Transforming Engineering Education at the Collegiate Level

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Invited Presentation
3DS AND ACADEMIA: where learning meets innovation
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Outline

1. The Founding of Olin College
2. The Olin Learning Model
3. Lessons Learned
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F.W. Olin Foundation

Timeline
• 1997 – Charter
• 1999 – First employee
• 2000 – Founding Faculty, begin campus construction
• 2001 – Olin Partner Year
• 2002 – first courses taught
• 2006 – first commencement

“There is a lot of unhappiness about the way engineering is taught today…”

Lawrence W. Milas, President, F.W. Olin Foundation, Founding Chairman, Olin College Board of Trustees
“Olin College is intended to be different, not for the mere sake of being different, but in order to become an important and constant contributor to the advancement of engineering education in America and throughout the world,…”

Founding Precepts, Olin College

→ Olin College is intended to become an education laboratory.
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The current Olin model for engineering education
Olin College Overview

• Undergraduate residential engineering education
• Total enrollment of about 350
• 50% women
• BS degrees in ECE, ME, Engr only
• 9-to-1 student/faculty ratio
• 75 acres and 400,000+ sq. ft. new buildings
• Endowment > $1 million/student
• Research expenditures > $1 million/yr
• Adjacent to Babson College, Wellesley College

• No academic departments
• No tenure
• Low tuition
• Everything has expiration date
Some Features of the Olin Curriculum

- **Candidates’ Weekend**: interviews required for admission
- **Extensive DESIGN** core required
- Multiple Team design projects required in 6+ semesters
- **SCOPE** senior project: corporate sponsored, year-long ($50k/project)
- **EXPO** at end of each semester: “stand and deliver”
- **Olin Self Study** self-directed independent research required for graduation
- **AHS/E! Capstone** project required for graduation
- Study Away in Junior year
- Summer internships: REU and corporate experience
- Business and entrepreneurship: **all students must start and run a business or enterprise** for a semester
- Continuous improvement: **continuous curriculum review and renewal**

- **BUT, the learning culture** is far more important than the curriculum!

**The Culture Is the Curriculum**

“We’ve never worked this hard in our life, and there is nothing else we would rather be doing!”
SCOPE – Corporate Sponsored Senior Design Project

- Teams of about 5 working for one academic year
- $50,000 USD/project team
- Learning to be an engineer

2014-15 SCOPE Sponsors
Three College Collaboration

“A Virtual University”

ENGINEERING
Olin College of Engineering

BUSINESS
BABSON

LIBERAL ARTS
Wellesley College

Students freely cross-enroll
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Lessons Learned

To produce innovators, we must change:

- Who we teach
- What we teach
- How we teach
Lessons Learned

To produce innovators, we must change:

• Who we teach
• What we teach
• How we teach
Creativity
the process of generating original ideas and insights
(Sir Ken Robinson)

Inventiveness
the process of generating original ideas and insights that have value (purposeful creativity)

Innovation
the process of generating original ideas and insights that have value, and then implementing them in ways that change people’s lives

Note: Without implementation, it’s not an innovation, it’s just an innovative idea
Our traditional approach to higher education may be actually preventing us from producing innovators!
Feasibility
Engineering and Science

Viability
Business and Economics

Desirability
Psychology, Arts, Humanities, etc.

Innovation

- All people have at least 7 “intelligences”
  - Linguistic
  - Logical/mathematical
  - Spatial
  - Bodily-kinesthetic
  - Musical
  - Interpersonal
  - Intrapersonal

`Academic Intelligence (IQ, SAT, etc.)`

`Artistic Intelligence`

`Persuasion, Management`

Example: Prof. Diana Dabby
Creativity may now be as important as knowledge(!)
Not everything that is important is learned from a book!

What you know

What you can do

What you conceive

content ➔

imitate ➔

perfect ➔

Knowledge ➔

Skills, Behaviors ➔

Motivations, Creations ➔
Can Creativity be Taught?

Learning to Improvise
A Whole New Engineer

The Coming Revolution in Engineering Education

DAVID E. GOLDBERG
and MARK SOMERVILLE
with Catherine Whitney
“Making universities and engineering schools exciting, creative, adventurous, rigorous, demanding, and empowering milieus is more important than specifying curricular details,”

Dr. Charles Vest, former President of MIT and of the US National Academy of Engineering.
Outcomes at Olin College

2013 Bernard M. Gordon Prize for Innovation
In Engineering and Technology Education
US National Academy of Engineering

Princeton Review:
#3 – Students Study the Most
#19 – Happiest Students

US News & World Report - #3

Newsweek/Kaplan – “New Ivies”

Among top producer of
NSF Grad Res Fellowships,
Fulbright Scholarships

40% of alumni pursue graduate
degrees, 25% of these at
Harvard, Stanford, or MIT

Starting salaries for Olin graduates average about
$20,000 above US national average for engineers