

Entrepreneurship in Engineering Education



The case for Entrepreneurship in Engineering Education

- Innovation is required to address problems and maintain global competitiveness.
- No longer adequate to graduate with technical skills. Engineers need to be entrepreneurial to understand the marketplace and business pressures, and the societal implications of their work.
- Entrepreneurship education provides experience in a wide array of areas, such as product design and development, prototyping, technology trends, and market analysis.
- Students gain skills needed to identify opportunities and bring them to life.
- And, students gain valuable experience in critical thinking, working in interdisciplinary teams, and basics of business.

See: Byers, et al., “Entrepreneurship: Its Role in Engineering Education”, The Bridge, 2013.

The case for Entrepreneurship in Engineering Education

- Study by Pryor of US College freshmen: 41% wanted to start their own business.
- ASEE study: Over 50% of faculty and administrators reported entrepreneurial programs are important for engineering students.
- Faculty are increasingly entrepreneurial and bring that mindset to their students, directly or indirectly.
- Entrepreneurship can be integrated into the curriculum, an add-on to the curriculum, or somewhat independent. It can be dedicated activities or woven into the broader education process.

Three Examples of Programs for Broader Support of Entrepreneurship in Engineering

- Kern Entrepreneurial Engineering Network (KEEN)
- National Academic of Engineering (NAE) Global Grand Challenges Scholars Program
- EPICenter – National Center for Engineering Pathways to Innovation (Stanford – NSF)

Kern Entrepreneurial Engineering Network (KEEN)

- www.engineeringunleashed.com
- Founded in 2005 in the US Midwest.
- KEEN is “a national partnership of universities with the shared mission to graduate engineers with an entrepreneurial mindset so they can create personal, economic, and societal value through a lifetime of meaningful work.”
- Currently 33 US universities, some are Global E3 members.
- Based on three C’s: Curiosity, Connections, and Creating Value.
- Members buy-in at all levels of the institution to invoke change in student experiences.



NAE Global Grand Challenges Scholars Program

- www.engineeringchallenges.org
- Started in 2009, endorsed by the NAE.
- The GCSP is a combined curricular, co-curricular, and extra-curricular program with five competencies that are designed to prepare the next generation of students for addressing the grand challenges facing society in this century.
- Each institution creates their own specific realization of how the competencies are implemented, which are approved by the GCSP steering committee.





NAE GRAND CHALLENGES FOR ENGINEERING

NATIONAL ACADEMY OF ENGINEERING

<http://www.engineeringchallenges.org/challenges.aspx>



Advance Personalized Learning



Restore & Improve Urban Infrastructure



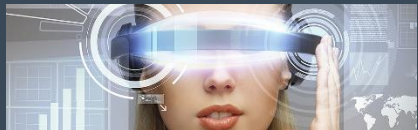
Develop Carbon Sequestration Methods



Make Solar Energy Economical



Secure Cyberspace



Enhance Virtual Reality



Provide Access to Clean Water



Engineer the Tools of Scientific Discovery



Reverse-Engineer the Brain



Provide Energy from Fusion



Engineer Better Medicines



Prevent Nuclear Terror



Advance Health Informatics



Manage the Nitrogen Cycle

NAE Global Grand Challenges Scholars Program

Research/creative: Mentored research or project experience related to a Grand Challenge to enhance technical competence and creativity.

Multidisciplinary: Understanding gained through experience of the multidisciplinary character of implementable and viable Grand Challenge solutions

Business/entrepreneurship: Understanding gained through experience that viable business models are necessary for successful implementation of Grand Challenge solutions

Multicultural: Understanding gained through experience that serious consideration of cultural issues is mandatory for all viable Grand Challenge solutions

Social consciousness: Deepen social consciousness and motivation to address societal problems, often gained through service learning, because serving people is the vision served by the Grand Challenges



- Arthur M. Spiro Institute for Entrepreneurial Leadership
- Creative Inquiry Projects
- Living-Learning Community
- Curricular Initiatives





- **Executive Experience Program**
- **How to Start a Startup Program**
- **Research Initiatives**
- **Event Sponsor**
- **Organizations**

New Facility Focused on Innovation and Entrepreneurship





The DEN™ (Design & Entrepreneurship Network)



The DEN™ is a student-led open mic platform on which students share ideas for a business product or concept, students form interdisciplinary business teams, and teams receive instant feedback and mentorship from DEN mentors - real entrepreneurs, designers, CEOs, founders, etc.





Design Thinking
Phillip McCreight



Market Analysis
Jeff Ball



Customer Identification
Jeremy Boeh



Rapid Prototyping
Rajeev Jindal

DISCOVERY

BUSINESS CREATION

Revenue Models
Jay Cox



Branding
Clemson CC

Customer Channels
Cody Reynolds



Marketing
Sharon Kelly

Stakeholder Identification
John Moore



Story Telling
John Desjardins



Fundraising
Jonathan Stanley



Company Voice
Scott Millwood



MONETIZATION



Before the DEN, I was just another lost engineering student, searching for a purpose in the bowels of higher education. The DEN connected me with students, faculty and titans of industry to show me what life looks like after graduation. Now, I know what skills are necessary to build in order to have an impact in the work force.

- Alex Bina



Entrepreneurship LLC open to sophomores, juniors and seniors of all disciplines

Provides an environment that is conducive to the creation of student businesses and encourages active dialogue in the realm of entrepreneurial thought and action



MBA in Entrepreneurship & Innovation

Grand Challenge Scholars

Entrepreneurship Minor

Undergraduate Courses:

- Entrepreneurial Mindset
- Creative Inquiry in Entrepreneurship
- Special Topics in Entrepreneurship
- Internship in Entrepreneurship



Grand Challenges



This educational and extracurricular program is designed to prepare the next generation of engineers to **address this century's most pressing challenges and opportunities**, through the fulfillment of five main emphasis areas. Each participating institution develops their own unique program, with the common thread of facilitating top engineering and science students in their desire to change the world.

Founded in 2014, the Grand Challenge Scholars Program at **Clemson University** became the **19th engineering school in the country** to join the burgeoning effort to help students prepare themselves to become world changing engineers. Our program embodies the solutions-centric vision of the National Academy of Engineers, helping students to engage in the real-world application of their classroom education through experiences such as research, international travel, seminar talks, and community outreach. Rather than following the traditional, field-specific educational path, **Grand Challenge Scholars will work with other Scholars and faculty mentors to develop and execute an interdisciplinary plan tailored to the Grand Challenge of their choice.**

Program Components

1. Research Experience

2. Interdisciplinary Curriculum

3. Entrepreneurship



4. Global Dimension

5. Service Learning

Learning outcome:

Scholars will practice translating invention to innovation.

To achieve this learning outcome, Scholars will **either**:

1. Complete at least 3 credits of coursework designed to develop market ventures that scale to global solutions in the public interest; **or**

2. Incorporate a significant (equivalent to at least 3 credits of effort) entrepreneurship component in their Grand Challenge research experience.