Work-integrated learning experiences of South African technical and vocational education and training lecturers

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This study investigated the impact of work-integrated learning (WIL) experiences for Technical and Vocational Education and Training (TVET) lecturers on their industry expertize and teaching skills. WIL was introduced to address the inadequate work experience of TVET lecturers and improve their capacity to deliver quality teaching. The study used face-to-face semi-structured interviews with 18 TVET lecturers to explore their WIL experiences. Non-participant observation was also conducted to validate findings from interviews. Kolb's experiential learning theory, Shulman's Teaching framework and the soft skills theory by Ibrahim et al. underpinned the study. Data were analyzed using thematic analysis. The study showed that WIL enhanced lecturers' ability to integrate theory with practice and provide effective teaching. Lecturers acquired a deep understanding of pedagogical content knowledge, soft skills, and awareness of workplace culture. Future studies focusing on a variety of trades for lecturers are recommended.

Keywords: Technical and Vocational Education and Training (TVET), lecturer, industry, practical skills

OVERVIEW OF TECHNICAL VOCATIONAL EDUCATION AND TRAINING IN SOUTH AFRICA

Technical and Vocational Education and Training (TVET) in South Africa is defined as the study of technologies and related sciences, practical skills acquisition, and knowledge related to various economic and social life careers (UNESCO, 2013). TVET is perceived to be instrumental in providing the necessary human capital required by industry, as its role is to prepare TVET students for sustainable livelihoods (Tikly, 2013). TVET lecturers provide services in the post-school education sector, which falls under the higher education department in South Africa. While TVET is the cornerstone of national skills development, with a mandate to provide the public with intermediate to high-level skills to create a strong base for higher education, the current situation in TVET may not promote the achievement of these objectives. TVET lecturers lack the requisite knowledge, practical skills and experiences to provide learning experiences that equip students with the required attributes (Marope et al., 2015; Ngcwangu, 2019). Blom (2016) attested that the currency of workplace knowledge and experience of TVET lecturers is often non-existent or outdated, with no supporting mechanism to ensure that lecturers update their practical experience. In an investigation into the status of South African TVET lecturers, Zinn et al. (2019) found that one in five TVET lecturers do not have basic lecturer qualifications and are not equipped with the necessary workplace skills.

Enacting Quality Work-Integrated Learning

The success of WIL programs for TVET students relies on the qualifications and competencies of TVET lecturers to ensure that WIL is integrated across the curriculum and enables students to bridge the

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theory-practice gap. Ideally, TVET lecturers should be multi-faceted professionals with two qualifications, a trade and professional teaching qualification (Schmidt, 2019; Swiss-South African Cooperation Initiative, 2016). Practical exposure and guided learning experiences in industry settings form crucial elements of TVET lecturers' expertize in the delivery of WIL for students. WIL placements for TVET staff allow them to work alongside well-established industry practitioners, engage in authentic practice, strengthen industry networks, and maintain currency of contemporary industry operations (Ferns et al., 2014). Furthermore, WIL provides TVET lecturers with industrial workplace exposure aligned to the TVET college syllabi and industry needs.

WIL refers to "approaches and strategies that integrate theory with the practice of work within a purposefully designed curriculum" (Patrick et al., 2008, p. iv). In South Africa, WIL is also referred to as workplace-based learning, work-based experience, experiential learning and cooperative education (South African Council for Higher Education, 2011). In an experiential learning context, quality outcomes are intrinsically linked to the application of theory in practice-based scenarios (Thaba-Nkadimene, 2017). WIL is regarded as a pedagogy that offers experiential learning to students in educational programs. According to Chilvers et al. (2021, p. 433), WIL helps "students connect with authentic work-related learning opportunities in the context of engagement and partnership with organizations outside the educational institution". WIL provides an important link between training and the practical realities of the world of work (Mesuwini et al., 2020). The Department of Higher Education and Training (DHET) established an initiative to improve TVET college efficiency. This initiative led to lecturer WIL placements arranged by a WIL officer at the TVET College. TVET lecturers were relieved of their teaching responsibilities while participating in a WIL experience in an industry setting and continued to receive a full salary. The conditions under which industry placements occurred in South Africa differed from Australia, where VET lecturers had to volunteer their time for industry placement (Schmidt, 2019).

LITERATURE REVIEW

Benefits of Work-Integrated Learning for Technical and Vocational Education and Training Lecturers

The current study examined South African TVET lecturers' experiences and the knowledge gained during WIL, to establish if the experience had an impact on the lecturers' industry expertize and if it informed their approach to teaching. Schmidt (2019) found that vocational education and training (VET) teacher industry-based professional development in Australia could develop lecturers' pedagogical content knowledge (PCK) and their technological skills. Schmidt (2019) stressed that required skills balanced with industry and educational currency and teaching pedagogies, including digital technologies, are needed for effective VET institutions. Industry skills developed during WIL at the workplace inform PCK and the ability to apply this knowledge in diverse workplace contexts (Mukhale & Hong, 2017). PCK promotes the blending of pedagogy with content (Shulman, 1987) and technology (Mishra & Koehler, 2006). The findings further indicate that training programs that included WIL components assisted TVET lecturers in using practical learning experiences when teaching (Mukhale & Hong, 2017). TVET lecturers need regular industry exposure to update skills according to industry trends (Jahonga, 2020).

Global Perspectives of Work-Integrated Learning Experiences for Lecturers

VET teachers in Australia demystified and simplified technical jargon by sharing examples of recent industry-based work experiences, and acted with technical authority when facilitating student learning, because of their WIL experience (Smith & Yasukawa, 2017). Smith and Yasukawa reported that teachers revealed the importance of in-depth subject knowledge, by including personal experiences of their time in industry, and using diverse teaching approaches to explain concepts to students. The ability to explain different approaches to workplace practices with technical authority, signifies that WIL for VET lecturers has the potential to equip them with requisite industry knowledge and skills. However, VET teachers in Australia report challenges balancing their full-time workload with maintaining industry currency, as time devoted to industry placement is not considered a formal part of their teaching role, but is a requirement for retaining teaching positions (Schmidt, 2019). Tyler and Dymock (2019) agree that VET practitioners need to balance teaching commitments with the necessity to update industry knowledge and skills. In a related study conducted in Australia, Dickfos (2019) confirms that WIL provided an opportunity for academics to retain industry currency.

In Malaysia, Omar et al. (2020) found that TVET lecturers acquired machine operation skills in the workplace, gained skills to apply safety practices in the workshop and developed competence in their disciplines during WIL. The results implied that the TVET lecturers gained PCK, which is a determinant of their effectiveness as lecturers. In addition, while on WIL placements, TVET lecturers gained in-depth knowledge of their disciplines that translated to teaching content material from an informed perspective.

In a Kenyan study, Muchemi et al. (2013) found that industry placements enabled staff to apply contemporary technology in the workplace and use machinery, equipment, tools and systems. Lecturers strengthened their expertize and understanding of scientific concepts and acquired knowledge and skills that improved their teaching and learning efficacy. Furthermore, participants gained innovative ideas to establish links with industrial and socio-partners; and gained the ability to relate teaching and learning processes to the latest industry developments (Muchemi et al., 2013).

Due to the lack of TVET lecturer training in Mozambique for the past 20 years (Billetoft, 2011), the World Bank and other donors provided funds to the government to upskill lecturers. The funding intended to align the outcomes of the TVET system to the skills demands of industry through upskilling TVET lecturers in practical workplace training. In support of lecturer WIL, Baffour-Awuah and Thompson (2012) confirm that the quality of TVET lecturers impacts the delivery of TVET programs. Amedorme and Fiagbe (2013) reiterate that there are generally few TVET lecturers with relevant industry exposure in Ghana and proposed establishing a college of technology education to give lecturers industry exposure in their technical areas to mitigate this challenge.

South African Context

The Swiss-South African Cooperation Initiative (SSACI) introduced WIL for lecturers to address the limitations of industrial exposure and experience in South Africa. Very few TVET lecturers in South Africa are qualified in spearheading WIL for success (Republic of South Africa Department of Higher Education and Training [DHET], 2013). TVET lecturers lack practical knowledge and industry experience (Bantwini & McBride, 2011; Kuehn, 2019), which is a requirement for their teaching. An in-service training model where TVET lecturers were situated in industry was adopted to provide professional development programs for TVET lecturers and to address the deficits in their awareness of industry practice. In addition to a lack of practical and industry knowledge, Brand (2021) identified the inadequate cognitive and social competencies of TVET curriculum leaders and lecturers.

WIL for TVET lecturers is a relatively new initiative in South Africa spearheaded by SSACI. DHET formulated the Policy on Professional Qualifications for TVET Lecturers that informs the construction of professional development programs offered by South African higher education and regulates qualifications for TVET lecturers (DHET, 2013). The Policy on Professional Qualifications for Lecturers in TVET observes that the design of training systems such as curricula requires close collaboration between education and training providers and employers (DHET, 2013). This implies that WIL programs operate according to the confines of TVET colleges and industry expectations. Furthermore, the policy stresses the significance of a substantial workplace component incorporated into TVET lecturer qualifications, to equip them with the skills to teach practical-based programs.

WIL for TVET lecturers provides practical experiences in different trade disciplines, focusing on integrating operational theory with practical application in the workplace, thereby developing and strengthening professional skills (Bogo, 2015, 2020; Smith et al., 2016). WIL facilitates the expansion of TVET lecturers' experience and keeps them up-to-date with cutting-edge technological developments (Mabhanda, 2017). Exposure to workplace practices enables TVET staff to acquire in-depth discipline knowledge and apply that knowledge in complex workplace settings. The TVET lecturers in South Africa benefit from WIL as a staff development programme intended to upgrade their practical knowledge by integrating theoretical knowledge with workplace experience. WIL improves lecturers' confidence and competence, enabling them to link their teaching to actual workplace practices and specific requirements. TVET teachers who undertake WIL understand the application of industry knowledge and technical skills at the workplace and are, therefore, better equipped to support students in developing employability skills (Ferns et al., 2014).

SSACI piloted WIL for TVET lecturers with the intention of improving teaching and learning in TVET colleges through lecturer workplace learning experiences (Education Training and Development Practices-Sector Education and Training Authority (ETDP-SETA), 2021). SSACI assumes responsibility for the operational management of WIL, while TVET colleges are responsible for providing acquittal of expenditure for allocated funds from SETA. The funds may be used to pay salaries of the persons hired to replace the lecturers on WIL programs and/or buy personal protective equipment as prescribed by the specific workshop rules. SETA collaborates with industry and the TVET colleges to facilitate WIL placements for lecturers, while SSACI is responsible for developing the WIL model for TVET lecturers. Responsibilities include developing TVET lecturer WIL material as required, managing the evaluation of the program, training college personnel in the implementation of WIL for TVET lecturers, and building capacity of other staff to support the implementation of WIL for staff. The vision is for TVET colleges to deliver a quality education that prepares students for dynamic workplaces and become institutions of choice for students.

Problem Statement

Wedekind and Watson (2016) proposed that research into TVET in South Africa has generally been conducted by a small group of researchers and is comparatively underdeveloped. Advocates such as Blom (2015); Mutereko and Wedekind (2017); Papier (2017) acknowledge the limited research and the need for more research on TVET lecturers' learning in industry. The South African "education faculties have a strongly developed practice of school-based WIL, none currently offers a formal programme that includes WIL in industry" for TVET staff (van der Bijl & Taylor, 2018, p. 126). Further, there is a dire need for research in the South African TVET sector since there is limited evidence in the public domain on industry trainers (Jahonga, 2020; McGrath & Powell, 2016). This research contributes to the existing literature on WIL for TVET lecturers, and influences curriculum design and policy on TVET lecturer training, recruitment, and minimum qualification standards. The study further highlights the potential of industry-based WIL for TVET lecturers, by revealing what happens in industry during their practical work immersion.

Focus and Purpose of the Study

While WIL is known to enhance student development and employability, this study takes a different perspective and focuses on WIL for TVET lecturers. The study explored TVET lecturers learning through WIL to ascertain the knowledge and capabilities gained while lecturers were immersed in industry. WIL is designed to bridge the skills gap of TVET lecturers to ensure they have the practical experience that meets industry expectations and curriculum needs. TVET lecturers were attached to industries that specialized in manufacturing, production, maintenance, and repair. Industry processes are aligned with the core competencies and knowledge expected in their practical competence trade testing, which qualifies them as artisans. This study explored WIL programs for TVET lecturers and identified the knowledge and expertize gained by staff that enhanced their capacity to enact WIL for students. Kolb's Experiential Learning Theory (ELT) was suitable for unpacking, understanding, and explaining the nature of experiential learning for TVET lecturers. The research drew on a conceptual framework related to knowledge as proposed by (Shulman, 1987). In addition, conceptual frameworks related to skills (Ellis et al., 2014; Ibrahim et al., 2017) were employed to understand the generic skills that the TVET lecturers gained during WIL.

METHOD

A qualitative approach using semi-structured individual interviews was used to explore skills TVET lecturers acquired during industry-based WIL. The interview questions were developed and piloted to eliminate ambiguity and confirm that they drew the required data. Durban University of Technology Institutional Research Ethics Committee (IREC) granted ethical clearance approval. Lecturers were given pseudonyms (Lecturers 1-18) to ensure anonymity (Cohen et al., 2017).

Eighteen TVET lecturers from three colleges participated in both face-to-face interviews and non-participant observations. Non-participant observations involved observing participants to monitor performance and expectations of lecturers. Observations were recorded using a checklist to capture data that might have gone unnoticed during interviews (Wagner, 2006). The observations assisted in triangulating the interview data. The TVET lecturers were teaching civil, electrical, and mechanical trades. Kolb's ELT was employed to unpack and explain TVET lecturers' learning during WIL. Kolb's theory portrays experiential learning as occurring in four stages: concrete experiences, reflective observation, abstract thinking and active experimentation (Kolb, 2007). An early proponent of experiential learning (Dewey, 1933) described it as a cyclical process that involves observation, action and reflection. Kolb defines experiential learning as a continuous process where knowledge is created through experience transformation. Bergami and Schuller's (2009) industrial placement model was used to understand the stages lecturers underwent during industry placement. The model is represented by six connected steps around a community of practice that reflect lecturers' experiences during industry placements. The stages are teacher industry placement, industry placement experience, industry placement skills, theory development (from practice), classroom teaching, theory into practice, community of practice and community engagement. Furthermore, conceptual frameworks (Ibrahim et al., 2017; Shulman, 1987) related to the domains of teacher knowledge and soft skills were used to understand what lecturers acquired in industry. Ibrahim et al. (2017) advocate for the development of soft skills in preparation for engineering industries due to their increasing significance in the job market. Ellis et al. 2014 identified soft skills as skills that are non-technical in nature including teamwork, effective communication, creativity, accepting and learning from criticism, self-motivation, leading others, networking, problem-solving, multitasking, and the ability to prioritize tasks.

Shulman (1987) initially advanced the domains of teacher knowledge as content knowledge, general pedagogical knowledge, curricular knowledge, pedagogical content knowledge, knowledge of learners and their characteristics, knowledge of educational contexts, knowledge of purposes, educational purposes and educational values and their philosophical and historical bases. From these domains, pedagogical content knowledge and content knowledge were relevant to this study on WIL for TVET lecturers. Shulman (1987) addressed how certain kinds of knowledge interacted in the minds of teachers. Grossman (1990) expanded Shulman's theory to understand the knowledge TVET lecturers acquired during WIL and explored the development of their teacher knowledge and how they constructed insights, interpretation, and practice. The data were transcribed verbatim and analyzed thematically. The analysis process involved identifying patterns, organizing, and indexing the data, coding, and developing themes. Connections between themes were identified, thereby enhancing the meaning of the data (Maquire & Delahunt, 2017).

RESULTS

The data from interviews and observations were combined, as responses incorporated similar themes. Three major themes, discipline knowledge, soft skills, and awareness of workplace culture, emerged during lecturers' WIL experiences. Lecturers broadened their expertize in these areas, which subsequently improved their teaching.

Table 1 outlines the frequency the sub-themes underpinning each of the broader themes occurred.

TABLE 1: Number of sub-theme occurrences for each major theme.

Major theme	**Discipline knowledge**	**No**	**Soft skills**	**No**	**Awareness of workplace culture**	**No**
Sub-theme	Engineering skills	18	Computer skills	5	Safety precautions	18
	Using machines	18	Communication	14	Induction	16
	Programming and simulation	14	Teamwork	15	Teaching skills	14
			Networking	9		
			Problem-solving	8		
			Reflection on practice	5		
			Workplace mentoring	16		

Discipline Knowledge

A major theme that emerged was discipline knowledge, described as a powerful form of content illustrations, demonstrations, examples, explanations, and ways of acquiring in-depth subject knowledge that makes it understandable to students (Gess-Newsome, 1999). During interviews, lecturers raised many topics in relation to discipline knowledge acquired during WIL placement. The sub-themes for discipline knowledge included: engineering skills, using machines and programming and simulation. The discipline knowledge that TVET lecturers gained from WIL strengthened their workplace capabilities, thereby enabling greater confidence in their ability to impart discipline knowledge to students, as exemplified by Lecturer 1 who "used the dumpy level and theodolite under the strict supervision of a qualified artisan and gained much confidence."

Engineering skills

TVET lecturer learning during WIL took place in different industries (civil, electrical, and mechanical) where new knowledge was gained. Bergami and Schuller (2009) acknowledge that TVET lecturers on industry placement accessed new or improved industrial processes and other forms of organizational knowledge. In civil engineering, lecturers learnt to use "the correct mega Pascal (MPa) of concrete to ensure a strong material bond, surveying, and soil testing" (Lecturer 1). Through the application of different concrete ratios, lecturers explained that "the foundation for the workshop must withstand vibration and load from heavy machinery" (Lecturer 8). Through experiential learning, lectures "learnt calibrating, installing programmable controllers, assembling solar plants, and testing equipment and underground cable faults" (Lecturer 18). Additional activities during WIL included inspecting "workpieces for defects and ensuring conformance to specifications" (Lecturer 10). The knowledge of engineering skills empowered lecturers to have a deeper understanding of engineering processes and procedures.

Using machines

Experiential learning in industry involved testing, repairing, or manufacturing using different machines. Before using the machines, Lecturer 6 confirmed that "artisans introduced the machines and showed the controls and demonstrated the machine operations." While in industry, Lecturer 5 "did gouging welding, to repair and maintain conveyor feeders." Through WIL, TVET lecturers developed the knowledge and skills to operate different machines and equipment. Through workplace experiences TVET lecturers acquired in-depth discipline knowledge about their trades and the ability to convey knowledge to students, strengthening the application of theory to practice in authentic settings. Enhanced knowledge about how equipment functions and recognition of the indicators of machine behavior enabled greater efficiency as a trades practitioner. For example, lecturers gained the expertize to diagnose operational issues with machinery by recognizing the sounds that indicated faults with machine function. Lecturers were able to "understand the operations and meaning of different sounds produced by the machine" (Lecturer 1). Using a diverse range of machinery types and sizes, TVET lecturers "learnt machine usage procedures" (Lecturer 4), which enabled greater awareness of using machinery in the workplace. While on the WIL placement, Lecturer 4 "fabricated different shapes, … drilled holes, and aligned flanges (steel cylinders) from drawings." Knowledge of properties of metals and workplace processes enabled the TVET lecturer to perform the tasks efficiently.

Programming and simulation

In addition to acquiring discipline knowledge around operating machinery, TVET staff also boosted their ability to "use programmable machinery to program and do a test run to see if the program was correct" (Lecturer 15). Lecturer 15 also attested to improvement in discipline knowledge about programming through his ability to "use lathe and milling machines to mount different brass blocks for machining to precision". Similarly, Lecturer 17 learnt from "Computerized Maintenance Management Systems and MS Projects software to guide daily tasks." Lecturer 18 used "testing equipment and computer software to map out electrical pathways and locate electronic malfunctions in the vehicle electrical system." The knowledge of using programmable machines and software enhanced TVET lecturers' ability to plan workplace tasks and understand programming concepts.

Soft Skills

Soft skills are generally those intangible and non-technical skills that lecturers experienced and strengthened through WIL. Talaue (2022) describes soft skills as non-technical abilities and abstract personality skills determining one's strength as a leader, mediator, negotiator, and listener. The soft skills strengthened TVET lecturers' capacity to engage and inspire students as confidence, communication and networking capabilities improved (Ibrahim et al., 2017).

Computers skills and communication

The lecturers commented on the "communication skills, creativity, problem-solving and attention to detail" (Lecturer 2) developed while on WIL. They "learnt to communicate with other trades like plumbers and electricians" (Lecturer 13). Lecturers valued the sense of teamwork in the workplace and enjoyed "shar[ing] ideas and tools and help[ing] each other because you cannot do everything if you are alone" (Lecturer 5). Staff gained expertize in "computer skills … such as MS Project, and to plan work completion within a specific period. I am drawing using AutoCAD, civil design software, and Prokon structural analysis" (Lecturer 14).

Teamwork networking and problem-solving

One lecturer needed assistance from "two or three laborers … two for tiling and one for paving when bricklaying. Other trades like plumbers, electricians, plasterers and carpenters form part of the team I engage with to complete a good job" (Lecturer 13). TVET lecturers made valuable connections "through discussions with colleagues, mentors and networking with qualified artisans" (Lecturer 14) while in the workplace. Nine respondents confirmed that they benefited from the networking opportunities in the workplace. The industry connection was deemed critical for applying "theory in industry through problem-solving, troubleshooting and repair of electrical connections and components" (Lecturer 2).

TVET lecturers' experience in industry improved acquisition of soft skills such as computer skills, communication and teamwork, networking, and problem-solving. These skills are vital to executing workplace processes (Ellis et al., 2014; Payne, 2018). Procurement of soft skills required by industry is essential for lecturers to convey the importance of role model practices when working with students (Mesuwini et al. (2020).

Reflection on practice

TVET lecturers looked back on practical experiences and considered their strengths and weaknesses and whether they used appropriate methods, by analyzing where challenges emerged, considering how to overcome them, and determining the future directions of their practical experiences. Through reflection "… we looked back and asked what the cause of a particular part to fail was" (Lecturer 7). Reflection was evident in the morning meetings where lecturers "considered what was done the previous day and if those tasks were accomplished without hardships, before starting on new tasks" (Lecturer 7). A flashback to check how events unfolded helped lecturers learn from realizing what they could have done differently.

Workplace mentoring

Mentoring in the workplace is a process where an experienced artisan provided ongoing and on-the-spot guidance to TVET lecturers during WIL, on processes and technical information. Lecturers acknowledged that "The artisans were always on the forefront assisting to have a job started and outlining the ways to be followed to make sure the job is correctly done" (Lecturer 17). During WIL, "Proper workplace training had to take place before using any machine" (Lecturer 14). Mentoring was a vital component of lecturer learning, which emphasized inquiry, experimentation, and reflection.

Awareness of Workplace Culture

Safety precautions and induction

Safety precautions, workplace induction and teaching skills [PCK] formed the sub-themes of awareness of workplace culture. Throughout the WIL experience, lecturers were required to conform to industry operations, organizational ethos, and safety practices, including daily routines. Awareness of workplace culture emanates from understanding the company environment, its norms, practices, routines, cultures, safety protocols, guidelines, approaches and other company-related factors (Seufert et al., 2021). Through awareness of workplace culture, TVET lecturers gained insights into human activity within the organizational context.

In response to awareness of workplace culture and safety precautions in industry, Lecturer 13 "clean[ed] up and took tools back to the storeroom. We put wheelbarrows, spades, levels, trowels, and other tools in the storeroom." Similarly, "The artisans and the supervisors give us induction first. You cannot use any machine without induction on how that machine works" (Lecturer 12). Through engaging in industry settings, lecturers "learnt precautions when working in confined spaces" (Lecturer 4).

Safety refers to managing all operations within an industry to protect employees and assets by minimizing hazards, risks, accidents and near misses (Mora et al., 2018). Lecturer 8 reported that TVET lecturers were "reminded of the importance of safety" and were provided an update on safety issues about behavior, hazards and wearing of personal protective equipment. There were constant reminders about "safety awareness to ensure that precautions were followed at all times when working with machines" (Lecturer 11). When lecturers follow safety precautions, they safeguard human life, prevent damage to machinery, and thereby prolong machine lifespan.

Teaching Skills

The participants also identified their experience and exposure to variety of teaching and learning approaches and methods within the workplace, which enhanced their understanding and informed the design of WIL activities for students. These TVET lecturers are referring to PCK, that refers to "content knowledge that embodies the aspects of content most germane to its teachability" (Shulman, 1986, p. 9). The finding further revealed that this aspect was not included within the WIL material but stressed their concern that future WIL programs should include PCK and related teaching skills. Lecturers 5 explains "I am a teacher and expected WIL to include impartation of teaching skills". It follows that lecturers need to possess adequate teaching skills to enable high quality engineering education, as prescribed by Sustainable Development Goal 4 (United Nations, 2022).

DISCUSSION

Benefits of Work-Integrated Learning for TVET Lecturers

This study confirmed that WIL in South Africa improved TVET lecturers' workplace skills and subsequently impacted positively on their ability to embed WIL pedagogy in their teaching. Findings suggest that WIL equips lecturers with practical skills, making them better placed to understand workshop equipment and operations. The skills assist lecturers to use workshop equipment in colleges and prevent machine accidents, thereby preserving machines' life span. Working under close supervision in the workshop developed WIL lecturers' self-confidence to handle machine operations and design students' projects (Atsumbe & Saba, 2008; Mhlahlo, 2020). Kolb (1984) acknowledges that knowledge is created through experience transformation. This was reflected in the TVET lecturers' making sense of practical experiences gained and understanding the relationship between equipment parts and drawings. In support, Khuzainey et al. (2020) concur that vocational teachers could use hand tools and explain step by step processes and troubleshooting because of the practical skills acquired during industry exposure. The work of Jawarneh and Al Azam (2017) found that the skills lecturers needed included appreciation of the value of materials and consumables and using them prudently. Lecturers gained skills to ascertain the material requirements and resources for discipline projects relevant to students' learning experiences. They acquired automation skills by programming machines and running simulation operations before starting full-scale mass production. Lecturers further highlighted and appreciated the use of computer numerical control (CNC) machines. CNC machining involves a manufacturing process which employs computerized controls and machine tools to remove layers of material from a workpiece (Mamadjanov et al., 2021). Similarly, Ellis et al. (2014) echoed that listening skills were paramount in industry where TVET lecturers understood different machine sounds, thereby acquiring skills to control and maintain machines in good working order. The use of machines formed the essential skills for industry experience, translating to industry exposure which enhanced lecturers' knowledge for teaching.

Benefits of Work-Integrated Learning for Teaching

Given the importance of TVET lecturer knowledge to student progress, enhanced discipline knowledge gleaned from lecturers' involvement in WIL is key to improving TVET education delivery. Shulman (1987, p. 9) further explains: "The teacher needs to understand that something is so and further understand why it is so". TVET lecturers acquired a deep understanding of the technical subject matter in industry and indicated their experience and exposure to PCK for engineering education during lecture interaction. By doing so, knowledge and skills were improved, leading to a lecturer with command of the subject matter. For example, experience of working with engineering drawings enhanced teaching performance because lecturers could interpret drawings and apply that knowledge in their teaching. These skills provide a platform for lecturers to explain and demonstrate practical processes while teaching. The findings align with the soft skills outlined by Payne (2018) that computer skills strengthened creative problem solving and interpersonal skills, skills valued by employers. Furthermore, lecturers benefited from industry contacts established while on WIL for co-teaching opportunities in partnership with industry personnel. In addition, TVET lecturers maintained awareness of technology advancements through ongoing connections with industry.

Lecturers' Skills Development

Improved soft skills enriched lecturers' careers, improved their teaching effectiveness and quality, and increased efficiency in managing students and equipment. Skills such as problem-solving, communication and computer skills in teaching engineering fields at TVET colleges were developed by WIL (Mesuwini, 2015). Computer skills are necessary to make engineering processes simpler, faster, and more efficient. Improved computer skills enable lecturers to be more efficient in their lesson preparation and planning. Lecturers acquired the expertize to develop digital presentations and the ability to design innovative assessments using technology. Computer technology provided quicker workplace solutions during WIL, which assisted lecturers to apply digital educational technology tools to teaching and learning scenarios.

TVET lecturers acquired diverse communication skills in industry, including written, oral, and non-verbal communication. Advanced communication skills enable TVET staff to implement a broader range of teaching methods and ensure greater clarity for students. Demonstration of practical skills in workshops improved as lecturers had the capacity to draw on different communication techniques. WIL experiences derive several benefits, such as communicative abilities and interpersonal relations (Govender & Wait, 2017). Lecturers could communicate more effectively and acquired the ability to listen, thereby improving two-way communication with all stakeholders.

Teamwork and Networking

Teamwork demands the collaborative effort of lecturers and artisans to achieve a common objective. Lecturers worked towards building collaborative groups to achieve common goals and acquired open communication skills from supervisors and colleagues. Teamwork skills developed in the workplace enhanced team teaching activities that facilitate diverse ideas and perspectives in the student experience. Teamwork encouraged lecturers to implement group work tasks so students could learn to listen and function as a cohesive unit. TVET lecturers acquired skills from workplace colleagues and built relationships while in the workplace (Bukit, 2012), that strengthened their capacity to build relationships with students.

Lecturers developed networks that involved interacting with artisans, engineers and other industry personnel, developing and exchanging contacts and information. WIL provided an opportunity for academics to retain industry currency (Dickfos, 2019) and improved networking between academia and industries.

Problem-Solving

Through experiential learning, lecturers acquired practical skills to diagnose and solve real-world problems through prioritizing and selecting alternative solutions to problems. Problem-solving skills helped lecturers to learn, think and act beyond the confines of their course structure (Ellis et al., 2014) and learn compulsory fundamental practical tasks (Mesuwini & Thaba-Nkadimene, 2021). They learnt to identify a problem, consider approaches to solve the problem and chose optimal strategies through discussion and meaningful engagement. In support, Cheong et al. (2014) acknowledge that learning takes place beyond the confines of the classroom, where an opportunity is availed for first-hand experience through WIL.

Safety Precautions

WIL experiences reinforced safety precautions with awareness of safety procedures and potential work hazards. Khalid et al. (2021) posit that toolbox talks caution workers to care for themselves and remind them to perform their tasks with due care. Toolbox talks are quick meetings that focus on safety topics related to a specific task, such as workplace hazards and safe work practices. Mastery of, and adherence to, the safety precautions assist lecturers in saving lives, reducing injuries, and preserving machines and tools. Safety precautions also built a sense of lecturer responsibility and ownership that they instilled in students. The life of tools and equipment was prolonged when lecturers imparted safety precautions to students, which improved their approach to tools, machines, and equipment usage.

Induction

Induction promotes lecturer learning through WIL by familiarizing and adapting to industry settings. Govender and Wait (2017) identified significant WIL benefits through induction, where lecturers were introduced to the equipment, working teams, and allocated tasks and responsibilities. Through induction, TVET lecturers were introduced to company culture and processes to gain familiarity, feel socially comfortable and become aware of their responsibilities. Induction training reinforced the importance of introducing students to machines and equipment before using them to ensure they understood the working procedures. Lecturers acquired the background information about the work environment and equipment, preparing them effectively to facilitate student workshops. It was during induction that teaching skills, encompassing PCK were raised and discussed.

During WIL lecturers improved their mentoring skills through realizing the value of being mentored in the workplace. Observing the practices of artisans during the mentoring process, lecturers acquired skills in mentoring to support student learning with targeted mentoring strategies. Through mentoring, lecturers developed stronger teamwork and networks, received feedback and recognition for good work and improved knowledge transfer from artisans. Mentoring further improved TVET lecturers' technical competencies and extended their professional knowledge base to guide students. Uen et al. (2018) suggested that mentoring may positively influence and shape lecturer learning because a mentor is perceived as knowledgeable, skilled, and competent. Students receive individualized instruction and technical assistance through mentoring, which concretizes the knowledge they learn.

Reflection

Reflection increased awareness of experiences and allowed TVET lecturers to learn from errors and make informed decisions. As reflective practitioners, lecturers encourage students to reflect on their daily practices. Learning through reflection developed an understanding of how lecturers could have performed specific actions in the industry. Reflection involved re-playing the scenario, critically analyzing and asking questions about what happened, and why it happened, what factors contributed to the event, and what could have been done differently (Kolb, 2014; Korthagen, 1999). Through the experience of reflecting on workplace practices, TVET lecturers realized the value of reflection as a learning tool and subsequently encompassed reflection in their teaching practice. Dewey (1933) posits that "we do not learn from experience but from reflecting on experience." Reflecting on practical experience promotes learning and is fundamental to awareness of workplace skills.

CONCLUSION

This study explored TVET lecturers learning during WIL and outlined the experiences and skills gained. The study validated the benefits of WIL to TVET lecturers. TVET lecturers gained technical knowledge and industry currency to operate equipment, tools, and systems in the workplace. They also acquired practical expertize and established communication networks, both of which informed and improved teaching methodologies. Lecturers were inducted and mentored in a community of practice with subsequent improvement of professional practice. Further, TVET lecturers gained self-confidence, which translates to a lecturer with the ability to convey a wide range of workplace skills to students. TVET lecturer learning emanated from practical experience, observation, and learning from others. Lecturers gained PCK, which shaped subject matter knowledge and influenced lesson delivery techniques. Through awareness of workplace culture, TVET lecturers developed knowledge of educational contexts related to understanding safety issues around complex work environments. This study showed that industry skills gained by TVET lecturers during WIL improved teaching and credibility with students.

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