Educating for I&E in Physics

VentureWell Open 2017
Hyatt Regency Washington Capitol Hill
Sunday, March 26
Overview of Current PIE Activities

CU Denver
- Technical Competencies Course
- Psi* - student innovators
- Value of student research on campus
- Innovation Hyperspace 2.0

Loyola University MD
- Pathways to Innovation + PIPELINE
- Technical Entrepreneurship Course
- Pop-up courses (interdisciplinary)
- Minor in entrepreneurship (under review)
- 6 credit course on product development (under review)

Rochester Institute of Technology
- Dev. of Physics Entrepreneurship Track (plus others)
- Career Seminars/Enhanced Co-Op
- Pop-Up Courses
- Assessment tools on student & faculty attitudes towards PIE

Wright State/WPI
- 1st year seminar course - “save the world with physics” project
- Intro. Mechanics course w/value proposition
- Pop-Up courses
- Project based courses with entrepreneurial mindset/design thinking

College of William & Mary
- Dev. Physics Entrepreneurship (engr. Physics and applied design) Track
- Modules on Maker Space Technologies
- Expanding “shark tank” activities
- Project-based entrepreneurship/innovation thinking course

George Washington University
- Lab course with communications aspects
Ashesi University
- In Ghana
- Pre-calc, leadership, fund. Of design and entrepreneurship

Univ. of Wisconsin Madison
- Garage Physics
- Pop-Up courses
- Revising lab curriculum
- Reach program
- Increasing technical literacy in students
- Labs focusing on open access to data
Top Challenges/Goals - What do you want to get from today?

Group 1: Implementation
- Not enough time to develop courses
- Sustainability of pop-up courses
- Not enough industry partners
- Students’ perception of themselves in terms of success in physics

- Not enough high-level support
- Silos in a big institution
- Not enough “evangelism” tools

Group 3: Pedagogical issues
- More training on teaching PIE
- Keeping the physics content *while* teaching PIE
  - integrating PIE into curriculum
- Inflexibility of faculty/faculty buy-in
- Expanding vision of educators to include the entire student experience (not just classrooms)
- Learning how to grade based on process rather than outcomes

Group 4: Community
- Need unifying vision for how to move forward
- Lack of community/not connected to other practitioners
- Need strategy for collecting resources
- Clearing house of ideas/implementations that worked or didn’t work
Breakout Session #1

- Group 1 - challenges in category #2 (inst. change)
- Group 2 - challenges in category #3 (pedagogical issues)
- Which two strategies learned at Open are most transferrable. Why?
Group Discussion
Each group pick **top two transferrable approaches**

Which new approaches are most transferrable and why?

**Group 2: Inst. Change Mgmt**

Institutional change mgmt wrt students - Cooper Union included student in design of course (customer discovery)
Implement things in steps - results can be shown before you head to the next thing

Why these? Doesn't require any larger level buy in

Integrate into existing frameworks/courses
Interdisciplinary teams as a method for breaking silos
Review process - brings departments together and gets buy-in
Buy in from admin and faculty - focus on one rather than both

**Group 3: Pedagogical issues**

Encourage students to do early-stage competitions*, pitch competitions
Assessments - be informed by other instruments
Why? Assessments: The tools already exist - leveraging existing resources.
Competitions: Because there are existing models
Start doing PIE earlier to start students off in entrepreneurial mindset - maybe competitions are a way to do this?
Focus on value for students - money, credit, etc.

*but it may be better to use positive motivation, i.e. I’m doing this because it’s fun or challenging/interesting

“We need small victories.”
Breakout Session #2

- Group 1 - challenges in category #1 (implementation)
- Group 2 - challenges in category #4 (community)
- Which strategies learned at *Open* are most transferrable, and why?
Group Discussion
Each group pick top two transferrable approaches

Which new approaches are most transferrable and why?
Group 1: Implementation

Maker spaces - document campus-wide resources available (e.g like the MIT mobius app)*
Support sustainability issue for pop-ups by using library spaces, starting student-taught pop-up courses
Provide workshops where other faculty can see the teaching in action
Documenting curricular development using in Jupyter Notebook

Why? These were the only ones discussed during the breakout

*would be better if administrated in a cohesive manner

Group 4: Community

Opportunity to network with other practitioners
Learning what strategic doing is and how it can help build community
Concept of accessing vs. curating information
Partnerships that can bring resources beyond those available from NSF (VentureWell, KERN, etc)

Why? Did not get to this.