. The two theories explained the observed phenomena and explored their commonalities and differences. This process can enrich the discussion and offer a more nuanced interpretation. The interview schedule was piloted to eliminate ambiguity and grammatical errors. Most qualitative researchers use interviews to access information that remains inaccessible, such as people's attitudes and experiences (Crawford & Johns, 2018). Participants were free to express their opinions throughout the interview, and questions were asked to elicit detailed data. Audio recording devices were used to increase attention to the participants, which resulted in increased attentiveness. Stringer (2008) recommended recordings for a more detailed and accurate interview description. Braun and Clarke (2021); Bryman (2012) caution that a good-quality recording machine should be used when interviewing participants to ensure clarity when transcribing and capturing information. The interviews took one hour on average. This duration carries the consciousness of a standard unit of time that participants can afford, while two hours is too long to sit at once (Stringer, 2008). The interview venues were scheduled as agreed with the interviewees to remain comfortable in a relaxed and receptive frame of mind. The data generation process was described as follows:

1). Obtaining ethical clearance from the university research office (Institutional Research Ethics Committee (IREC).

2). Finalising the interview appointments with participants, introducing and explaining the purpose of this study as contained in the consent letter, and signing before starting the interview.

3). Interviewing using the schedule and voice-recording device.

4). Transcribing verbatim each recording proximately after each interview.

Some interview schedules at TVET colleges were delayed due to the late receipt of gatekeepers' letters. To circumvent this challenge, the company training managers and the DHET regional office were contacted for assistance and facilitated appointment meetings.

Data Analysis

Qualitative data analysis is an inductive process that involves categorising data, seeing patterns and relationships between the categories, and posing questions about these data patterns (Maree, 2012). Similarly, data analysis breaks data into patterns, trends, manageable themes and relationships (Braun & Clarke, 2021; Mouton et al., 2006). Open manual coding was adopted by sorting data according to each theme. Data were repeatedly read and checked to familiarise with the transcripts and checked if all codes were captured. Audiotapes were played and replayed to pick captured points. The following section shows the thematic data analysis steps that were followed.

In-field data analysis employs inductive techniques to discern patterns within the gathered information. This process entailed conducting verbatim transcriptions of voice-recorded tapes and meticulously organising and indexing the data for further analysis. Through data coding, a deductive analysis approach was applied to categorise and structure the information according to predetermined criteria. Subsequently, theme development occurred, identifying and refining overarching themes and concepts. Furthermore, the exploration of relationships among these distinct themes uncovered valuable insights. Ultimately, the culmination of these efforts leads to the development and interpretation of the data, providing a comprehensive understanding of the subject under study.

The meaning and interpretation of data were developed to select quotes representing each theme and ensured representation across participants so that their WIL experiences were accurately described (Maquire & Delahunt, 2017). Trustworthiness was achieved by returning to the participants to verify the meaning of their transcripts, thereby enhancing rigour (Lawal & Duma, 2023). Triangulation is sourcing information from multiple sources to corroborate, elaborate, or illuminate the research problem and its outcomes (Cohen et al., 2017). The triangulation process clarified meaning by identifying how participants experienced WIL through opportunities and challenges.

9. Presentation and Analysis of Results

This study presented findings regarding opportunities and challenges experienced by lecturers during WIL. The analysis of the results was embedded in the presentation. TVET lecturers' responses during WIL and company personnel were integrated and presented as they were closely similar.

Professional development

Professional development entails acquiring skills through career training. Lecturers were trained in different disciplines and acquired industry-specific skills to enhance their teaching. Lecturers were developed by installing machines and equipment, machine learning, and automation skills. Lecturer 10 responded to the kinds of skills gained during WIL:

> *I work with different refrigeration gases. The cycle steps are compression, condensation, expansion and evaporation. I work on cold rooms, domestic and industrial fridges and learnt to prevent oxidation by running nitrogen in the pipe system when pipe welding. I used leak detectors like the bubble soap method, electronic, and halide light. Also used a recovery unit to remove gas from the fridge into a gas tank.*

Training Manager 2 acknowledged:

> *They use precision instruments to measure, test parts, detect faults and ensure conformity to required specifications. Boilershop specialised in welding processes and types; fitters were stripping, fitting and fault-finding. Machinists aligned and secured holding fixtures and machined parts as per drawings.*

Lecturer 10 learnt general pedagogical knowledge (GPK) by experiencing the principle of the refrigeration cycle. For example, "*I used leak detectors like the bubble soap method, electronic, and halide light*". The lecturer also learnt curriculum knowledge through different terminologies, like the recovery unit and different steps in the cycle. Knowledge of the learning environment and how to safely conduct themselves with the teaching and learning material was also acquired during WIL (Shulman & Shulman, 2009). The lecturer reported gaining experience in types of gases, refrigerators and leak detectors. Therefore, the kinds of knowledge that lecturers learnt during WIL included the four-step refrigeration cycle, where the value of each step was appreciated. The lecturer used a recovery unit as a safety measure to prevent the gas from escaping into the atmosphere. The practical skills indicated by Training Manager 2 showed GPK, where lecturers learnt to organise tasks and use machinery. Training Manager 2 summarised the skills gained by lecturers and highlighted that lecturers learnt everything. The lecturers could reorganise and separate the subject matter into examples, activities, and demonstrations in ways that students understand. (Shulman, 1987). It implied that lecturers had an opportunity to learn industry-related mechanical skills in their respective trades. Some lecturers reported:

> *The industry I attended is a world-class standard with the latest technology. It is fully equipped. It is a suitable environment for one to learn (Lecturer 10).*

> *The environment and industry are very complex. There are different structures, e.g. a mall, government low-cost houses, halls and roads. They are all construction but done differently and with different specifications, tools and requirements (Lecturer 1).*

Lecturer 10 suggested that the WIL experience was based on the latest technology. It probably implied that the TVET lecturer was exposed to the universal skills of the 4IR. Lecturer 1 indicated the complexity of the civil engineering industry in terms of the sub-disciplines of specialisation. While it is all construction industry, the types of tools and skills in building construction were not similar to those used in road construction, suggesting that civil engineering lecturers engaged in different industry skills.

Installations

Installations entail fitting equipment, machinery and any other systems in position and testing it for functionality. For instance, geysers, pipes and machinery can be installed in engineering. Lecturer 11 narrated installation processes to '*install geysers, sinks, porcelain bathtubs, washing basins, drain systems, water supply, sewer and shower*". Foreman 2 disclosed the kinds of skills that the plumbing lecturer engaged in:

> *The lecturer installs and fixes domestic appliances, such as dishwashers, pipes and fixtures, sinks and toilets, air-conditioning and heating systems, and gas water heaters. The work complies with local municipality regulations. The plumbing team installed different heating and cooling systems, water distribution and sanitation in domestic and business properties.*

A plumbing lecturer related to installing fixtures and different other plumbing fittings. The installation varied from connecting different plumbing pipe systems to connecting fixtures. It appeared that Lecturer 11 gained GPK to install and fix different systems and equipment during WIL. Foreman 2 confirms: "*The plumbing team installed some heating fixtures, cooling, water distribution and sanitation systems*". The foreman narrated the installation of plumbing equipment and expressed interest in the skills that Lecturer 11 experienced. During the installation process, lecturers learnt to plan and set out what they intended to achieve (Shulman, 2005), a tool they would use back in their classroom.

During the installation process, Lecturer 16 "*did all procedures for installing and maintaining electrical systems*". Training Manager 3 also confirmed: "*Lecturers also installed electrical equipment*", while Training Manager 2 reported on installations: "*They install new or replace equipment parts such as hydraulic systems, electrical wiring and mechanisms*". Installation involved connecting electrical wires to machines and ensuring their readiness for operation. Lecturers gained GPK through installations which involved unpacking, assembling, aligning and setting up the machine to its working order. The installation of equipment in civil, electrical and mechanical engineering industries was supported by Training Managers, whose responsibility ensured that lecturers learning during WIL gained knowledge from performing various tasks. Installation processes depended on industry type but generally included fitting equipment, machinery and fixtures in position and ensuring their functionality.

Machine skills

Machine skills are competencies that allow the safe operation of machines and equipment. Using some machines requires multiple skills, such as reading blueprints, attention to detail and using precision measuring instruments. Lecturer 5 shared experiences on the knowledge that was gained through WIL:

> *I learnt to strip, align, assemble and find faults on pumps. I used the dial test indicator for shaft alignment when machining work mounted on the four-jaw chuck.*

GPK was gained when the lecturer operated different machines. The utilisation of different materials aligns with Jawarneh et al. (2019), who found that the awareness of the worth of materials and consumable components and their

sensible use were among the job skills requirements for vocational teachers and Engineering and Technology students. Industry skills developed at the workplace formed pedagogical content knowledge (PCK) when lecturers in the current study worked in different contexts over time. It is the key to developing expertise (Shulman, 1987). Different industry experiences built grounded knowledge on how to organise content and deal with complex technical issues of the subject matter.

Automation skills

Automation is the skill of making a machine or process operate automatically (Madakam et al., 2019). Automation forms a more significant part of today's industrial processes as the world works towards the 4IR (Onu & Mbohwa, 2021). The entire automation operation depended on the human hand to monitor and control the technical systems where lecturers on WIL were involved. Some lecturers were exposed to programming and simulation skills. A simulation imitated a planned machine operation used to visualise real production sequences. Lecturer 15 "*learnt to operate the programmable machinery and programme and perform a trial run (simulation)*". Programming machines and running simulation operations trained lecturers to apply automation skills before mass production. Lecturers adapted to the new learning environment using the latest technology, preparing them for the new learning processes (Villegas-Reimers, 2003).

Sewell et al. (2015) confirm that managers vented their unwillingness to host students for WIL, citing challenges of adequate time to coach or mentor them effectively. Lecturer 15 expressed the following experiences with using Computer Numerical Control (CNC) machines:

> *I learnt different CNC machines such as lathe, milling and cutting machines such as laser cutters, plasma, thermal, shearing machines, band saws and flame cutters. I learnt to read and convert data into coordinates for the machine tool, develop motion instructions for CNC, and set codes for various instructions.*

Foreman 1 supported:

> *Yes! The mechanical lecturers learnt to use advanced CNC here as most of our plant is automated. They were exposed to preparing and writing simple programmes and setting machines to perform specific tasks.*

The method of CNC machining involves using machine tools and computerised controls to remove layers of material from a workpiece (Mamadjanov et al., 2021). The findings from Lecturer 15 and Foreman 1 showed that CNC machines were used to carry out various operations. Converting data to coordinates refers to drawing information inputted in the machine using the designated codes. Bergami and Schuller (2011) explain the acquisition of new skills and knowledge as the subsequent results produced by WIL. Interview excerpts below (pp. 11) represented TVET lecturer experiences during WIL:

> *You get more knowledge, skills, and learn how to apply your knowledge from academics, use tools, work and finish your tasks on time (Lecturer 3).*

> *DHET must expand this WIL idea for TVET lecturers, maybe once every 3 years. We must be taken back to the companies to remind ourselves of work exposure and gain more skills and knowledge because we are at college teaching, so we grow old and forget about the other information. Returning to the industry for months will help us gain the latest skills and knowledge to teach relevant trade skills (Lecturer 4).*

The comments showed that lecturers acquire skills and knowledge during industry practice. The responses from Lecturers 3 and 4 align with Alias et al. (2020) and Mulati et al. (2019), that vocational teachers received the latest industry insights during their practical experience. Bergami and Schuller (2009) report that lecturers considered WIL necessary to expand their knowledge since they acquired professional development, career growth, and current industry practices.

Lecturer 6 reiterated that "*a proper induction before going to the plant was needed*". Lecturer 2 also vented that "*WIL gave exposure to many instruments and an exciting industry*". Comments from the excerpt immediately above suggest the importance of preparing lecturers before they engage in industry practice so that they gain fundamental industry skills. Paryono (2015) confirms that teachers in Malaysia gained industry experience, content, curriculum and teaching and learning methods. The comments by industry personnel below shed light on the nature of WIL lecturer experiences:

> *It is good because it equips teachers with up-to-date skills to share with students. Technology is changing fast, so this is the only way to catch up. Even if they learn at university by the time they graduate, some skills would have evolved due to evolving technology in this 4th industrial revolution (4IR) (Training Manager 1).*

> *Attachment is a ground-breaking exercise that gives the bolts and nuts of the trade. Attachment exposes to workplace demands and challenges. They gain practical experience, work ethics, develop a professional network and understand workplace expectations (Training Manager 2).*

In addition, Lecturer 8 expressed:

> *We are in 4IR, and things have changed in industry. It is important to visit the industry, get new updates, and not fall behind on the latest technology developments.*

The 4IR was mentioned by Lecturer 10 earlier, focusing on the beginning of a new universal high-technology revolution. Innovations were developed in different fields of engineering, bringing in the use of new material technologies. Training Manager 1 emphasised gaining up-to-date skills through evolving technology. There was agreement on learning new skills and utilising the most recent technologies in the TVET sector. According to Subbiah et al. (2017), participants believed that WIL offered practical experience and job-ready competencies. The results are consistent with research by Ngwane (2016), who found that TVET lecturers' abilities and conceptions were strengthened, professional practice was improved, and skills including teamwork, communication, self-management, and comprehension of the working world were acquired.

Kolb's experiential learning cycle commences with concrete experience where lecturers learnt from actually doing or using a machine for the first time. The first-hand experience enriched through touching and doing enhanced lecturer learning during WIL (Kolb, 1984). Another lecturer said:

> *WIL makes me explore further to interact with industries on the latest technology so that I am updated with current engineering news. I network with my suppliers to give me the latest technology, obviously hard copies of engineering newsletters and emails to keep updated (Lecturer 9).*

There was agreement with lecturers' interactions with industry professionals in the field which kept them informed of recent developments in engineering, enabling them to connect their subject matter to cutting-edge innovations. The mechanical lecturer consulted with company personnel, exchanged contacts and sourced information on industry developments. Bergami and Schuller (2011) show that industry placement experience for lecturers during WIL may develop a community of practice where artisans share an understanding of the work to be done. The finding that lecturers networked with industry personnel aligns with research which revealed that some lecturers explored their future collaboration possibilities with industry personnel in the form of guest lecturing in TVET colleges (Mabhanda, 2017).

During WIL experiences, lecturers had the opportunity to acquire valuable professional development and gain essential technical skills. These experiences also enhance their ability to deliver high-quality education to students. Lecturers had exposure to real-world industry practices and challenges and developed a deeper understanding of industry trends, innovations, and best practices. WIL exposure helped them stay updated with current developments and align their teaching methods with the demands of the job market. WIL allowed lecturers to work directly with machines and gain proficiency in operation, maintenance, automation and troubleshooting skills. Acquiring machine skills helped lecturers provide more comprehensive training to students and fostered a practical understanding of how theoretical knowledge translates into practical outcomes. During WIL, lecturers engage in real-world experiences, collaborating with industry professionals and witnessing first-hand the challenges and innovations in their field (Kolb & Kolb, 2018). This hands-on experience provides them with concrete insights into the industry's dynamics and needs. Overall, WIL offered lecturers a chance to expand their professional horizons, learn new technical competencies, and bridge the theory–industry practice gap.

Challenges: Lack of industry support and engagement

TVET lecturer learning during WIL depended on the support they received while engaged in experiential learning. Lecturers experienced challenges which included a lack of industry support and resources,

Five TVET lecturers acknowledged receiving limited WIL support and engagement during WIL. Generally, the support given in any initiative could be a vehicle for success. Lecturer 4 narrated:

> *There was a lack of support from industry colleagues; for instance, the semi-skilled workers behaved like we wanted to take their jobs. They were angry and did not like us. They would refuse to assist us when we asked for help. Supervisors were not directly involved, as we had mentors. It*

> *was hard to find help if you needed a supervisor. We followed protocol and reported to a mentor.*

Negative Attitude

A negative attitude is referred to as rudeness to other employees, careless performance of work and anything that threatens a positive workplace culture (Baker & Kim, 2020; Hershcovis et al., 2017). Some more challenges were reported by Lecturer 5:

> *Some supervisors are unwilling to assist or feel I am wasting their time, and you will be disadvantaged. Sometimes artisans do not provide the knowledge you want but give it at the surface because of a lack of time to attend to lecturers because of company responsibilities.*

The supervisors reportedly could not share in-depth information due to the high workloads of their company responsibilities. The supervisors referred to by Lecturer 5 may have been overwhelmed by their primary duties. Smith and Yasukawa (2017) state that some company personnel were reluctant to show things for fear of losing their jobs. Some supervisors were reportedly not committed to ensuring they received everything they needed to work safely, like personal protective equipment. The literature by Smith and Yasukawa support the finding that the "*semi-skilled*" employees might have intentionally chosen not to assist lecturers to eliminate threats and secure their jobs.

Lecturer 9 reported:

> *The general attitude among employees was not right as they did not generally like us; they did not give us fair treatment. There was a lack of commitment from managers in the company as they said we were not part of the company, and it was the responsibility of the SETA to ensure the replacement of worn PPE. They did not give us the support we needed.*

The responses obtained from lecturers indicated a lack of fair treatment and a bad attitude from company personnel working with daily duties. Smith and Yasukawa (2017, p. 26) confirm that: "*They could not believe I was coming for practical experience. They thought maybe I was coming to take their jobs. They were quite reluctant to show me things*". The excerpt immediately above explained why some industry personnel were hostile to lecturers during WIL. Pirzada (2021) indicated a lack of support regarding the capacity to host and train teachers. The semi-skilled workers felt threatened that lecturers would take their jobs. Semi-skilled workers did not support lecturers because they might not have received the introduction and purpose of TVET lecturers in industry.

Working times

Working hours refer to the hours an employee is expected to spend productively at work. The industry and college working times were reported as different. In this regard, lecturer 6 expressed:

> *We leave before knock-off time because we use college working hours. It was not ideal. You must leave an unfinished job while artisans and other company personnel continue working, portraying a bad impression. The college did not provide transport, and we were not paid.*

Training Manager 1 commented about working hours:

> *The knock-off times need to be aligned with company times because once they come here, they must follow company times for conformity and compliance, but our efforts to correct it were fruitless.*

The Training Manager advised lecturers to follow company operating hours and maximise learning by spending most of their time onsite. Lecturer 9 said, "*I am not used to working six to six shifts, including Saturdays and Sundays"*. Lecturer 10 added: "*Not many bad things except that time issue where you start at 7:30 am to 4:30 pm*". Duncan (2017) confirms that lecturers are infrequently there to perform demanding work, which develops technical skills. The working times in industry were longer than TVET college contact hours. The working hours in the industry were longer than the standard working hours for TVET lecturers in colleges. The findings align with McLennan and Keating (2008), who identified a lack of communication and coordination between industry and the TVET sector where they failed to fit in with industry needs. Lecturers worked different hours from industry shifts since they were not paid extra. It shows that they did not leave their 'lecturer status', which made them dictate working hours in industry. According to industry reports, lecturers did not adjust to the working hours. Issues around resources were also outlined.

Inadequate resources

Resources are the tools and equipment needed to perform duty effectively. These could be but not limited to materials, tools, machines and equipment. A successful initiative strives for the availability of resources. Plumbing Lecturer 11 recounted:

> *"There is a challenge of a shortage of tools, workers, and materials, which can be avoided if proper planning is done. Fortunately, I have the tools to complete my tasks" (Lecturer 11).*

The shortage of tools limited lecturer learning because they could not follow correct procedures when working on their tasks. Lecturer learning was negatively affected by the limited support and time allocated to attend WIL. The host company supervisors and artisans reportedly failed to share in-depth information due to the demands of their company duties. It emerged that there was a gap in industry where lecturers did not have a training officer fully in charge of their WIL practice. Both learning opportunities and challenges emerged in this study. Lecturers acquired skills and learnt to find their way from the challenges.

Lecturers participated in hands-on tasks related to installations and machine operations during WIL. They engage with equipment, systems, and tools in real-world scenarios, acquiring practical skills. Kolb's theory reinforced lecturers' WIL experiences, professional development, installation, machine, and automation skills through active engagement, reflection, conceptualisation, and experimentation. This integration empowered lecturers to provide more dynamic and industry-relevant education, preparing students for successful careers in their chosen disciplines.

10. Conclusion and recommendations

This study revealed the opportunities and challenges experienced during WIL. Some lecturers were exposed to world-class standards with the latest technology, learnt to use different machine types, participated in engineering processes

through teamwork, and carried out maintenance and repair work. It implied they could relate their theory to practice when teaching practical subjects. Contrarily, the WIL experience was muddled with limited support from some TVET institutions and industry personnel who did not provide the necessary backing when needed. There were administrative and supervision concerns raised which hindered the implementation of WIL. Some of the issues pointed at a lack of a WIL model that addresses WIL TVET lecturer placement so that all role players participate from an informed viewpoint. This study informs the challenges encountered during lecturer WIL and proposes a WIL model to enhance TVET lecturer skilling. Communication and coordination between industry and TVET colleges needs serious attention to ensure that lecturers are placed in industries that can fully support WIL. Industry personnel should be trained to host lecturers so that they disseminate vital information for their learning. The WIL initiative should be industry-driven so that lecturer placement challenges are minimised. Participants of this study were limited to engineering lecturers in one province. A study on other disciplines and including lecturers from other provinces would assist in generalising the results.

This study recommends the appointment of dedicated training officers who receive, induct and guide lecturers through the WIL practice to limit challenges. Colleges should design an induction programme in collaboration with industry so that lecturers attend a common induction course which qualifies them to engage in WIL. This study proposes that lecturers on WIL should report to the company supervisor for the duration of their training to prevent double reporting.

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Appendix 1: Interview Questions

1. What kinds of knowledge do TVET lecturers gain through WIL?
    i. Tell me what you learn in Industry during WIL?
    ii. Please share with me the tasks that do you do here.
    iii. What kinds of things do you learn?
    iv. Are there any new skills which you have learnt through WIL?
    v. Tell me what the knowledge relates to.
    vi. Tell me about using machines ... What is it like?

2. What is the nature of TVET lecturers learning through WIL?
    i. Will you please take me through your typical day at work?
    ii. Do you meet and discuss as colleagues?
    iii. Do you have meetings with supervisors?
    iv. Are these meetings helpful? If so, in what way?
    v. What do you learn from those meetings?
    vi. Are you able to work alone in doing tasks?
    vii. How did you get to know how to use machines in this company?
    viii. Did anybody assist you?
    ix. Tell me the kinds of learning/activities which take place in this company?
    x. Do you have time to look back and think about what you have done?
    xi. Dou you enjoy talking about work?

xii. Please tell me what guides you to do your daily tasks.

3. What are the conceptions of lecturers learning through WIL?
   i. Share with me your thoughts about industrial attachment?
   ii. Tell me what you feel about this environment?
   iii. Tell me about your learning experiences during WIL? …
   iv. Would you recommend your colleagues to do WIL here?
   v. What are your views about WIL?
   vi. Tell three good things that happened to you on WIL
   vii. What about the bad things that happened on WIL?
   viii. From all this, what does WIL mean to you?

Appendix 2: Observation Checklist

Question	Comment
What kinds of knowledge do TVET lecturers gain through WIL?	
Type of work done, e.g., production/maintenance.	
Type of tasks done and the role played.	
Evidence of teamwork	
What is the nature of TVET lecturers learning through WIL?	
Daily routine work. Working independently with machines/tools or under strict supervision.	
Interaction with colleagues or supervisor.	
Nature of instructions from the supervisor, i.e., verbal/non-verbal/written.	
The nature of the environment and general working conditions. Conducive to work environment.	
What are the conceptions of lecturers learning through WIL?	
Punctuality	
Any notable gestures, facial expressions.	
Cooperation/teamwork	