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"It's not my job to teach writing": Activity theory analysis of [invisible] writing practices in the engineering curriculum

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Although writing is still the main form of assessment at university, the practice of writing continues to be marginalised, particularly in technical disciplines such as engineering, notwithstanding decades of reports identifying gaps in graduate communication abilities in these fields, and diverse interventions to address these gaps. The assumption underlying many of the reports and interventions is that engineering students neither value nor are interested in writing, but actually many engineering students are not provided with the opportunity to develop or practise disciplinary writing in the subjects they study, despite being required to write in a range of genres as part of their assessment. This implies that writing practices are neither seen as developmental nor as intrinsic to the engineering curriculum. This demands the question: why not? This paper reports on a study investigating perceptions of writing practices in the engineering curriculum at the level of engineering academics. Using activity theory to capture the dynamic interactions of the various participants in engineering subjects, the study analyses the perspectives of engineering subject coordinators about writing practices in their subjects through interviews and documents. Current findings show tensions between the value of propositional or technical knowledge and that of writing practices. These findings can be used to develop a discussion with engineering academics to emphasise the developmental nature of writing and to make writing practices more visible in the engineering curriculum.

Key Words: activity theory, writing in engineering, disciplinary writing.

1. Introduction

Although writing is still the main form of assessment at university, the practice of writing continues to be marginalised (Turner, 2011); Swales refers to "an ivory ghetto of remediation" in regard to academic literacy within the institutional discourse of academe (1990, p. 11). This is particularly the case in technical disciplines such as engineering. It appears that decades of reports identifying gaps in graduate communication abilities in these fields, and diverse interventions to address these gaps have had little lasting impact. These reports focus mainly on employer expectations, which consistently list communication as one of their top five necessary or desirable attributes (Accreditation Board for Engineering and Technology [ABET], 2011; King, 2008; Royal Academy of Engineers, 2007; Sheppard, Macatangay, Colby, & Sullivan, 2009). When these reports are examined in more detail, the ability to write persuasively and concisely is identified as being a necessary part of engineering practice.

The assumption underlying many of the reports and interventions is that engineering students neither value nor are interested in writing. The deficit model of the linguistically impoverished engineering student is a recurring feature in the literature both in Australia and overseas (Her-

rington, 1985; Hilgers, Hussey, & Stitt-Bergh, 1999). However, this view is rarely interrogated; few if any studies explore the extent to which students commencing an engineering degree are less competent in writing than their peers in other disciplines, although there is anecdotal evident to support this (Mort & Drury, 2012; Pflueger, Weissbach, & Gallagher, 2015).

The root causes of engineering students' poor writing proficiency may be complex and difficult to tease out; however, the actuality is that many engineering students are not provided with the opportunity to develop or practise disciplinary writing in the subjects they study. This is despite the fact that they are expected to write in a range of genres as part of their assessment. In order to address the perceived deficiencies in student writing, a wide range of strategies and interventions have been implemented over several decades and in several continents. The majority of interventions reported in the literature cover the gamut of writing development models (Lea & Street, 1998) from study skills to socialisation within the discipline to academic literacies (Carter, Ferzli, & Wiebe, 2007; Lord, 2009; Mort & Drury, 2012), and generally provide models, exemplars and scaffolded writing exercises around authentic tasks. The US examples occasionally utilise the first year composition classes to introduce engineering topics and/or report genres (Pflueger, Weissbach, & Gallagher, 2015). Unfortunately, most of these interventions lack sustainability. The intervention, no matter how well-considered, timely, relevant and effective, is likely to disappear as soon as the writing champions move on, lose funding, undergo an organisational restructure or collapse from exhaustion and despair. It seems almost impossible to embed writing permanently in the engineering curriculum so that it is seen to be an integral element of becoming an engineer.

This suggests that writing practices are neither seen as developmental nor as intrinsic to the engineering curriculum, and thus demands the question: why not? What is it that prevents engineering students, teaching staff, heads of engineering schools and faculties from seeing writing practices as part of the engineering curriculum? What is it that causes the title of this paper to be a common refrain in the corridors of engineering faculties? In other words, what makes writing practices invisible, so that they are not seen at all, or seen as somebody else's problem, or seen only intermittently as isolated examples of good practice on the part of individual engineering academics? When we began to explore these questions, it became clear that there was a lack of research into the perspectives held by engineering academics about the place writing development should have in the engineering curriculum. There are few studies that look at how engineering academics experience writing: how they develop their writing practices, how they view writing in the engineering curriculum, how they view themselves as engineering writing practitioners, how or if they see themselves as modelling writing practices for their students. The majority of the literature examines the research writing practices of engineering academics: that is, the research papers that they write, usually as leaders or members of a research team (Curry, 2014; Koutsantoni, 2007; see also Blakeslee, 1997). Dorothy Winsor examines the writing practices of practising engineers (1990) and of novice engineers (1996); the latter study in particular contrasts the purpose and text types of the writing that novice engineers do as part of their internships with the writing they do in their engineering degree. However, gaps remain in the exploration of the understandings that engineering academics have about their own writing practices and those of their students who are doing coursework rather than research degrees.

Therefore, we have chosen to consider writing practices in the engineering curriculum by exploring the interactions between individual engineering academics, the subjects they teach, their teaching and assessment practices of the subject content and the role that writing plays. This can go some way towards providing a better understanding of how writing practices are or are not enacted in the engineering curriculum, the extent to which there is visible development of writing practices, and how engineering academics see or do not see writing practices within their subjects. Through interviews and documents, the study analyses the perspectives of engineering subject coordinators about writing practices in their subjects.

2. Methodology

The theoretical framework for this study is activity theory, which originated from Vygotsky's and Leont'ev's work in early 20th century Russia, and since the 1960s, has been used to explore

learning in educational and in workplace contexts (Engestrom, 2001; Jonassen & Rohrer-Murphy, 1999). It regards learning as culturally, socially and historically situated, so that there is no Cartesian mind/body divide; learning takes place within a social context. Activity theory (AT) focuses on human actions in the context of the larger human activity in which it is situated (Dias, Freedman, Medway, & Pare, 1999, p. 23). AT thus enables an analysis of human actions in context (1999, p. 27). Because of its situated nature, AT allows researchers to explore "the wider social and cultural contexts that are grounded in the history of [a] particular professional practice" (Orland-Barak & Becher, 2011, p. 116). It also reveals internal contradictions in practices, which can be overlooked when people focus on individual process and textual products (Dias, Freedman, Medway, & Pare, 1999, p. 28). AT analysis examines these activities in the framework of an activity system. Each system comprises subjects (the actors performing activities), objects (of activities: artefacts produced, goals achieved), outcomes of objects (such as longer term goals); mediating tools that are used to carry out the activity (writing, computers, documents); the community in which the activity takes place (a faculty, a class, a university); the rules and norms that surround the activity (assessment regulations, course requirements) and the division of labour (who does what, such as who produces the assessment item, who marks it).

An activity system is usually represented as a triangle to illustrate each element of the system, how it connects to other elements, and most importantly to identify and illustrate tensions and contradictions within the system. Tensions are indicated within an activity system as breaks in the line of the triangle. AT analysis allows the researcher to capture interactions between academics, their disciplinary knowledge, their students, the mediating tools they use to achieve their outcomes, and the community in which the activity system is situated. Figure 1 shows a typical activity system.

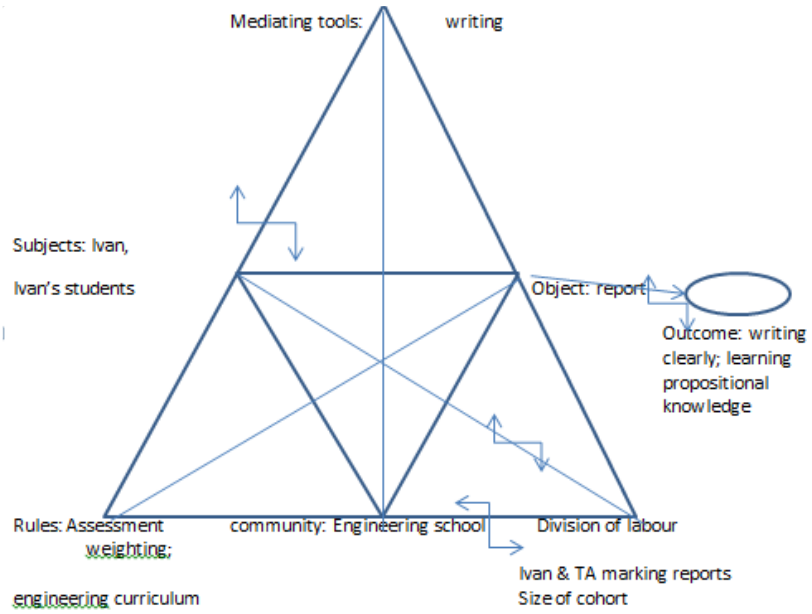

Figure 1. Example of activity system.

A key characteristic of any activity system is the occurrence of internal contradictions, which are also seen as tensions among the elements of the system. These tensions can generate disturbances, but can also bring about innovations. An example of such a tension might be in an activity system of an engineering subject where assessment tasks include a report worth 5% and an exam worth 60%; this leads to a contradiction in how students allocate time and effort to the two tasks (element of division of labour) and how they view the relevance of the two tasks to their learning (element of learning outcomes of the subject). Awareness of these conflicts can

spur subject coordinators or curriculum designers to consider different types or weightings of assessment tasks.

3. Approaches

The first phase of the investigation was the recruitment of engineering academics who coordinate an engineering subject in undergraduate or postgraduate degree programs in Australian universities. Subject coordinators were selected as they have considerable control over subject content, teaching approaches and assessment practices. Potential participants at a number of Australian universities were contacted by email and invited to participate. Nine participants were recruited from five institutions; all the participants teach technical subjects from a wide range of engineering disciplines. The participants were asked to provide relevant documents such as subject outlines, support documents and samples of student assignments if available. Published writing by the participants (available in the public domain) was also included in the analysis. The documents were analysed and the participants were then interviewed using semi-structured questions to investigate how they view their students' writing practices, their own writing practices as engineers, and the writing practices of the engineering curriculum.

The interviews were transcribed and analysed to identify key themes, using Concordance (Watt, 2011). As the themes emerged, they were examined in the context of the activity systems constructed for each of the participants, using the engineering subject as the unit of analysis. Thus thematic analysis was used to 'zoom into' the data and AT to 'zoom out' to examine the identified tensions and contradictions, following Behrend (2014) who has used action research and activity theory in a similar way. The activity systems show the interactions among the elements of the system, including contradictions and tensions between the reported perspectives of the subject coordinators about writing practices and what happens in the subject.

4. Findings and discussion

This study's findings indicate a number of tensions in the activity systems of the participants. Firstly, writing practices are taught differently, practised differently and assessed differently from propositional knowledge. Secondly, there is considerable slippage of terms used by the participants when they talk and write about writing. Both of these tensions demonstrate how writing practices can be rendered invisible in the engineering curriculum, although the activity system of one of the participants shows that this does not have to be the case. All participants and institutions have been de-identified and have been given pseudonyms for reporting purposes. Each tension is demonstrated with examples from the activity systems of participants in the study. These participants are: Adam, University A; Bernice, University A; Damien, University B; Felicity, University C; Garth, University C; Harry, University D; Ivan, University E.

4.1. Writing practices are assessed but not taught or practised; propositional knowledge is taught, practised and assessed

This tension occurs in almost all the engineering subjects. Firstly, writing practices are not specifically taught by the subject coordinators in the engineering subjects; engineering academics tend to outsource the development of writing to other work units or to student support services. Whether this is because they are not confident about providing direct instruction about disciplinary writing or because it is seen (by them) to be outside their domain is not yet clear. Most, if not all of the participants have an expectation of the type of writing that the students should be producing, and can produce this writing themselves, but are not comfortable about giving input about how the students should approach or acquire the expected style and genre. Specifications such as "professional style" or "an engineering report" do not generally provide sufficient illumination of the standards expected. It is probably not reasonable to expect that engineering academics would have in-depth knowledge about teaching writing, but it is reasonable to think that these academics should understand the importance of modelling the writing practices that they themselves have acquired, or at least provide an example of what is required in the assessment tasks that they have designed. The following comment by one of the participants about the role

of writing support for their subject within their institution shows the distance between developing writing and learning propositional knowledge:

> actually they learn that also – we already have another unit [subject][1] which is run by the – I think – I'm not quite sure about the name of the unit, but for that unit they will learn how to prepare a report, how to write a report of their project or how to attempt each question of their assignment or other work. (Felicity, University C)

Clearly it is not her job to teach writing. When Felicity was asked whether the unit was specifically for engineering, she was unsure: "No. This is for – I have no idea about the other disciplines but as far as I know yes, this is similar to other ones" (Felicity, University C). In other words, students are taught generic report writing in another subject and are expected to transfer that knowledge to the very specific domain of Felicity's subject.

Secondly, in most of the activity systems writing is not practised formatively but it is assessed summatively. Garth's activity system and comments provide the clearest illustration of this contradiction. Garth has had industry experience as well as a number of years working in academia. An activity system has been constructed for a third year subject that he coordinates. In the subject outline, one of the learning outcomes is: "Apply a professional dialogue with specialists and non-specialists by way of written documents and drawings" (Garth Subject Outline Spring 2014, p. 1). However, the learning outcome related to writing is not practised, nor is there specific instruction about how to achieve "a professional writing style"(Garth interview):

> …we use most of the tutorial times to practise those technical questions. This unit is very special because this is like a flagship unit for [the engineering discipline]. So we have too many things that we want to teach and we only have 13 weeks. So we actually use tutorial times, most of the tutorial times, to teach something, do a practice. So I thought that is the best way to utilise the time but by doing that there's no practice actually for a student to improve their writing skill. (Garth, University D)

The assessment items are two assignments (20% each) and a final exam (60%). The two assignments focus on solving mathematical problems "they just solve some mathematical questions in [discipline knowledge] and that's it" (Garth interview). The exam tests the students' knowledge of theory and requires them to describe particular processes, but there are no tutorial activities to develop this type of writing, as is revealed in the following extract from the interview.

> Facilitator: So what opportunities are there for students to practise their writing in your subject?
> Interviewee: Practise?
> Facilitator: Yeah.
> Interviewee: Well, the report. That's practice isn't it?
> Facilitator: Yeah. So that's in [this subject]?
> Interviewee: Yeah. No, [this subject] is just a - well it's a math and equation.
> Facilitator: But then in the exam you're asking them to do that kind of descriptive writing so I'm just wondering through the semester do they get opportunities to practise the kind of writing that they're being asked to produce in the exam?
> Interviewee: Unfortunately no. That's a good point. (Garth, University D)

As in most subjects, the students do not have their exams returned to them, so there is no opportunity to review or learn from any writing they do.

[1] The universities in this study have different ways of referring to a unit of study: University A & E = subject; University B & D = course; University C = unit.

The activity system for Ivan's subject provides another illustration of this contradiction, and is demonstrated by differences in teaching and assessing writing as opposed to teaching and assessing propositional knowledge. It is also revealed in Ivan's attitude to both his own and his students' writing. Ivan is an engineering academic of many years' experience and has an extensive list of publications. He has also had involvement in initiatives to develop writing practices within his faculty over a number of years, seeing his subject as a flagship for ensuring that students learn how to write appropriately for their careers: "So then my subject's really where I say okay, now we've got to up the standard and expectations of writing dramatically here" (Ivan, University E). The subject for which the activity system is constructed is a second year second semester subject. The activity system includes the following tensions: between the object and the longer term outcome of the subject; between the assessment tasks requirements and the form they take (between the element of rules and that of mediating tools); between the assessment tasks and the amount of time they take to complete and to mark (between rules and division of labour), and between the assessment tasks and the object and outcome (rules, object, longer term goal). The tensions are indicated by breaks in the lines connecting the elements of the triangle (see Fig. 1). In Ivan's case, the tension between the lack of practice of writing and the emphasis on practising propositional knowledge is more pronounced because of his frequent comments about the poor quality of students' writing, and the lack of opportunities to practise the writing of the reports or to submit drafts. In this subject there are five assessment tasks; one is a computer report and one is a lab report, but only the lab report involves any substantial writing.

There is little description about what is required for either report in the subject outline, but Ivan spends at least some time telling students in the lectures what he expects in the two reports for his subject, as reported in his interview. Students are also directed to the WRiSE site to look at exemplar reports (Writing Reports in Science and Engineering, 2012). Ivan provides comments on all the reports (computer reports and lab reports), but only after they have been submitted, assuming the students will learn the expected practices from his comments on their reports and will then apply that learning in subsequent subjects. In contrast, the propositional knowledge is practised in labs, in tutorials, in work outside of class (tutorial questions to be covered before the tutorial), and with formative feedback provided in the tutorials. At the same time, there is some conflict between the amount of time and effort that goes into providing feedback for the writing compared to the feedback provided for the propositional knowledge (division of labour in the activity system). A recurring comment is the increasing size of the cohort in the subject (from 100 in 2009 to 300 in 2014) and how difficult it is to mark the number of reports and to give meaningful comments. In spite of this, Ivan persists, and marks all the computer reports himself, including written comments. The lab reports are marked by him and by one of his PhD students (after a marking standardising meeting). The technical content (calculations) can be marked with ticks and crosses.

The level of distress that Ivan expresses about the poor quality of the reports is greater than his distress over students' poor performance in the subject overall. A striking feature of Ivan's responses in the interview is the emotional tenor of his comments about writing (e.g. depressing, dreadful, pleasant, frustrating, happy, hated, hopeless, horrified, jaundiced), compared to the lack of affect in his comments about the propositional knowledge of his subject. What is also striking is the language he uses around the propositional knowledge in his subject, which he refers to as "simple", "basic", "calculations", "just sums". Writing obviously resonates more in the affective domain for him, perhaps because it is so much more than "just sums". It could be construed that on one level he recognises the complexity of writing compared to what he sees to be the relatively straightforward nature of the knowledge in his subject, but at the same time he sees the propositional knowledge as more important, and less contested.

As has been discussed in Goldsmith and Willey (2015), Adam's activity system (Adam, University A) demonstrates a notable contradiction in the practice of propositional knowledge compared to writing practices in his subject. Report writing is stated as one of the learning outcomes: "Students learn to structure their reports according to expectations in engineering practice" (Adam Subject Outline Autumn 2014, p. 1). The students are required to write three re-

ports, but it is not until the third assignment description that the word "report" is used: "Any assumptions needed to develop the design [specifications] need to be discussed in the assignment report" (Adam Subject assignment 3 description 2014). Adam makes the comment:

> I tell them what I want in terms of that but I don't really give them an example of one. What I would suggest is it's really a hurdle that - they've got to get over the hurdle without a lot of actual marks being attributed to that component (Adam, University A).

It is concerning that this seems to be a practice in engineering education that is not challenged: students are assessed on learning outcomes that have not been taught or practised. Somehow, writing practices are invisible, both to teaching staff and to students. If the same practices occurred with propositional knowledge, students would protest vehemently and there would be faculty procedures to sanction the subject coordinators. This prompts the question: what is it that makes writing so 'other'?

4.2. Assessment weighting of written assignments vs exams

This tension is strongly linked to the previous one in many of the activity systems, where exams have much greater weighting than written assignments. An example of this is Ivan's subject where the assessment weighting of the written assignments is far less than the weighting given to propositional knowledge as measured by quizzes and exams (see below for the assessment tasks and weightings).

Assessment Tasks
Assignment 9% (team) Assignment 9% (computer/excel) Lab Report 10% Quiz 12% Final Exam 60%
(Ivan Subject Outline Spring 2014)

There is considerable tension both within the activity system and within Ivan himself: he expresses so much distress about the poor quality of the students' writing: "You can't read it, it's just dreadful" (Ivan, University E), and has put a great deal of thought and work into ensuring that there are assessments of writing, but can only give this task 10% of the total marks for the subject. This is acknowledged both explicitly in the interview and in Ivan's choice of words; the frequency with which he uses the word "serious/seriously" in the context of student writing or their attitude to the writing tasks demonstrates this.

> some students always respond oh, if I'd have known that was serious at the start I would've done it differently, I mean so I don't know quite whether it's because they're not taking it seriously and they were capable of doing it.

Later in the interview he makes the following comment, suggesting he is aware that the students would take the task more seriously if it were worth 20% rather than 10%[2]:

> Yeah, so one of the feedbacks, so why they don't do better at the lab report was well it's only worth eight per cent of the mark. Well if I made it 20 per cent would you do a better job? I think they would (Ivan interview)

This then begs the question: why not increase the weighting? If it causes so much angst, why not give it more face value? It is one of the contradictions that emerges not only in the activity system but throughout the interview; it appears that the writing is a different kind of knowledge, separate from the propositional knowledge, and not as important. In his response to a question about the learning outcomes, Ivan says:

> Yeah, so I mean the main learning outcomes are to do with learning the technical content, so but tacked on at the end is ability to, yeah actually I don't remember them, but there's something about writing a lab report and there's something about the computer skills or something like that. So it's intended to be addressing the generic skills. (Ivan, University E)

[2] Note that the subject outline states that the lab report was worth 10%, but in the interview Ivan stated that it was worth 8%.

And there you have it. It's "tacked on at the end" (his words), and writing is "lumped in" with computer skills as a generic skill.

All of the preceding tensions then lead to the next contradiction: unlike propositional knowledge and technical skills, writing practices are not seen as developmental. This tends to render them invisible, because there is a reluctance to acknowledge what is involved in developing writing, either within or beyond the individual engineering subject. The majority of participants did not feel confident about commenting on the development of writing throughout the engineering curriculum. Damien was the one participant who could comment on this, but only within his school and in the context of report writing for his discipline. The other participants either were unable to comment or were keenly aware that development of writing was at best ad hoc, and at worst almost non-existent.

> Interviewer: Do you think students can develop their writing practices in this curriculum?
>
> Bernice: I think they have opportunities to do that if they see them as opportunities to develop their writing but I don't think anyone, or in a lot of cases, the opportunities are flagged as well yes you've got to calculate this stuff. It's about doing the calculations, it's not flagged as this is also an opportunity to learn to write as a practising whatever type of engineer you're planning to become (Bernice, University A)

Another comment from Ivan about the somewhat random development of writing in his faculty (which could equally apply to many engineering faculties):

> … so it's what we do is we set the levels, right. So it's level one, level - and each level's meant to be higher attainment. But in reality they kind of [do] level one, level one, they do my course as level four and then the next one's back to level two. It's sort of, it's difficult to get that bit right and how to do it right. We've never really discussed - (Ivan, University E).

If writing practices are not made visible in the engineering curriculum it becomes difficult for them to be developed, because subject coordinators will not be aware of what types and levels of writing students have practised in preceding and subsequent subjects. As Ivan points out, it is likely that students do the same type of writing ("level one, level one") until their final year when they are expected to write an honours thesis. While this is regarded as problematic by the participants, few solutions are offered. In contrast, subject coordinators have a clear knowledge of what propositional knowledge is covered in the subjects that precede and follow their subjects. Propositional knowledge is less contested, more easily trackable, more easily measured, and for the engineers, more easily understood than the slippery, messy and often emotional process that is writing.

Several participants, including Adam and Ivan, often refer to the importance of writing for engineers, but do not acknowledge the learning of writing in the space of their subjects. This could be an example of doublethink: writing is important until it competes for air time with propositional knowledge. Writing is important for engineers but it is not modelled or taught by subject coordinators, unlike the way that the propositional knowledge is modelled, taught and practised. This of course raises the question of how writing can be developed if it is not practised.

Examples of good practices in the development of writing from this study do exist: Damien's subject is one of these and is discussed in detail in Goldsmith and Willey (2015). Briefly, report writing is scaffolded in Damien's subject (University B), and is developed throughout the major in which his subject is situated. In his subject students write two field reports; the first (preliminary) report is given formative feedback which can then be used for the second report. On Damien's own admission, scaffolding was introduced because the ALL lecturer at his university suggested it. Although writing practices are developed in Damien's school of engineering, they are very narrowly defined; he refers to writing only in the context of report writing skills. There is no broader interpretation of what else student engineers might write and why.

One participant who sees writing as both developmental and as less constrained than report writing is Bernice:

> … I think there's a strong link between writing and thinking so to get the students to actually write something down they have to have thought about it beforehand. You can punch numbers into a calculator without thinking about it very much and get a number out and write that number down but what I want to see is some thinking, some critical thinking about why did I do that, what does that number and what am I going to do with it now or what's someone else going to do with it now? (Bernice, University A).

Bernice displays a deep understanding about the role of writing in learning; she refers to genres of writing and can distinguish between surface features of writing such as the mechanics of writing (which she explains as grammar, spelling and accurate referencing) and rhetorical features. Where did she come from? Why does she know this and the others don't? She teaches a technical subject, like all the other participants; she has industry experience, like most of the other participants. Yet she has developed a nuanced and thoughtful approach to integrating writing in her subject which is absent in other participants' subjects, and she is aware of gaps in the development of writing within her faculty.

4.3. What do engineering academics understand by the term 'writing practices'?

The insights from Bernice point to one other major contradiction: the slippage of terms about writing. Although I [RG] as interviewer never used the word "English" in any of the interviews, many of the participants did. In fact a range of terms was used by the participants to talk about writing, such as: English; communication; understanding; presenting information; and reporting. This confusion of terms reflects confusion about the role and nature of writing practices in the engineering curriculum, and can be seen in the wording of assessment tasks and of criteria for assessing written assignments. Closer examination shows the range of meanings associated with 'English': English as English language proficiency; English as grammar; English as language; English studied as a subject in high school, as the ability to analyse literary texts, as expression, as clear communication.

If engineering academics think that writing practices are "English" (either the high school subject or English language proficiency), then it is not so surprising that they say: "It's not my job to teach writing". But they are not being asked to do that; what is expected of all academics teaching at university is to induct their students into their disciplinary discourse and assist students to develop this discourse. Perhaps the lack of clarity about what writing is forms part of the resistance to see development of writing as part of their role as engineering educators and to embed writing in the curriculum.

Ivan presents the most striking example of conflicted perspectives about writing, but others express similar, if milder, reactions, where they somehow recognise how difficult writing is. This recognition tends to occur around their own writing, less so around students' writing: "There were times in my life where writing was just almost impossible. But you climb over that hill and you develop the skills to be able to string thoughts together and to be able to then put it onto paper" (Harry, University D).

4.4. Writing practices as 'other'

Going back to the question raised earlier, of why writing practices are "other", a number of possible answers are emerging, which also connect to the invisibility of writing practices. They are "other" because they are seen as a separate thing: separate from the technical content, separate from the calculations, separate from the image of an engineer (think of the ubiquitous hard hat and/or lab coat). It is intriguing to think about where this separation situates itself. There are many disciplines where the academics would not see themselves as writers, but engineering academics seem more intransigent than most in separating or keeping separate the practices of writing from the practices of engineering. One facet of this is the location of writing (as part of communication) in the domain of generic attributes in Australian and international engineering faculties, as noted by Ivan. Engineers Australia (2013) has "effective oral and written communication in professional and lay domains" as one of its competencies in the personal and professional attributes, which are frequently referred to as "soft" skills. Although prominent engineer-

ing educators acknowledge that these skills are both important and challenging to teach (Johnston & McGregor, 2004) it is conceivable that casting such skills as "soft", as opposed to the "hard" skills of technical knowledge, condemns the former to a lower status in the eyes of many engineering academics. Therefore, to be involved in the development of soft skills might make the academic somehow – soft?

5. Conclusions

In this paper we have sought to illustrate how AT can provide a lens through which to view perceptions of writing practices in engineering subjects. As with previous studies such as Orland-Barak and Becher (2011) and Behrend (2014), AT has been used to "zoom out" to provide a wider context, and to "magnify … contradictions" (Orland-Barak & Becher, 2011, p. 127) in these learning environments. Overall, the current findings show that engineering academics have a different view of the value and nature of technical knowledge compared to their view of value and nature of writing practices, consequently leading to tensions and contradictions in practices. Many also have only a partial understanding of writing practices. One possible explanation for the tensions and contradictions demonstrated by participants such as Ivan could be that they are experiencing a clash of activity systems. That is, trying to get the students to care about writing is a different kind of activity system that conflicts with the activity systems of the majority of engineering academics; those who practise a 'traditional' mode of teaching engineering where writing is not considered part of the responsibility of the lecturer.

It is likely that further themes and tensions will emerge as this study continues. The analysis to date has revealed that there are obvious tensions between engineering academics' perspectives of propositional knowledge and of writing practices within their subjects, leading to the conclusion that they see writing as a different kind of knowledge, or a different kind of knowing. While this is no surprise to Academic Language and Learning lecturers working with staff in STEM disciplines, it is important to conduct further research in this area to support our anecdotal evidence. We will continue to explore this avenue in depth. For the moment, consideration needs to be given to the impact of the individual subject coordinators on such an integral aspect of engineering education and engineering practice as writing. Currently, if an engineering subject coordinator decides that it is not their job to teach (provide opportunities to practise, develop, model) writing, that is their prerogative. There is nothing to prevent 100% of engineering subject coordinators from making that decision. It should not be up to the "Bernices" and "Damiens" of engineering education to shoulder the responsibility of providing students with opportunities to practise and develop their writing, and to help students understand the complex roles that writing plays in academia, in work, and in society. Engineering faculties need to adopt top down and grassroots strategies to ensure that students can write proficiently in their disciplines and in their jobs, for diverse purposes and audiences. Findings such as these can be used to develop a discussion with engineering academics to emphasise the developmental nature of writing and to make writing practices more visible and more integral to the engineering curriculum. If changes do not occur, there is a strong risk that engineering graduates will continue to enter the workplace with inadequate abilities to discuss, argue, reason, evaluate and communicate, with all the limitations that this implies for society.

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