

How does matter matter in engineering education?

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How does matter matter in engineering education?

Purpose:

We aim to explore how experimental practices shape learning processes, beyond human-human interaction, including the importance of emotions that may arise in connection with these activities in university educational programs.

Research questions:

What context-specific views of practical skills are expressed, and how?

How can student-teacher-material-emotions intra-actions be understood?



Theoretical framework



Karen Barad

Agential realism

Niels Bohr:

Quantum physics

Identities are not inherent:

They are formed in the interactions with other matter

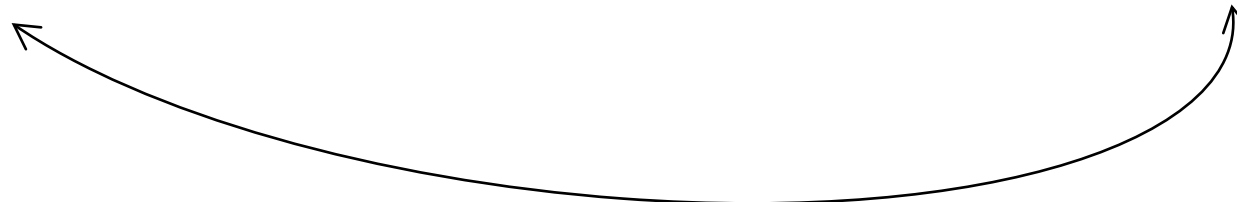


Judith Butler:

Performativity

Identities are not inherent:

They are formed in the interactions with other people



Theoretical framework

Classical science

Measuring instrument



Cartesian cut

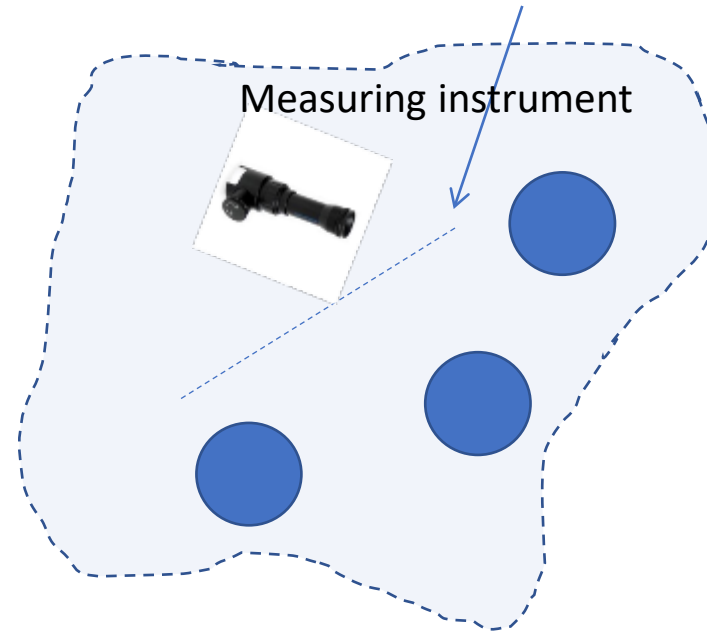
Subject
*researcher/
observer*



Object
- what is
being
studied

Barad

Agential cut



Phenomenon = observer +
experiment + object

Theoretical framework



Sara Ahmed

The Cultural Politics of Emotion (2012)

- Emotions are a product of cultural practices
- Material objects can unite and exclude
- Repetition of words/signs elicits and reinforces emotional response (sticky sign)
- Emotions generate meaning because of their history and social context
- Change is possible



Theoretical framework

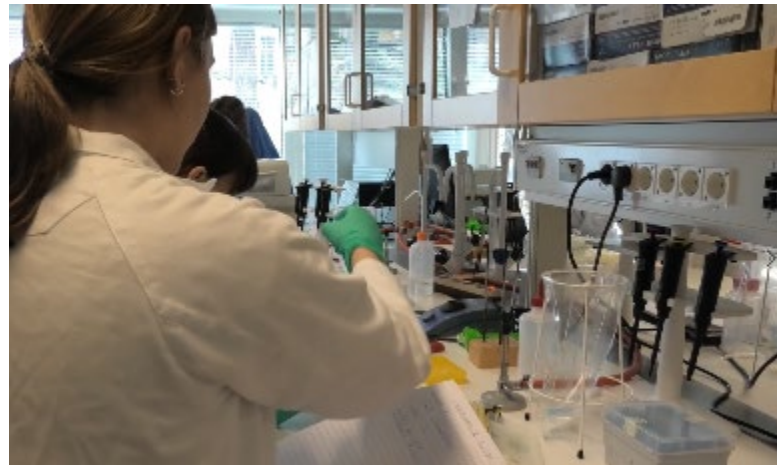
Emotions are situated



Data collection

Two universities – nuclear physics and genetic engineering course

- Observations
- Micro-interviews
- Structured interviews



Results

Two themes emerged from our data:

1. Crowded spaces crammed with artefacts
2. Human bodies-material-emotions-learning intra-actions

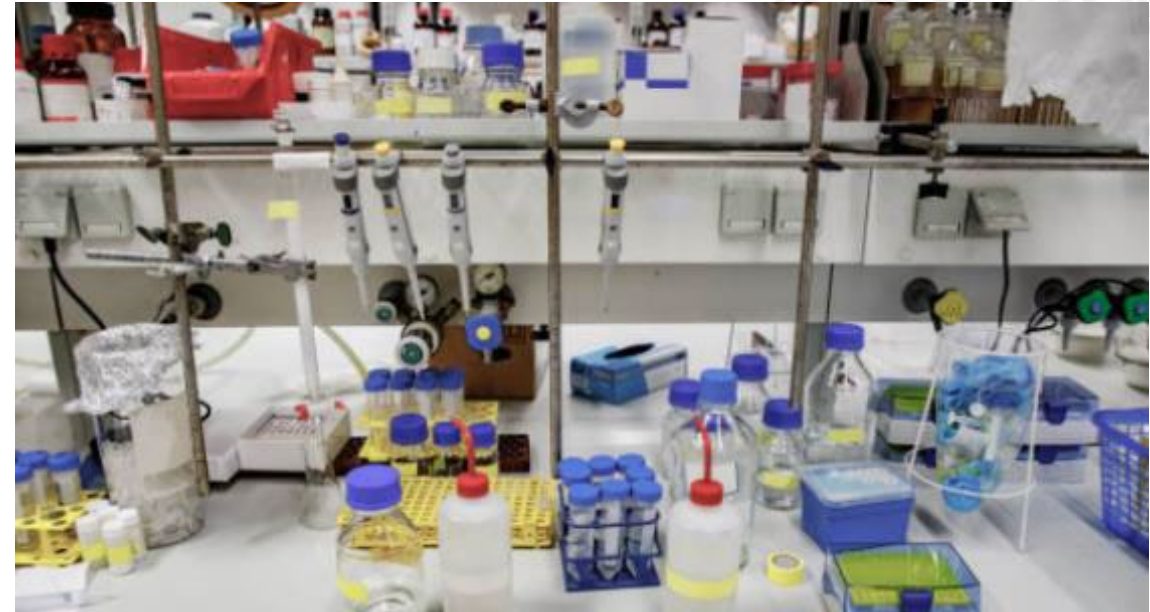


Results

1. Crowded spaces crammed with artefacts

25 students with equal gender distribution, have a four-day lab with the purpose to alter bacteria genome using many different biochemical methods.

The students use around 80 different artifacts during the lab session.

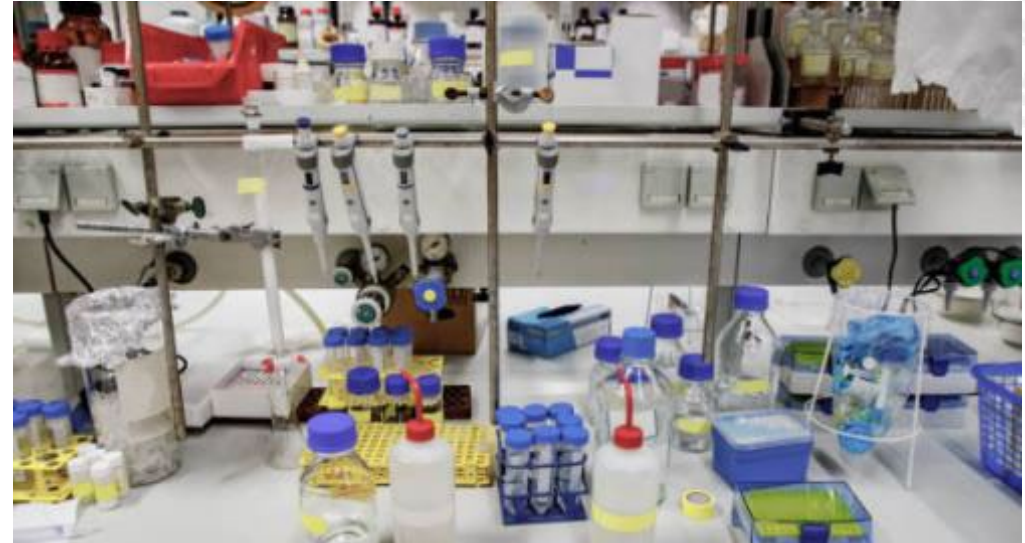


Results

1. Crowded spaces crammed with artefacts

- .. What to handle and what to ignore?

Black boxes





Results

2. Human bodies-material-emotions-learning intra-actions



Results

2. Human bodies-material-emotions-learning intra-actions

"I find it very alarming because I don't think about them being radioactive. I would easily just grab that [radioactive substance] if no one had told me it's dangerous."

Her lab partner, Valle, responds:

"Which is locked in, in a cabinet!" pointing out that the locker should indicate the danger. To which Malva responds:

"I know, but I still don't feel scared about it."

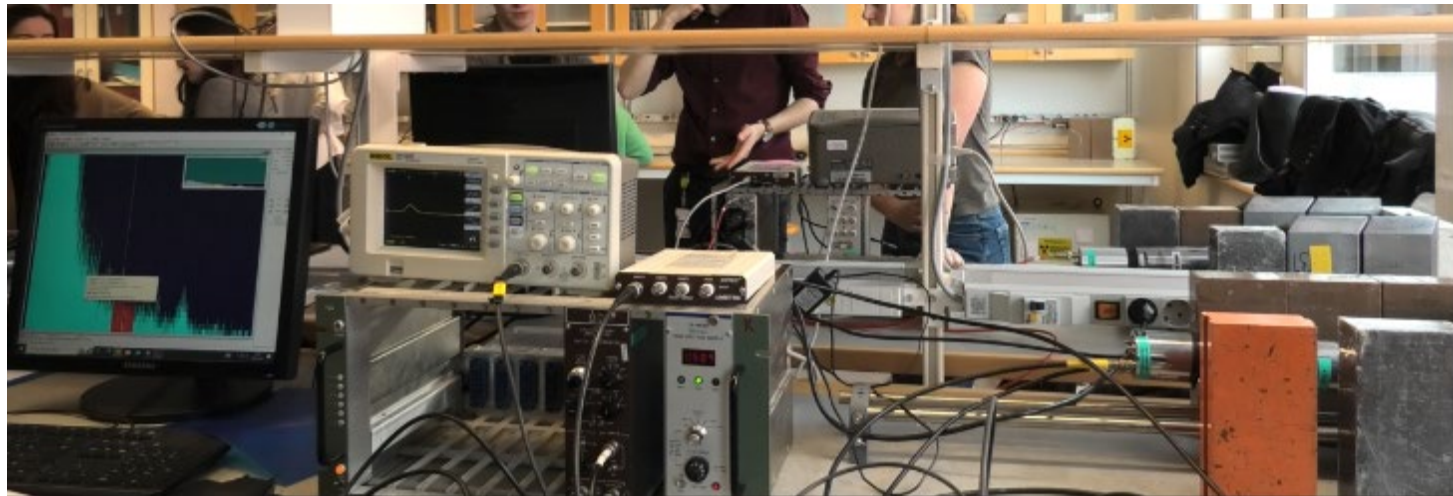
"So you are scared, because you are not scared?"

"Yes!"



Discussion and concluding remarks

- Handling instruments is entangled with bodily knowledge and emotions
- Teachers have agency in this entanglement, in scaffolding the students



Thank you!

