

Article

A Framework for Holistic Assessment of Professional Competencies in Environmental Health WIL at a University of Technology

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Abstract

The benefits of work-integrated learning (WIL) in higher education are well documented. Conversely, the assessment thereof, across disciplines, remains challenging. WIL is embedded in the environmental health (EH) degree at a University of Technology (UoT) in South Africa (SA), with similar challenges. The absence of explicit competency indicators and associated assessment criteria in the current curriculum necessitates an understanding of the full range of professional competencies necessary for achieving environmental health goals. Concomitantly, research relating to EH WIL and its assessment in EH programmes are sparse. The aim of this study is to present a holistic assessment framework for competencies developed due to WIL. Using a qualitative design, data collection occurred through in-depth interviews, document analysis and focus group discussions. Data analysis was guided by the Legitimation Code Theory's (LCT) Specialization dimension. The results foregrounds competencies beyond mere knowledge integration and technical skill development in WIL. It is thus recommended that current assessment be altered to adopt holistic assessment of EH WIL and include the full range of professional competencies essential for EH practice success. Further research may explore where additional opportunities exist for authentic assessment of the foregrounded competencies, throughout the programme, additional to the WIL assessments.

Keywords: work-integrated learning; environmental health; holistic assessment framework; competency indicators; assessment criteria



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1. Introduction

Assessment of students' growth and development in higher education institutions (HEIs) across the globe, have transitioned from mere knowledge and skill 'testing' to consider an extended range of competencies required for employment (Gulikers et al., 2004; Bosco & Ferns, 2014). Upon programme completion, graduates are expected to have attained competencies beyond theoretical knowledge and technical skill (Dean & East, 2019), to ensure that the institution and its graduates are current, relevant, and responsive to societal demands and 21st century employability requirements (Tushar & Sooraksa, 2023). Desired outcomes for graduates from HEIs, are ensuring that they easily transition

from the classroom into the workplace (Adegbite & Govender, 2022) and that they can meet the demands of the workplace with relevant responses in variable contexts. Additionally, graduates are expected to possess a combination of graduate attributes, relevant to their institution and discipline (Oraison et al., 2019). To meet these requirements, most HEIs have included work integrated learning (WIL) as part of their undergraduate programmes (D. Jackson & Dean, 2022). In addition to presenting an authentic learning context (Bosco & Ferns, 2014; Gulikers et al., 2004) WIL holds benefits for various disciplines, HEIs and industry, presented in the literature by, among others Dunn et al. (2018), Rowe et al. (2012), Govender and Taylor (2015) and Ndlovu and Mofokeng (2018).

WIL, defined as: “An umbrella term to describe curricular, pedagogic and assessment practices, across a range of academic disciplines that integrate formal learning and workplace concerns” (CHE, 2011, p. 4), has always been part of University of Technology (UoT) undergraduate programmes in South Africa (SA) (Scholtz, 2020) and is embedded in its curricula to meet the workplace demands. In the WIL modality of work placements, described as a “way of gaining on the job experience in the real world” (Maseko, 2018, p. 1316), WIL may positively contribute to the students’ perception of their work-readiness (D. Jackson & Dean, 2022) and provide them with experience and opportunity to learn about professional culture and -discipline (Trede, 2012). Similar WIL benefits even extend to students who are enrolled in generalist undergraduate programmes, such as health sciences at traditional universities (Abery et al., 2015). The benefits are reported to include, e.g., students’ understanding of workplace operational processes and the development of soft skills, such as developing an understanding of the situation in which different communities find themselves (Abery et al., 2015).

WIL affords students with authentic and career-focussed experiences (Dunn et al., 2018; Rowe et al., 2012). The preparedness of graduates may be gauged through the assessment of competencies of undergraduate students and their ability to solve discipline-specific problems (Bosco & Ferns, 2014). Problem solving abilities are desired as a 21st century employability requirement (Tushar & Sooraksa, 2023), and require a full range of competencies, beyond mere application of theoretical knowledge and technical skills (Tushar & Sooraksa, 2023). This is especially true in disciplines where there are not right or wrong solutions to real world problems, but rather desired or suitable outcomes (Stewart et al., 2023). In this instance, WIL aides in developing a combination of analytical and critical thinking skills for decision-making and problem-solving (Gerding et al., 2020a).

Literature confirms that assessing the competencies gained through WIL is difficult, complex, time-consuming, and subject to biases—by way of the assessor (D. Jackson, 2018; Ferns & Zegwaard, 2014). Designing the method and practice to assess competencies reliably and holistically, therefore necessitates employing a variety of assessment methods (Winchester-Seeto & Rowe, 2017) and includes various assessors (Heidari et al., 2019). Von Treuer et al. (2011) suggest probing recent graduates to obtain a clear understanding of the competencies they gained due to their work placement and for opinions of their fulfilment the work placement programme once they are employed. This may assist in determining competencies needed for a specific job, and whether the work placement contributed satisfactorily to the development of the needed competencies (Von Treuer et al., 2011). Boud and Falchikov (2006) regard the student, who is undergoing learning in the workplace, as an important stakeholder in the assessment of their own competence, and thus they can evaluate their own competencies and gauge their competency gaps. Additionally, the supervisor in the workplace, who spends more time with the students during the work placements than those assessing their growth, is merely a bystander in the assessment of competence (J. Jackson et al., 2017; Ajjawi et al., 2020; Ferns & Zegwaard, 2014) for varying reasons, such as supervisory leniency, being subjective, no assessment

training and inconsistencies across different workplace settings. However, WIL supervisors can and do prove valuable in the assessment of WIL competence (Garraway & Reddy, 2016; Bosco & Ferns, 2014; Peach et al., 2014) as they are better able to align student development to professional requirements. Ajjawi et al. (2020) emphasise aligning the WIL assessment practice with what students learn in the workplace, to enhance the authenticity of the assessment. Authentic assessment of WIL means the assessment task takes place in high proximity to the workplace, and the task itself requires active engagement by the student in real world tasks (Bosco & Ferns, 2014). Gaining the student perspective on their experiences in the workplace setting may assist in improving their educational experience and can help in making the assessment more holistic (Billett, 2014).

This article presents a holistic assessment framework for Environmental Health (EH) WIL competency, considering the competencies gained and/or developed during WIL, by way of the work placement modality, and reported by the students themselves, and those observed in the students by their WIL supervisors during the work placements. The theoretical lens used is Legitimation Code Theory (LCT) (Maton, 2014) which guided the data analyses, and organised the results which informed the aspects of the holistic WIL assessment framework for EH competence.

Building on the contextual backdrop illustrated, this study is intentionally situated within a single university of technology, framed as a contextual boundary that enabled focused analysis of assessment practices in Environmental Health education. In the absence of formal WIL assessment guidelines—across the professional body, curriculum, and other institutions—the framework proposed here seeks to strengthen assessment practice at this institution, while offering insights that may inform broader standardisation efforts. Given that all EH programmes register with and are quality assured by the same professional body, the study's findings hold relevance for wider application across accredited programmes.

The specific research question (RQ) asks:

How should assessment practices of workplace-based learning (WBL) be structured to measure undergraduate Environmental Health (EH) student's learning experience holistically?

The sub-research questions (SRQs) ask:

- SRQ1: What competencies do students acquire during work-placements?
- SRQ2: What competencies are reflected in the students' work-place reflection journals?
- SRQ3: Which competencies do the workplace EHP supervisors observe in the students during their work-placement?
- SRQ4: Where should the assessment of competencies developed during workplace learning be oriented on the LCT Specialization plane?
- SRQ5: What does a holistic framework for the assessment of workplace-based learning in the EH programme look like?

2. Overview of the Environmental Health Profession in South Africa

Environmental Health (EH) practice is an allied health profession, concerned with government's responsibility to ensure a healthy environment for all in South Africa (SA) (RSA, 1996). This role is performed by Environmental Health Practitioners (EHPs) through rendering municipal health services, with the aim of preventing adverse health outcomes for people (Shezi et al., 2019; Morse et al., 2020). The profession requires that practitioners solve EH issues or intervene where hazards in their environment pose a potential risk to human health (Patthanaissaranukool et al., 2020). To achieve this, EHPs employ risk assessment techniques, through hazard identification, -evaluation and -prioritization relative to the extent and severity of the potential or real risk (Shezi et al., 2019). The practice is underpinned by legislation, but not confined to its limitations (Dhesi & Lynch, 2016). Due the dynamic and multi-faceted nature of EH (Jepngetich et al., 2019; Morse et al.,

2020), the EHP must be able to work as part of a team within EH, with other sectors and disciplines in municipalities, as well as with members of the public which includes whole communities (Shezi et al., 2019). Additionally, EHPs must employ strategies suitable to the socio-economic contexts of SA society (Morse et al., 2020), solve EH problems by employing innovative strategies that comply with legislation but navigate beyond its confines to reach desired EH outcomes (Rodrigues et al., 2021). Often EHPs are the first point of contact between the aggrieved communities and local government, and thus require a specific competency set to manage the community temperament and solve problems to satisfy the community and achieve environmental health goals (Gerding et al., 2020a). This implies that to work competently, the EHP must have a range of competencies that extends beyond knowledge and skill, but which also includes behavioural dispositions. Behavioural dispositions are the behaviours exhibited in response to stimuli in the workplace. In EH practice, it includes the observance of ethical codes and adhering to acceptable principles of behaviours expected of an EHP in a specific to attain an appropriate outcome (Stewart et al., 2023).

Despite the many benefits presented by WIL such as enhancing student development and developing a professional identity (D. Jackson, 2018), for the EH programme at a UoT in SA there are no clear proficiency standards for the assessment of competence developed in the student due to the learning occurring in the workplace. Although WIL is embedded in its curriculum (SAQA, 2017), the guidelines and criteria for assessing competencies developed in EH students in the workplace are not explicitly stated. This EH curriculum clearly states the exit level outcomes and its associated assessment criteria, having the main emphasis on theoretical knowledge and technical skill. Subsequently, the foci of assessments are aligned to the latter competencies. The full range of competencies needed to practice EH successfully, as described by e.g., Shezi et al. (2019), Morse et al. (2020), Rodrigues et al. (2021) and Stewart et al. (2023) is not assessed. The absence of clear competency assessment criteria for WIL presents challenges, the EH programme in SA.

3. Assessments in Work-Integrated Learning

Assessment of the full range of competencies that are required to practice EH in specific contexts is necessary. If exposed—by making it explicit in the training, learning and assessment of students—the holistic competency range required may be appreciated and understood by students as part of their full professional imperatives beyond merely using knowledge and technical skill, e.g., applying appropriate legislation to solve EH issues (Dhesi & Lynch, 2016; Stewart et al., 2023). The holistic growth of students into professionals possessing desired competencies can therefore be achieved by making explicit the implied professional requirements, together with including these in a holistic assessment of competency. Students recognise competencies important to practice EH during their work placements and subsequently try to acquire and/or develop these (Von Treuer et al., 2011; Boud & Falchikov, 2006). Additionally, the EH practitioners who supervise the students, and who spend more time with them in the workplace during WIL, can provide valuable feedback as it pertains to desired competencies for successful EH practice, and that which they observe unfolding in the students during WIL (D. Jackson, 2018).

The assessment of competencies developed due to workplace learning remains challenging for a variety of reasons, and these challenges span global regions and disciplines. The following section presents an overview of these challenges.

3.1. General Challenges Associated with WIL Assessment

Assessing WIL in academic programs proves difficult due to factors such as the validity and reliability of assessment methods (Ferns & Zegwaard, 2014), the time-consuming nature

of conducting developmental type of assessments, e.g., formative, (Palermo et al., 2015) and having to individualize assessments, either due to the diverse contexts in which students are assessed, or where group assessment of learning is not possible (Winchester-Seeto & Rowe, 2017). The tasks associated with programmes that have a WIL component, regardless of modality, such as coordinating placements, fostering relationships with industry, ensuring an acceptable quality in the workplace learning experience for the student has been found to increase the WIL academics' workloads (Bilgin et al., 2017). Contributing to WIL assessment complexity are that real-world problems can be complicated and therefore do not have a straight-forward right or wrong answer (Bilgin et al., 2022).

The issues with WIL assessment, albeit diverse, affect several HE programmes for e.g., Schonell and Macklin (2019) and Rusznyak and Österling (2024) report a lack of standardised assessment criteria for WIL in teacher education programmes across Australia and in South Africa respectively, and in undergraduate law degrees also in Australia (McNamara, 2013).

Although students expect the development of professional behaviours, meaning how to behave in a professional setting, to be developed by HEIs (Assamoi, 2015), the workplace plays a greater role in its development. Subsequently WIL contributes to improvements in all competencies (Pennaforte, 2016), yet this holistic growth is infrequently part of assessment of competence.

In their study to enhance WIL through collaboration between with some SA and Irish HEIs, Winberg et al. (2022), informs that for both countries relationships with partners are important for the success of WIL, yet, for both assessment is a "contentious issue" (Winberg et al., 2022, p. 473) for both as, in practice, in the assessment the academic remains dominant in rewarding a final decision on student performance, despite formal or informal agreement for sharing the WIL load. Apart from academics, all WIL role-layers must be part of the WIL assessment, stating with its design, to enhance its authenticity (Ajjawi et al., 2020), i.e., students themselves, peers, workplace supervisors and/or mentors. Mäkelä (2022, p. 170) reports that collaborative inputs in the creation and design of all aspects of WIL contributes to a "multivocality" which enhances "more authentic assignment types and ensures their trustworthy assessment". During the workplace learning experience, students are often aware of, and able to identify, gaps in their professional development (Heidari et al., 2019) and work towards attaining these (D. Jackson, 2018; Gerding et al., 2020b). If included as part of the assessment team, the WIL role players prove valuable in WIL competency assessment, as variable assessors may aide in contributing to the reliability and validity of the assessment (Bilgin et al., 2017). Using numerous assessors may eliminate the misalignment between competencies encouraged in academia and industry as reported by Omid et al. (2021) and Assamoi (2015), to include the holistic competency range to achieve EH goals.

3.2. Challenges Associated with Environmental Health WIL Assessment

The issues related in the previous section affects the EH programmes globally (Rodrigues et al., 2021) as well as in South Africa. Dunn et al. (2018) reports of a lack of standardised assessments and WIL practices, in EH programmes offered in Australia. Knechtges and Kelley (2015) similarly reported the latter for EH programmes in the United States of America (USA). Omid et al. (2021) reports shortcomings in competencies in new graduates in Iran necessary to meet sustainable development goals. Walekhwa et al. (2022) report similar shortcoming for Ugandan graduates due to a lack of consideration—in the training—of key competencies required for acceptable EH service delivery.

In South Africa, the WIL component in EH programmes offered by the HEIs differ by way of WIL modalities and assessment practices. To enhance EH WIL management

across HEIs offering it, the discipline's professional council, via their professional board for environmental health, strictly monitors WIL in the EH programmes. The education, training and registration committee of this board ensures that their requirements for undergraduate training are met through monitoring and evaluation of all matters relating to training EHP undergraduate students. Subsequently, EHP undergraduate students enrolled for the 4-year degree must complete compulsory WIL, some of which are embedded in the curricula and some not. The board's verification and audit criteria include completion of a minimum 100 days, or 600 h of exposure to the EHP duties (HPCSA, 2018) as stipulated in the professional scope of practice (DOH, 2009). This monitoring includes a mid-year verification of WIL completed for each student in their final year, as well as an audit of student WIL portfolios of evidence (POEs). Contrary to the suggestion that competency frameworks be developed by its professional councils, such as is the case for nursing (Lepre et al., 2021), this is not so for the EH profession in SA, or elsewhere (Knechtges & Kelley, 2015). Instead, for the WIL part of the EH programme, the professional board focus is on the management of WIL in the undergraduate programmes at the HEIs offering it ((Health Professions Council of South Africa (HPCSA) Education Committee, 2018).

The lack of a standard framework, and explicit criteria for competency assessment in EH across institutions offering the programme, presents a void in the development of the full potential of the student (Dunn et al., 2018). This may mean that the competencies students recognise, acquire, or enhance during WIL, could be disregarded as not necessary for holistic competent performance in all areas of their professional training (Nyanjom et al., 2023). They may develop a skewed professional identity (Gerding et al., 2020b) and be misguided of their competence due to the focus on mere exposures to items of the professional scope and time spent in the workplace, which is not an adequate measure of competence (Dunn et al., 2018).

3.3. Commonly Used Assessment Practices in Medical and Allied Health Professions

Literature suggests that to adequately assess technical competencies in medical and allied health professions, an Observed Structure Clinical Examination (OSCE) could be used (Solà-Pola et al., 2020; Harden, 1988). Although OSCEs are acclaimed in assessing clinical skills, their structured nature and associated limitations in validity, reliability and objectivity make them a less favoured method for assessing EH WIL competence (Schuwirth & Van Der Vleuten, 2003; Dewan et al., 2024). OSCEs may miss essential competencies, such as analytical reasoning and practitioner disposition (Schoenmakers & Wens, 2014), which are vital in EH WIL. Unless specifically taught and deliberately included, some competencies may go unassessed (Lai et al., 2022; Witheridge et al., 2019).

The Miller Pyramid (Al-Eraky & Marei, 2016) aims to address limitations in competency assessment by including practitioner behaviour in real-life contexts. However, professional identity formation and collaborative workplace behaviours are not explicitly considered. Simulations and conditioned problem-solving tasks are valuable, particularly for sensitive or ethically challenging issues (Drisko, 2015) but may fall short in capturing workplace realities.

The nature of EH work often deals with “wicked problems,” i.e., problems that have no clear right or wrong answer, but rather desirable or suitable solutions depending on context (Stewart et al., 2023). This necessitates assessment approaches that can accommodate variability, real-world constraints, and practitioner judgement—elements that simulated assessments are limited in capturing.

In contrast, the five-dimensional framework by Gulikers et al. (2004) is better suited to authentic assessment of holistic competencies. It considers actual workplace contexts, resources, and social collaboration. Assessors include the student, WIL supervisor, academic

and, where relevant, peers—dimensions echoed by [Bosco and Ferns \(2014\)](#) and consistent with the WIL component in University of Technology programmes ([Scholtz, 2020](#)).

The aforementioned assessment practices reveal limitations in adequately capturing the full range of competencies required for competent EH practice. These insights informed the rationale for adopting a contextually responsive assessment framework that aligns with the authentic and dynamic nature of EH WIL. Drawing on the five-dimensional model proposed by [Gulikers et al. \(2004\)](#), this study proposes an approach that integrates real-world task design, collaborative work, and stake-holder informed evaluations, involving multiple sources. The framework responds to the inherent complexities of EH practice—including practitioner judgement, values and relational behaviours—as such competencies unfold within authentic and unpredictable work environments. These real-world settings require contextually appropriate solutions ([Stewart et al., 2023](#)). The conceptual structure of this framework, along with its alignment to the study's theoretical framing and practical intent, is elaborated further in the paper.

4. Materials and Methods

This research employed a qualitative, phenomenological study design which provides in-depth and nuanced perspectives of the research participants ([Rahman, 2017](#)). In this research context, it is the acquired, developed, and unfolding professional competencies as experienced by the students during the work placement and observed by their EHP WIL supervisors. The participants could thus provide “legitimate insight” into their lived experiences ([Maton & Chen, 2017](#), p. 47).

The methods followed for recruitment and selection of participants, and data collection were aligned to each of the sub-research questions (SRQs). To facilitate readability and clarity of the approach followed, the mentioned sections will be presented per SRQ.

4.1. Sub-Research Question 1 (SRQ1)

4.1.1. Student Participants

Purposive population sampling was used to select participants to obtain data for the SRQ 1 and SRQ2. Participants met the inclusion criteria if they had fulfilled the EH professional board's requirements for WIL in the undergraduate professional degree, at a UoT in Cape Town, SA. These participants could vividly express their workplace experiences. Thus, at the time of data collection, one cohort of senior students ($N = 21$), i.e., those in their 4th year and one cohort of recent EH graduates ($N = 7$), met the inclusion criteria. It was necessary to include alumni (AL), as they formed the first cohort who completed WIL in the professional degree. Only the WIL reflection journals of those who volunteered to participate in the study were used for document analyses. All participants met the inclusion criteria and individualised demographic data was not considered for this study. Demographic data were not collected, as the study centered on professional behaviours, workplace-based experiences, and competency development within authentic EH WIL contexts. The analysis foregrounded relational and contextual behaviour patterns over individual characteristics.

Sequential numbers, aligned to the interview order were assigned for anonymity, e.g., senior students were assigned the code SS and alumni were assigned the code AL, followed by a number signifying the interview sequence. Reflection journals (RJ) for each participant were coded similarly, by adding their interview code, example RJ_SS1, RJ_AL2, etc. This is illustrated in Table 1.

Table 1. In-depth interview participant break-down and examples of codes used.

Data Source		
Students (Number of in-Depth Interviews)		Documents (Number of Documents Reviewed)
Senior Students (SS) (15)	Alumni (AL) (06)	Reflection Journals (RJ) (21)
Example: Senior student 1 = SS1	Example: Alumnus 1 = AL1	Example: Reflection journal of senior student 1 = RJ_SS1 Reflection journal of alumnus 1 = RJ_AL1

Key: SS: Senior Student/AL: Alumnus (i)/RJ: Reflection journal. 1: example of sequential number aligned to sequence of participant interviewed, or corresponding document analysed.

4.1.2. SRQ1 Data Collection

Ethics approval, to interview students enrolled at the time of data collection, and to access the WIL reflection journals, was obtained from the dean of the faculty concerned (Ethics approval Reference no: 189045701/11/2021).

Subsequently, participants were invited via an announcement on the respective WhatsApp groups (Prof Prac 4, 2021; PFP 4, 2020) and on the UoT's secure learner management system (LMS), Blackboard ultra, version 3900.4.0.

Data was collected through individual, once-off semi-structured in-depth interviews, at a date, time and on a virtual platform chosen by the participant. Interviews were conducted and audio-recorded on [Microsoft Teams \(2021\)](#) and/or Blackboard Ultra ([Blackboard Inc., 2021](#)). Both in-depth interview and document analysis were guided by the following questions:

- What skills have you developed during your work placement?
- What knowledge have you acquired during your work placement?
- What values unfolded in you during this experience?
- What attitudes were you encouraged to develop during your work placement?

Interviews lasted an average time of 45 min. After each interview, the recorded data was downloaded and saved on an external hard-drive and on a cloud-based data saving platform.

4.2. Sub-Research Question 2 (SRQ2)

4.2.1. Practitioner Participants

The focus group (FG) participants were purposely selected and comprised all EHPs who hold the portfolio of WIL coordinator at a municipality in Cape Town, SA (N = 17), and who supervised EH undergraduate students during work placements. Focus group discussions were used as this allowed for open, in-depth, and unconstrained discussion by the participants. EHP WIL supervisors were homogenous in their duties at the municipality and in their roles in supervising EH students during their work placements. To ensure analytic transparency while upholding ethical standards, anonymised codes were assigned to participants during transcription and analysis. These internal identifiers do not link to publicly available data but were used to maintain traceability between verbatim quotations and their respective stakeholder groups. For example, Focus Group 1 (FG1) consisted of six participants, identified as EHP1 through EHP6. Similarly, Focus Group 2 (FG2) comprised four participants, coded as EHP7 through EHP10. These codes support thematic coherence and enable readers to interpret quotations within context, without compromising participant confidentiality, as illustrated in Table 2.

Table 2. Focus group participant breakdown and examples of codes used.

Data Source	
Environmental Health Practitioner Workplace Supervisors	
Focus group discussion 1 (no. of participants)	Focus group discussion 2 (no. of participants)
Focus group 1: FG1 (6)	Focus group 2: FG2 (4)
Environmental Health Practitioner work-place supervisor(s) 1–6: EHP1–EHP6	Environmental Health Practitioner workplace supervisor(s) 7–10: EHP7–EHP10
Example from text: EHP1_FG1	Example from text: EHP7_FG2

4.2.2. SRQ2 Data Collection

Permission to interview the EHPs was requested and granted via the municipality's research request portal (Reference no. 9479). All EHP WIL portfolio holders (N = 17) were given an overview of the research of the study and invited to participate in the study by direct email. Possible dates and times were shared for the respective FG discussions, allowing participants to select the date and time that would suit them best. It was anticipated that 3 FGs would be held. After conducting 2 FG discussions, FG1 and FG2, two follow-up invitations were extended to participants who did not respond to the first invite, and no further replies were received to participate.

Participants met with the FG facilitator in a seminar room at the UoT housing the research study, as it was deemed comfortable and provided for free and open discussion without the distraction of duties at their offices (Shabina et al., 2024). The total number of participants were 6 for FG1 and 4 for FG 2, which was considered adequate as participants were experienced in their WIL supervisory roles, knowledgeable on the subject, and, as advised literature, small numbers of participants can yield valuable insights (Gundumogula & Gundumogula, 2020).

Written consent was obtained from each participant before the start of the FG discussion. Participants could withdraw from the FG at any time, or have data shared by them in the FG omitted from the results—on their request—during or after the discussions. The FG discussion was guided by the following questions:

- What skills did you observe develop in the students during the work placement?
- What knowledge did you observe the students acquire during the work placement?
- What values did you observe unfold in the students during the work placement?
- What attitudes did you observe students develop during the work placement?

The discussions were recorded with an electronic recording device. The facilitator made notes whilst the discussion was underway to probe issues relevant to the study which required further discussion and elaboration. On completion of each FG, the data was downloaded onto an external hard-drive and saved on a cloud-based data saving platform.

4.3. Sub-Research Question 4 (SRQ4)

This SRQ was informed by the results obtained from the results of the foregoing SRQs 1–3.

4.4. Sub-Research Question 5

This SRQ was informed by the synthesis of the SRQs 1–4.

4.5. Data Analysis

To establish themes, all audio-recorded data were firstly transcribed, followed by several iterative readings to become familiar with the data and then applying initial open coding (Saldanha, 2016). Atlas.ti 9 software (ATLAS.ti Scientific Software Development GmbH, 2022), based in Berlin, Germany, was used to organise the data, assign the initial codes mentioned, collapse the codes into categories and further develop the initial themes. This process was repeated manually, by colour coding patterns and similarities in the transcripts, recording them in a notebook, developing categories and collapsing it into themes (Braun & Clarke, 2006). This assisted in substantiating the themes derived. The entire process of code establishment and theme derivation was shared and discussed with the research supervisors. After discussion and debate, the themes were derived were agreed upon by the student and research supervisors.

The LCT Specialization translation device, developed during the planning phase of the study, was used to guide the thematic analysis. This is described in the following section.

4.6. Analytical Framework: Using the Legitimation Code Theory (LCT) Specialisation Dimension

The thematic analysis was guided by the Legitimation Code Theory's (LCT) Specialization dimension (Maton, 2014). LCT is a practical theory, underpinned by the work of Basil Bernstein (Bernstein, 1999, cited in Georgiou et al., 2022, p. 4). Bernstein splits knowledge into two structures, namely hierarchical knowledge structures, whereby knowledge is built vertically, from basic to complex, e.g., mathematics which commences with basic concepts and extends to learning and understanding complex mathematical theories; and, horizontal knowledge structures, whereby knowledge is compartmentalised, comprising different knowledge fields, e.g., as in humanities disciplines (Bernstein, 1999, cited in Georgiou et al., 2022, p. 4). LCT can dissect knowledge practices (Maton, 2014) through using one, or several LCT dimensions as theoretical lens (Winberg et al., 2018). The LCT Specialization dimension, suited to this study, unpacks practices by organising it in terms of how knowledge is structured and legitimised, i.e., its epistemic relations (ER), 'what you know' and its social relations (SR) i.e., 'who you are' (Maton, 2014). Orientations of a practice will always have both epistemic relations (ER), and social relations (SR), but the relative strength may be weaker or stronger toward a specific relation.

The LCT Specialization dimension can expose the codes of legitimation, i.e., knowledge structures, foregrounded by the legitimate knowers/participants. By developing and applying a Specialization translation device to the data, the LCT Specialization codes of legitimation are revealed. When plotted on the Specialization plane, the relative strength to either the ER or SR unfolds. In this research, it provides insight into what counts as competent in EH practice, from the perspectives of the EH WIL students and their supervisors.

The Specialization translation device was applied to the data to interpret the evolving themes and plot their position on the Specialization plane, thus creating a "dialogue between data and theory" (Maton & Chen, 2017, p. 27). The translation device was guided by words and phrases, emphasising or down-playing competencies in the responses and/or discussions, thus revealing what is legitimised as competence to practice EH by the WIL students and their supervisors. Interviews and FG discussions were conducted in English, which is not the first language of most respondents. The translation device was adapted to include different expressions of emphasis, or downplay in responses and/or discussions, such as tone, colloquialisms, and nuances. When applied to the data, the competencies could be situated in a particular quadrant on the Specialization plane, referred to as "codes

of legitimation” (Maton, 2014, p. 72). These codes of legitimation, in the context of this research, refers to the orientation of the competencies that were emphasised, or downplayed, as legitimate by the participants. When illustrated on the LCT Specialization plane, themes could be situated it in a quadrant as follows:

- a *knowledge* code, whereby the competencies legitimised by participants are relatively stronger in its epistemic relations (ER) than in its social relations (SR)
- a *knower* code, whereby the legitimised competencies are relatively stronger in its social relations than in its epistemic relations
- a *relativist* code, whereby the legitimised competencies are relatively weaker in both the epistemic relations and the social relations, or
- an *elite* code, whereby the legitimised competencies are relatively strong in both the epistemic relations and the social relations.

The Specialization plane and its codes, with relative relations of strength and/or weakness, to either the ER and/or the SR, is illustrated in Figure 1.

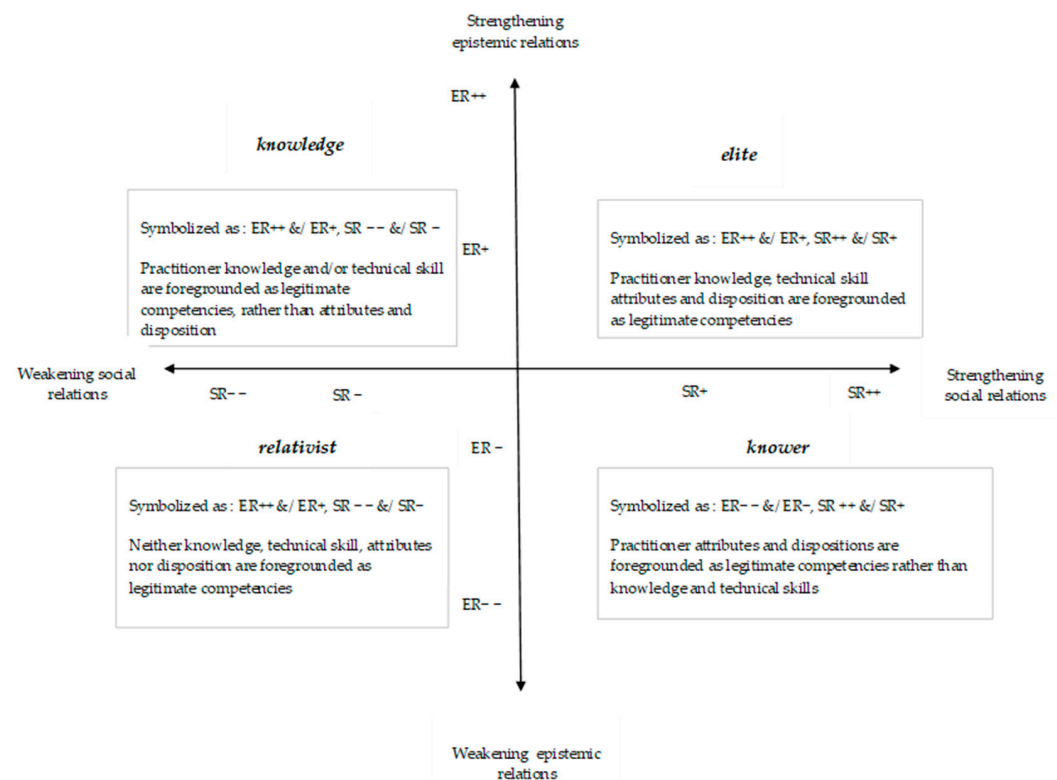


Figure 1. The LCT Specialization dimension and its codes (adapted from Maton, 2014).

4.7. Ethical Considerations

Ethical clearance and permission to undertake the study was obtained from the UoT ethics committee for student participants. Permission to interview EHP WIL supervisors was obtained from their employer organisation. Written and verbal informed consent was obtained from all participants, after explaining the purpose, process of data collection and procedure of the study. Participants were ensured of confidentiality and anonymity. Additionally, participants could opt to withdraw from the study at any point.

4.8. Researcher Positionality

Researcher positionality, e.g., their relationship with participants and insider knowledge of the issue under study, presents a limitation in qualitative research (Holmes, 2020). This required the researcher to recognise how their perspective may influence the study

(Johnson et al., 2020). The researcher, due to her role as EH WIL coordinator and lecturer, had a vantage position of the issue under study. This proved a benefit to the study (Fleming & Zegwaard, 2018), as the researcher has comprehensive understanding of the issue being investigated. Familiarity between researcher and participants due to the existing working relationship, means that rapport was already established. This proved valuable as it allowed for open dialogue and comfortable interviews (Holmes, 2020). The researcher recognised and remained mindful that these aspects may introduce biases and consequently exercised continual reflexivity (Holmes, 2020; Chavez, 2008) and being flexible enough to omit data not relevant to the objectives of the study (Holmes, 2020), but which interviewees felt comfortable enough to share.

Ongoing peer review was undertaken between the principal researcher and her two research supervisors, involving reciprocal discussion and debate during the entire research process, including the design of the interview question- and focus group discussion guides to ensure dependability. This involved similar dialogue and debate concerning data analysis, coding, and theme establishment. Member-checking was undertaken by sharing audio-recordings and transcripts with participants to check accuracy and identify corrections where relevant. Amendments were made to the transcripts especially where dialogue was unclear and could be clarified by the respective participants. Additionally, some grammatical errors were discovered and corrected during iterative readings of the transcripts. This entire approach enhanced credibility and confirmability, as themes agreed upon were arrived at through a process of interpreter-triangulation and the researcher was guided and advised by experienced supervisors with varying backgrounds.

5. Results

This section presents the findings and is followed by the discussion in which the significance and relevance are presented. As the EHP workplace supervisor groups are homogenous in their roles in supervising students, no distinction is made between the focus groups in this section.

The findings revealed competencies across knowledge, skills, and behaviours underpinned by values and attitudes, necessary for competent EH practice. However, to move beyond merely describing what students and supervisors reported or observed, the data was interpreted using the Legitimation Code Theory's (LCT) Specialization dimension. This theoretical lens enabled the identification of the basis upon which competencies were legitimised—either through what the students know (epistemic relations) or who they are (social relations). Using this framework, the study situated EH practice within an elite code, signified by ER++ and SR++, as both knowledge and knower dimensions were foregrounded with equal strength. This classification transcends thematic description, offering a structured analytical positioning of competencies necessary for professional success within the discipline. Using the LCT Specialization dimension revealed legitimacy patterns within EH practice. The following section plots these onto the Specialization plane.

5.1. Orientation and Relative Strength of Competencies on the Specialization Plane

SRQs 1–3 revealed that knowledge, skills, and behaviours, underpinned by values and attitudes, are required to practice EH successfully.

In this context, knowledge relates to facts or information (Schmidmaier et al., 2013), specific to EH practice, and includes both theoretical and technical knowledge, i.e., knowing the legislation and its associated technical requirements in different EH contexts. Knowledge of the legislation gained in the workplace was foregrounded and emphasised as “the most important” (SS11) by one participant. This was echoed by the EH workplace supervisors who emphasised knowledge of the role of the EHP, as aligned to the mandated scope

of the profession (DOH, 2009), and in rendering municipal health services, as something that they teach and observe developing in the students “first of all” (EHP4).

In this study context, defining ‘skills’ is adapted from Lamri and Lubart (2023) and includes soft skills, e.g., communication-, problem-solving- and team-work skills, technical skills specific to the discipline, e.g., taking food and/or water samples, and interpreting sampling results, transferable skills, i.e., critical-, analytical- and organisational skills. Participants foregrounded skills, in its entirety, as necessary for competence to practice EH in various contexts. One student described the development and enhancement of detailed inspection procedures as “crucial” (RJ_SS6). The EHP supervisors too observed the broad skills range developing in the students, describing these as important to “get right first” (EHP4).

Professional behaviours are described as the principles of behaviour exhibited through the conduct, attitude and actions deemed acceptable and appropriate in a professional setting (Louwen et al., 2023). Values, i.e., standards that guide behaviour and beliefs, i.e., what individuals accept to be true or real, underpin attitude and the interplay between these in turn influences behaviours (Nazirova & Borbala, 2024). Behaviours in the context of this paper, considers and includes values and attitudes, and forms part of one theme. Acceptable professional behaviours, were foregrounded by all participants, as expressed by a participant:

“...being calm and patient and... always, like especially whether someone is angry with you or speaking in a foul manner; never, like speak in such a manner. You [the practitioner] should always speak professionally and be professional and be patient and calm...” (SS8)

The findings for SRQ 4, are depicted in Figure 2 which illustrates the orientation of the themes, i.e., competencies, on the LCT Specialization plane.

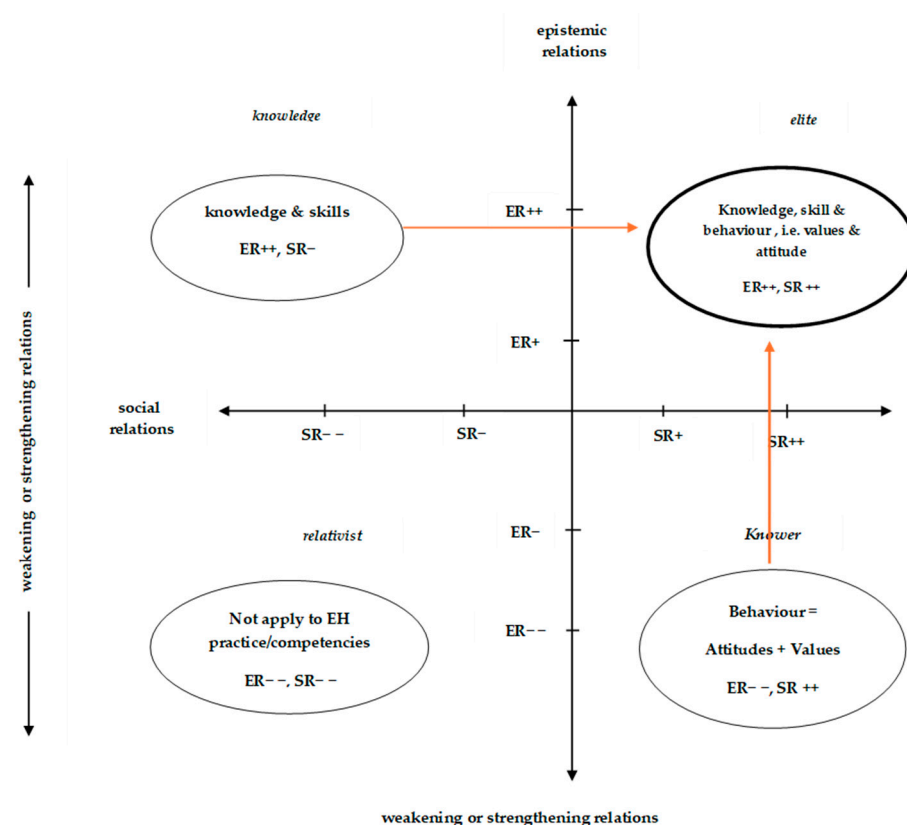


Figure 2. Competencies foregrounded by EH WIL students and EHP WIL supervisors.

Figure 2 shows that competencies legitimised by EH WIL students and EHP supervisors align with the elite quadrant (ER++, SR++) on the LCT Specialization plane, reflecting a dual emphasis on disciplinary knowledge and relational competence essential for holistic, context-sensitive EH practice.

The analyses furthermore unveiled a tension existing between the basis of achievement used by the role-players assessing WIL. This tension revealed shifts in the EH students' competency emphasis within varied contexts, i.e., between what is essential for success in: the workplace, the classroom—by way of current WIL assessment focus-, and the professional credentialing criteria. The student shifts their focus to align and adhere to requirements for achievement—as recognised by them—in the different contexts.

Despite the tension and subsequent shift in student focus, they do recognise, the holistic competencies to practice EH successfully, as confirmed by their workplace supervisors. These professional behaviours include emotional intelligence and its traits, whereby the students modify behaviours as the context dictates. This is explained by a participant in the student interviews, whereby the participant expressed empathy for the client (*the specialization relation is included in square brackets merely to illustrate orientation to either ER or SR and is not part of the interview feedback; relative strength is omitted*):

Today I learned that being calm [SR] in all situations, no matter what the situation [ER] is—even if you are being insulted—it's important as we have to come to an understanding [SR] with people and work with them well [ER] as EHPs. (RJ_SS9)

This sentiment was echoed by the EHP WIL supervisors, describing how the EH students demonstrate self-regulation, critical and analytical skills, and social awareness skills during WIL:

I think what they gain there is being able to understand—even though you know all the legislation possible [ER], you're still going to be put in a situation where ... I still need to think for myself [SR]. . . (EH8)

The abovementioned statements, from the student and the EH WIL supervisor group informs that a combination of knowledge, skills, attitude, and values, i.e., behaviours, are required to reach a desirable EH outcome, i.e., ER++, SR++.

The tension uncovered by the LCT Specialization analyses further informs that current assessment of competence should be structured to include criteria for the full range of professional competencies, consisting of a combination of knowledge, skills, and behaviours, the latter encompassing values and attitudes, as the EH discipline is located in the *elite* code, i.e., relatively strong epistemic relations (ER++) and relatively strong social relations (SR++) is required for competence to practice EH successfully. These were emphasised in the findings from interviews with the EH WIL students and the WIL EHPs supervising them.

Additionally, Tables 3 and 4 describes how the knower and knowledge codes were foregrounded by both the students and EHP WIL supervisors, to locate the profession in the *elite* code. Each table illustrate the use of the translation device, qualifying words, and phrases by participants to foreground and/or downplay the ER in Table 3, and the SR in Table 4, and examples of these by quotes from the data.

5.2. An Assessment Framework for EH WIL Competence

The tasks performed during the EH students' work placements allow them to participate in real-world challenges, reflect on their learning and evaluate their progress. This meets criteria for being "highly authentic" (Bosco & Ferns, 2014), especially for students in their senior years, namely year 3 and 4 of the degree. The EH workplace presents an authentic setting and is considered a reliable and credible context for assessing workplace competencies (Gulikers et al., 2004; Bosco & Ferns, 2014). The limiting aspect in EH WIL

assessment is that industry does not currently contribute to the assessment of EH WIL students. The criteria and proficiency indicators are not explicit for WIL competency assessment. Although assessing learning and competence development through WIL is tricky (Bilgin et al., 2022), the workplace, presents an opportunity in which all role-players, i.e., students, HEI and industry could partake in competency assessment (Bosco & Ferns, 2014).

Table 3. Epistemic relations foregrounded with examples from the data.

Relationship Strength	Epistemic Relations (ER)	Competencies Informed by the LCT Specialization Analysis	
	Relative Strength of an Identified Competence	Student Reported Competencies with Examples from the Data	EHP WIL Supervisor Observed Competencies with Examples from the Data
Strengthening relations ↑	ER++: express strong emphasis, e.g., vital, crucial, very important or essential	<i>"I think I would say that knowing your scope is very important..." (SS10)</i>	<i>"... it's important to mention, first of all, the role of the EHP to unpack that... by law, you are obliged to do certain things that's mandatory..." (EH5)</i>
	ER+: express importance but not a strong emphasis, e.g., important, required, favoured, or valued	<i>"The stuff like conducting inspections and going out with the EHP's, the practical work, it helped a lot! I mean that was more important actually. I wouldn't say more important, but equally as important as the knowledge we obtain at campus." (AL4)</i>	<i>"I do feel that they do get to a point where they gain confidence on how to apply the legislation... with the students now, the more exposure they get, more confident they get." (EH9)</i>
	ER— express no emphasis, e.g., trivial, no role or not relevant	<i>"Having a relationship with your colleagues helps you learn about things you didn't know about, enquire about things you do not understand, all helping you improve and increase your competence as an individual." (RJ_SS10)</i>	<i>"Yes, you have your legislation, but not everything is that black-and-white. Sometimes you're gonna have to like, bend a bit and you're gonna have to like, re-write your script actually..." (EH8)</i>
	ER— —: express strong down-play, e.g., not needed at all, does not matter, or plays no role	<i>"The first thing is that, in environmental health we have to put people first. That's the first thing." (SS2)</i>	<i>"We don't want, you know, to send a student out into the field not armed, and to us in the [area name withheld] its: professionalism first... with us professionalism is high on the priority list." (EH4)</i>
Weakening relations ↓			

Table 4. Social relations foregrounded with examples from the data.

Relationship Strength	Social Relations (SR)	Competencies Informed by the LCT Specialization Analysis	
	Relative Strength of an Identified Competency	Student Reported Competencies with Examples from the Data	EHP WIL Supervisor Observed Competencies with Examples from the Data
Strengthening relations ↑	SR++: express strong emphasis, e.g., vital, crucial, very important or essential	<i>"I was never a patient person! But I guess as you learn and grow over the years, you see that being patient is very important... now, when you get to a workplace, you remember all those things and you try to apply them... So, patience is very important." (AL5)</i>	<i>"... eventually they develop into that... they become mediators, and they will know how to control themselves or their tone of voice..." (EH2)</i>
	SR+: express importance but not strong emphasis, e.g., important, required, favoured, or valued	<i>"You must have the right manner or approach of how you deal with people... you shouldn't treat people as if you are doing them a favour, or want to show them: I'm better than you, or undermining people" (SS1)</i>	<i>"There's different... diverse people, in diverse areas and dynamics? So, at the end of the day, ... yeah, what I see grow is their service orientation... to add value, actually; just not to enforce and to walk away." (EH10)</i>
	SR—: express no emphasis, e.g., trivial, no role or not relevant	<i>"I have also learnt that it is important to know and be sure about the legislation". (RJ_SS5)</i>	<i>"... they're so thorough in their work, they would go through that regulation and write it according to the regulations and so on..." (EH7)</i>
	SR— —: express strong down-play, e.g., not needed at all, does not matter, or plays no role	<i>I think the most important knowledge that I've gained is from the legislation because they outline our scope of practice in a way that they act as a guidance in order for us to execute the job correctly. (ss11)</i>	<i>"By the 2nd year, you know I feel a bit, sometimes, upset when they can't give me at least the short title of one or two pieces of legislation..." (EH4)</i>
Weakening relations ↓			

Contrary to the limitations of OSCEs, which assesses only some competencies in a simulated setting, with simulated patients (Dewan et al., 2024), the variability in the workplace setting presents more favourable for assessing holistic competencies, as it requires interaction with real clients (Bilgin et al., 2022).

Dissimilarly to Gulikers et al. (2004) findings, the total context, i.e., physical, and social, was foregrounded as important in EH practice, in addition to the disposition of the

practitioner. Therefore, social context must be included in the framework for authentic assessment of holistic competence in EH, which adds an *additional* authentic layer.

The 5-dimensional assessment framework proposed by [Gulikers et al. \(2004\)](#), a competency-based assessment framework, such as that described by [Cano et al. \(2023\)](#) and the criteria for assessment in an authentic setting described by [Bosco and Ferns \(2014\)](#) meets the requirements for credibility, of the South African Qualifications Authority (SAQA, 2017), and the UoT that serves as the research site. These credibility criteria are validity, reliability, replicability, and integrity, i.e., relevance to the 'task' ([Gulikers et al., 2004](#); [Bosco & Ferns, 2014](#); [SAQA, 2017](#); [Cano et al., 2023](#)).

The learning and teaching of holistic competencies must align to the assessment of holistic competencies, meaning either to student performance in the workplace, e.g., doing a presentation to raise awareness about a health issue to an audience, and/or producing a product, e.g., writing an inspection report. The EH context (issue) in which the assessment is conducted will inform and guide the assessment outcome(s), proficiency level and following action. It is therefore necessary to include routine formative and summative assessments scaffolded in levels of complexity and aligned to the various levels of study.

[Bosco and Ferns \(2014\)](#) argue that escalations in: proximity to the workplace; engagement in social and physical workplace contexts; scholarly demands and student self-reflection; and involvement of industry in the assessment increases the authenticity of the assessment task. This authenticity criteria exists in the EH WIL component.

Due to the multi-faceted nature of EH practice and variety of issues addressed as per the scope of the profession ([DOH, 2009](#)) the student, during their work placement, together with their WIL supervisors may identify an EH issue, context where a professional gap exists, which is necessary to develop the full range of competencies needed to be proficient in the discipline. This is recommended from year 2, as level one of the programme consists mostly of foundation non-EH specific courses (modules) e.g., mathematics, chemistry, and physics. The purpose of WIL in year one at this UoT is, in summary, to expose students to an authentic professional work environment so that they may understand what the work of the EHP entails.

Results, i.e., performance or products ([Gulikers et al., 2004](#)) will be aligned to exit level outcomes as well as course level outcomes. In this example, the outcomes will be scaffolded between levels of study but result in assessment of competence in a particular area/issue of the scope of the EH profession ([DOH, 2009](#)). As ethics features strongly in each level of the qualification, students will be expected to reflect on, document and present the ethical behaviours they upheld throughout their WIL.

To consolidate the findings and illustrate how each sub-research question informed the development of the assessment framework, Table 5 presents a structured mapping of data sources and emergent competencies.

The mapping illustrated in Table 5 directly informed the development of the Holistic Assessment Framework (Table 6), which integrates these competencies into a structured model for evaluating student readiness for independent professional practice. The assessment framework, together with proficiency indicators is presented in Table 6, with an extension to the table to present the assessment types, the role-players involved, and their respective roles in the assessment of holistic competencies.

Table 5. Mapping of sub-research questions, sources and main findings.

Sub-Research Question (SRQ)	Data Source	Main Finding(s)
SRQ1: Student reported competencies acquired during WIL	Structured individual interview transcripts with senior students (SS) and recent alumni (AL)	Students foreground relational and context-sensitive behaviours, knowledge application, technical skills and collaboration
SRQ2: Competencies reflected in student journal	WIL reflection journals (RJ)	Students foreground behaviours, ethics and professionalism and application of knowledge and technical skill
SRQ3: Competencies observed in students during WIL	EHP WIL supervisors focus group discussion transcripts	Supervisors foreground relational and context-sensitive behaviours, stake-holder engagement and -communication, knowledge and technical skill
SRQ4: Orientation of competencies on LCT Specialization plane	Visual mapping of results from SRQ1, 2 and 3	The holistic competencies identified across SRQ1, SRQ2, and SRQ3 align with an elite code orientation on the LCT Specialization plane, reflecting strong epistemic relations (ER) and strong social relations (SR) within EH practice.
Holistic framework for EH WIL assessment	Synthesised results	Findings across all data sources support a multi-dimensional framework integrating knowledge, technical skill and professional behaviours, incl. attitudes and values for entrusting activities aligned with independent practice

Table 6. Holistic EH WIL competency assessment framework, assessment role-players and their roles.

Assessment Domain			Performance Indicator
Competency/ Dimension	Description	Example	
Knowledge	Knowledge relevant to the EH profession, incl. specific legislation, best practices, and procedures	Knowledge of appropriate legislation relevant to food premises inspections	Basic/Foundational Elementary knowledge of legislation
			Intermediate Application of relevant legislation in routine/typical EH daily tasks
			Advanced Accurate knowledge, i.e., practice and procedural, is applied and integrated in a variety of EH contexts and supports innovative problem-solving.
Skill	Relevant EH knowledge is applied, and analytical ability is demonstrated when performing technical tasks and in the assessment of environmental health contexts and when solving problems	Performs water sampling, following procedures prescribed by relevant legislation and interprets results.	Basic/Foundational Task performed is guided by supervisor.
			Intermediate Task is performed independently, and results are evaluated against relevant legislation, guidelines, codes and/or standards
			Advanced Task is performed independently and aligned to relevant procedural requirements. Accurately assesses an EH issue, applies relevant knowledge, technical and analytical skills to solve problem(s) in an innovative and creative manner, and communicates clearly and effectively.

Table 6. Cont.

Assessment Domain			
Competency/ Dimension	Description	Example	
Professionalism - value: accepted principles of behaviours - attitude: opinion or view of the EH profession	Upholds ethical codes of conduct and acceptable professional behaviours across all EH contexts	Demonstrates ethical and professional conduct when interacting in diverse setting, with members of the public, colleagues, and other professions.	Basic/Elementary Aligns and/or adjusts behaviour to conform with ethical codes, and expected professionalism under guidance
			Intermediate Self-adjusts behaviour to uphold acceptable EH standards of professional behaviours and independently makes ethical decisions across all contexts
			Advanced Independently makes ethical decisions, adjusts behaviour to be professional and foster relationships and collaboration across all EH contexts
Assessment	* Formative (Developmental: Progress Toward Competency Achievement Assessment)	Summative (Assessment of Competency Achieved)	
Assessor	Role (Evaluator/Monitor/Feedback)	Role (Grades/Judges)	
Student	- Self-evaluation of strengths & competency gaps - Develop a progress plan - Regular self-evaluation - Monitoring of progress - Discussion with WIL supervisor & or WIL academic(s)	** N/A	
WIL Supervisor	- Direct observation of student’s performance/completion of tasks in specific context - Feedback to student on progress - Feedback to WIL academic(s)	Assesses through feedback on student’s final products &/performance	
Peers	Direct observation of student of performance with feedback as an individual or in a group setting	** N/A	
Academic(s)	- Monitor(s) student self-evaluation & progress plan - Evaluates progress as informed by supervisor - Provides feedback on progress to student & WIL supervisors	Assessment of final POE, WIL reflection journal and WIL presentation, as relevant	
Professional council	- Monitor WIL in the programme against clear quality criteria for meeting competency standards and credentialling criteria - Feedback to UoT	Audit & verify final WIL students POEs (assessed) against clear credentialling criteria &/quality indicators	

* Formative assessment includes 360-degree feedback methods from several sources, e.g., peers, clients, EHP workplace supervisors and academics, and the student being assessed/evaluated. ** N/A—not apply/applicable as assessor plays no role in the assessment.

Literature suggests that to eliminate subjective biases, a clear understanding must be agreed upon by all involved in assessing progress (Bosco & Ferns, 2014; Gulikers et al., 2004). It is therefore necessary to define the criteria, describe and clarify it and increase reliability and validity by using multiple role-players. This for the EH context this means that the WIL supervisor, academic assessing the student, and the student themselves, as well as the collaborative contexts needed to solve EH problems/issue are important aspects to be part of the assessment process and practice (Bosco & Ferns, 2014; Gulikers et al., 2004; Boud & Falchikov, 2006; Von Treuer et al., 2011).

Rubrics and assessment criteria provide clarity to students and EH WIL supervisors, and it helps them understand how and what will be assessed (Bilgin et al., 2022). It is therefore best to share the assessment criteria, together with its descriptions with all role players before the actual assessment(s). As EH practice competence falls within the elite quadrant of the LCT Specialization plane, the criteria must reflect indicators relating to both knowledge, skill, and dispositions relevant to the context (EH issue) being assessed.

6. Discussion

This paper sought to present a framework for the holistic assessment of professional competencies required for successful environmental health practice. The framework presents the competencies legitimised by EH WIL students and their workplace supervisors. These form the basis of achievement in EH practice. The assessment framework organises it in a simplistic manner, so that both industry, students and academics may synergistically pursue competencies through teaching, learning and acquisition thereof during WIL. This study confirms findings by Bosco and Ferns (2014), in that WIL provides an authentic setting for workplace learning and the assessment of competencies that students develop in the workplace developed due to the highly authentic setting and proximity to real tasks that students engage with.

The findings inform that the competent EH practitioner must be able to apply relevant knowledge, skills and behaviours as is needed for efficient EH service delivery in the 21st century (Stewart et al., 2023; Omid et al., 2021; Walekhwa et al., 2022) and as the South African context requires (Morse et al., 2020; Shezi et al., 2019). The tension uncovered fuels a shift in focus between the aspects legitimated for classroom success, professional credentialing, and workplace competence. This is a common consequence where competence criteria and or aspects other than theoretical and technical knowledge are not explicit in a curriculum and its associated assessment criteria (Rusznayak & Bertram, 2021).

To address the tension uncovered the literature suggests revising the part of the curriculum that is lacking by way of an outcomes-oriented competency-based assessment (Matsuzuka, 2020). This means that instead of revising the entire curriculum, only the EH WIL component, and its assessment can be revised to include both the knowledge and knower competencies in the assessment. Indeed, the UoT concerned expects these as part of graduate attributes, specifically relevant to 'Relational'- and 'Ethical capabilities' (Cape Peninsula University of Technology, 2017). To fully assess all the competencies needed to meet the EH goals, simulations may merely assess technical competencies for EH, but not competencies needed to meet those involving critical and analytical thinking, as the real-life context, including the temperament of clients, context, and resources available cannot be simulated (Dewan et al., 2024). Authentic assessments i.e., those which mirror actual issues, with all its associated limitations, challenges and contexts are presented in EH WIL, providing an ideal backdrop in which students' competencies may be practiced and assessed (Wesselink et al., 2017). WIL provides.

Literature regarding competency assessment suggests the scaffolding of assessment criteria, from simple to complex (Garraway, 2022; Gulikers et al., 2004) as part of holistic

assessments. WIL in the EH programme allows for this due to its structure consisting of varying work placement periods per study year.

Using Gulikers et al.' (2004) 5-dimensional assessment framework specifically for EH competency assessment is most suitable as its WIL component comfortably integrates the dimensions and eliminates the weaknesses of e.g., having WIL presented as one continuous block in only part of the qualification. Adopting a comprehensive assessment framework for competency assessment is pertinent to meet the dynamic EH discipline-related challenges, highlighted by, amongst others, [Morse et al. \(2020\)](#) in EH practice in RSA, [Patthanaissaranukool et al. \(2020\)](#) Thailand, [Walekhwa et al. \(2022\)](#) Uganda and [Omid et al. \(2021\)](#) in Iran. Subsequently, having a valid assessment framework for the professional EH competencies can better suite graduates for meeting the requirements of employers and demands for employability success in the 21st century and enhance the delivery of municipal health services.

7. Recommendations

To enhance development of holistic competencies in the EH graduates, meet the institutional graduate attributes and respond adequately to 21st century demands—i.e., future-proof the profession—it is recommended that a comprehensive evaluation of the EH programme be undertaken to better establish where WIL, together with its assessment, could and should be embedded in the entire programme. This implies participation of all EH programme lecturers, beyond the WIL role-players described in this article, and especially those teaching discipline—specific courses. The guidelines suggested by [Bosco and Ferns \(2014\)](#), together with the credibility and proficiency criteria suggested in this article can serve as the basis of such evaluation and dialogue.

Future research recommendations are to: Explore/determine where authentic assessments can be located throughout the EH undergraduate programme in addition to the WIL component; explore the how the holistic competencies are developed in the EH students by e.g., using the LCT Semantics dimension and best practice in EH to evidence student learning and holistic competence development. While this study focuses on preparing undergraduates for professional practice through the assessment of entrustable professional activities (EPAs), the emerging role of EPAs in Environmental Health (EH) practice may warrant further investigation, particularly in relation to their implementation and long-term impact within competency frameworks.

8. Conclusions

The strength and longevity of academic programmes lie in their stand-out qualities—among which WIL remains a defining feature of UoT training. Its value in shaping, strengthening and ultimately future-proofing the Environmental Health profession has far-reaching implications. This study set out to explore how WIL assessment should be structured to holistically assess EH student professional development. Using LCT's Specialization dimension, the findings revealed that professional competency comprises both epistemic and social relations—placing EH practice firmly within the *elite* code. The results, summarised in Table 5, highlighted competencies developed and observed during WIL—across knowledge, skills and behaviours—that were legitimised by students and their workplace supervisors. These informed the development of a five-dimensional assessment framework foregrounding real-world task design, collaborative workplace engagement, conceptual transparency, credibility criteria, and alignment with entrustable professional activities (EPAs). If adequately assessed and rewarded, these competencies may serve as a cornerstone in preparing students for independent professional practice, and in doing so, future-proof the EH profession.

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