Nanotechnology as a 21st Century Educational Tool

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http://www.leblanclab.com/nanotechnology-fellows.html
“...introducing nanoscale science, engineering, and technology through a variety of interdisciplinary approaches into undergraduate education.”
Shift in Perspective

Nanotechnology as an Educational Tool
vs.
Nanotechnology Education

Framework:
“Educating the Engineer of 2020: Adapting Engineering Education to the New Century”
National Academy of Engineering
Engineering schools should... experiment with novel models for baccalaureate education.
Nanotechnology Fellows Program

Summer program + Seminars
[Recommend that] Engineering schools introduce interdisciplinary learning in the undergraduate environment...
Nanotechnology Seminar

Nanotechnology Devices & Systems: How They Are Made, Measured, & Monetized

Interdisciplinary Units:
• Nanoengineered devices and materials
• Micro- and nano-fabrication tools
• Cutting-edge characterization techniques
• Social, economic, and policy factors

Details:
• Open to all majors
• No prior experience or prerequisites
• 1 credit hour seminar
• Counts towards Sustainability Minor
• Co-taught with instructors from mechanical, electrical, and systems engineering
Program Activities

- Microfluidics
  - Fluid mechanics
  - Mass transport
  - Lithography
- Computer-aided design
- Characterization
  - Materials science
  - Microscopy
- Monetization
- Fabrication
  - Electronic transport
  - Optics
  - Device basics
As well as delivering content, engineering schools must **teach engineering students how to learn**...
Learning Modalities

- Tutorials
  - Materials science
  - Device physics
  - Finance
- Hands-on training
  - Lithography
  - Microscopy
- Mini-projects
- Research project
Pedagogical Framework

- Experiential & problem-based learning
- Collaborative & peer learning
- Peer assessment
- Integrating research & education
- Scaffolding
Professional Development

• Project planning
• Project presentations
• Resumes
U.S. engineering schools must develop programs to encourage/reward domestic engineering students to aspire to the M.S. and/or Ph.D. degree.
Learning & Research

- Graduate student mentoring
- Literature
  - accessing, reading, interpreting, applying
- Research projects
Engineering schools should lend their energies to a national effort to improve math, science, and engineering education at the K-12 level.

The engineering education establishment should participate in a coordinated national effort to promote public understanding of engineering and technology literacy of the public.
Outreach

• Research & Development Showcase
• Workshops with local high school
• Student Leaders Conference at TechConnect World Innovation Conference
• Nano Film & EnvisioNano contests
Engineering educators should explore the development of case studies of engineering successes and failures and the appropriate use of a case-studies approach...
Nanotechnology Seminar

Connecting Nanotechnology to Your World
• Curricular integration project

Nanotechnology Devices & Systems
• 3 “lectures” and 1 guest speaker per unit
• Final project: new venture pitch
http://blogs.gwu.edu/nanotechfellows/