The inWorks: Solving Hard Problems that Matter

- Solutions to hard problems require more than one kind of knowledge.
- The knowledge needed to solve these problems is often to be found in a completely different domain than the problem itself.
- Interdisciplinary innovation is thus an essential tool for solving challenging problems, and an essential skill set for people entering the future workforce.

The inWorks: Creating Lifelong Innovators

- Many of today’s graduates will likely have more than ten different careers during their lifetime.
- Half of those jobs do not exist today.
- How should we prepare our students for careers that do not yet exist?
- How do we create an environment in which people learn and practice interdisciplinary innovation?

The inWorks: What Is It?

The inWorks is a new initiative of the University of Colorado Denver | Anschutz Medical Campus that draws together faculty, staff and students from across the two campuses, as well as entrepreneurs and leaders from industry, government, education and the community, to address problems of importance to human society.
inWorks: What Do We Do?

• Our mission is to impart skills and habits of mind that allow people to collaboratively create impactful solutions to human problems.
• We seek to create innovative solutions to some of the world’s most challenging problems, while in the process creating life-long innovators.
• We do this by scaffolding collaborative innovation and providing extensive facilities for rapid prototyping.

The Lockheed “Skunk Works”

• In 1943, Kelly Johnson created a small, experimental organization where designers, engineers and “shop artisans” worked together to create revolutionary aircraft designs.
• The Skunk Works was known for its flat managerial hierarchy, the exceptional dedication of its workforce, and its uncanny ability to produce results on time and under budget.
• In return for these results, the Skunk Works enjoyed significant autonomy from routine bureaucracy.
• The term “skunk works” has come to represent any project developed by a small and loosely structured group of people charged with the creation of something radically new.

What Would an Academic Skunk Works Look Like?

• How can we constructively incorporate this approach into our teaching, research and practice?
• Our answer was to envision the “inWorks” as a set of programs that actively
  – facilitate interdisciplinary collaboration;
  – promote academic innovation and entrepreneurship;
  – and encourage risk-taking and leadership.

How Do We Help Create Innovators?

The personal traits of “design thinkers” and innovators have been characterized in many ways, but there is consensus around a few core principles:
  – Empathy,
  – Curiosity,
  – Integrative thinking,
  – Optimism,
  – Collaboration, and
  – A bias toward action and experimentation.

Importantly, these characteristics are not innate; rather, they represent a set of skills and habits of mind that can be nurtured, taught and mentored.

That role defines the primary purpose of the inWorks.
How Do We Do This?

• The inWorks, drawing upon ideas from modern entrepreneurial practice, was created to provide educational experiences that develop these intellectual capacities.

• We do this by providing a scaffold for innovation that integrates empathy, creativity and practicality to match human need with feasibility.

• Through hands-on, human-centered, team-based projects, we help create experiences that allow individuals to encounter their own creativity, and we show students how to be intentional about the way they work together to solve significant problems.

Connecting to the Outside World

• The inWorks actively collaborates with industry, government and educators from around the world.

• We also offer broad opportunities for lifelong learning: speaker programs, workshops and other programs that bring together people from radically different backgrounds to consider issues of importance to human society.

• Visiting faculty, designers, entrepreneurs and leaders from many different fields will spend a few weeks to a year working as “Mentors in Residence.”

What’s Under the Hood?

• Our work is informed by theory and practice in the nature of creativity and innovation, how people learn, how people frame and solve problems, how people work together, how people find common vocabulary across disciplinary boundaries, as well as relevant work in cognitive science and neuroscience, psychology, pedagogy, and construct(ive/ion)ism.

• We try ideas that we know might fail because failure is an essential element of innovation. We evaluate everything that we do, learn from our mistakes, and try again; in short, we “fail fast.”

What About Research?

• The inWorks is primarily an educational initiative. However, the inWorks deliberately blurs lines between research, education and entrepreneurship.

• Unique synergies between the two campuses and external business, government, and educational organizations will likely create innovations in healthcare and healthcare delivery, technology and policy, education, and global development.
What is Design Thinking?

- A human-centered process for creatively developing solutions to complex problems.
- A scaffold for innovation that integrates empathy, creativity, and practicality to match human need with feasibility.
- Highlights the critical role of creativity in every human endeavor.
- Extends the design philosophy to things outside of products.
- Provides a vocabulary for being intentional about the way we work together to solve significant problems.

Does the inWorks Teach This?

YES

(and we also try to practice it)

inWorks Downtown Facilities

- Large teaching/workshop area (~50 people)
  - Can be set with adult or children’s round tables and chairs
  - Large number of portable whiteboards
  - Up to ~50 people or so
- Large digital creative/prototyping area (~30 people):
  - High-power laser cutter (fully enclosed and vented)
  - 4-axis CNC mill (all metals, plastics, composites)
  - 3-axis CNC router (wood and aluminum)
  - 3D printer (ABS plastic, plastic wood)
  - 3D printer (carbon fiber, Kevlar, human-implantable plastic)
  - Electronics shop with extensive Arduino and robotics support
  - Extensive software for 2D/3D design, microelectronics design
- Large “analog” creative/prototyping area (~50 people):
  - Extensive assortment of hand tools and materials
  - Wood and metal working large power tools (drill presses, band saw, grinder, etc.)
  - Extensive assortment of hand power tools (drills, saws, hot glue guns, scroll saw, router, Sanders, etc.)
  - Sewing facilities (sewing machine and serger, hand tools, materials)
  - Small and large work tables, workbenches, etc.
  - Vinyl cutter and materials
  - Heat presses for vinyl application on various materials
  - Laser printers
  - Extensive assortment of parts, hardware and materials
  - Large assortment of Legos
- Project breakout/discussion rooms, plus a large conference room/small teaching space
- Safety equipment (aprons, safety glasses, ear plugs, gloves, dust masks, first aid kits, etc.)
- Kitchen 😊

Some of the Programs From Which the inWorks Draws Inspiration

- Stanford d.School
  - “…brings students and faculty from radically different backgrounds together to develop innovative, human-centered solutions to real-world challenges”
  - Graduate students only
  - 650 students/year
  - Significant design focus
- MIT Media Lab
  - “…creates disruptive technologies that happen at the edges”
  - MS in Media Arts and Sciences, plus extensive array of research programs
  - ~800 students/year, ~3000 visitors/year
  - Significant research/technology transfer focus
- Lockheed’s Skunk Works
- Rice University Oshman Engineering Design Kitchen
- CU Boulder ATLAS Institute
- Other innovative educational programs at Olin, Berkeley, Georgia Tech, Kansas, Cornell, the University of Washington, and elsewhere
How is the inWorks Different?
Some of the characteristics that differentiate the inWorks from these other excellent programs include an educational focus at both the undergraduate, graduate and professional levels, a multi-faceted approach to addressing complex societal problems, extraordinary interdisciplinary, and porous boundaries that invite participation from both on and off campus.

How Can you Become Involved With inWorks?
• Get on our mailing list (visit inWorks.org)
• Visit the Downtown space (Open House Week March 2-6)
• Talk with us
• Respond to the inWorks Call for Interdisciplinary Course Proposals (out next month)
• Attend our workshops this semester (tentative list; info on the website soon)
  – Ryan Bethencourt – Biotech entrepreneurship
  – Ron Shigeta – Plasmids workshop
  – Martin Borch Jensen (Buck Institute) – Evaluating claims in biology (i.e., how not to be fooled by the headlines)
  – RJ Duran – Make almost anything
  – RJ Duran – Virtual Reality
  – Brian Frezza – Emerald Cloud Lab/Mathematica
• Visit our permanent space on the Anschutz campus (as soon as we have it)

Questions?

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