Engineering, Justice, and Human Rights:
Engaging Students for Ethical Action on Climate

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FOUR INTERVENTIONS IN THERMODYNAMICS

- The challenge of climate education interventions in a core engineering course
- Descriptions
  - Reading Jim Hansen
  - Climate Action Project
  - Global Injustice & North-South Climate Negotiations
  - Energy Infrastructure Disasters
- Outcomes

THE CHALLENGE

- This is an intervention
  - Against textbooks
  - Against denial
  - Against greenwashing
- Motivating students is key
  - Why Climate Matters
  - Why it belongs in thermo
  - Reading, writing, ethics
  - Support of colleagues

There was a lot of reading assigned [on climate] that was unrelated to the course content…that I did not read because I was not interested and it was not what I had signed up to study.

Ethics were difficult since we were never taught them [before this class]

Thermodynamics is a required course but climate change is not and it feels unfair that they force us to take it. Fine, it relate[s] to thermo… but all of the fluff, and writing, and the climate action project…takes away from the real course content.

STORMS OF MY GRANDCHILDREN

- "Gore was right: I did not have a clear, succinct story."
- "It seems my untactful communication had sparked the strong reaction – a response I had not expected, given my background in planetary and space science."
- "Unfortunately this second meeting served to confuse [the audience] rather than illuminate them."

- Motivating communication skills as a core competency area and professional ethical responsibility for engineers

CLIMATE ACTION PROJECT

big picture ←→details theory ←→ practice

student ←→ citizen college ←→"real world"

Significant reduction –**potential** 1000 Tg CO_2 equivalent per year. (14% of US 2010 output; 1990 levels) (41% needed!)

Action - beyond learning/research (team or individual)

- Small-scale demo, or work toward structural change

Justification

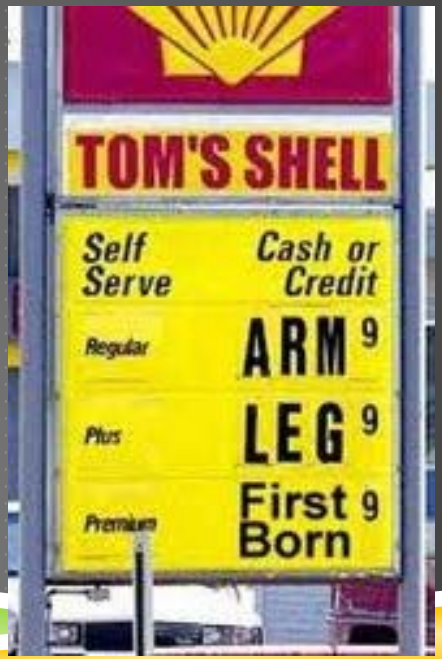
- Quantitative (reduction estimate with sensitivity)
- Qualitative (feasibility, effectiveness)
- Ethics (multiple frameworks)

NORTH-SOUTH INJUSTICE

- Contemporary International Talks (Copenhagen, Cancun, etc.)
- G77: 2 degree rise in temperature a "suicide pact" for Africa
- Leadership from North in curbing emissions and funding renewable energy infrastructure not forthcoming
- Role of energy in developing/maintaining economies:
  - In South, poverty, basic human needs, overcoming history of colonialism that created today's global economic inequalities
  - In North, lifestyle to which we've become accustomed
- Analyze ethics of the (non)agreements from a variety of philosophical standpoints and stakeholder perspectives

GLOBAL ENERGY INJUSTICE BEYOND CLIMATE

- Frank Von Hippel's Back-of-Envelope calculation
  - If we paid for the military budget that goes to protecting oil resources by a tax at the pump, what would we pay per gallon?
  - (other intangibles!)



ENERGY DISASTERS

- Gulf Spill(s) and Nuclear Accident(s)
  - Structural problems – neoliberalism, deregulation, scale of technologies – is pattern of the unanticipated predictable?
  - Structural Inequality – who pays? Environmental justice, impacts on ecosystems (who counts?)
  - Who is responsible? Not just blow-out preventer, quake….
  - Design for the "unanticipatable"
- Connections to Climate
  - Present structure implies disaster part of business as usual
  - Nuclear can not bail us out

OUTCOMES

- Moral reasoning
- Critical thinking
- Social engagement
- Communication
- Organizing skills
- Essential complements to the energy engineer's technical expertise
- Enables participation in justice work

Now I am more critical; critical about the problems we solve, about the issues we cover in class and the discussions we have there also.... It was not just the sciences, the technology, and all the math behind it, it was also this other side that helped me develop these critical thinking skills. (EGR 290 Focus Group Participant)

The concepts we learn as students are most likely the ones we will later on be most comfortable with as engineers. This means that the choice of concepts has power not only over individual students, but also over the people whose lives our engineering will influence. (EGR 290 reflective essay)