

Should a Center for Green Innovation and Technology for the Automotive Industry have an Education and Training Mission?

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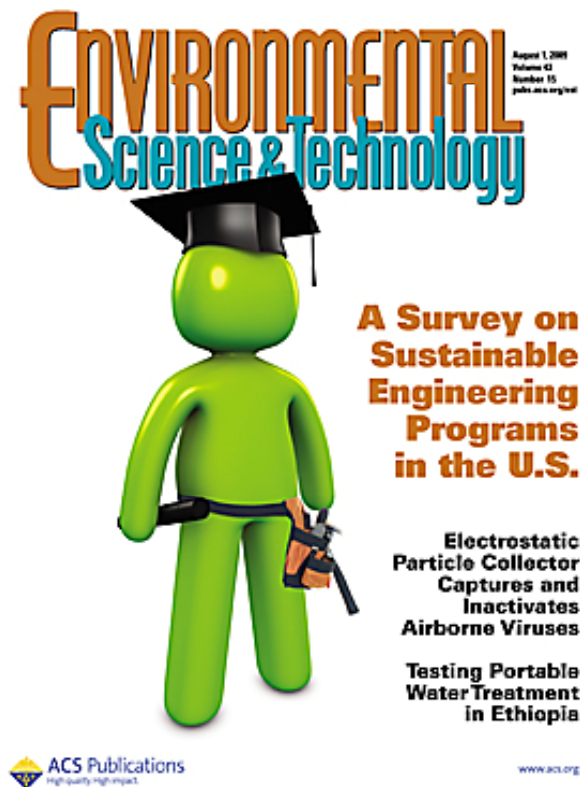
Should a Center for Green Innovation and Technology have an Education and Training Mission?

- What topics would the education and training address?
- Do education and training programs like this already exist?
- What are best practices?



Benchmarking Sustainable Engineering Education (BSEE)

How are engineering programs around the U.S. implementing sustainability into curricula?

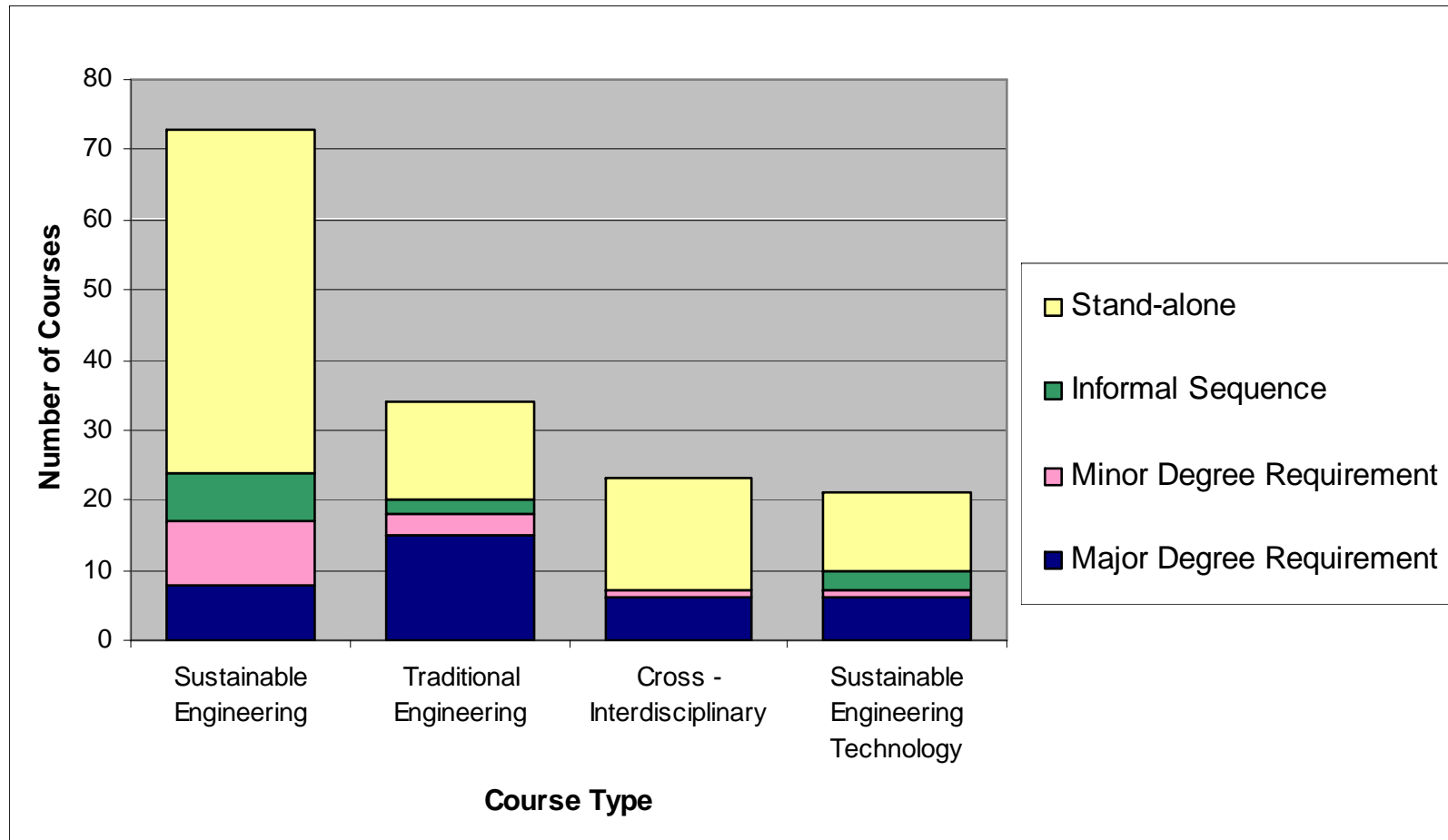


Benchmarking process

- Contact more than 1500 department chairs and program heads
- Based on information from department heads, and other contacts, identify more than 350 sustainable engineering faculty champions
- Sustainability champions described 155 courses

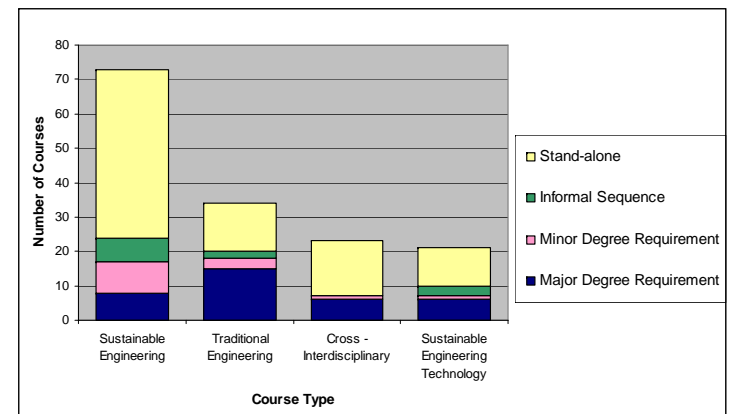


Categories of courses and role in the curriculum



Who takes the courses?

- Sustainable engineering: mixed upper division and graduate
- Traditional engineering: upper division
- Cross/Inter-disciplinary: often graduate
- Sustainable engineering technology: mixed upper division and graduate

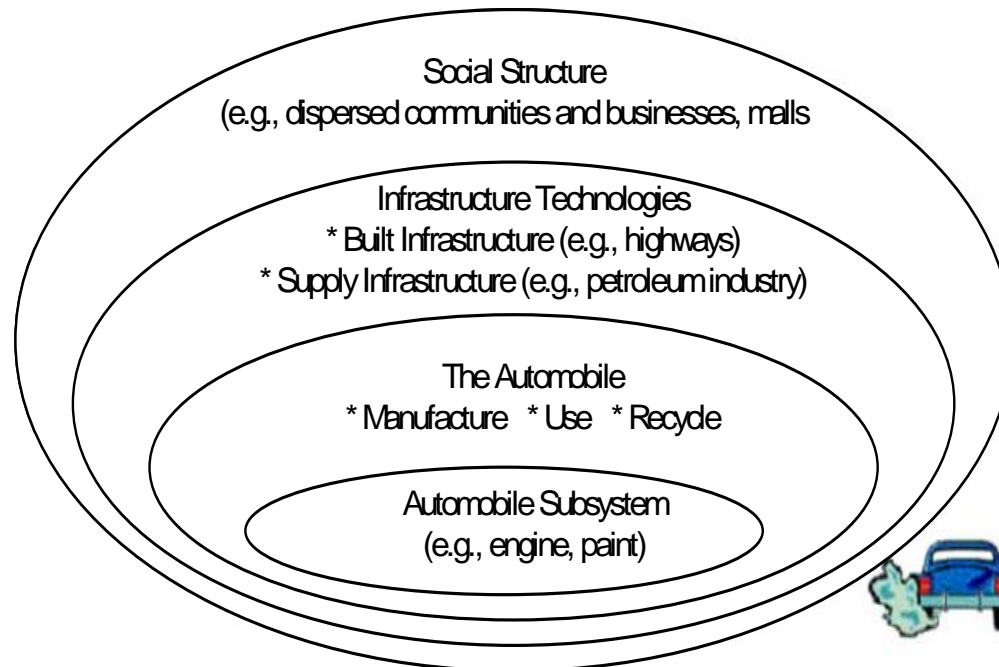


Overall synthesis

- A student in an engineering course covering sustainability is most likely to be an upper division undergraduate or graduate student taking a stand alone course that is not part of a formal sequence

What's in these courses?

A structure for categorizing content

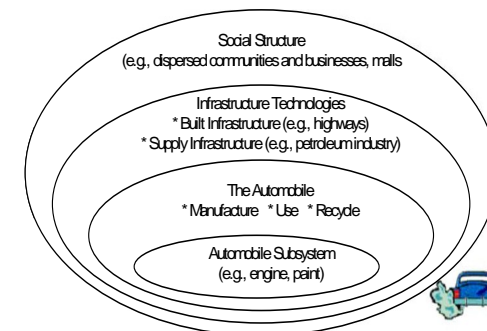


What system sizes are covered in courses?

The entries report the number of courses and, in parentheses, the percentage of the courses covered in the survey
 Maximum values for each system size (within 2 percent points) are shaded to indicate tendencies.

System Size	Portion of Total Course Content				
	Some*	none	Small (1-10%)	Moderate (10-50%)	Significant >50%
Gate to Gate	27	19 (19%)	31 (32%)	38 (39%)	10 (10%)
Cradle to Grave	15	26 (24%)	35 (32%)	37 (34%)	12 (11%)
Inter-Industry Interactions (Industrial Symbiosis)	10	62 (54%)	25 (22%)	28 (24%)	0
Extra-Industry	11	62 (54%)	33 (29%)	19 (17%)	0

* Percentage of course content not specified by respondent, but topics within this system size were covered



Conclusions

- Including sustainable engineering concepts into engineering programs is becoming widely accepted (80% of top 100 engineering programs are doing something)
- Wide range of content
- Some common elements:
 - Life cycle methods
 - Green materials
 - Recycling and reuse
 - Integration into product and process design

More details available at:

<http://www.csengin.org/>

Murphy, C., D.T. Allen, B. Allenby, J. Crittenden, C. Davidson, C. Hendrickson and S. Matthews
“Sustainability in Engineering Education and Research at U.S. Universities” *Environmental Science and Technology (Feature and cover article)*, 43, 5558-5564 (2009).

Allen, D.T., C.F. Murphy, B. Allenby and C. Davidson,
“Incorporating Sustainability in Chemical Engineering Education, *Chemical Engineering Progress*, 105 (1) 47-53 (2009).