Learning by Making at BeAM

• What is Making?
• Where are we?
• Examples for teaching: Nanotechnology, Radios, Music
• Neuroscience/Microscopy Teaching – Vladimir Ghukasyan

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RESEARCH
HUB
@ Kenan Science Library

UNC Neuroscience Center

BEAM
BE A MAKER
What is Making?

- Things! Materials, Electronics, Sensors, Motors, 3D printing

UNC Art LAB
NASA Theater Set Shop
Where are we?: BeAM@

4/13/2015 – BeAM@Hanes Art Center

4/2016 – BeAM@Murray Hall

Now – BeAM@ Kenan Science Library MakerSpace
Where are we?: BeAM@Hanes Art Center

Training, Workshops
Wood/Plastic/Metal working
Electronics, Digital Fabrication
Where are we?: BeAM@Murray Hall (4/2016)

Full Wood/Metal shops
Digital Fabrication
Electronics
25 seat project classroom
Lounge
BeAM@KSL Makerspace

3D Design Consultations
3D Printing, 3D Scanning, Arduino, Sewing
Workshops & Course-integrated instruction

Course Integrated Instruction

- ECON 325: Entrepreneurship: Principles and Practice
- JOMC 585: 3D Design Studio
- ECON 327: Commercial Venture Creation
- ARTH 089: First Year Seminar on Islamic Art and Science
- NBIO 890: Special Topics in Neurobiology: Microscopy Methods in Neurobiology
- ARTS 300: Studio 15: Art Majors Seminar
- JOMC 585: 3D Design Studio
Making for First Year Seminar: Mike Falvo (Physics/Astro)
Pedagogy and Evaluation

- PHYS 53.001: Handcrafting in the Nanoworld: Building Models and Manipulating Molecules
- Structure – models of proteins/complexes
- Dynamics – modeling processes
- Function – Mechanical model
“You first see really basic representations, then next more complicated, and on up to the real thing. This is an effective progression [for teaching] because if I saw the microscopes [pictures] right away I’d have been confused.”

“It [the course content] is not simplified, but it helps to build the model and visualize what is going on.”
Making for 100+ classes

• Making = active learning – for all classes
• How to make the abstract real

Physics 100: How Things Work
125 students-NonScience Majors!
Everyone – crystal radio kit
Wire, diode, earpiece :3$/kit
Making Music: The Interplay of Physics and Music

• FYS taught by Laurie McNeil (Physics/Astro) & Brent Wissick (Music)
How do you use it for teaching?

• Classes – entirely or in sections
  • Physical Computing (entirely): Sp’17
  • NeuroScience Microscopy (4 sections): Sp’15
• Course Development grants – coming soon…
• Training in software – current calendar, we come to you!
• Training in use of spaces/tools – ongoing, customized for you
• Open project time in space for out of class experiences.
NBIO 890-001 Microscopy Principles and Applications

To update the graduate course on microscopy to be in pace with the modern trend in research. Students need to be able to:

• build scientific equipment on their own
• adapt the equipment built by others through technology transfer
• save money
• overcome the limitations of commercially available equipment and develop independent thinking
The Challenge

Electronics and 3D Printing

• Joint design of the program and shared materials

• Makerspace provided:
  • Expertise
  • Equipment
  • Materials

Project:
A simple compound microscope with adjustable light source
The Challenge

4 weeks is NOT ENOUGH

Evaluation

Interesting and fun, but could have been more related to the general topic
The Future

4 weeks is NOT ENOUGH

Changed approach (Lessons learned)

We will use the Makerspace
- Throughout the full semester
- In the context of the material presented / intertwined approach
- Build a few projects of useful equipment

Projects:
- Mobile phone-based microscope
- A simple compound microscope
- Liquid handling for tissue clearing
- ...and more
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UNC Neuroscience Center