
“Beyond the immediacy”: Axiological experiences of engineering students during the “new normal”

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ABSTRACT

Writing Centre Intervention (WCI) in the faculty is a pedagogical resource to facilitate the students’ academic literacy development. In our universities, literacy development focuses mainly on enhancing students’ cognitive, linguistic and epistemological experiences – with little attention given to the psycho-social and ontological dimensions of learning, especially in the science related fields such as electrical engineering. This paper draws on Academic Literacies, Systemic Functional Linguistics and Legitimation Code Theory to study the axiological experiences of first year electrical engineering students at the Cape Peninsula University of Technology (CPUT). The participants for the study were drawn from the students who participated in the WCI, a collaborative, interdisciplinary project designed to help electrical engineering first

year students to develop “soft skills” alongside technical-scientific knowledge. Since the workshops were facilitated under Covid-19 lock down restrictions, blended learning was employed. Interviews were conducted via MS Teams. The participants’ utterances demonstrated a mixed bag of emotions, an ideological shift, albeit at different degrees, and strong attitudes toward the learning of the engineering “soft skills”. Therefore, the study calls for a pedagogy of wholeness wherein the epistemological, spiritual, axiological and ontological dimensions of learning are attended to and activated in order to move students’ perceptions “beyond the immediacy” of the current experience.

Keywords: writing centres; scientific report writing; soft skills for engineers, electrical engineering, axiological condensation, scientific discourse Ubuntu, pedagogy of wholeness.

1. Introduction

The advancement of a knowledge-based economy within a globalised world means engineering education institutions ought to produce graduates who possess exceptional technical and “soft skills” (Munir, 2021). In fact, the collaborative and interdisciplinary nature of engineering work has prompted an ideological shift, a change in attitude and approach toward “soft skills” (de Campos, de Resende & Fagundes, 2020; Munir, 2021). The National Society of Professional Engineers (2013) requires today’s engineers to develop analytical and practical as well as communicative skills without which engineering students cannot easily understand the task at hand, execute their jobs well and/or develop critical thinking (Skinner & Mort, 2009).

Concerns related to a lack of “soft skills” among engineers and engineering graduates have come to the forefront over the last decade (Hirudayaraj et al., 2021). This is demonstrated by a great disjuncture between employers’ expectation and what the academy offers epistemologically. Engineering is a profession that utilises knowledge of mathematics and science in order to find solutions to multifaceted problems for the benefit of humans (Munir, 2021). According to de Campos et al. (2020) society expects engineering graduates to demonstrate an ability to absorb and develop new technologies, and to act critically, boldly, and creatively when identifying and solving problems.

Such “soft skills” enable engineers to develop their own personality so as to succeed in both their social, private and professional life. Non-technical requirements, usually designated as “soft skills”, are being required by accreditation boards, engineering schools’ authorities and the industry itself (Cukierman & Palmieri, 2014). This marks a ‘paradigm shift’ from fascination with “hard core” engineering and technical skills to a holistic literacy development. However, negative attitudes and perceptions of engineering students toward what is called “soft skills” makes it difficult for them to appreciate and invest in these requisite skills.

A crucial question is “how can one ensure such abilities and skills that are important for an engineer in a rapidly changing information society (Holik & Sanda, 2021:238) are scaffolded and enacted to go beyond the current experience?” Although it is fundamental to induct students into the disciplinary ways of doing and knowing (Duff, 2010; Duff & Anderson, 2015; Wette & Furneaux, 2018) it should not be the end in itself. Current practices foreground the notion of epistemological access at the detriment of the ontological and axiological being of the Electrical Engineering students. Morrow (2000:77) defines epistemological access as “learning how to become a successful participant in an academic practice.”

During the Covid-19 lockdown, requests for academic literacy intervention grew geometrically. For instance, two Electrical Engineering lecturers (one content and the other communication skills lecturer) approached the writing centre at CPUT to initiate the academic literacy

intervention (“Writing Centre Intervention”) to facilitate scientific report writing – a genre highly valued in engineering. A new approach ought to be devised essentially to explicate the underlying discourse of the report writing genre and promote student engagement. Without scaffolding discourses many students are unlikely to gain access to disciplinary ways of learning and writing, and they, therefore, can be excluded from the university (Laubscher & Van der Merwe, 2014). Discourses, according to Gee (1990:142), “are ways of being in the world, or forms of life which integrate words, acts, values, beliefs, attitudes, social identities, as well as gestures, glances, body positions and clothes.”

A scaffolding strategy of using a research article as a model for writing a lab report is proposed by Laubscher and Van der Merwe (2014). These authors are of the view that this strategy can be useful despite its pros and cons (Laubscher & Van der Merwe, 2014:6). The authors conceded that there are some major differences between the research article and the lab report, however, they reckon a lab report is a pedagogical version of the research article genre. Consistent with the need to promote access to disciplinary discourses and privileged genres in the engineering and science fields, we believe the lab report genre needs to be supplemented with other theoretical tools such as translanguaging. Such initiative can address both the epistemological and ontological needs of the English second language speakers trying to access disciplinary knowledge and often-hidden epistemic values in a University of Technology.

Translanguaging, or engaging in bilingual or multilingual discourse practices, is an approach to bilingualism that is centred, not on languages as has been often the case, but on the practices of bilinguals that are readily observable (Poza, 2017:101). The act of ‘languaging’ involves that language users continually make strategic choices from all the semiotic resources at their disposal (Carstens 2016). Translanguaging as a pedagogic strategy ensured deeper understanding of the content and identity formation – important pillars for a positive schooling experience (Malekela, 2015:28).

This study reports on the Electrical Engineering first year students’ axiological experiences of Writing Centre Intervention wherein the underlying structuring discourses of scientific report were explicated and scaffolded. The affordances of this pedagogical approach were evaluated and proven to have axiological and ontological implications for students.

2. Discourse and knowledge structure in engineering

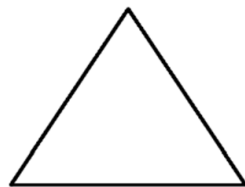
Disciplines such as applied linguistics, business, and social sciences all rely on the careful interpretation of qualitative analyses or statistical probabilities to construct and represent knowledge, requiring more elaborated exposition and greater tentativeness in expressing claims (Hyland & Tse, 2004:173). On the contrary, hard disciplines such as engineering emphasise greater reliance on multi-modality and arguments which require frequent reference to tables, figures, photographs and examples (Hyland & Tse, 2004:173-174). Readers are often familiar with prior texts and research, and so a strong interpersonal element is not so necessary in the

sciences. Writers are able to rely more on shared background and proven methods (Hyland, 2011:203).

Bernstein's (1999, 2000) characterisation of disciplines with hierarchical and horizontal knowledge structures could help the academic literacy practitioners to understand the nature and distinction between hard science and social science. A horizontal knowledge structure, illustrated by the humanities and social sciences, is "a series of specialized languages with specialized modes of interrogation and criteria for the construction and circulation of texts" (Bernstein, 2000:161). The segmented nature of humanities and social science languages is represented visually in terms of languages:

$$L^1 L^2 L^3 L^4 L^5 L^6 L^7 \dots L^n$$

Horizontal knowledge structures can be expressed as, in the case of English literature criticism, a specialised language with specialised modes of interrogation and criteria for the construction and circulation of texts; in sociology, the languages refer to functionalism, post-structuralism, post-modernism and Marxism (Bernstein, 1999). According to Bernstein (2000:168) each horizontal knowledge structure has its own grammar, which might be 'strong' or 'weak' and 'explicit' or 'tacit.' In contrast, a hierarchical knowledge structure, illustrated by the sciences, is "a coherent, explicit and systematically principled structure, hierarchically organized" which "attempts to create very general propositions and theories, which integrate knowledge at lower levels, and in this way shows underlying uniformities across an expanding range of apparently different phenomena" (Bernstein, 2000:160–161). Diagrammatically, the hierarchical knowledge structure is represented by a triangle:



Hierarchical structures are inclined towards greater integration toward the apex of the triangle – the abstract levels. At the lower levels, the general propositions, theories and beliefs show an expanding range of apparently different phenomena. It could be said that hierarchical knowledge structures are produced by an 'integrating' code (Bernstein, 1999). Integration of knowledge does not occur through the context, but through integration of meanings, meanings that are not tied to a specific context (Bernstein, 2000:160). Martin, Maton and Matruglio (2010:437) state that hierarchical knowledge structures test theories against data whereas horizontal knowledge structures use theory to interpret texts.

Scientific discourse relies on technical terms and dense clause structures that pack meaning into a single sentence, often using the nominalization of verbs to make claims about abstract phenomena (Gebhard, Chen & Britton, 2014). Nominalization has the capability to distance the

author from the event by developing the representation of a circumstance to a higher level of abstraction (Dezfuli, 2021). Students who choose science as a field of study are generally disposed towards a knowledge code which requires working with concrete facts and proceduralised methods and will likely focus their efforts on epistemic relations rather than on social relations (Ellery, 2017:95). Winberg (2007:323) posits that a vertical engineering discourse is difficult to relate directly to engineering practice because it is based on hierarchical, decontextualised structures, and not contextualised segments of practice. She further proposes the horizontalisation of vertical discourses if it is to be related to practice.

Bernstein's concept of recontextualisation comes to mind. It entails delocating knowledge from the field in which it was produced and relocating it into pedagogic discourse (Bernstein 2000:113). In engineering, recontextualisation can apply to movement both from disciplinary to real-world settings and from the real-world to academic disciplines, or even within particular (academic or real-world) contexts (Winberg, 2007:324). Hyland (2011:194) alluded to the fact that scientific papers are seen as persuasive because they communicate truths which emerge from people's direct access to the external world. Text is merely the channel through which scientists report observable facts.

As disciplines need explicit teaching of disciplinary discourses and genres (Kelly-Laubscher & Van der Merwe, 2014), the challenge is to find a holistic strategy that explicates underlying discourses and enables students to transcend their deficit situations and affirm their being. Investment in both content area literacy and disciplinary literacy is a way to go. Shanahan and Shanahan (2012) distinguish between content area literacy and disciplinary literacy. Accordingly, content area literacy focuses on study skills that can be used to help students learn from subject specific texts. On the contrary, disciplinary literacy is an emphasis on the knowledge and abilities possessed by those who create, communicate, and use knowledge within the disciplines (Shanahan & Shanahan, 2012:8).

Disciplinary literacy is a culture that involves the practices of the discipline (engage), depends on providing students the literacy strategies used within that discipline (elicit/engineer), examines the language of the discipline, and evaluates why those practices are valued (Howell, Barlow & Dyches, 2021:3). This description is informed by Moje's (2015:255) 4E framework, which is composed of engage, elicit/engineer, examine, and evaluate which suggests that disciplinary literacy is more than just the "accumulation of skills." Shanahan and Shanahan (2012:8) further state that content area literacy refers to surface learning which is used instrumentally to study for test or examination whereas disciplinary literacy emphasises the unique tools that the experts in a discipline use to engage in the work of that discipline (the deep learning approach).

Gillis (2014:615) argues that content area reading tends to impose generic reading strategies on content-specific texts whereas disciplinary literacy considers content first and asks, "How would a scientist (or historian, mathematician, or writer) approach this task?" The latter view is corroborated by Gee (2016:35) who argues along the lines of New Literacy Studies stating

that literacy was a social and cultural achievement centred in social and cultural practices. Success is dependent on knowing the feeling, attitude and perception of the actors or participants. Thus, the WCI project was designed to go beyond a mere socialisation of students into the disciplinary ways of knowing and doing (Lea & Street, 1998) but to foreground their psychology and affect (ontological being).

3. The value of “soft skills” in engineering

The field of engineering can be divided into “hard” and “soft” engineering. In the United States, stereotypes about science include robust beliefs that science fields do not afford opportunities to fulfil communal goals (Cheryan et al., 2015). It is all about ‘hard’ science skills. Communion involves a drive toward people in terms of working with, helping, and developing relationships with others; and its counterpart, agency, involves a drive for oneself in terms of one’s own achievement, status, and independence (Pöhlmann, 2001; Abele & Wojciszke, 2007). Communal and agentic goals are critical for understanding science participation, because science fields are perceived as unbalanced in their ability to afford both communal and agentic opportunities. That is, the culture of science is stereotyped as highly agentic, whereas opportunities to fulfil communal goals are perceived as missing from science majors and careers (Diekman et al., 2017).

The National Society of Professional Engineers (2013) demand that the following attributes must be acquired in preparation for tomorrow’s professional engineers:

- Analytical and practical
- Thorough and detail-oriented in design
- Creative and innovative
- Communicative
- Knowledgeable about the application of sciences and mathematics
- Thoroughly knowledgeable in a selected field of engineering and conversant in related technical fields
- Knowledgeable about and skilful in business and management
- Able to provide leadership - with ability to effect change in strategies, tactics, policies, and procedures in project and other roles
- Professional and positive in attitude
- Aware of societal and historical considerations in the global context
- Aware of and compliant with relevant laws, regulations, standards, and codes
- Licensed as a professional engineer and knowledgeable about engineering ethics and applicable codes of professional conduct
- Dedicated to lifelong learning

The above attributes bring together the social, practical, cognitive and psychological – *the ontology of whole person*. Hirudayaraj et al. (2021) believe that the soft skills required vary based on the career levels which engineers occupy. Put differently, the set of soft skills required in entry-level occupations are not the same, as those necessary for senior management level positions (Hirudayaraj et al., 2021; Kappelman, et al., 2016). “Being endowed with great intellectual abilities, one may become a brilliant fiscal analyst or a legal scholar, but a highly developed emotional intelligence is what will make one a candidate for a CEO, a brilliant trial lawyer, a successful politician or a powerful bureaucrat” (Singh, 2006:20).

Serrat (2017:337) claims that emotional intelligence may be the (long sought) missing link that unites conventional “can do” ability determinants of job performance with “will do” dispositional determinants. Tripathy (2018) acknowledges the centrality of emotions to everything people do such as action, decision and judgement. The author believes, “emotionally intelligent people recognize this and use their thinking to manage their emotions rather than being managed by them” (2018:2). Emotional intelligence gives modern leaders competitive edge and is a sought-after skill in the engineering industry.

As the understanding of emotions has become more nuanced, their effect on cognition, attention, memory, decision-making and social skills has great implications for education (Barry, 2022: 62). This means emotions and social relations are central to the development of “soft skills.” de Campos, et al. (2020) cluster soft skills into five categories: communication, creative thinking, teamwork, emotional intelligence and ethical perspective (see Figure 1 below).

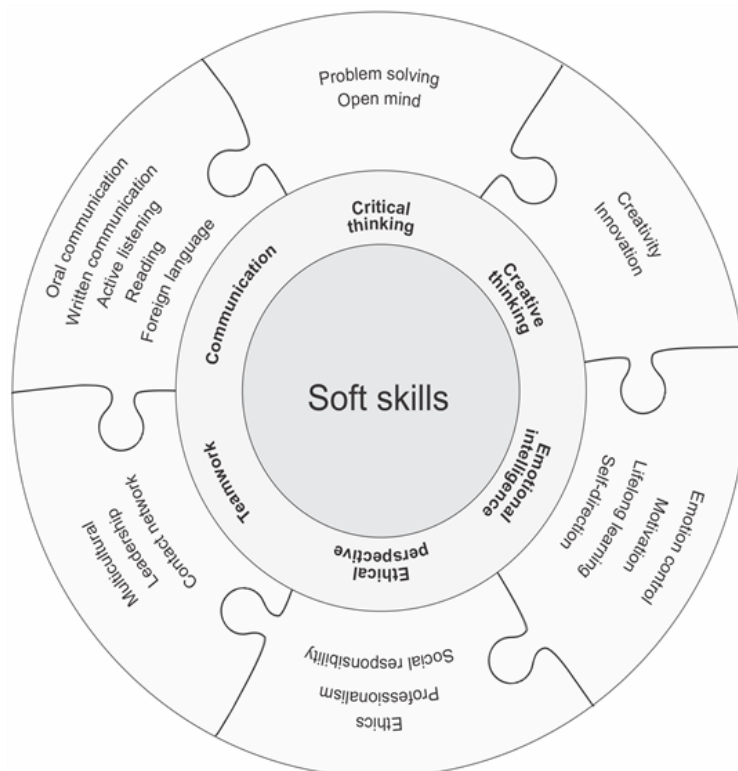


Figure 1: A compilation of soft skills for engineers (Source: de Campos, de Resende & Fagundes, 2020)

Although all the categories of soft skills dovetail to one another, the Writing Centre Intervention (WCI) dealt with in this article focused mainly on the development of communication, ethics and emotional intelligence. Goleman (1998) is credited for the development of the concept of emotional intelligence. Segal (2008) posits that emotional intelligence skills are instrumental in enabling people to recognise, contain and effectively communicate their emotions.

Communication is multifaceted and incorporates various forms, such as oral, written, listening, visual, intercultural, interdisciplinary (Riemer, 2007). Regular and effective communication is crucial for engineers because projects will suffer if there is a breakdown in communication among executives, managers, team members and customers (Munir, 2021:164). Since engineers often work in multidisciplinary projects and teams, team members need to enhance their ability to communicate well – as such skills are pivotal to the presentation of oral and written proposals. “If engineers were to rely solely on their technical skills, they would not be able to complete their team projects and would probably be left with serious misperceptions and loss of time, capital and even their jobs” (Munir, 2021).

Effective communication and emotional intelligence make it possible for one to recognise the emotions of other people and develop empathy and live/work with them relationally. For Lejano (2020) relationality emphasises connectedness and that the ethic of relationality is distinct from an ethic of rationality (i.e. dominant Western logic). Thus, the valuing of others, empathy and relational understanding of people’s social reality are some key components of *ubuntu*. The link is between ontology – *umuntu* – and epistemology and ethics *ubuntu* (Ramose, 2004:149).

4. Conceptual/theoretical framework

This study is underpinned by Karl Maton’s (2014) Semantics dimension, especially the concept of axiological condensation, which points to social relations (“the people”), values, politics and emotions. Systematic Functional Linguistics was used to analyse the data. Martin and White’s (2005) concept of “engagement” was used to determine the participants’ adopted stance toward the Writing Centre Intervention (WCI). In addition, the African philosophy of *Ubuntu* (Ramose, 2002, 2007), genre pedagogy (Martin & Rose, 2003; Laubscher & Van der Merwe, 2014; Hyland 1999, 2011; Hyland & Tse, 2004) and the soft skills for engineers’ framework have been used to conceptualise the study.

de Campos, de Resende and Fagundes’ (2020) clustering of soft skills provided a way of viewing soft skills in engineering. As indicated earlier, five categories of soft skills (communication, creative thinking, teamwork, emotional intelligence and ethical perspective) are linked to the development of academic literacies of the students. Emotional intelligence has emerged as one of the crucial components of emotional adjustment, personal well-being, interpersonal relationships, and overall success in life (Goroshit & Hen, 2012). Emotional

intelligence describes the ability, capacity, skill, or self-perceived ability to identify, assess, and manage the emotions of oneself, of others, and of groups (Serrat, 2017:330). This soft skill is valued in the engineering industry, as part of leadership development.

Legitimation Code Theory (LCT), especially the dimension of Semantics, was used to conceptualise both the epistemic relations (knowledge) and social relations (knowers). Semantics is one of the five set of organising principles underpinning practice (Clarence 2016:126). Others are; Specialization, Autonomy, Temporality and Density (Maton, 2014). Semantics can be enacted to explore the ways in which knowledge is packaged as it is produced, recontextualized or transmitted (Siebörger & Adendorf, 2017:197). Two concepts that form the core of Semantics are semantic gravity (SG) and semantic density (SD) (Maton, 2014:18). SG is the degree to which knowledge is related to its context, while SD is the extent to which meanings are condensed into particular words, phrases or symbols, regardless of context (Maton, 2014; Siebörger & Adendorf, 2017).

Semantic density can be strengthened in terms of epistemological condensation and axiological condensation. This paper focuses on axiological condensation. Axiological condensation is defined by Maton (2014:130) as the association of action and ideas that are both awarded with a particular moral or affective worth in order to depict their version of the method to be followed as morally superior to that of their opponents. Maton believes that interpersonal meanings, which are a process of condensing “affective, aesthetic, ethical, political, and moral orientations,” are an expression of axiological condensation (Maton 2014:130). Axiological condensation is active in a text to varying degrees while the process of amplification of the axiological-semantic density is axiological condensation (Maton, 2014).

Axiological condensation can help people group knowledge into groups of ideas called “constellations”. The ideas tend to cluster around a main idea or concept mentioned by Maton's central signifier. This constellation can be loaded with positive and negative values. In fields with horizontal knowledge structures and hierarchical knower structures the focus is on ‘who you are’ through a way of viewing the world that emphasises values and attitudes. This axiological cosmology is the basis of measuring one’s legitimacy as a knower, as a historian for example (Maton, Martin & Matruglio, 2010:451). Values are superordinate to both purpose and perspective (Hill, 1984:66-67). This view is sustained by the researchers in this paper and seek to explore the degree of axiological engagement among the Electrical Engineering students.

Systemic functional linguists such as Martin and White (2005:94) conceptualised a taxonomy of engagement which is directed towards identifying the particular dialogistic positioning associated with given meanings and towards describing what is at stake when one meaning rather than another is employed (Martin & White, 2005:97). Engagement examines the ways in which text producers use lexical choices to open and close space for alternative voices, or

heteroglossia, in discourse around the subject matter of the text (Siebörger & Adendorf, 2017:203). Table 1 outlines the taxonomy of engagement and its sub-types:

Table 1: Engagement Taxonomy (Adapted from Martin & White, 2005)

Taxonomy of Engagement		
Subtype	Description	Examples
Disclaim	The textual voice positions itself as at odds with, or rejecting, some contrary position	<ul style="list-style-type: none"> • (deny) negation (<i>You <u>don't</u> need to give up potatoes to lose weight.</i>) • (counter) concession/counter expectation (<i>Although he ate potatoes most days he still lost weight.</i>)
Proclaim	By representing the proposition as highly warrantable (compelling, valid, plausible, well-founded, generally agreed, reliable, etc.), the textual voice sets itself against, suppresses or rules out alternative positions	<ul style="list-style-type: none"> • (concur) naturally ..., <i>of course</i> ..., obviously ..., <i>admittedly</i> ... etc.; some types of 'rhetorical' or 'leading' question • (pronounce) <i>I contend</i> ..., <i>the truth of the matter is</i> ..., <i>there can be no doubt that</i> ... etc. • (endorse) <i>X has demonstrated that</i> ...; <i>As X has shown</i> ... etc.
Entertain	By explicitly presenting the proposition as grounded in its own contingent, individual subjectivity, the authorial voice represents the proposition as but one of a range of possible positions – it thereby entertains or invokes these dialogic alternatives.	<ul style="list-style-type: none"> • <i>it seems, the evidence suggests, apparently, I hear</i> • <i>perhaps, probably, maybe, it's possible, in my view, I suspect that, I believe that, probably, it's almost certain that</i> ..., <i>may/will/must</i>; some types of 'rhetorical' or 'expository' question
Attribute	By representing proposition as grounded in the subjectivity of an external voice, the textual voice represents the proposition as but one of a range of possible positions – it thereby entertains or invokes these dialogic alternatives.	<ul style="list-style-type: none"> • (acknowledge) <i>X said.</i>, <i>X believes</i> ..., <i>according to X, in X's view</i> • (distance) <i>X claims that, it's rumoured that</i>

In relation to attachment of value to the utterance/text, the notion of “like” and “dislike” is similar to Martin and White’s (2005) concepts of “alignment” and disalignment”. “By ‘alignment/disalignment’, these authors refer to agreement/disagreement with respect to both attitudinal assessments and to beliefs or assumptions about the nature of the world, its past history, and the way it ought to be” (Martin & White, 2005:95). In other words, engagement values scale for the degree of the speaker/writer’s intensity, or the degree of their investment in the utterance (Martin & White, 2005:135-136).

Society expects engineering graduates to be able to consider political, social, environmental and cultural aspects (de Campos, de Resende & Fagundes, 2020). This means that they should not limit themselves to technical competencies but should embrace a holistic view of the engineering science (i.e., technical, commercial, social and ethical dimensions of engineering practice). The fairness approach to ethical decision making provides that the course of action chosen should treat individuals equally (Mabvurira, 2020:75). This notion of social justice is what Letseka (2014) associates with *Ubuntu*, the African philosophy based on humanness and relationality. A pedagogy similar to *ubuntu*, known as “Sentipensante”, is proposed by Rendon (2009) to cater for the integration of the mind and the soul, theory and practice, epistemology and ontology. Sentipensante (sensing/thinking) Pedagogy represents a teaching and learning approach based on wholeness, harmony, social justice, and liberation. Rendon developed the theoretical underpinnings and elements of Sentipensante Pedagogy from the lessons taken from her learning inquiry and from her own personal experiences in employing a sensing/thinking pedagogy (Rendon, 2009:132).

5. Research methodology

This is a qualitative research study. It is designed to study a psycho-social phenomenon of Electrical Engineering students’ experience, perception and attitude at the Cape Peninsula University of Technology. 12 first year Electrical Engineering students were interviewed via Ms Teams after the academic literacy intervention was concluded. Interviews lasted between 20 and 35 minutes. From August to October 2021, the Writing Centre Intervention (WCI), a series of 2-hours workshops modelled on Kelly-Laubscher and Van der Merwe’s (2014) were facilitated virtually using MS Teams. The WCI’s objective was for the students to grasp the underlying discourses of scientific report and feel confident about writing, as this is one of the assessment tools privileged in electrical engineering.

At the end of the intervention, an open invitation was made to the students so that those students who are interested can participate in the study. Out of 12 students who were interviewed, a sample of 5 was selected. Only the parts of the interview that spoke to the purpose of the study were sampled and analysed. Interpretation of data could possibly be partly influenced by the researchers’ bias, as they participated in the WCI process. However, the selection of the relevant

data was performed after a series of listening to the MS Teams audio and refinement of the MS Teams transcription, which came with some errors and unintelligible clauses.

Two main questions were posed:

- What were your impressions of scientific report writing at the beginning of the Writing Centre Intervention (WCI)?
- To what extent has your experience or perception changed as a result of the WCI?

The analysis of data was made possible by Maton's (2014) concept of axiological condensation and Martin and White's (2005) concept of engagement. Jackson (2021) states that by analyzing the axiological constellations one makes clear how the participants align and disalign ideas and entities in their utterances in order to construct value positions in relation to broader sociocultural discourses.

6. Presentation and interpretation of findings

Abstraction of values: Maton's (2014) axiological condensation

Maton's (2014) concept of axiological condensation was used to determine from the data, constellations of positive and negative values. For Maton (2014), axiological condensation creates hierarchies of knowers, assigning to these knowers a positive, negative or neutral moral charge given to the constellations with which they are associated. The participants (Denvor, Nandi, Thabo, Aliwaru and Zodwa) were asked to reflect on their perception, attitude and experience of the scientific report writing process – highlighting how they felt at the beginning of the process and the extent to which their perception and attitude change at the end.

Denvor (pseudonym) could not believe when they were instructed to do writing, as his expectation was different about the University of Technology and Electrical Engineering course:

I was like confused when we were given writing tasks. I had no expectation to write essays and reports. I just expected hard work. Since this is a University of Technology I expected a more practical work... After the writing centre intervention I began to see the value, although writing is demanding and still complicated (Denvor).

The realisation that Electrical Engineering students have to write reports and essays came as a surprise. Axiologically, this is a minus value. Denvor participated in the process and was ultimately made to realise the value of the literacy practice (plus axiological value). However, he still believes that scientific writing is demanding and complicated (minus axiological value). Possibly, much of this is owed to his attitude or prior knowledge that engineering entails “more practical work” than theory.

Nandi (pseudonym) was not happy that she was unable to “write” and “get it done” (minus axiological value). Although one can view her utterance positively as inclined to mastering the writing process, but on close examination, she is agitated and would want to get rid of the task and move on (minus axiological value):

I hated the fact that I was not able to write the report and get it done with. Putting my idea /thought into words... Also grammar and sometimes spelling of terminology. When Writing Centre lecturers explain things you understand. But when you are alone, it gets difficult to apply writing theory. Only if Writing Centre can come early in the year to teach us these things... they make it sound easy (Nandi).

From Nandi’s utterances, one can deduce resentment and pessimism about the WCI. The choice of phrases such as “I hated”, “it gets difficult” and “they make it sound easy” indicate not only strong negative feelings but distance from the process. Axiologically, a minus sign should be attached to her attitude and feelings about the process. Other important challenges raised by Nandi are the following: “putting ideas into words” (problem of transference and composition), “grammar and spelling of terminology” (surface language features) and “to apply writing theory” (application of knowledge). Besides, these being linguistic and epistemic challenges, Nandi expressed concern that the WCI was introduced late. This also warrants a minus axiological value.

When Thabo referred to the academic literacy practitioners as “the writing people” one can see that he does not care much about their precise identity. During the interview he came across as someone who does not see the purpose of learning to write. Thabo expected “rocket science, just calculations and principles.” Writing is distant and irrelevant to him. Although his negative utterances are similar to those of Denvor, but his positive axiological value cannot be equated with that of Denvor. Thabo used three words, “That, I appreciate”, to express his approval. To us this constitutes a condescending attitude. The use of the pronoun “I”, for example, does not give a sense of full appreciation and investment in the process:

I don’t understand the skill of writing that I am expected to use. My expectations were rocket science, just calculations and principles... why bother teaching us writing? It’s unlike we are going to publish books or something. The writing people explain the process and language of practical report to us. That, I appreciate (Thabo).

Another minus axiological value can be associated with Thabo’s utterance, “it is unlike we are going to publish books or something.” Moreover, Thabo said, “the writing people explained process and language.” This indicates a distant attitude of someone who is disinterested.

Aliwaru (pseudonym) is axiologically positive about the value of language in the university and world of work. She even contextualises it “in the workplace...” and further argues “if one cannot use proper technical language” (disciplinary discourse) she would not be understood.

She revealed that the content lecturer gave Electrical Engineering students a template to learn about and fill out in respect of report writing. She conceded that the template was difficult to comprehend and utilise:

In the workplace, you need to have presentations so language is useful. If you can't use proper technical language it makes things harder to understand... It was difficult at first to understand our lecturer. We were also given template that was difficult to understand... Writing centre came and explain, especially data analysis and explaining terms – correlations, contradictions, co-efficiency, presentation of data, discussion of findings, triangulation of data with literature, etc. We did not know about these things. In fact, I did not worry myself about them (Aliwaru).

The scientific report template takes both positive and negative axiological values. It is a good pedagogical strategy used by the lecturer for modelling and raising awareness about the layout and discourse of a scientific report. From the students' perspective, it is seemed "difficult to understand", which takes a minus value. Moreover, Aliwaru feels positive about the Writing Centre Intervention (WCI) because they were taught so many things – definition of terms, data analysis and various concepts used "including "triangulation of data with literature" – things she was not worried about before.

Zodwa (pseudonym) is extremely positive about the WCI, especially the shift from English-only pedagogy to the one that adopts a translanguaging strategy. She also expressed a desire to have an opportunity to engage with the facilitators, but her content lecturer muted their microphone and did not allow them to contribute ideas and questions in the chatbox:

I was happy when isiXhosa and Afrikaans was used alongside English during workshops. Though we could not participate, as our lecturer muted the class, we could not use the chatroom either, but the Writing Centre people explained in detail, section-by-section the scientific report writing process...from abstract to references...More than two languages were used, which is good. Well, at the end of the day, you felt confident that you can do it on your own. They also shared their PowerPoint presentations to use as reference in the future (Zodwa)

A positive axiological value is expressed by Zodwa with respect to the scaffolding of the scientific report "from abstract to references". The use of multilingualism ("more than two languages" is commended – a plus axiological value. What is also promising is the fact that Zodwa is committing to use the material resources (Power Point presentation) in her future writing endeavour.

Analysis of Data: Martin and White's (2005) concept of engagement

As indicated earlier, in order to understand the notions of alignment and disalignment, agreement and disagreement with respect to attitudinal assessments and assumptions underpinning the participants' utterances, Martin and White's (2005) concept of engagement was used. Of particular importance was the revelation of engagement sub-types, namely: 'disclaim', 'proclaim', 'entertain' and 'attribute'.

Denvor's utterances:

The expression, "*I was like confused...*" represents a proclaim because the proposition is highly warrantable (Martin & White 2005:98). The word "confused" is a property of the mind that denotes a negation of lucidity or intelligibility. Another clause, which is an element of negation (disclaim) is, "*I had no expectation...*" because Denvor "*expected hard work*" (proclaim). A disclaim is defined as "the textual voice positions itself as at odds with, or rejecting, some contrary position" (Martin & White 2005:97). For the proposition is grounded in its own contingent, individual subjectivity (Martin & White 2005:98). An example of entertain is, "*I began to see the value...*". The complementary clause that ensues is a concession.

Nandi's utterances:

Nandi's expression, "*I hated the fact that...*" is an example of the proclaim because the proposition is representing a highly warrantable statement (compelling, valid, plausible, well-founded, generally agreed, reliable, etc.) where the textual voice sets itself against, suppresses or rules out alternative positions (Martin & White 2005:98). Here, Nandi pronounces upon her feelings, a psychological state of mind. A disclaim, in the form of negation, is captured by Nandi in two expressions, "*I was not able to write...*" and "*it gets difficult to apply writing theory*". Nandi attributed other challenges to "*Putting my idea /thought into words...*", "*Also grammar and sometimes spelling of terminology*" and to the fact that she did not get joy in applying what Writing Centre lecturers explained when she is alone. This points to a cognitive linguistic state (epistemology).

Thabo's utterances:

Disclaim, attribute, entertain and proclaim are evident in the number of Thabo's utterances. When Thabo said "*I don't understand the skill...*", he is uttering a disclaim. He is denying understanding the requirements or expectations of writing a scientific report. This is attributed to the fact that his expectations were "*rocket science, just calculations and principles*" (a proclaim). Another disclaim and attribute is that Thabo is asking rhetorically, "*why bother teaching us writing?*" That is associated/attributed to the belief that they are not "*going to publish books or something.*" The clause, "*That, I appreciate*" is so abrupt and indicates

disengagement or disalignment (negation). Even if it may sound positive, its intensity is reduced. In fact, it is both the entertain and disclaim.

Aliwaru's utterances:

The phrase, "*In the workplace...*" is an example of an attribute, an identification of location, of context. A Proclaim is captured in "*...so language is useful.*" The following conditional clause, "if you can't use proper technical language..." is a disclaim, a negation. Another proclaim can be abstracted from, "*We were also given template that was difficult...*" The last two clauses indicate a disclaim, "*We did not know is...*" and "*In fact, I did not...*" In addition, the latter is a proclaim because Aliwaru is contending to have not paid attention to the pertinent concepts, processes and values in scientific report writing.

Zodwa's utterances:

Zodwa's utterances can be categorised into both a proclaim, disclaim and attribute. The phrases, "*I was happy...*", "*...the Writing Centre people explained...*", "*...which is good*" and "*they shared...*" are the instances of a proclaim. A disclaim is captured in "*...we could not participate...*", "*...we could not use...*" The reference made to "*More than two languages...*" and "*...you felt confident...*" are examples of an attribute.

Disclaim (negation and inability) and proclaim (statement of conviction and identity) are dominant in the participants' utterances. As much as this is an ontological dimension, it has epistemological implications, as the participants would not be able to succeed in their studies (unless a tailored intervention that brings ontology and epistemology together is conceptualized and implemented in engineering).

7. Discussion and conclusion

From data analysis, general cognitive-epistemic, linguistic-rhetorical and psycho-social factors emerged. Using Maton's (2014) axiological condensation and Martin and White's (2005) concept of engagement, emotive (positively and negatively charged utterances), ontological and some epistemological relations were identified. The choice of words/phrases and clauses to describe the participants' state of mind (positive and negative) have pedagogic implications. Technical linguistic features were downplayed in this study because we (the researchers) were interested in thick descriptions that reflect the participants' state of mind, their experiences and perceptions of the Writing Centre Intervention (WCI) and the affordances of scientific report writing for Electrical Engineering students.

From the participants' utterances (the entertain and proclaim), one can deduce a mixed bag of emotions where Denvor, Thabo and Nandi were grappling with the idea of learning about

writing instead of “hard core” engineering skills (i.e. “practical work”, “hard work”, “rocket science”, “calculations” and “principles”). A minus axiological value (disclaim) is underscored by words or phrases like “confused” and “no expectation” of writing. Moreover, proclaims such as “I was like confused”, “I hated” and “why bother teaching us writing?” demonstrate the varying degree of negative feelings the participants had of learning the “soft skill” (writing). This view may be attributed to historical stereotypical beliefs about science and engineering - a false dichotomy often reflected in the society about theory and practice and about science and humanities.

The participants’ disclaim relate to Hyland’s (2011) account on that which reinforces a view of science as an impersonal, inductive enterprise and allows scientists to see themselves as discovering truth rather than constructing it: a pursuit of valid truth. But “Truth” is acknowledged as the product of social endeavour, subject to its historical specificity and material conditions of construction. Science, in this sense, always carries the mark of human labour and its material praxis (Judd, 2003:5). Kuhn (1970) believes that the work of science progresses normally via a scientific community continuously accumulating knowledge under a particular paradigm; however, as anomalies begin to accrue under the old paradigm, the community falls into crisis.

Science related subjects owe a great deal to Emmanuel Kant’s philosophy, which focuses on epistemology to the neglect of ontology (Judd 2003). Issues of epistemology are emphasised, but whenever epistemological questions displace ontological questions, we continually risk conflating ontology with epistemology (Judd 2003:32). Roy Bhaskar calls this the epistemic fallacy and describes it as “the view that statements about being can be reduced to or analyzed in terms of statements about knowledge, i.e., that ontological questions can always be transposed into epistemological terms” (Bhaskar 1997: 36). Changes in the society and industry require that engineers must develop soft skills (National Society of Professional Engineers, 2013; Hirudayaraj et al., 2021; Munir 2021) which de Campos, de Resende and Fagundes (2020) cluster into four categories: communication, creative thinking, teamwork, emotional intelligence and ethical perspective.

A leader who possesses strong emotional intelligence tends to be an effective and efficient performer (Balamohan & Gomathi, 2015). Effective bosses are also able to manage their own emotions, with the result that employees trust them and feel good about working with them (Cherniss, 2001:5). A recognition of an ideological shift in engineering and science disciplines (community and industry alike) calls for transformative pedagogy. Such pedagogical practices would foreground both epistemological relations and ontological positions, as it is reflected in the interview data. Actually, communal and agentic goals are critical for understanding science/engineering participation instead of a focus on the agentic “hard’ science/engineering skills (see Diekman et al., 2017; Cheryan et al., 2015; Abele & Wojciszke, 2007).

Sentipensante as a pedagogic approach recognises the connection between Western and non-Western ways of knowing, the scientific method, and knowledge derived from the humanities and social sciences, as well as the spiritual experience. The WCI was a short term project but can be strengthened to push the boundaries of literacy in electrical engineering – by encouraging the discipline to engage critically with knowledge (epistemologies) and psycho-social ontology and communicative abilities (rhetorality). An investment in the Academic Literacies approach has the potential to make tacit knowledge more explicit (Elton, 2010). Academically literate students are empowered to engage critically with the curriculum and ought to strengthen their resolve to social change as critical human agents.

Clarence and Mckenna (2017) suggested that academic literacy practitioners should recruit powerful resources such as Legitimation Code Theory to understand the nature of disciplines and underlying structuring principles of disciplinary knowledge. In addition, we call for Systemic Functional Linguistics (SFL) to add to the arsenal of academic literacies practitioners. SFL provides nuanced social semiotic resources for meaning making (Halliday & Matthiessen 2004). This can potentially strengthen the practical side of the Academic Literacies Model (Lea & Street 1998; Lillis & Scott, 2007). For instance, participants' proclamations such as "I see the value" of writing, "still demanding" and "complicated", although they are not explicit, indicate a change of perception, and therefore should be realised as either plus or neutral axiological values. This is a window of opportunity for more philo-theoretical resources to enable student's meaning making.

A Systemic Functional Linguist, Hyland (1999), establishes a link between citation and the development of disciplinary knowledge. "Explicit reference to the previous literature is a substantial indication of a text's dependence of contextual knowledge and a vital piece in the collaborative construction of new knowledge between the writers and readers" (Hyland, 1999:343). This speaks to the synthesis of ideas following the dictates of particular social conventions and practices. This includes ethics and academic integrity (Moxely & Archer, 2019). Students are more likely to understand referencing as a rational and legitimate practice when they understand its relevance and value (Moxely & Archer, 2019).

In another place, Hyland and Jiang (2017:2) characterise citation as a keyway in which claims are integrated into current knowledge, either by situating the new work in the scaffolding of already accredited facts, or by challenging those facts to carve out a novel position. Ethical issues such as honesty, integrity, plagiarism avoidance and acknowledgement of copyright and sources of information, are crucial in the university, world of work and society (Moxely & Archer, 2019). Aliwaru expressed appreciation of the facilitation of scientific report writing (entertain) because it is valued in the industry. It exposed them to concepts, processes and principles that were often ignored.

Zodwa was excited that translanguaging was used to promote not only epistemological access but to affirm the being of the majority of students who speak English as either second or third language. Transformative pedagogies will not only promote students' engagement but shall prepare them as critical change agents. Critical agency is a prerequisite in decolonising higher education because it entails counteracting hegemonic forces and epistemic practices at the individual level with transformative implications for identity formation and social transformation (Maseko, 2018). Ramose (2002, 2007) posit that *Ubuntu* as a philo-praxis guarantees the inseparable link and interwoven nature of ontology and epistemology.

Just as any epistemology or theory of knowledge presupposes an ontology or theory of reality, whether or not the latter is acknowledged and articulated, any stable set of practices people employ sooner or later presupposes a theory (Judd, 2003:6). So, a pedagogy of wholeness (Rendon 2009), *Ubuntu* as philo-praxis (Ramose 2002, 2007), Legitimation Code Theory Maton (2014) and transformative praxis (Luitel & Dahal, 2020) ought to be recruited to scaffold genres and explicate hidden dimensions and structuring mechanisms of discourse and knowledge in the field. A sharpened WCI has great potential to move students beyond the current realities of not being able to “apply writing theory”, “translate ideas into paper” and deal comfortably with the complexities and difficulties attributed to scientific writing. Therefore, the study welcomes a move toward a pedagogy that brings together the technological, epistemological, spiritual and ontological dimensions of learning beyond the “new normal.”

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