

# **PATHWAYS PARTNERS:**

## **Entrepreneurial Change Across Campus**

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### **Abstract**

The Pathways to Innovation program is specifically focused on helping college and university engineering programs integrate entrepreneurship into their programs and institutions. The program, part of the NSF-funded National Center for Engineering Pathways to Innovation (Epicenter), is designed to help institutions transform the way learning happens, giving students the technical skills, the tools, and the attitudes they need to turn ideas into practical solutions that solve real problems. This paper examines the approach four Pathways Partner institutions took to implement change in their programs and on their campus. The diversity of the innovation and entrepreneurship change efforts implemented, and the interdisciplinary nature of each of these efforts, highlights the need for sharing best practices in implementation and in overcoming university obstacles. The four partners—California Polytechnic State University, University of Nevada, Las Vegas, University of Massachusetts Lowell and University of Wisconsin-Milwaukee—each describe initiatives they either are implementing or have implemented to expand entrepreneurship in their engineering programs. These initiatives, flexible interdisciplinary faculty hiring and engagement, development of student entrepreneurs, integrating cross-campus curricula, and the development of cross-campus collaborations, while still in their infancy, serve as examples for other institutions and provide a basis for impact assessment in future years.

### **Introduction**

The Pathways to Innovation program is a project conducted by the National Center for Engineering Pathways to Innovation (Epicenter) to support engineering programs across the country in integrating accessible and effective innovation and entrepreneurship courses into formal and informal undergraduate engineering curricula. Epicenter is an NSF-funded partnership between Stanford University and VentureWell (formerly the National Collegiate Inventors & Innovators Alliance) that is specifically focused on increasing innovation and entrepreneurship education in undergraduate engineering programs. Epicenter's mission is "to unleash the entrepreneurial potential of undergraduate engineering students across the United States to create bold innovators with the knowledge, skills and attitudes to contribute



to economic and societal prosperity” (Nilsen 2013).

The Pathways program officially launched in late Fall 2013, with the recruitment of faculty participants from twelve undergraduate engineering programs. Schools participating in the first Pathways cohort included:

- California Polytechnic State University, San Luis Obispo
- The Cooper Union for the Advancement of Science and Art
- Howard University
- Michigan Technological University
- New Mexico State University
- Tennessee Technological University
- Texas A&M University
- University of California, Merced
- University of Massachusetts Lowell
- University of Nevada, Las Vegas
- University of Pittsburgh
- University of Wisconsin-Milwaukee (Moore 2013)

Institutions selected to participate in the first Pathways cohort were asked to identify campus goals related to potential changes in their own engineering curriculum and programming, as well as commit a team lead and team members to participation in the program and leadership back on their respective campuses. Team members represented different campus constituents in roles that could support curricula change. This included engineering faculty, business school faculty, department chairs, deans, and other campus innovation champions. In January 2014, team leaders met at Stanford University to learn more about the program and to better prepare team leaders for their role in rallying their team and campus around Pathway goals and commitment. This was followed by a February 2014 meeting/retreat in Phoenix, where 54 faculty and administrators from the twelve campuses convened to prioritize institution-specific goals and develop an action plan they would then implement upon their return. In addition, peer groups were

formed among member institutions to provide a working group that would regularly share best practices and lessons learned during the implementation of the various initiatives that each institution is pursuing.

This paper shares the experiences of four of the Pathways Partners from one of the peer groups: California Polytechnic State University, San Luis Obispo; University of Massachusetts Lowell; University of Nevada, Las Vegas; and University of Wisconsin-Milwaukee. The experiences shared provide examples of various ways each institution chose to foster entrepreneurial change on their campus, and serve as a basis for future assessment of the effectiveness of each approach.

### **Pathway Partner Institutions** **California Polytechnic: Fostering an entrepreneurial culture through multifaceted interdisciplinary faculty hiring and development**

California Polytechnic State University in San Luis Obispo (Cal Poly) is made up of six different colleges, with the largest being the College of Engineering (CENG). The Center for Innovation and Entrepreneurship (CIE) is a cross-campus center founded by faculty within the Orfalea College of Business (OCOB). While the activities and programming of the CIE are truly interdisciplinary with broad reach across campus, the entrepreneurship curriculum was initiated specifically in the OCOB. Cal Poly identified faculty hiring and engagement as a primary strategic initiative for the Pathways Program. At the time the program was launched, efforts were underway to secure a tenure-track engineering faculty with a specific charter for innovation and entrepreneurship. While the CIE had also initiated several methods to engage faculty, a coordinated effort of engagement and expansion had not been established. Several new initiatives were developed to expand faculty engagement and entrepreneurial curriculum beyond the OCOB. These initiatives

included hiring tenure track faculty outside of OCOB that were specifically charged with advancing innovation and entrepreneurship curriculum and activities of the CIE, establishing a CIE faculty fellows program to encourage participation and entrepreneurial teaching/programming between faculty across colleges, and engaging practicing entrepreneurs in various roles, including lecturers, entrepreneurs in residence, and mentors. This multi-faceted approach was implemented to establish a sustainable approach to entrepreneurial teaching throughout the colleges with tenure track faculty, while utilizing other resources that don't require the same investment inherent in hiring tenure track faculty.

### Tenure Track Faculty

Cal Poly is establishing entrepreneurial faculty in each of the individual colleges, with a recent initial hire outside of OCOB that was made by the CENG. Tenure track faculty are viewed as the avenue that formalizes entrepreneurship as an academic discipline on campus, and provides the most sustainable impact on the university's entrepreneurial efforts. Since joining the Pathways Program, the first tenure track innovation and entrepreneurship hire in the College of Engineering was finalized, and efforts to expand to other colleges with a similar position has begun. Although more tenure track faculty are desired, the realities associated with the long timeline for getting approval and hiring for these positions requires additional, more flexible faculty engagement methods. These include the hire of entrepreneurs in residence, entrepreneurial lecturers, and the use of mentors.

### Entrepreneurial Faculty Fellows

Cal Poly's Entrepreneurial Faculty Fellows program was initiated in the 2012-2013 academic year. Three fellows are announced during each academic year. They receive financial and programmatic support from the CIE to develop entrepreneurial programs in the disciplines from which each fellow

originates. While the financial support is for two years, the program, now in its third year, is designed for fellows to remain active in CIE's activities beyond the two years, and for the programs that were funded to have sustainable impact beyond their two-year duration. Alumni of the program serve as mentors to new fellows, and CIE activities are scheduled throughout the year to keep the fellows engaged. These activities include on-campus forums and entrepreneurial field trips for the fellows and alumni.

This program was initiated through the Coleman Fellows Program and then transitioned to an institutionalized, self-supported program (The Coleman Foundation n.d.). With nine fellows across campus, there is now representation by at least one fellow from each of the six colleges, with three from the College of Liberal Arts and two from the College of Engineering. This flexible and minimal program investment allows the development of entrepreneurial seeds throughout the various disciplines on campus, taking advantage of the already existing skills and interests of the faculty, and expands existing faculty involvement in the activities of the CIE. As part of the Pathways peer group experience, the process for internalizing this program and the rubric utilized for screening potential fellows was shared with other member institutions that are considering such a program.

### Practicing Entrepreneurs

This element of Cal Poly's interdisciplinary entrepreneurial leadership efforts is the most flexible and has the widest breadth of the three initiatives. These members of the innovation and entrepreneurship team do not have the same vetting and hiring process as traditional faculty, with most working on a volunteer basis. While some stay engaged with the program for many years, the lack of long-term commitment either by the individuals or the university makes engaging them easier for both parties. We have broadly defined below their various roles within

the university and CIE.

- **Lecturers:** This is by far the most stringent of the positions, as these individuals supplement the entrepreneurial teaching of the tenure track faculty. They commit to expanding their knowledge of the formal curriculum that is taught at Cal Poly, and go through a formal hiring process with the university. They are, however, hired with renewable contracts, which are a more flexible employment vehicle for the university. These members of the innovation and entrepreneurship team are critical for expanding course offerings. They bring varied points of view based on their diverse entrepreneurial backgrounds, and are considered by the CIE to be contributors equal to tenure track professors.
- **Mentors:** These individuals work directly with student entrepreneurs on an ongoing basis as an intimate part of their team. A concerted effort is made to match teams with an entrepreneurial mentor with relevant domain-specific knowledge. The mentors are expected to meet with the teams on a regular basis and be available to provide additional guidance as needed.
- **Advisors:** These individuals are available to counsel student entrepreneurs and typically bring a specific area of expertise (e.g., sales, fundraising) to their work with the various teams in the program.
- **Guest Experts:** These individuals are similar to advisors, but may only desire to engage infrequently with students on a specific topic. They volunteer as topical forum speakers, sit on panels during CIE events, or hold infrequent open office hours at the CIE.

While the Cal Poly CIE is still very young, entering its fourth year, the Center has established various means to engage and develop interdisciplinary faculty in innovation and entrepreneurship with a goal to formalize sustainable faculty in this field, while also implementing more flexible methods that enable programs and curricula

to develop faster than is possible through the conventional faculty hiring model.

### **University of Massachusetts Lowell: Growth of the student-focused DifferenceMaker™ program**

The UMass Lowell *DifferenceMaker*™ program was launched in June 2012, under the auspices of the Center for Innovation & Entrepreneurship at the university (see <http://www.uml.edu/Innovation-Entrepreneurship/>). The goal of the program is to introduce UMass Lowell students to creative problem solving, innovation, and entrepreneurship, as well as accelerate purpose in their education, connect them to experienced alumni, and encourage an ethos of social responsibility. *DifferenceMaker*™ introduces a range of extracurricular and co-curricular activities meant to engage UMass Lowell students and faculty in creating sustainable solutions to problems that affect our community, our region, and our planet. These activities, which span academic disciplines and include freshman through graduate students, engage our students and faculty in creative problem-solving, innovation, and entrepreneurial action directed toward the development of sustainable solutions products, services, organizations, and businesses.

Prior to the launch of *DifferenceMaker*™, entrepreneurship education was focused exclusively in the Manning School of Business. At the time, the business school offered an undergraduate concentration in entrepreneurship (only available to students majoring in business) and a graduate MS in Innovation and Technology Entrepreneurship (available to students with an undergraduate degree in business, science, or engineering). The Deshpande Foundation supported a community entrepreneurship program through its Merrimack Valley Sandbox (see <http://www.eforall.org>), and UMass Lowell students participated in their Campus Catalyst program (along with students from three other regional community and private colleges).

However, there were no university-sponsored, interdisciplinary courses or extracurricular activities on campus that encouraged and supported student entrepreneurship. While the College of Engineering offered capstone design courses, and a very successful service-learning program (see SLICE at <http://www.uml.edu/Engineering/SLICE/default.aspx>), there were no entrepreneurship or business elements integrated into the engineering course offerings.

The first year of the *DifferenceMaker*<sup>™</sup> program focused on raising awareness about innovation and entrepreneurship among students, faculty, and alumni. The university appointed an associate vice chancellor for entrepreneurship and economic development (AVC), and charged this position with championing campus efforts that encourage entrepreneurship and sustainable economic development across disciplines and in the region. Prior to the formal launch of *DifferenceMaker*<sup>™</sup>, the AVC reached out to the various academic and administrative deans and directors to develop a better sense of the context and need for entrepreneurship programs and initiatives. The AVC represented the university on the MV Sandbox leadership team, which helped integrate university initiatives with Sandbox programs and the broader Deshpande Foundation Innovation Network. The AVC also met with alumni, and their representatives in the campus Development Office, to better understand their interest in supporting and participating in student and faculty entrepreneurship initiatives.

These initial relationship-building activities helped to inform the core programs launched as part of the *DifferenceMaker*<sup>™</sup> program. Three important program elements are listed below.

### Freshman Make A Difference - Orientation

These orientation sessions are a collaborative effort between UMass Lowell's Office of Orientation, Student Activities and Leadership, and Residence Life in order to introduce all incoming freshmen to the *DifferenceMaker*<sup>™</sup> Program, as well as engage them in creative problem-solving within the university, community, region, and world. During our first summer, 1,265 freshmen participated in summer rapid ideation workshops.

### DifferenceMaker<sup>™</sup> Faculty Fellows

Faculty Fellows are recruited through the deans of each college at the university in an effort to involve all departments and majors in the *DifferenceMaker*<sup>™</sup> Program. Six faculty members (at least one from each college) are recruited to actively support and contribute to the development of the program. The colleges represented include Business, Education, Engineering, Health Sciences, Sciences, and Fine Arts and Social Sciences. Fellows assist *DifferenceMaker*<sup>™</sup> staff in understanding the specific needs of students and faculty within their colleges, increasing participation across disciplines. In addition, Fellows are active participants in the design and execution of *DifferenceMaker*<sup>™</sup> workshops and programs. They also assist with the recruitment and mentoring of student teams that apply to the Idea Challenge.

### DifferenceMaker<sup>™</sup> Idea Challenge

The *DifferenceMaker*<sup>™</sup> Idea Challenge is a signature event for the program and campus. Over 100 students participated in the 2013 Idea Challenge, including 45 teams representing 24 academic departments. This increased to 70 teams and 200 students in 2014. Ten teams ultimately pitch in the Idea Challenge Finals. The 2013 teams shared in a portion of the \$25,000 award, and, through the support of our alumni, the award increased to \$35,000 in 2014. The 2013 campus-wide *DifferenceMaker*<sup>™</sup> team, Developing Nation Prosthetics, was awarded a \$5,000 prize and has since gone on to

win an additional \$100,000 in regional and national competitions, including Stage I and II VentureWell E-Team awards and a top ten recognition by *Entrepreneur* magazine's Young Entrepreneur competition.

While these activities served to raise awareness of entrepreneurship across campus, and increased student participation in extracurricular entrepreneurship activities, they did not necessarily serve to integrate entrepreneurship into additional courses and curricula. Several changes occurred during the summer and fall 2013 to help address this need. First, a new dean was hired in the College of Engineering. This dean joined the university after serving as a chair and professor at the University of Florida and came to UMass Lowell with an interest in engaging students, faculty, and alumni around innovation and entrepreneurship. The dean was also open to examining how students and faculty from different colleges might work together around these topics. Next, our campus was invited to participate in the Pathways to Innovation Program, and this opportunity aligned neatly with the vision the new dean brought to our College of Engineering. Working together, the dean and the AVC identified three engineering professors and one business professor who would form the core Pathways team, along with the dean and the AVC's support and participation. Additionally, separate alumni in the Manning School of Business and the College of Fine Arts, Humanities and Social Sciences requested development of college-based competitions, with each alumna providing seed funding for the events. Within a year, the campus was starting to percolate with entrepreneurial activity.

Our Pathways experience has proved helpful in pulling together a focused approach toward integrating entrepreneurship into our engineering program. Our Pathways team identified five strategic opportunities:

1. Development of a joint Business-Engineering Capstone course
2. Development of a student-governed makerspace
3. Development of a college-wide Capstone Expo
4. Development of a Faculty Innovation Network
5. Introducing a Freshman Design-A-Thon

Upon returning to campus, the team commenced developing the Business-Engineering Capstone course. This course was successfully offered to senior business and engineering students during the Fall 2014 semester and will be improved and repeated during the Fall 2015 semester. Simultaneously, the dean embraced the makerspace concept and embarked on a successful fundraising and design effort for creation of this space. The makerspace is scheduled to open in late March 2015 and will support engineering and other students in the design and development of prototype devices. The college-wide Capstone Expo was revised to a campus-wide Prototype Competition sponsored by the College of Engineering. This successful event was offered during Fall 2014. Thirty teams submitted project proposals, 27 teams displayed prototypes in the preliminary competition, and five teams pitched their prototypes before a panel of judges. Winning teams are now invited to participate in the *DifferenceMaker™* Idea Challenge in April.

#### **University of Las Vegas, Nevada: Cross-campus entrepreneurship collaboration**

In 2010, the UNLV College of Engineering joined forces with the Lee Business School in an effort to develop engineering senior design projects into business ventures. It has seen great success so far. Activities centered on this collaboration led to our participation in the Pathways to Innovation Program. UNLV Pathways goals include:

- Strengthening industry participation in our capstone engineering programs
- Increasing the number of new startup ventures coming out of capstone engineering and research programs
- Improving the coordination between various innovation and entrepreneurial programs on campus.

### Examples of Cross-Campus Entrepreneurship Collaboration

#### Entrepreneurial Environment

Southern Nevada has attracted bold innovative thinkers throughout its history, from its early days as a mining and railroad town through the Boulder (Hoover) Dam construction years, and then as the primary atomic testing site during the Cold War years. The dramatic rise of the casino, gaming, and entertainment industries has continued to attract entrepreneurs who have helped shape this into one of the most unique regions in the world. In recent years, a number of technology companies have sprung up and established a thriving community eager to take advantage of the many economic diversification opportunities in the area.

The University of Nevada, Las Vegas (UNLV), has paralleled this growth from its humble roots just over 50 years ago as a small community college - "Tumbleweed Tech" - into the largest and most diverse university in the state of Nevada. However, the nationwide economic crisis was particularly devastating to southern Nevada's construction and tourism industries. During those lean years, state budgets were cut drastically (while student enrollment was relatively constant) and many university programs were forced to adapt.

One very bright spot has been the support of local entrepreneurs, who envision UNLV as the hub for economic growth and diversification in the region. They have provided millions of dollars to improve technology commercialization efforts. Their support, guidance, and mentorship helped spur an integrated effort between the Lee Business

School (LBS) and the Howard R. Hughes College of Engineering (COE) to promote commercialization of university projects. The collaboration of these two colleges is no better evidenced than by their joint participation in the Pathways to Innovation program. The Director of the Center for Entrepreneurship (business), and the Director of the Mendenhall Innovation Program (engineering) are co-team leads on the Pathways project. These directors also jointly attended the Lean LaunchPad educators seminar held at Columbia University. The close relationship between these two colleges and centers has resulted in the creation of many new businesses, including Skyworks Aerial Systems (<http://skyworksas.com/>), a recently created student business discussed in detail below.

Established in 2005 by the Nevada System of Higher Education (NSHE) Board of Regents as part of the Lee Business School, the UNLV Center for Entrepreneurship (CFE) (<http://entrepreneurship.unlv.edu/>) promotes the teaching, research, and practice of entrepreneurship in Southern Nevada. The CFE oversees the implementation of entrepreneurship curriculum at UNLV, including an MBA concentration in New Venture Management and an undergraduate major and minor in Entrepreneurship that includes courses incorporating the Lean Startup principles. The CFE also offers, to any UNLV major, the Global Entrepreneurship Experience (GEE), a program that emphasizes strategic thinking, creativity, and innovation. GEE students receive annual scholarships and complete one specialized entrepreneurial course per semester. The CFE works closely with students, faculty, business leaders, and the southern Nevada angel investment community to transition academic and community projects into the marketplace. As outlined later in the proposal, several businesses have been launched as a result of the CFE's activities, and many other



collaborative projects are currently underway.

A critical resource developed by the CFE is the \$500,000, student-run Rebel Venture Fund (RVF). Formed in late 2012, the RVF finalized its first investment last summer: a \$25,000 investment as part of a larger \$500,000 Series A round. The investment was made in cooperation with local accredited investors, several of which serve on the RVF management board chaired by the CFE director. One of the primary factors determining whether an RVF investment will be made is the company's association with UNLV; thus student, staff, and faculty inventions are prime candidates for funding.

The CFE also works closely with the Mendenhall Innovation Program (MIP) of the Howard R. Hughes College of Engineering (<http://engineering.unlv.edu/programs/mendenhall/program/>). The program has several major functions. It provides a 4,400 square foot makerspace that offers students and faculty access to dedicated laboratory space, manufacturing support, training workshops, and equipment used for prototype fabrication. It creates and facilitates self-paced, hands-on activities that supplement engineering lecture classes at all levels so that students can experience open-ended creative labs each year. The MIP promotes and manages the Technology Commercialization minor that exposes engineering students to the requirements needed to find non-engineering partners and mentors, develop commercially viable prototypes, and start new businesses. The lean startup course offered as part of the Entrepreneurship major and minor is also a required course in the Technology Commercialization minor. These activities lead to an interdisciplinary and successful capstone senior design experience, which has produced twelve recent patent filings.

The interdisciplinary capstone engineering program was established more than ten years ago with the goal that all students would

work collaboratively to develop practical and commercially viable products. Students are encouraged to initiate projects that must pass through a screening and approval process. Prototype fabrication costs are provided by program donors and students have full intellectual property rights if they want to pursue commercialization after graduation. There is a competition with industry-sponsored awards each semester for department winners, a grand prize, and several category prizewinners. The awards banquet is a special event that generates significant local television and print media attention (Feldberg 2014; Komenda 2014; MyNews3 2014).

Figure 1 illustrates how the UNLV Center for Entrepreneurship and the Mendenhall Innovation Program are integrated to achieve their common goals. New students from a variety of backgrounds and different majors enter UNLV. The CFE and MIP offer unique interdisciplinary courses and teamwork opportunities as part of the students' educational experience. In addition, students receive exposure, mentorship, and training from successful entrepreneurs and other external professionals. Ongoing assistance is provided by the UNLV Startup Center (SC) (<http://unlvstartup.org/>), and patent filing, grant assistance, and industry matching are provided by the Technology Transfer Office (TTO) (<http://www.unlv.edu/research/technology>). Many successful graduates leave the university as competition winners and owners of new companies, while others graduate with the skills necessary to help existing companies diversify the southern Nevada economy. This formula has been successfully applied for several years.

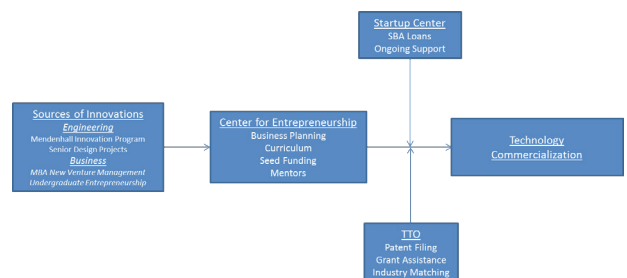




Figure 1. Collaborative relationship between Lee Business School's Center for Entrepreneurship and the College of Engineering's Mendenhall Innovation Program

**University of Wisconsin-Milwaukee:  
Development of a certificate program  
spanning credit and extracurricular activities,  
and a student-focused innovation space**

**UWM Pathways Team**

The University of Wisconsin-Milwaukee Pathways to Innovation interdisciplinary team was drawn from College of Engineering & Applied Science, Peck School of the Arts, Lubar School of Business, Mobile Technology Incubator (App Brewery), and UWM Research Foundation. The team's challenge was to design and implement curricular, co-curricular and supporting infrastructure projects for undergraduate engineering students in ways that would have positive impacts on students in other colleges and majors. The team's diversity of views and experiences reflected the diversity of the student population. It became clear very early that any proposed interventions (projects) would have to be built with interdisciplinary foundations in mind in order to have a ripple effect beyond engineering.

UWM also leveraged the NSF-sponsored Epicenter University Innovation Fellows program to increase UWM student awareness of the entrepreneurial resources available to them. Here at UWM, three engineering students were among the 110 students nationwide selected as University Innovation Fellows. They are charged with implementing programs that will boost entrepreneurial activities on campus.

**Action Plan Driven by Strategic Outcomes**

The UWM team applied Epicenter's Campus Innovation & Entrepreneurship Inventory Assessment tool in order to identify gaps in curricular, co-curricular, and extracurricular programs, as well as in infrastructure. Five strategic outcomes emerged early and after several ideation sessions and retreats, the

team had identified the following campus-wide projects to tackle that aligned well with these five outcomes:

Strategic Outcome 1: Incentivizing I&E awareness and skills

- Pathfinder Project 1.1: Innovation Pathfinder Certificate
- Pathfinder Project 1.2: Entrepreneurship Experience Freshman Course

Strategic Outcome 2: I&E spaces – creating community of practice

- Pathfinder Project 2.1: Kulwicki Innovation Pit Stop
- Pathfinder Project 2.2: Invention Lab (Institute for Industrial Innovation)

Strategic Outcome 3: Community outreach and engagement

- Pathfinder Project 3.1: Innovation Pathways Workshop Series: Discovery

Strategic Outcome 4: New partnerships

- Pathfinder Project 4.1: Sustainable Communities Track (SSC)
- Pathfinder Project 4.2: Water Technology Track (SSC)

Strategic Outcome 5: Amplifying impact of I&E programs on campus

- Pathfinder Project 5.1: Idea Challenge: Freshman Competition
- Pathfinder Project 5.2: Idea Challenge: Curriculum intervention (Engineering)

With the help of the University Innovation Fellows, we were able to launch two infrastructure development projects: an ideation space (Kulwicki Innovation Pit Stop) and an invention/makerspace. The next section describes the first project.



## Kulwicki Innovation Pit Stop: A Student Ideation Space

UWM has a variety of student centers that support a multitude of student activities. Students can work in design labs, fabrication labs, or research labs on academic as well research projects. However, a designated space for students who want to engage in innovation and entrepreneurship activities was missing. The increase in the number of campus business competitions, such as the UWM Student Startup Challenge and the New Venture Business Plan Competition (Lubar School of Business), along with the recently initiated University Innovation Fellows program, the Entrepreneur-in-Residence position, and the Innovation Pathways Workshops, reflect the increase in entrepreneurial and innovative initiatives happening on campus. These types of activities require a different type of space than what is traditionally offered in the College of Engineering & Applied Science (CEAS) or in any other parts of campus.

There was a need on campus to create an innovative and collaborative space designed specifically (while not exclusively) for innovators and entrepreneurs. The space would foster high-impact collaborations between students that inspire creativity. The space would become a focal point on campus where students from all disciplines could gather to innovate, create, make, share, foster, and build new ideas and launch businesses.

The University Innovation Fellows and their faculty mentors identified an existing space at CEAS, the Kulwicki Student Center, that could be repurposed and redesigned. This space is ideal as a center for innovation and entrepreneurship because it is on the main campus and easily accessible; in close proximity to many of the student entrepreneurs; currently used for Entrepreneur Meet-up Sessions; by the Grind Coffee Shop for high traffic; and visibly open with a glass

front that makes it welcoming. Additionally, the room was already built and only needed to be marginally refurbished.

The space was refurbished with mobile furniture that can be rearranged to help foster high contact and easy sharing of ideas. By designing the space for multiple situations, the room can be reconfigured for different activities: groups, meetings, or “pop-up” classrooms. Additionally, allowing student

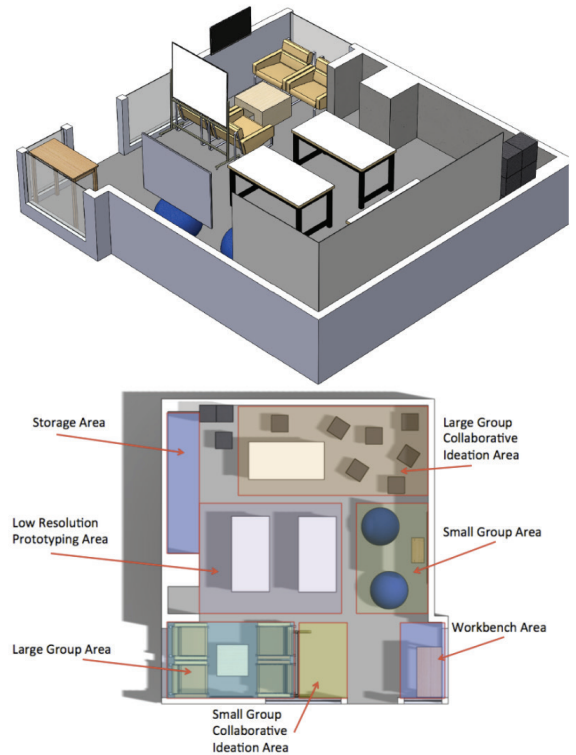


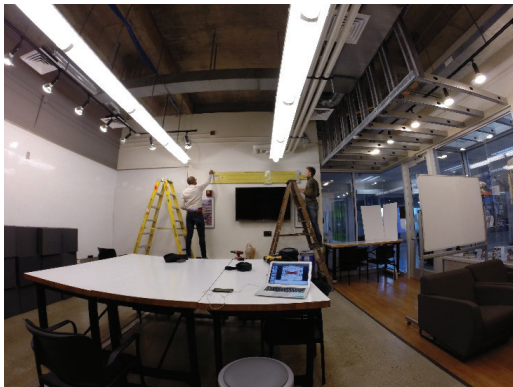
Figure 2: Innovation Center design



Figure 3: Kulwicki Pitstop almost complete

entrepreneurs to have access to the room most of the day allows them to feel like it is truly a student center (Figure 2). The space underwent renovation in the summer of 2014 (Figure 3) and Kulwicki Innovation Pit Stop opened for business in the fall 2014 semester (Figure 4).

The Kulwicki Pit Stop offers 24-hour access to student entrepreneurs who participate in (1) student organizations within the CEAS, (2) business plan competitions, (3) the student



startup challenge, (4) entrepreneurially-focused student organizations, or (5) any other innovation and entrepreneurship activity. Undergraduate academic advisors, current University Innovation Fellows, and the Entrepreneur-in-residence share responsibility for developing a sense of community and culture.

Figure 4. Kulwicki Innovation Pit Stop open for business

### Innovation Pathfinder Certificate

UWM offers a wide range of innovation and entrepreneurship programs to all students. However, many of these opportunities are co-curricular or extracurricular in nature. Students expressed an interest in receiving recognition or some type of credit for participating in these programs. The Innovation Pathfinder Certificate allows students to gain innovation and entrepreneurship experience and gain credit based on their level of participation and engagement. Examples of activities counted toward the certificate are depicted in Figure 5.

The UWM Student Startup Challenge (SSC) is one example of a co-curricular program that provides an opportunity for students to earn credit toward the Innovation Pathfinder Certificate. The SSC helps students turn their ideas into companies while teaching them skills that will make them successful as entrepreneurs, innovators, and business leaders. Since the program's inception in 2012, twenty-one winning teams have built physical and virtual product prototypes and developed business models around student inventions. This year, winning teams came from engineering, the arts, freshwater science, health sciences, and business. The strength of the program is its diverse and interdisciplinary nature. Participants are judged based on ideas, not on a formal business plan. Winning teams are then partnered with other students in engineering, information studies, business, and the arts – strengthening their teams. The teams participate in boot camps and booster sessions that help them refine their business models, map a customer discovery strategy, and learn about intellectual property and venture finance. The teams are also connected with a broader innovation ecosystem at UWM and in the Milwaukee community, where they share experiences with other entrepreneurs. The program is made possible by initial support from VentureWell, the UW System, and UWM schools and colleges.

- **Activities**
  - Registration
  - New Member Referral
- **Workshops**
  - Business model canvas
- **Events**
  - Lectures
  - Special Events
- **Curriculum**
  - Product Realization Course
  - Innovation and Commercialization Course
  - New Ventures Course
  - Graphics Design II
- **Idea Competitions**
  - Student Startup Challenge
  - Lubar Business Plan Competition
  - New Ventures Business Plan Competition
  - Wisconsin Governor’s Business Plan Competition
  - NCIIA E-Team Proposal
- **Skills Development**
  - UI Fellowship
- **Experiences**
  - Entrepreneurial Internship
  - Mentorship
- **Venturing**
  - Start a venture
  - License with UWM Research Foundation



Figure 5. Innovation Pathfinder Certificate: curricular, co-curricular and extracurricular components counting toward certificate

## Conclusion

The overall goal of the Pathways to Innovation program is to support engineering programs across the country integrate accessible and effective innovation and entrepreneurship courses into formal and informal undergraduate engineering curricula. This paper shared the experiences of four of the twelve Pathway Partner institutions. As the program ends its first year, these stories suggest that Pathway Partner institutions have met with reasonable success in attaining program goals. The four partners met to determine the change initiatives most relevant to their region and institution. They then returned to campus to begin the hard work of changing culture and introducing new approaches and innovations. The unanimously interdisciplinary nature of these diverse initiatives, and the resistance that such expansive efforts face in university environments, supports the need for continued open dialogue and publication on best practices for the implementation of innovation and entrepreneurship

initiatives. These best practices: flexible models for interdisciplinary faculty hiring and engagement, development of student entrepreneurs, integrating cross-campus curricula, and the development of cross-campus collaborations, represent four topically relevant initiatives that have now been implemented through the Pathways Program, and will serve as the basis for lessons learned in implementation and for future assessment on institutional impact.

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