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This study sought to explore emerging university-industry partnerships in technology transfer education, the process for the engagement, and benefits to the learning and teaching experience. Participants were a convenience sample of ten lecturers at a technology university (females = 80%; management sciences = 70%). Data on the scope and nature of industry partnership practices and experiences were collected using semi-structured interview. Thematic data analysis revealed the lecturers to perceive benefits to learning and teaching from the university-industry engagement, including the use of field practice examples, customer service-orientated skills, innovation learning and technology transfer, curriculum enhancement and professional learning. A work-integrated approach to learning appears to be a serviceable model for real-world technology transfer education outcomes.

Keywords: academics, industry exposure, teaching and learning, pedagogical practices

Introduction

Higher education institutions (HEIs) worldwide are expected to produce graduates who are ready for industry and possess skills that are suitable for the needs of industry (Bates 2011; Patrick, Peach, Pocknee, Webb, Fletcher, & Pretto, 2009). In order to achieve this goal, work-integrated learning (WIL) has been adopted by HEIs to adapt the university curricula to industry demands. WIL refers to a range of educational activities that integrate theoretical learning with its application in the workplace, community, studio or practice setting, and provide an authentic experience of work or professional practices that typically occur in these settings (Patrick et al., 2009). In the context of HEI, university-industry-government collaboration and partnership are increasingly adopted to support the emerging creation and dissemination of emerging technologies (Kenney-Wallace, 2000; Robertson, 2000). The South African Department of Higher Education (DHET) policy framework for funding of teacher development requires academics to engage in industry to "enable the development of appropriate, relevant, responsive, paced, quality curricula, or course materials" (DHET, 2013, p. 8) which in turn will improve the quality of teaching. Quality industry partnerships are those that enable knowledge transfer. However, the nature of university and industry experiences in the context of technology education in South Africa are in need of documentation to inform WIL practices in a developing country setting.

In the context of manpower needs of the 21st century, the higher education sector must be responsive to knowledge production, commercialisation, commodification and entrepreneurship opportunities with industry partners (Robertson, 2010). Commercialisation refers to translation of learning activities into industry-relevant products in which students and academics are both customers and entrepreneurs with industry partners

(Hejwosz, 2010). This is an aspect of commodification of education. Commodification is when education is a service provision rather than just an academic function (Dzvimbo & Moloi, 2013). Through the commodification of education, universities become teaching entrepreneurship centres (Jenvey, 2015), and industry partners are essential to enhancing the chances of higher education institutions achieving their business-oriented activities. In order to achieve this, Biggs and Tang (2011) advocate for constructive alignment of teaching and learning activities with assessment so that what the students learn can change how they view the world and how they can change it.

In South Africa, work-integrated learning is increasingly adopted for translating classroom or laboratory-based learning and teaching experiences into industry-relevant skills (Higher Education South Africa [HESA] & South African Qualifications Authority [SAQA], 2009). WIL holds promise to transform higher education practices to serve the needs of industry, and to enable academics to design and teach curricula that are relevant and responsive to the needs of industry. This study investigated the nature and scope of a university-industry partnership for WIL as engaged by academics of a South African technology university.

University-industry collaboration

WIL requires of academics to apply their subject expertise to address the changes in industry practices (O'Kane, 2010). For instance, the link with industry creates an opportunity for collaboration regarding programme development and delivery, which further ensures relevance (Duncan, 2014). WIL also allows for industry-relevant research or the commercialisation of public research and development (R&D) outcomes, thereby increasing productivity. For example, a study in Chile and Colombia showed that collaboration with universities substantially increased the propensity of firms to introduce new products

and to patent (Marotta, Mark, Blom, & Thorn, 2007). Thus, successful industry-university collaboration is premised on mutual benefit. WIL has the potential to contribute to curriculum development by ensuring that what is taught is relevant to industry (Moll, 2002). Universities' curricula should continue to be aligned to what is happening in industry, and also to inform industry which profitable concepts to adopt (Choy & Delahaye, 2009).

The South African university-industry context
In the South African knowledge development and transfer context, industry engagement typically aims to respond to the needs of the industry by offering *applied* knowledge and skills required in industry (Ngetich & Moll, 2013). HESA and SAQA (2009) further state that "Universities of Technology have typically focused on vocationally orientated diploma programmes with work-integrated learning as a compulsory component of qualifications" (p. 9). South African technology universities aspire to these partnership development goals and develop strong links with business and industry through public and private partnerships (PPP) and other mechanisms (CUT, 2014–2020). University-industry engagement is premised on the integration of industry-based experiences into learning and teaching delivery outcomes (Akili, 2011; Duncan, 2014).

This study aimed to explore the university-industry engagement practices and experiences for teaching and learning enhancement. The study sought to answer the following research questions:
1. What industry engagement practices are feasible by a technology education institution?
2. What WIL experiences are supported by the industry partnerships?

Method
Participants and setting
A purposeful sample of ten academics from three faculties (Engineering ($n = 1$), Management Sciences ($n = 7$), Health and Environmental Sciences ($n = 2$)) of a university of technology were the participants (females = 80%). The time spent by different participants in industry presence ranged between five and ten days for different levels of collaboration.

Data collection
Data were collected on the experiences of academics who have engaged with industry, including:

• the purpose of their industry exposure; and
• the specific activities they were involved in.
Other questions probed how academics linked industry exposure to WIL for their teaching and students' learning, including what they learnt from the engagement with industry for efficient two-way knowledge transfer between university and industry.

Data analysis
Data were thematically analysed along five main categories: purpose of industry engagement and practices, curriculum enhancement, innovative learning, knowledge transfer, and significant inter-professional learning. Credibility and trustworthiness were enhanced by establishing any emerging corroboration of data collected from academics and from the literature review.

Findings and discussion
Academics reported their industry engagement to have involved a wide range of activities (depending on their area of expertise) such as client service, information management, quality and inventory control, as well as global travel. The pertinent themes from the data analysis are presented and discussed in Table 1.

Customer service
Learning about customer service practices was an important quality of industry engagement. For example, a Tourism lecturer said that

> *air fares, ticketing and Galileo are crucial to the success of a travel consultant and/or manager. From industry's side it was also identified that even once employed, consultants should receive regular training to stay updated with a fast-changing industry* (Lecturer #1, Tourism).

> *In our profession, technology is advancing so fast at the moment. I think if you or somebody close to you goes for an X-ray, you will notice that you no longer get films, you get CD's, not only on X-rays but also scans they are all digitalised. That is why us working at a technology university, not keep up to date with what is out there, what will we tell or teach our students?* (Lecturer #10, Radiography).

> *We saw patients together with industry partners and she would do the consultation and we would analyse them together. That's what we did, but I didn't do any*

Table 1. Themes and supporting statements

Themes	Illustrative statement by participants
Customer service	• Provision of effective customer service, including air fares and ticketing • Regular in-house training to keep abreast of new developments • Improving customer service through emerging technology • Caring for patients
Curriculum enhancement	• Linking theory with practice, studying culinary skills and working in the kitchen • Exposure to specialised imaging and general radiography • Alignment of curriculum and qualifications in tourism
Innovation learning and knowledge transfer	• Application of new technology available in the work place • The importance of proper compilation of reports and inventories
Professional learning	• Aligning curriculum content with students' learning, outcomes, and learning strategies • Improvement of professional learning in dental assisting • Induction of students and regular monitoring of their progress

patients' treatments, but I assisted and saw how she conducts her surgery (Lecturer #5, Dental Assisting).

These findings support the notion of industry-university partnerships to prepare students to be both customer-oriented and technologically savvy as befitting of any information service-oriented industry (Wirtz & Lovelock, 2016).

Curriculum enhancement

The lecturers reported curriculum enhancement effects from their engagement with industry as follows:

Industry-linked learning provided opportunities for my students to work in the kitchen for the culinary, food and beverage services (Lecturer #3, Hospitality).

Students had exposure to specialised imaging and general radiography from working at the practice (Lecturer #10, Radiography).

Previous studies by Laguador and Ramos (2014) and Breen and Hing (2012) reported university-industry cooperation to inform and accelerate the development of industry-responsive university curricula. Similarly, Timperley et al. (2008, p. 12) were of the view that "effective development requires theories of curriculum, effective teaching and assessment to be developed alongside their application to practice" (as with industry-university partnerships).

Innovation learning and knowledge transfer

Lecturers perceived industry engagement to provide for cross-learning between university and industry partners in applications of technology. A case in point was from radiography and dentistry. For instance, a lecturer from the Dental department reported learning about new materials to improve innovative teaching:

I got exposed to new materials which the industry partner was using and new equipment and I have since bought the materials and equipment and shown them to our students (Lecturer #5, Dental Assisting).

This finding suggests workplace experience to enable the lecturer to transfer knowledge gained from the workplace to the academic environment (Patrick et al., 2009). Networks formed through university-industry partnerships are conducive to university-industry knowledge transfer and early adoption of innovations (Dolinska, 2013).

Professional learning

All the lecturers reported of their industry engagement to positively impact and advance their professional learning. For example, a Hospitality lecturer pointed out that she has learned from industry practical examples and technologies that could be used to enhance students' learning. She has this to say:

Industry engagement makes me enthusiastic about my teaching because when I go to these hotels I always come back with new examples,

new technology, things that I haven't seen before (Lecturer #4, Hospitality).

Another lecturer from Hospitality observed that

industry engagement has influenced my teaching a lot, along with other subjects, and has made me more confident about my students' employment (Lecturer #6, Tourism).

Another reported that

in one hotel we engaged their training department on how their training unit inducted the students and monitored their progress within the hotel (Lecturer #3, Hospitality).

A lecturer from Engineering reported to have experienced exposure to industry as follows:

l learned about project planning and in this case the project was the biggest mall in Africa, the one in Midrand started 3 years ago, and also the whole process they get to do before construction, like problems and how to get solutions or how to resolve them (Lecturer #7, Engineering).

Timperley, Wilson, Barrar and Fung (2008), Vescio, Ross and Adams (2008), and Breen and Hing's (2012) perceived industry-engaged lecturers to achieve heightened and accelerated professional learning. This process likely occurred from the university-industry partners being communities of practice in the respective disciplines (Schön, 1983).

Conclusion

From this study, we conclude that university-industry collaborations and partnerships through WIL have the potential to contribute positively towards improving quality teaching and learning. Key impact areas of these partnerships are improvement of customer service, innovative learning and technology transfer, curriculum enhancement, and professional learning. We further conclude that university-industry partnerships should be designed to optimise student learning, lecturer development and induction of students into their respective professions.

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