

Session 6 - Focus on Skills and Attributes

Beginning with the skills and attributes listed in both this and previous workshops rank them and discuss how they will be integrated into the curriculum and effectively taught. Participants were divided into three groups.

Group 1

Classification & Ranking

Skills and attributes were classified into Technical, Individual, and Interpersonal categories (recognizing that the categories are not exclusive). They were then ranked by vote (number of votes in parentheses; all received some votes)

votes	Technical	Individual	Interpersonal
(7)	Problem Solving <ul style="list-style-type: none"> • Critical thinking • Weigh options Complex Information & Data Analysis <ul style="list-style-type: none"> • Uncertainty 		Communication <ul style="list-style-type: none"> • Speak • Write • Listen
(5)		Motivation <ul style="list-style-type: none"> • Risk taking • Fearlessness • Independence 	Teamwork <ul style="list-style-type: none"> • Leadership • Negotiation
(1, 2)	Economics/Market	Ethics and Context Creativity Lifelong Learning	

Models for skill instruction

- Business school
- “Practice School” (the MIT ChE industrial immersion program)
- Formal course
- Outside seminars/mentoring

Teaching the Skills

Problem-solving [would benefit from new curriculum structure]

- Suffused throughout courses vs. a formal course in method?
- Formal resources (Fogler and LeBlanc text, industrial methods)
- Faculty training required
- Complex “data” analysis [would benefit from new curriculum structure]
 - Associated with problem-solving instruction
 - Formal courses – statistics, uncertainty analysis, curve-fit, design of experiments
 - Emphasize in lab courses and design

Communication [can be done in present curriculum structure]

- Formal classes in/out of department

Group 2

The overriding concern is to cultivate professionalism in our graduates.

Prioritized List of Skills and Attributes

- Communication skills – 12
- Creative problem solving – 12
- Teamwork/Leadership – 24
- Time management – 25
- Professionalism – 30
- Independent learning – 34
- Societal awareness – 39
- Business savvy – 43
- Safety – 48

Teamwork is more than simply dividing labor among students. To be fostered as a skill, the students' team experience should include review and chances to improve. They are taught teamwork methods, they use the methods, they review and discuss their performance. In a course, Teaching Assistants can help with teams.

Ethics requires clear standards, thoroughly adhered to. In the engineering curriculum, ethics is better addressed by case studies than formal lectures. The topics should engage students, such as things that might arise in a job.

Communication should be combined with Problem solving by providing a format and structure that aids critical thinking and leads to clear presentation of methods and results. Clear expression has intrinsic value.

Professional Development at Rensselaer Polytechnic Institute

- 1-hr Soph Meyers Briggs Assessment
- Junior Time Management/ Leadership Dynamics, Communication Skills, Conflict Resolution
- Senior Communication Skills
- “Outsourced” (the substitute teacher effect) and thus disconnected from ChE
- Should be integrated with the course, in analogy to statistics
- Skills should be taught, not just forced
- In every class (or at least once per semester)
- Should be clearly delineated
 - Need at least one “professional development” course that is separate → but how to teach?
- Ideally should be taught by ChE faculty
- Guest lectures can be helpful; lead to industry involvement
- However, faculty must be trained to teach these skills

Group 3

Professional practices start in school

- Behavior minimal
 - Basic responsibility
 - Dress
 - Shows up for appointments
- Library/educational continuity

Development of teamwork skills (not just teaming)

Mix of instruction and self-discovery

- Division of labor
- Team success incentives
- Open-ended problems
- Leadership roles
- Team-building exercises
- Involvement of faculty and TAs
- Team problem solving/creativity (distinct from individual)
- Appreciation of diversity as a value
- Communicating absolute standards
- Importance of teaching each other (hierarchy of skills and roles)
- Motivation for team success

Ethics

- Professional standards
- Integrity and credibility required for leadership
- Understanding of “rules”
- Preventing rationalizations
- Ethical dilemmas
- Proximity to personal impact
- Appreciation of diversity

Clarity of Expression

Introducing communications structures. FORCING THEIR USE!

- From the first homework solution => it's a communication
- Value of 1 page memo
- Using communication skills to develop critical thinking
- Lab reports
- Technical presentations, etc.
- Show counter examples
- Use the tools that are available
 - Proofing, spell checking, etc.
- Intrinsic value of clear expression
 - As persuasion
 - Providing a record

Positive feedback

- Leads to student self-confidence

Ensure that students recognize that these skills are a syllabus objective