# Session 4 - Keeping Industry Involved in Education of ChEs

Industry representatives joined the academic theme groups to discuss how industry can be more closely involved in university education of chemical engineers.

**Molecular Transformations Group**

- The curriculum affects:
  - What graduating engineers know
  - Who gets attracted to major in ChemE
- An "Elevator Speech"/Vision is needed!
  - Industry can supply success stories to help attract students to ChemE
- Industry advice this morning:
  - Fix simple things that are wrong with curriculum now – big reorganization needed for this
- Molecular Transformation academics focus:
  - 20 years from now ChemEs will need more molecular training/viewpoint than they get now
- Differing views were expressed about how much of the proposed curriculum revision is about improved pedagogy vs. adding/subtracting content. Some industries need more molecular focus, some don't.
- Industry is very broad
  - Certain jobs draw more heavily from different aspects of curriculum
- Integrated Engineering overview is more valuable than any specifics in curriculum
- Engineering is an art of trading time vs. knowledge
- Criteria for hiring:
  - Smart
  - Hard-working, chemical engineering view
  - Specific experience
- Industry notices that ChemE new-hires can't really use their chemistry knowledge. This is important for a significant fraction of ChemE jobs, but certainly not all.
- Suppose we want to separate A & B:
  - We want the ChemE to think "What are the differences between these molecules? What separation techniques take advantage of this difference in molecular properties? Do I know how to read the vendor's manual for this type of separator? Can I design an overall separation train that uses this separator?"
- Need a broader industrial sample set than at this workshop:
  - Not just PhD's (though better for future/new)
  - Not so many MIT graduates
- Crucial: ChemE's must know how to learn
- How to evaluate the success of any curriculum change – metrics?
  - What can we measure quantitatively?
  - Need to look at customer satisfaction - lots of customers
- Need to get more details on proposed changes in undergraduate <u>experience</u> (not just <u>curriculum</u> changes) to industry to get better feedback. Some representatives from industry interested in helping with developing proposal.

**Multiscale Analysis Group**

- Observations
  - Industrial partners have strong focus on attributes
  - Difficult to evaluate content
  - Industry has pulled back from Universities
    - Budgets are tighter
    - Visits are fewer
    - Consultants
- Opportunities
  - Use revision as a vehicle to re-engage universities and industry
  - Students want relevant examples in their curriculum
    - Time-consuming to develop
    - Access to information is difficult
  - How can industry help?
- Path Forward
  - Loan out engineers in partnership with academic curriculum developers
  - Mini-sabbaticals (both university and industry)
  - Transfer of examples that have both technical and social impact
  - Scalable
  - Refine the message to sell it
- Evaluation
  - Coarse measures
  - Better students/hires
  - Faster start in jobs
  - Attract new and better students to enter profession

**Systems Group**

- Problem solving
  - Industry can help find problems, but not solutions
  - Maybe change how we teach, less powerpoint concepts, more problem-solving
    - Not linear
    - More about pedagogy
- How does industry buy in?
  - Don’t ask industry for funding; instead, get them involved

**First-Year Experience Group**

- Industry Input
  - Topics easily related to
  - Simple match
  - What does a ChE do?
    - Case studies
    - Demonstrate putting things together
    - Several topics
  - Team participation
    - Technical and business aspects
    - How are decisions made?
    - Examples from "abandoned" projects
    - How long will it take?
    - How much will it cost?
    - Role-play decision making
  - How does a ChE fit into the product/process development team?
  - Tie case studies back to curriculum
  - Motivate need for several semesters of science/math fundamentals
  - Facilitate informed decision on a major
  - Allow creativity
  - Innovation
  - Gadget engineering
    - Needs to include quantitative analysis to scale up
- Role of industry
  - Periodic input
  - Construct ways to improve "soft" attributes
  - Mentors to students?
  - Work with faculty and/or students on uncertainty issues
  - Limited/well-structured time commitment will work best
  - HR departments already arrange campus visits. While on campus, could help with teamwork, etc.
    - Business schools too