THE NEED

Desired Attributes of an Engineering Graduate

• Understanding of fundamentals
• Understanding of design and manufacturing process
• Possess a multi-disciplinary system perspective
• Good communication skills
• High ethical standards, etc.

Underlying Need

Educate students who:

• Understand how to conceive-design-implement-operate
• Complex value-added engineering systems
• In a modern team-based engineering environment

We have adopted CDIO as the engineering context of our education
Engineers need *both* dimensions, and we need to develop education that delivers both
We envision an education that stresses the fundamentals, set in the context of **Conceiving – Designing – Implementing – Operating** systems and products:

- A curriculum organised around mutually supporting disciplines, but with authentic engineering activities highly interwoven
- Rich with student design-build projects
- Featuring active and experiential learning
- Set in both classrooms and modern learning laboratories and workspaces
- Constantly improved through robust assessment and evaluation processes
Most engineers learn from the concrete to the abstract. Manipulate objects to understand abstractions.

Students arrive at university lacking personal experience.

We must provide dual impact authentic activities to allow mapping of new knowledge (contextual learning).

Using CDIO as authentic activity achieves two goals: builds the cognitive framework to understand the fundamentals more deeply, provides education in the creation and operation of systems.
NEED TO GOALS: WHAT WE TEACH

Educate students who:

- Understand how to conceive-design-implement-operate
- Complex value-added engineering systems
- In a modern team-based engineering environment
- And are mature and thoughtful individuals

The CDIO Syllabus - a comprehensive statement of detailed Goals for an Engineering Education
CDIO SYLLABUS

- Syllabus at 3rd level
- One or two more levels are detailed
- Rational
- Comprehensive
- Peer reviewed
- Basis for design of curriculum and assessment of student learning
# THE CDIO STANDARDS: EFFECTIVE PRACTICE FRAMEWORK

<table>
<thead>
<tr>
<th>1. CDIO as Context*</th>
<th>Integrated learning experiences that lead to the acquisition of disciplinary knowledge, as well as personal, interpersonal, and product and system building skills</th>
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<tbody>
<tr>
<td>Adoption of the principle that product and system lifecycle development and deployment are the context for engineering education</td>
<td>8. Active Learning</td>
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<td>2. CDIO Syllabus Outcomes*</td>
<td>Teaching and learning based on active experiential learning methods</td>
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<td>Specific, detailed learning outcomes for personal, interpersonal, and product and system building skills, consistent with program goals and validated by program stakeholders</td>
<td>9. Enhancement of Faculty CDIO Skills*</td>
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<td>3. Integrated Curriculum*</td>
<td>Actions that enhance faculty competence in personal, interpersonal, and product and system building skills</td>
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<td>A curriculum designed with mutually supporting disciplinary subjects, with an explicit plan to integrate personal, interpersonal, and product and system building skills</td>
<td>10. Enhancement of Faculty Teaching Skills</td>
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<td>4. Introduction to Engineering</td>
<td>Actions that enhance faculty competence in providing integrated learning experiences, in using active experiential learning methods, and in assessing student learning</td>
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<td>An introductory course that provides the framework for engineering practice in product and system building, and introduces essential personal and interpersonal skills</td>
<td>11. CDIO Skills Assessment*</td>
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<td>5. Design-Build Experiences*</td>
<td>Assessment of student learning in personal, interpersonal, and product and system building skills, as well as in disciplinary knowledge</td>
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<td>A curriculum that includes two or more design-build experiences, including one at a basic level and one at an advanced level</td>
<td>12. CDIO Program Evaluation</td>
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<td>6. CDIO Workspaces</td>
<td>A system that evaluates programs against these 12 standards, and provides feedback to students, faculty, and other stakeholders for the purposes of continuous improvement</td>
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<td>Workspaces and laboratories that support and encourage hands-on learning of product and system building, disciplinary knowledge, and social learning</td>
<td>*essential</td>
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Growing body of scholarship:
  Documents the effectiveness of PBL in engineering (e.g. de Graff and Kolmos)
  Explains the effectiveness of PBL (e.g. Ambrose)

Significant institutional obstacles remain
  Space and time intensive
  P&T (Asst. Prof. stay away)
  Mismatched faculty skills

Industry must get involved.
  Enhanced student engagement
  Improved faculty buy-in
The CDIO syllabus scope meets and exceeds the ABET criteria, while the CDIO standards more broadly express a pedagogy of engineering education.

Contextual Learning is central to CDIO. This necessarily includes Project Based Learning, but PBL is set in a philosophical framework.

Joining the initiative provides an international/regional learning communities of practice.
CDIO RESOURCES

- Published papers and conference presentations
- Implementation support
- Support for change process
- Book: *Rethinking Engineering Education - The CDIO Approach* (Amazon.com)

Visit www.cdio.org!