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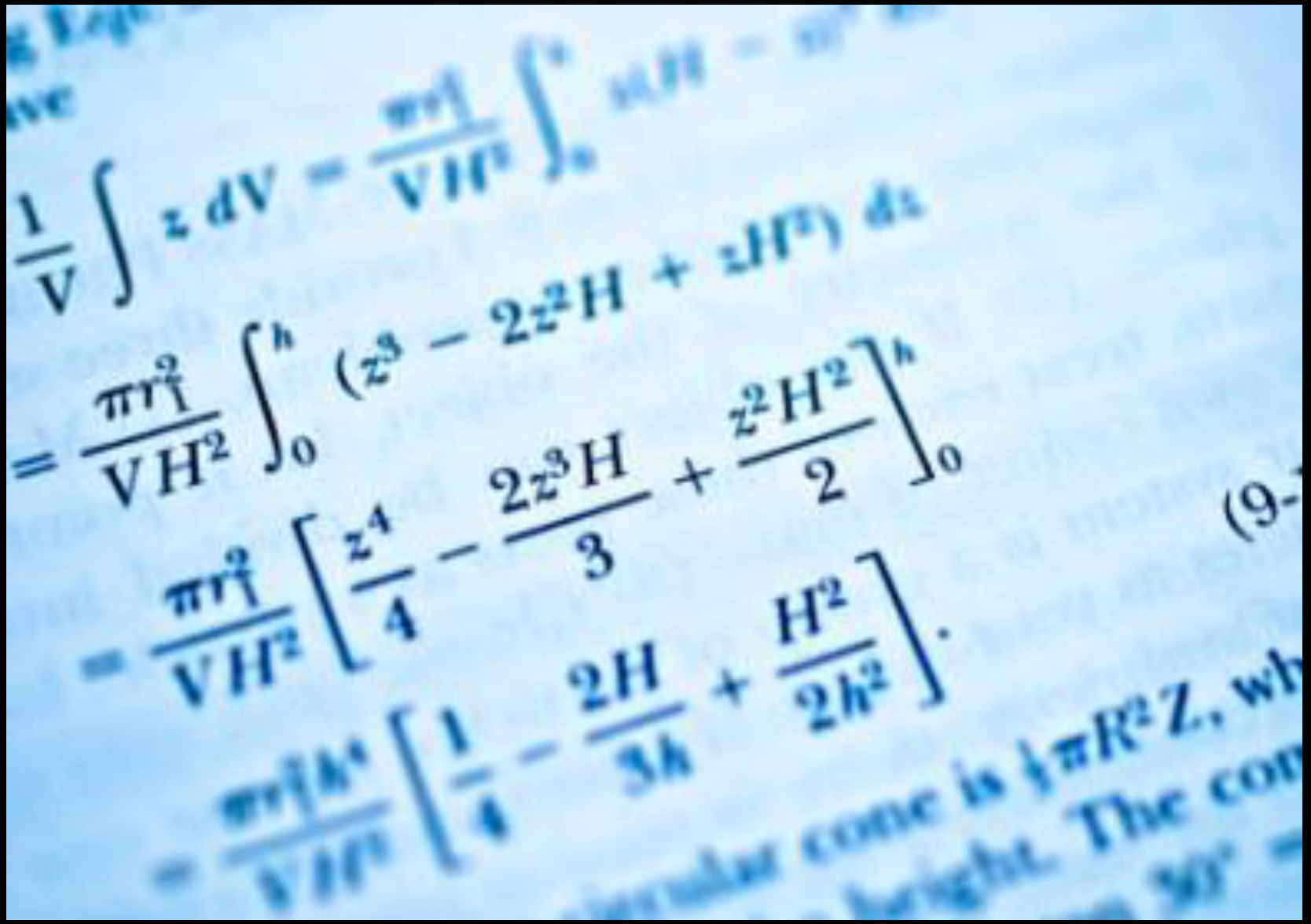
What do we mean by writing as ‘other’ in the engineering curriculum?

A gradually dawning realisation:

- **writing interventions not maintained beyond the initial push;**
- **howls of protest when engineering educators are expected to develop students’ communication;**
- **“it’s not my job to teach writing”;**
- **requests for communication subjects external to engineering to ‘fix’ student writing;**
- **regarding any subject that develops written or spoken communication as ‘soft’;**
- **not wanting to be seen as teaching a communication-type subject**



$$\frac{1}{V}\int z\,dV = \frac{\pi r_1^2}{VH^2}\int_0^h z(H-z)^2\,dz$$

$$= \frac{\pi r_1^2}{VH^2}\int_0^h (z^3 - 2z^2H + zH^2)\,dz$$

$$= \frac{\pi r_1^2}{VH^2}\left[\frac{z^4}{4} - \frac{2z^3H}{3} + \frac{z^2H^2}{2}\right]_0^h$$

$$= \frac{\pi r_1^2 h^4}{VH^2}\left[\frac{1}{4} - \frac{2H}{3h} + \frac{H^2}{2h^2}\right].$$

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circular cone is $\frac{1}{3}\pi R^2 Z$, wh

height. The co

Engineering educators define engineering as:

- **applied science and mathematics**
- **problem-solving**
- **making things**

(Pawley 2009, p.312)

What is missing?

- **Engineering practice requires engineers who are able to create, innovate, collaborate, coordinate and communicate**
- **it is multidisciplinary, relying on the complex reality of working in teams to build on ideas, design and decompose problems, evaluate strategies and optimise solutions**
- **Engineers therefore need to reason, argue, explain, discuss, negotiate, recommend, justify and evaluate**

How do engineers see writing?

From the ***Handbook for Preparing Engineering Documents:***

"We tend to think about preparing documents as writing. And writing is, for many of us, a bummer. It's a quasi-clerical chore that we face when the real (that is, engineering) work is done. It reminds us of Miss Thistlebottom's 8th grade English class, in which we were bombarded with now-forgotten rules of grammar, and for which we got the lowest grade of our academic career"

(Nagle, 1996, p.6 emphasis in the original)

Objective or persuasive?

engineers do not acknowledge or recognise the use of rhetoric in their writing because of the belief that engineering is about 'objectivity', but in fact 'persuasiveness…is built into the very goal of engineering' (Winsor 1996 p.11)

Tension between engineering images - the technical rationalist vs the persuasive social actor?

The engineering science curriculum:

places high value on

- **accuracy & speed of calculations**
- **excellence in problem-solving**
- **command of technical knowledge**

places much less value on developing professional attributes (acquired somehow): e.g.

- **oral & written communication skills**
- **team work**
- **critical analysis**

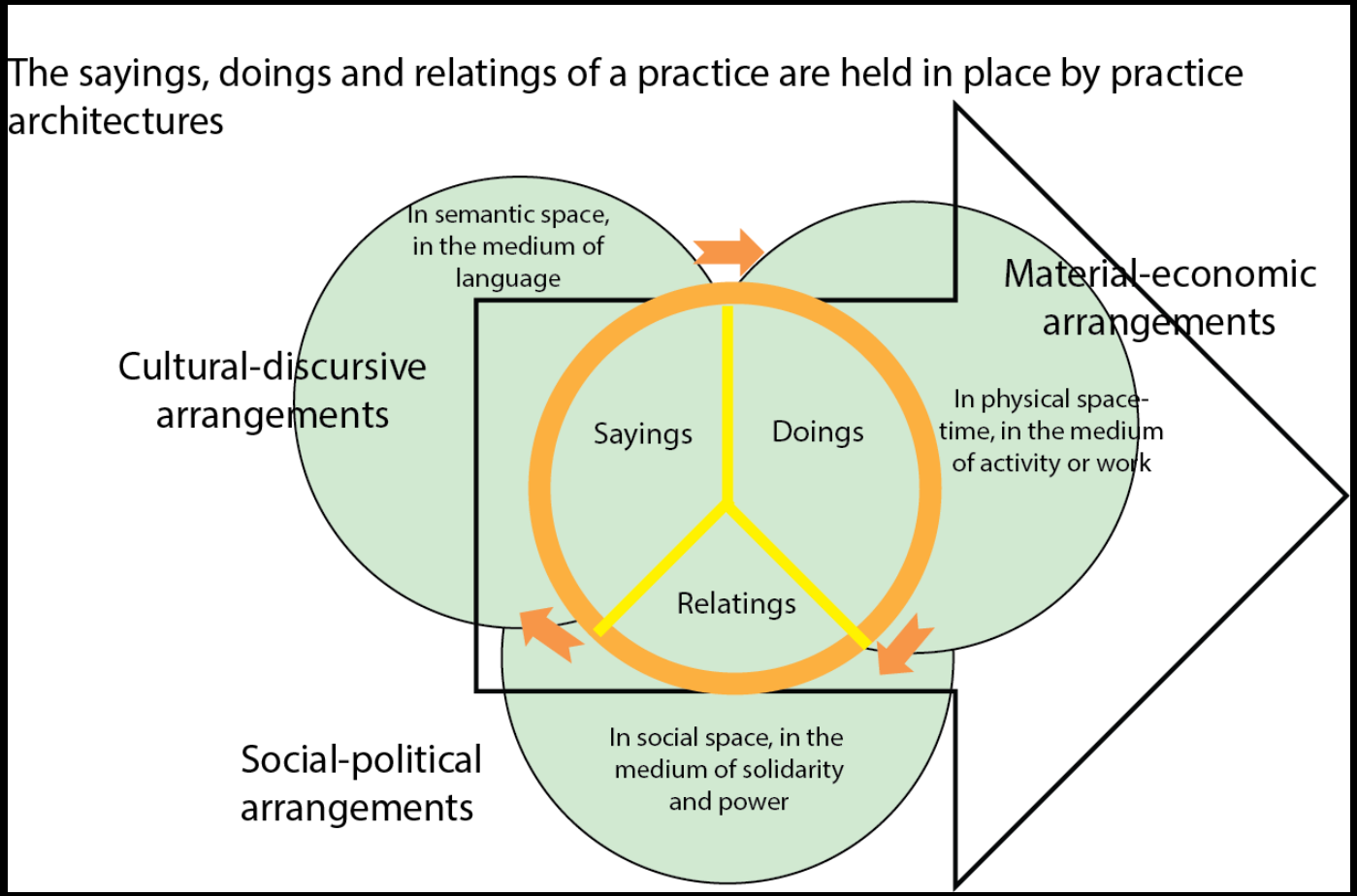
Practice Architectures Theory (PAT)

- **In order to change practices, we need to understand what they are and what holds them in place**
- **We need a language to describe and discuss what these practices are**
- **Practice Architectures Theory: developed by Kemmis & colleagues from Schatzki's practice theory perspectives**
- **PAT considers the arrangements: cultural-discursive, material-economic, & social-political – as the architectures of a site of practice (local) which:**
- **prefigure how practices unfold within that site**

PAT allows researchers to:

- **focus on a site of practice – e.g. an engineering course (or subject)**
- **analyse the practices within that site**
- **consider the extra-individual interactions of a practice**
- **and recognise the agency of the practitioner**

Visualising PAT...



The study...

9 participants (engineering subject coordinators) from 5 Australian universities

***Data*: subject & support documents, interviews about how participants view their students' writing practices, their own writing practices as engineers, & writing practices of the engineering curriculum and (some) classroom observations**

Analysed through lens of PAT

Practices that interact to make writing practices other:

- **The construction of the engineering identity as a technical problem solver (the Lone Ranger)**

- **mathematics as TH e of engineering**
- **the valorising of en science**
- **writing practices referred to as a ‘soft skill’**
- **Writing practices meaning many things**

The emotional dimension of writing

The transformative power of writing lies in its capacity to shape our sense of ourselves as beings in the world, to foster a deeper awareness of ourselves in relation to the world around us... (Yagelski 2012, p. 193)

But this can also be confronting…

Writing has a noticeably emotional dimension for several participants

Affect terms about writing & about propositional knowledge:

Participant	Affect terms about writing	language about propositional knowledge
Charlie	Abysmal, annoyance, beautiful, beautifully, beautify, boring, embarrassing, enjoyed, fear, Hallelujah, happy (not happy), joy, nice, poor, screaming, wonderful	simply
Eric	Difficult, terrible, worst	Fundamental, basic, basically
Garth	Disappointing	solely just math, equation and numbers
Harry	almost impossible	very abstract, very mathematical
Ivan	Appreciate, attitude, bad, best, confidence, confident, crazy, depressing, depressingly, dreadful, dreadfully, embarrassing, enjoy, feeling, feels, felt, frustrating, hated, hopeless, horrified, jaundiced, like, love, nuisance, pleasant, pleasure, poor, serious, surprising, suspect, suspicious, torn, trusted, valuable, woeful, worried, worry, worrying	very simple, technical (errors, issues, stuff), basic, basically, calculation (errors), just sums, stuff

How does this play out?

The distress: several comments refer to unreadability and the belief that some students have not taken the task seriously (Charlie, Eric, Garth, Ivan)

HOWEVER

- **Consequences of the students' poor writing practices: majority of participants would not fail a student on the poor quality of their writing**
- **but they would fail a student who did not demonstrate adequate subject knowledge**

THUS

- **Students will continue not to take writing seriously - until their final year honours thesis or capstone project - when writing suddenly becomes very visible and very serious**

A tension between:

- **how strongly the participants align their identity with that of the dominant engineering identity**
- **how uncomfortable writing makes them feel, because they have less control over it**
- **perhaps there is acknowledgement that the practice of writing is in its way as hard as the ‘hard knowledge’ of engineering**

Writing practices as ‘English’…

Either

secondary school English (English literature)

OR

English language proficiency

Neither of which engineering educators feel qualified or required to teach

And a lack of meta-language

‘Subject specialist and teachers often “know” what they are expecting students to produce but: a) they are not used to articulating such discursive knowledge; b) it may be that it is far from clear what the nature of the knowledge expected is…’ (Fischer 2015, p.83)

Lack of meta-language to explain requirements of a written assignment, or to provide feedback on students’ written work, can lead to confusion and frustration:

- **e.g.1: Ivan tells his students that they are supposed to be writing a story – ‘a narrative’ - but is concerned when they submit writing that is ‘flowery’ and inappropriate**
- **e.g.2: Adam - description of 1st assignment does not include text type that the students should be writing (does not use the word ‘report’), length of answer or weighting of parts; there is no information about assessment criteria**

Practices that do not 'other' writing:

teaching practices & assessment practices

-sayings, doings and relatings which normalise writing as part of acquiring engineering knowledge, e.g.:

- **opportunities for students to practise writing as part of their learning**
- **students write preliminary reports & are given formative feedback**
- **concise & explicit information about marking criteria for written assignments – text type, structure and expected length**

Differences in perceptions of writing:

All three practitioners say:

- **writing is a developmental practice, not a skill**
- **writing consolidates learning**
- **their role as engineering educators is to develop their students' professional engineering identity**

In conclusion…

We argue that writing is othered in the engineering curriculum because:

Engineer seen as solitary technical problem-solver

writing is a different kind of knowledge from engineering knowledge

Implications:

- **if writing practices are to be seen as part of engineering practice, writing needs to be seen as a practice**
- **these practices need to be developed consistently throughout a degree program**
- **The notion of 'practising writing', rather than 'teaching English' needs to be unpacked**
- **The importance of a shared meta-language about writing practices is not to be discounted**