Embedding Sustainability within Engineering Higher Education:

a multidisciplinary approach

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The Natural Edge
PROJECT

JCU Project Highlights

Our approach to rapid curriculum renewal :

1. Awareness raising & developing a common understanding amongst staff
2. Identifying graduate attributes (all disciplines)
3. Auditing and mapping each program against GAs (beginning with Chemical Engineering)
4. Embark on strategic content development & renewal
5. Bridging & outreach with industry & education
6. Integrating our curriculum with campus & community opportunities

The JCU attributes

1. **Knowledge** of sustainability including definitions, discipline context, relevance and importance.

2. Discipline specific exposure to sustainability **Applications** including examples of sustainable practice and design.

3. Ability to conceptualise complex **Systems** and their interaction across ecological, social and environmental dimensions.

4. Ability to use tools to **Quantify** sustainability of products, processes and designs.

5. Ability to **Optimise** engineering designs to trade off across the three dimensions of sustainability (environment, equity, economy)

Comparing to accreditation requirements

- Securing buy in from staff and demonstrating it's the right thing to do ....OR.... it will have to be done anyway
- Provide incentive ....what's in it for me ?
- Develop long term buy in ....link to research capacity

- Eng'g australia – bottom up attributes
- IChemE – top down capstone approach ?
- IChemE Australia – Key words

	Course						
	Engineering 1	Process eng'g	Process analysis	materials eng'g	fluid mechanics	thermofluid mech.	chemistry II
attribute	EG1000	EG1010	CL2501	EG2010	CS3008	ME2512	CH1002
knowledge	def'ns, product design, ethics	relevance, importance	definitions, ethics, LCA				
application		process examples	energy efficiency, carbon accounting, water minimisation	product design, material selection, waste min'n, sustainable materials, thermal efficiency	energy efficiency	energy efficiency	Green chemistry
systems	?		LCA - low level	embedded energy, LCA			
quantify							
optimise							

First Year - Common

2nd Year - Discipline specific

Reactors	Thermodynamics	project manag't	project economics	sustainability, safety and risk	Chem Engg design
CL3030	CL3010	EG3000	EG4000	CL4040	CL4071/72
		TBL, enviro economics			
waste minimisation, energy efficiency	Energy efficiency				
		TBL	?	?	? LCA
				? Enviro risk assessment	? LCA, enviro impact assessment/risk
			?	?	? Heat integration

3rd Year - Discipline specific

4th Year - Discipline specific

4. Course auditing

- Threats, opportunities and weaknesses ?
- Thinking about it is a great start
- A means to express resource limitations to curriculum renewal
- Providing a management tool – quality and efficiency
- Bringing in an expert
- Participatory process

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“ ..... if humanity is to somehow manage to adjust its behaviour in any controlled way to a position of sustainability, **we have limited time in which to do it, and we will need to do it with products and processes based on today’s technology and not tomorrow’s**. This is a very different mindset from that which is generally held today, and it is this mindset that needs to change. “

From 120th Presidential address to the Institution of Mechanical Engineers, 2004 by Andrew P Ives.