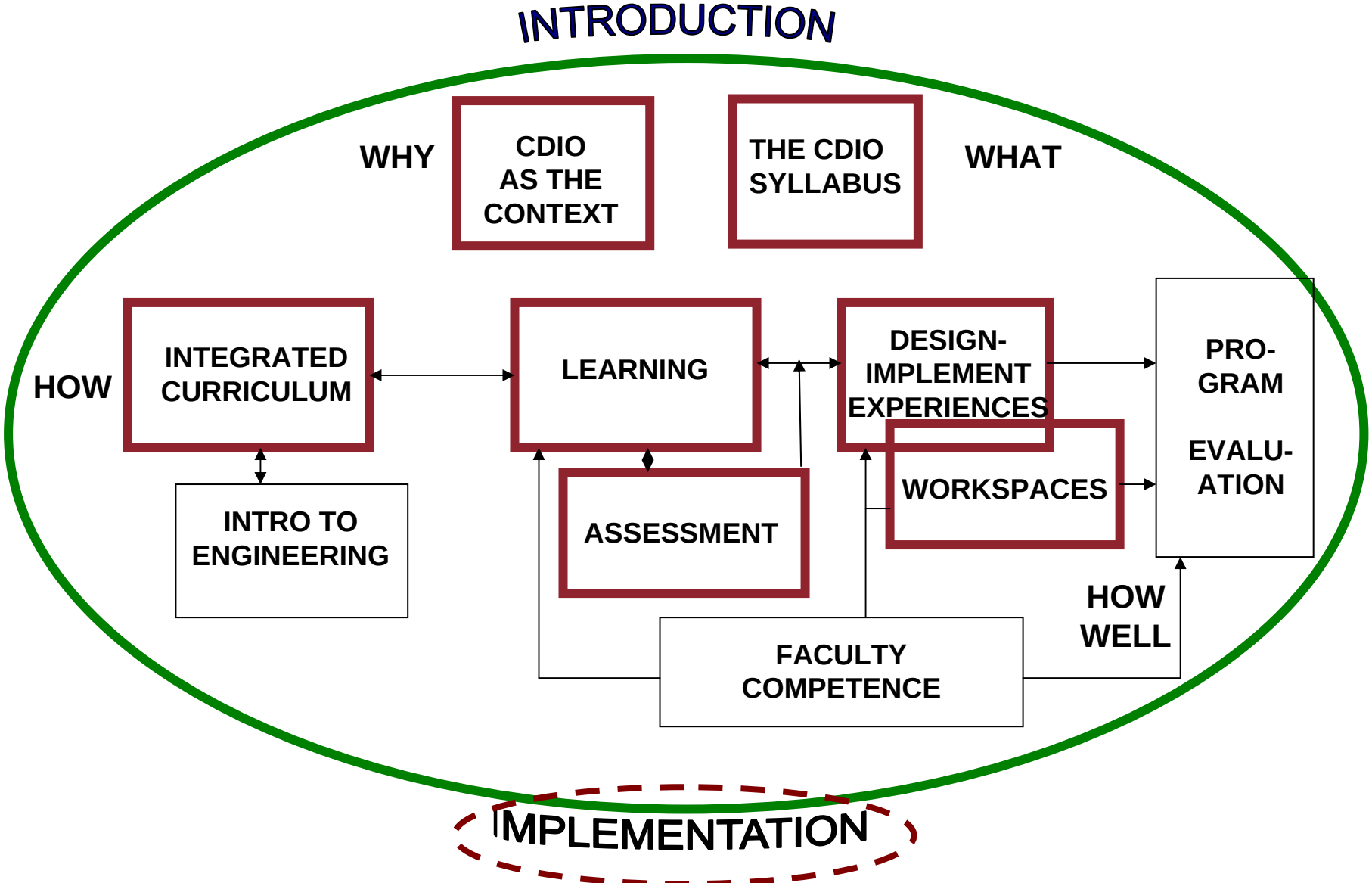
THE CDIO APPROACH TO ENGINEERING EDUCATION: 6. Adapting And Implementing The CDIO Approach

Revised January 2008

SESSION SIX


INTRODUCTION
WHY
CDIO AS THE CONTEXT
THE CDIO SYLLABUS
WHAT
HOW
INTEGRATED CURRICULUM
LEARNING
DESIGN-IMPLEMENT EXPERIENCES
PRO-GRAM
EVALU-ATION
INTRO TO ENGINEERING
ASSESSMENT
WORKSPACES
HOW WELL
FACULTY COMPETENCE
IMPLEMENTATION

SESSION SIX OBJECTIVES

Recognize key factors that influence change in an organization

Examine the implementation process in a selected CDIO program

Describe resources that facilitate the adoption of CDIO in engineering programs

KEY FACTORS THAT PROMOTE CULTURAL CHANGE

GETTING OFF TO THE RIGHT START

1 Understanding the need for change

2 Leadership from the top

3 Creating a vision

4 Support of early adopters

5 Early successes (see examples)

BUILDING MOMENTUM IN THE CORE ACTIVITIES OF CHANGE

6 Moving off assumptions

7 Including students as agents of change

8 Involvement and ownership

9 Adequate resources

(See Handbook, pp. 41-43)

INSTITUTIONALIZING CHANGE

10 Faculty recognition and incentives

11 Faculty learning culture (see examples)

12 Student expectations and academic requirements

EXAMPLES:
#5 EARLY SUCCESSES

- Identify learning outcomes for several courses.
- Start, or modify, a first-year engineering course that includes a simple design-implement experience.
- Modify an upper-level course to include a simple, low-cost design-implement experience.
- Modify an appropriate meeting room or flexible classroom space to create a design-implement workspace that supports hands-on and social learning.

EXAMPLES:
#11 FACULTY LEARNING CULTURE

Enhancement of CDIO Skills

- Hire faculty with industrial experience
- Give new hires a year to gain experience before beginning program responsibilities
- Create educational programs for current faculty
- Provide faculty with leave to work in industry
- Encourage outside professional activities that give faculty appropriate experiences
- Recruit senior faculty with significant professional engineering experience

EXAMPLES:
#11 FACULTY LEARNING CULTURE

Enhancement of Teaching Skills

- Hire faculty with interest in education and ask them to discuss teaching during their interviews
- Encourage faculty to take part in CDIO workshops
- Connect with the teaching and learning centers at your universities
- Invite guest speakers on teaching topics
- Organize coaching by educational professionals or distinguished peers
- Participate in teaching mentorship programs

ACTIVITY: KEY CHANGE FACTORS

Working with the key change factor assigned to your group, and the descriptions found in the Handbook, pp. 41-43

- **Discuss what the factor means**
- **List 3 or 4 examples of ways that you can apply that change factor in your engineering program**
- **Share an example with the whole group**

AN IMPLEMENTATION STORY

The Change Process
At École Polytechnique de Montréal

1. UNDERSTANDING THE NEED FOR CHANGE

- To adapt the program in order for students to achieve the new outcomes
- To address the drop in enrollment and low retention (output) despite high-quality students (input)
- To create better connections between mathematics, science, and engineering as required by the new common first-year program
- To help students, who are good technically, to integrate what they learn, and develop personal and interpersonal skills

3. CREATING A VISION

To modernize the programs,
taking into account the needs of society.
while focusing on students' strengths

Evolution

THE VISION

Educate mechanical engineering professionals competent in the development of complex products and systems who will be leaders in their domains

Align project with the CDIO approach to structure, support and accelerate the implementation

EDUCATIONAL PROJECT OBJECTIVES

- Increase general satisfaction and student success
- Increase student retention in the program
- Make academic programs more attractive
- Change perceptions of the common first year
- Answer today’s needs of organizations

12. STUDENT EXPECTATIONS AND ACADEMIC REQUIREMENTS

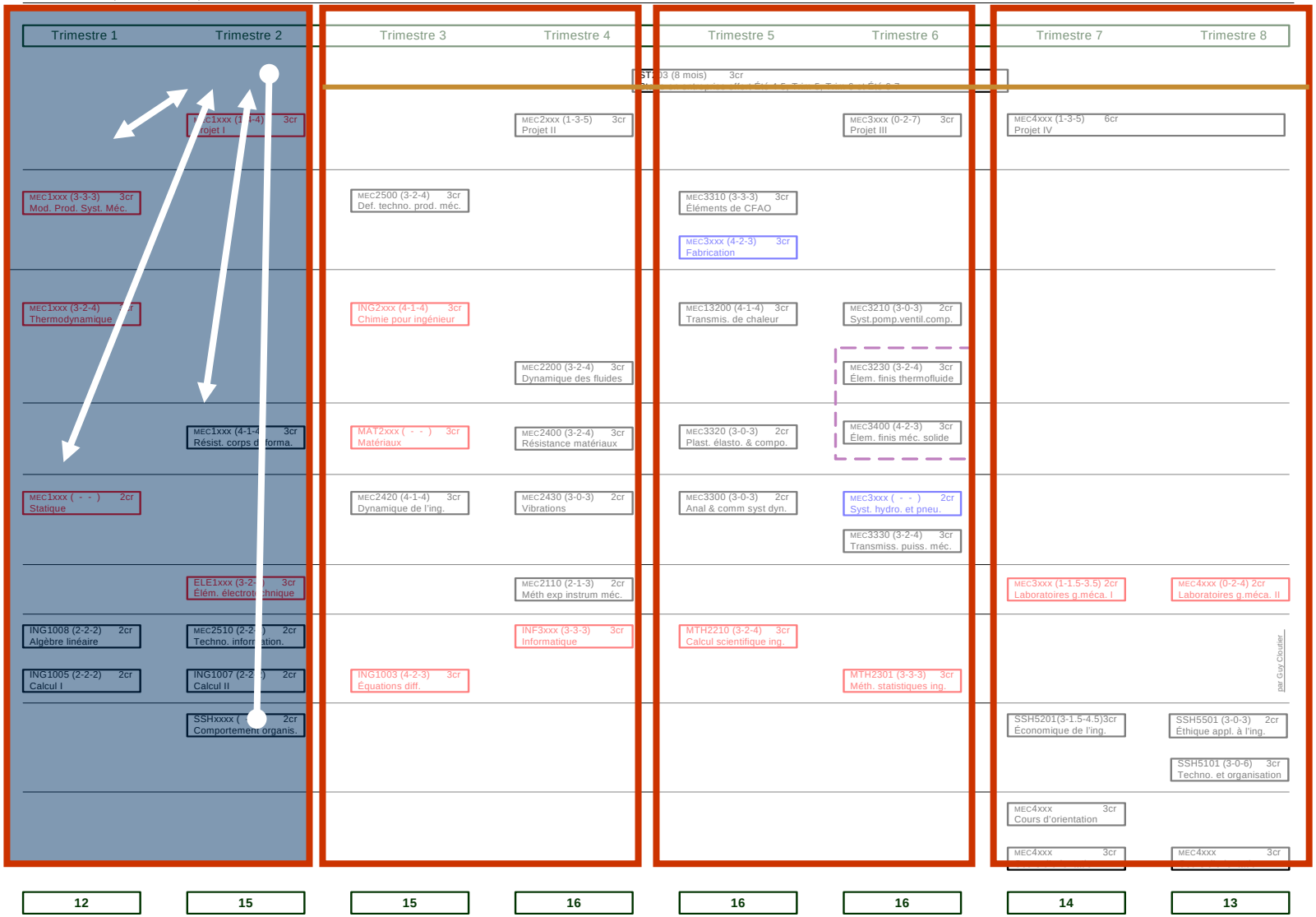
The development of the **new curriculum** is articulated around four principles.

To educate graduates

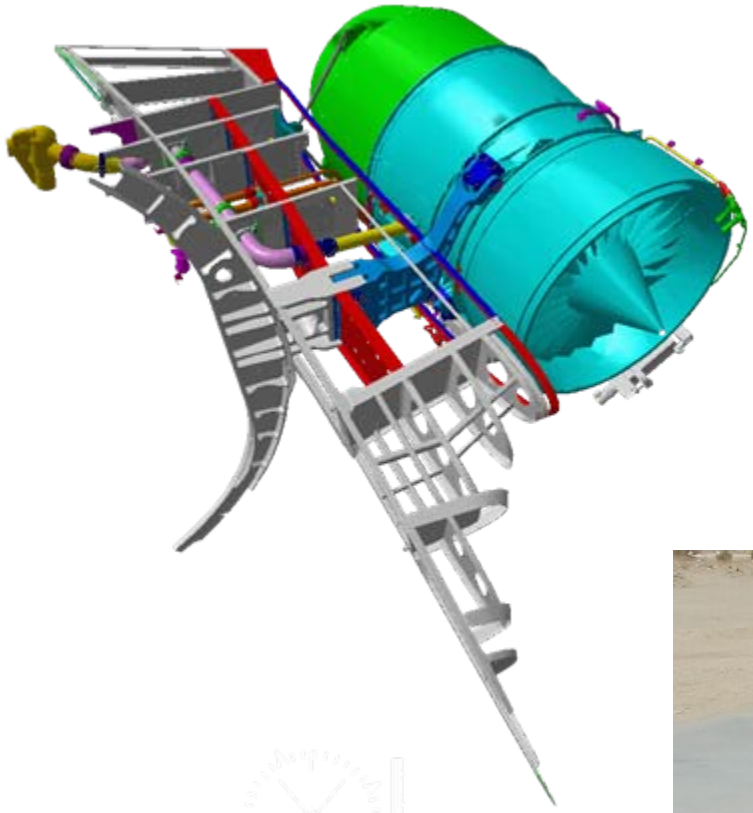
- With a strong knowledge of fundamental sciences
- With a solid experience in design
- Who master personal and interpersonal skills
- Ready for multidisciplinary international projects

INTEGRATION OF SUBJECTS

Projects, Design and Engineering Practice



DESIGN-IMPLEMENT PROJECTS



- Built on past experience
- Collaboration with industry
- C-D-I-O

CDIO-BASED INITIATIVES

- Stakeholder survey completed in 2006-2007
- Personal and interpersonal skills: communication, teamwork, critical thinking, listening, leadership
- C-D-I-O projects and workspaces
- Teaching Technology CDIO Chair
- Design Chair Initiative: Engineering-Industrial Design-Business schools collaboration

ADVICE FOR ADOPTERS

- Evaluate your program. What are your strengths and weaknesses with respect to the CDIO Syllabus?
- Identify some early successes **(5. Early Successes)**
  - Easy to implement
  - Quick payoff
  - Visible results
- Generate buy-in from faculty **(8. Involvement and Ownership)**
  - Give them tools to help with changes
  - Reward faculty who embrace CDIO
  - Give faculty ownership in the project
- Be ready to assess changes
- Identify resources needed before you embark on large changes – especially project-based courses **(9. Adequate Resources)**

TO LEARN MORE ABOUT CDIO …

OPEN-SOURCE RESOURCES

Available at http://www.cdio.org

- The CDIO Syllabus
- The CDIO Standards
- Start-Up Guidance
- Implementation Kit (I-Kit)
- Instructional Resource Materials (IRMs)

Other

- *Rethinking Engineering Education: The CDIO Approach* by Crawley, Malmqvist, Östlund, & Brodeur, 2007
- Annual international CDIO conference
- Local, regional, and international workshops

ACTIVITY: DISCUSSION

CHALLENGES

Identify 3 key challenges that you face in implementing a CDIO approach in your program.

What resources can you draw on to address these challenges?

See Handbook, pp. 45-47 for Frequently Asked Questions

SUMMARY: How much progress did you make toward the workshop objectives?

	Little or no progress	Some progress	Very good progress
Explain the CDIO approach to engineering education			
Determine ways in which the CDIO approach may be adapted to your own programs			
Share your ideas and experiences of engineering education reform			
Other (please specify)		**(See Handbook, p. 51)**	

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