

Session 4: planning for curriculum development
Friday morning, 2003 June 13

Discussion of the Summary Report

- Molecular transformations —too much focus on reactions? Missing separations?
- Separations would appear in Molecular (properties) and Multiscale areas
- Will such a curriculum fit into the typical university?
 - ~12 Chemical Engineering courses needed to fit present structure.
- How could new curriculum be phased in? Necessary to be abrupt!
- There are philosophical components of new curriculum that can be introduced now
- Developed labs, modules, examples can be introduced early, too
- Modules can be effective in introducing change
- we need “model predictive control” for implementation
 - Recreate the experience of these workshops for others to appreciate the change
- Expectations of freshman preparation: Freshman Lab to entice students into Chemical Engineering
- freshmen are better; however, we need to quantify
- freshman capabilities vary widely
- Practical difficulty—freshmen place out of service courses with AP credit
- ChE departments need good interaction with several other departments in a university
 - There has been some success in this
- Chemistry Department at Vanderbilt would love to change their course, if cooperating with ChE
- we need education of faculty on curriculum content
 - No texts yet to support new courses
- No texts yet—use web as evolving ‘textbook’?
- Need a coherent resource, (e.g., “textbook”) to implement the change
 - But not necessarily a paper book
- The funding proposal should include web FAQ facility for dissemination of information
- In advertising the new curriculum, need a complete document including the motivation for change
- we must ensure that this new curriculum will indeed appeal to students
 - those interested in life sciences, e.g.
- Emphasize need and opportunity for bio content integrated into curriculum
- Specify bio-based concepts as contributing new content to ChE - e.g., evolution, specificity
- What is the name? Are Chemical and Bio equal components?
- Packaging and marketing are important—need to include “Bio” in name
- ChE with integrated biological content is a stronger curriculum than bioengineering
- published measures of salary are listed under the traditional ChE name
 - Ensure any new name is understandable to these salary compilers
- at Penn State, Bio Engineering is perceived as more flexible than ChE. Is new curriculum even worse—rigid schedule??

Next steps

- NSF has already funded a “freshman year experience”, as well as curriculum initiatives in many individual ChE depts. → do the literature search
- Need to establish review process
 - Who, when, how
- How do we ensure integration with the de-centralized development?
 - A few test universities?
- We must include concept, materials, dissemination, evaluation
 - \$10M... \$20M?
- May raise flag during proposal review to specify testing too soon.
 - Yet want some mid-stream evaluation
- 1st year deliverable: plan workshops at test universities.

How to spread ideas: What worked in this workshop series?

- preconception was that the workshops were simply about putting biology into chemical engineering, but attending them made clear the full scope and possibility of curriculum change
- getting a clear vision of threats and opportunities for the profession
- realization that bio threat was REAL
- having meetings at remote locations
- facilities & accommodations were good
- the process we followed
 - RCA led, but did not dominate
- breakout sessions were effective
- using stickies during brainstorming: 1 idea/sticky
- network opportunity
 - the involvement of the full profession
- better than university planning committee

How to spread ideas: What are obstacles to promoting a new curriculum?

- Lack of textbooks to support new courses
- People think that we would discard fundamentals of chemical engineering
 - Must address that misperception
- People think these workshops are only about adding biology
- People perceive that ChE is already successful. Why change?
- Perception that the people who have attended this workshop series are biased to particular research areas
- The language and terms we have been using are not uniform
- Not yet supported by our colleagues
 - Must convince them of case for change
- ~5% penetration of ChE faculty so far
- Need a way to articulate the vision – must persuade
- Work with individuals - below “faculty meeting” level
- Need many small discussions

- Sense of urgency helps change
 - Bio most urgent
 - Less for the actual organizing principles proposed
- Lamar U. survey of CPI IT use indicates that even “old” CPI is changing

How to spread ideas: How to foster change?

- Leaders for curriculum change will be the young faculty
 - Need support, protection (by senior faculty)
- Remain consistent w/ABET, not in conflict
- Involve students, alums, industry
- Reassure the skeptics
- Use a department retreat as mechanism – repeat this workshop process so that others will feel ownership
 - should we therefore restrict distribution of our workshop proceedings?
- Peer pressure may help
- AIChE could find this change to their advantage
- Most resistance is from people unsure about their ability to participate (i.e., teach revised materials)
- Emphasize that we’re maintaining good content from the present curriculum
- Making a marketable engineer is a selling point
- Need good salespeople
- Need incentive for faculty who drive the change
- Need a fleshed-out statement of curriculum
- Describe clearly the threat that motivates this change; include data
- Welcome others to participate
- Can young faculty be formally rewarded for participation?
- Can academic departments reward/count grants and publications in pedagogy, as well as research?
- Convince others that the fundamentals are NOT lost in the new curriculum
- The present curriculum is not broken?
 - → sense of discovery and excitement is missing
 - → system is suboptimal, and we lose good students to other departments
- Now we can put leading-edge ChE into undergraduate curriculum
- This new curriculum is still engineering
- The prospect of change is reminiscent of 1920s & 1960s
- Enrollments have declined
- New curriculum features clear themes
- Present this curriculum as modern, even futuristic!
- ChE is more fundamental & broader than BioE
- Will expect lots of ChE faculty retirements in 10 years
- Need a list of the workshop questions
- Need a usable summary of the workshop
- Examples of needs of BS grad vs market to motivate urgency
- Supply slides to go with promotional materials

- Road show – an outsider to proselytize a department
- Let deans know.
 - Is there a ChE deans group?
- Can deans change the reward system?
- Persuade research people to be involved
- In the workshops, the solutions were developed by the participants
 - Faculty must recreate this experience in each department
- Need to build in flexibility for departments – not prescribe a rigid curriculum structure
- Future graduates will need an industry viewpoint
- Need a mechanism to bring the curriculum to AIChE
- AIChE – invite people to an information session with an assignment: “what does the BSChE graduate need over the next 15 years?”
- Involve ASEE → June 2004
- ASEE is a good home for ChEs
- We should promote ASEE in general
- Develop a simple private web site for development of course materials