



the KERN FAMILY FOUNDATION

keen
Kern Entrepreneurship Education Network

THE HOWL



Newsletter Overview

Dear Wolf Pack...in our ongoing efforts to keep everyone fully engaged in the KEEN Network, we are offering our second issue of *The Howl*. This issue's focus is to provide insights into some recent and near-term current events within the Network. Specifically, we are excited to share our new approach to assessment. We will present highlights from various "regional" KEEN meetings and give an overview of our NCIIA experience at their annual meeting in San Francisco. Please pay special attention to the workshops being offered in conjunction with our fall and winter KEEN meetings.

Generally, www.keennetwork.com is taking on life. Jonathan Weaver and Sridhar Condoor experimented with it to see if they could co-teach courses together. From what we heard, it worked almost flawlessly, was easy to use, and the two professors have already met to plan further teaching initiatives. Congratulations go to them and Jeff Blessing for developing the collaboration tool.

What Jonathan and Sridhar have done is only one example of a number of great collaborative efforts occurring between our KEEN campuses. We will highlight some others in this newsletter.

Finally, although engineers are typically unassuming and cautious about "tooting their own horn," it is important for KEEN faculty to share vignettes about how their involvement in the KEEN Network is making a difference in their teaching approaches, in the effect their new approaches are making in their students, and how the engineering pedagogy on their campus may be taking on a new form. Stories like these will position the college well for future higher levels of funding from the Foundation. One such example, which was selected from the semi-annual report, will be offered as an example for others. For those of you old enough to remember the TV show *Dagnet* and its trailer, names will be changed to protect the innocent.

Overall, KEEN seems to be flourishing and the credit goes to all of you. Foundation staff could not make the changes we see happening on your campuses. You are doing it and you are making our jobs very enjoyable. Thank you!

**Volume 1,
Issue 2**

May 2010

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**Mark Your
Calendars
for
January
2011!**

Announcing 2011 Winter KEEN Conference

The Foundation has secured the Tempe Mission Palms in Tempe, AZ for the 2011 Winter KEEN Conference on January 5-6th. The program will begin on Wednesday morning and go through Thursday evening. Travel days will be Tuesday, January 4th and Friday, January 7th. Tempe is located in Metropolitan Phoenix area and enjoys more than 330 days of sunshine. The hotel is located one block from the Mill Avenue District. This year the program will be two full days of content. Please make sure to note the change on your calendar. More information will be released via the KEEN listserv.

Workshop on Shaping Entrepreneurial Engineers: A Short-Course for Faculty

The Foundation is sponsoring a faculty workshop that will help KEEN faculty incorporate innovation and entrepreneurship into the engineering classroom, specifically those who are already interested, but would like additional training on how to do so. Co-organized by Kristen Mekemson and Sridhar Condoor, the workshop will include in-depth presentations from best-in-class KEEN members, advisors, and others. It will take place prior to the Winter KEEN Conference over a day and a half (January 3 - 4) at the same location.

Due to space limitations, only 40 faculty members may participate with each school having an opportunity to send two people. The Kern Family Foundation is covering the costs of the workshop, including participant travel, lodging, and meals. Sign-up will take place through the online registration for the Winter KEEN Conference. More information will be available in early fall.

Assessment

An assessment instrument, called the TriMetrix, is being evaluated as a means to assess the extent to which our KEEN students possess the seven key attributes of an entrepreneurial engineer, viz., a student should be able to:

1. Effectively collaborate in a team setting
2. Apply critical & creative thinking to ambiguous problems
3. Construct & effectively communicate a customer-appropriate value proposition
4. Persist through failure to do what is needed to succeed.
5. Effectively manage projects and apply the commercialization process
6. Demonstrate voluntary social responsibility
7. Relate personal liberties and free enterprise to entrepreneurship

Why the TriMetrix Assessment? It has been validated to specify the attributes necessary for a specific job and the attributes of a person who may be a candidate for the job. When these two sets of attributes are matched, the likelihood for productivity and happiness are maximized.

Assessment (cont.)

For KEEN, the TriMetrix Assessment has the potential to demonstrate the personal attributes of a student compared to the diverse set of skills mentioned above required by entrepreneurially minded engineers. In other words, it is not meant to be one-size-fits-all as it would for a specific job but instead it is matching attributes of a person (the student) to a profession requiring people of diverse skills.

If this TriMetrix potential is verified within KEEN, the students benefit in the following ways:

1. As incoming freshmen, their strengths are identified so that they can -
 - Omit any experiential learning options for which they already have strong skills,
 - Be guided to pursue those experiential learning options for which they would benefit by strengthening those areas in which they could be stronger,
 - Be counseled into appropriate educational pathways that play to their strengths,
 - Be counseled to understand why certain aspects of their engineering education may be a challenge for them but for which perseverance will benefit them.
2. As outgoing seniors, they will have an objective assessment of their professional skills as it relates to the seven key outcomes which employers of entrepreneurial engineers desire to see.

If this TriMetrix potential is verified, each KEEN engineering school benefits in the following ways:

1. A singular assessment instrument used by all KEEN colleges can be used to demonstrate that specific experiential opportunities designed for college students can make a difference in a measurable way,
2. The instrument can be used to support research papers focused on means to instill the entrepreneurial mindset in engineering education,
3. The instrument can be used to demonstrate achievement against a significant subset of the ABET a-k criteria during accreditation reviews.
4. The institution can rightfully distinguish itself from other engineering colleges with measurable evidence to show they deliver on their promise to create entrepreneurially minded engineers.

The TriMetrix Assessment is not intended to replace other forms of assessment individual colleges wish to use and should use.

Check out KEEN's web collaboration tool at www.keennetwork.com



Questions on Assessment?

Call Tim at the Foundation at (262) 968-6838 ext. 15.

Review of Regional Meetings

- **March 5 Lawrence Technological University (LTU)**

LTU hosted a KEEN Regional Conference March 5 that focused on changes KEEN institutions have made to integrate the entrepreneurial mindset and entrepreneurship into the curriculum. Eighteen faculty members presented units they have developed, projects added to courses, new course materials or media, and other course modifications. Thirty seven faculty members from six KEEN schools (Calvin College, Kettering University, Lawrence Tech, Ohio Northern University, Saint Louis University, and University of Detroit) attended the meeting.

- **April 7-8 Santa Clara University (SCU)**

SCU hosted a KEEN Regional Conference April 7-8 at which they identified and established specific collaborative opportunities among KEEN schools and initiated planning of such activities for the 2010-2011 academic year. Eighteen faculty from five KEEN institutions participated in the event (Baylor University, Gonzaga University, Milwaukee School of Engineering, Saint Louis University, and Santa Clara). Five explicit collaborative plans were developed including three distinct capstone project initiatives, a distributed collaboration tool project, and an entrepreneurship curriculum project.

- **April 19 Villanova University**

Villanova hosted a KEEN Meeting for the Northeast Region April 18-19. Eleven faculty members from four campuses (Boston University, Norwich University, Villanova University, and Worcester Polytechnic Institute) participated. David Pistrui, KEEN Assessment Scholar, presented on the goals and recent developments of the assessment program with supplementary information provided by Pali Singh. After each school gave updates, they discussed collaborative initiatives and determined: 1) to conduct a peer review of KEEN programs at NE institutions during regional meetings; 2) host a webinar series starting in fall 2010; and 3) host a NE Regional KEEN conference for students in conjunction with the March 2011 NCIIA conference in Washington, D.C.

Please visit www.keennetwork.com for more information on these meetings, including presentations and descriptions of collaborations developed.

Award Announcement

University of Evansville won the Williston Award for 2010 for Professor Andrew Rister's paper on solar water heaters. The award will be presented on November 15, 2010 during the ASME International Congress and Conference in Vancouver, British Columbia. Rister will accept the award at the conference and received a grant.

KEEN Testimonial

We wish to share a testimonial from a KEEN faculty member that came unsolicited in the most recent semi-annual reporting forms. We shared two such testimonials with the Kerns and the Foundation's Board of Directors. Mr. and Mrs. Kern were happy to hear these testimonials. They are examples to demonstrate mindset changes within specific faculty members. By offering these to the Foundation staff, they have a win-win-win effect: the institution wins because their name goes in front of the Kerns and the Board without it being a request for money, the faculty member becomes known within the Foundation and the Foundation staff (Tim, Kristen and Karen) feel energized by seeing the fruits of their work effecting change. If something similar happens to you, please share it with us. It isn't important for the purpose of this newsletter to share the name of the professor or university. It is given as an example of a good testimonial.

"The Kern entrepreneurial engineering project has opened my mind to terrific possibilities for deeper learning experiences in my classes (taken predominantly by engineering students). In the first term of the course modification project, I had an administrative role - helping to organize the teaching methods workshops and selecting and forming the faculty team that will implement the entrepreneurial mindset changes to our courses. I was on sabbatical in the first term, thus not actively teaching. During that time, I was also collaborating with another professor as he developed [problem-based learning] PBL problems for his class, and I could already experience the thrill of creating new types of problems with the potential for a far richer educational experience. . . One of the presenters at our intensive PBL workshop commented that 'once you start doing PBL, you'll begin to see PBL problems wherever you look.' I was amused by that comment at the time, and have become awed by how prescient that was - I definitely see PBL problems everywhere! Having taught for many years, I was constantly struggling to inject energy and new ideas into the teaching and learning environment in the classroom. Exposure to the entrepreneurial mindset attributes and methods has most definitely re-invigorated my teaching. I now have a greater number of terrific tools and strategies at my disposal to try to energize and awaken the curiosity and cleverness that I know resides inside my students."

"Exposure to the entrepreneurial mindset attributes and methods has most definitely re-invigorated my teaching."

Inaugural Issue of *JEEN* Released at 2010 ASEE Conference in June

The Journal of Engineering Entrepreneurship (JEEN) plans to release its inaugural issue at the upcoming ASEE Conference being held on June 20-23 in Louisville, KY. JEEN received funding from the Kern Family Foundation to launch in 2009. It is a peer-reviewed international journal. JEEN aims to open an essential window of opportunity for an intellectual dialog between engineering entrepreneurship educators, researchers, and practitioners.

For those interested in submitting articles for future issues, please see instructions on the JEEN website at <http://www.jeenonline.com>.

NCIIA Recap

At the NCIIA Conference held March 27-29, KEEN Program Director Tim Kriewall led a panel of seven KEEN faculty members in two separate sessions focused on KEEN and how it compares and contrasts to entrepreneurship education. Tim presented the first paper to articulate the similarities and differences between entrepreneurship education and instilling the entrepreneurial mindset in engineering students. The role of the remaining speakers was to demonstrate how they introduce these principles on their respective campuses. Speakers included David Pistrui who spoke to the Kern Innovation and Entrepreneurship Academy that has been established at IIT under his guidance, Bill Riffe for Provost Michael Harris of Kettering who spoke to faculty development, Jonathan Weaver who spoke on entrepreneurial engineering case studies as a means to instill entrepreneurial thinking in students, and Phil Doepker who described project-based learning as a means to instill the essence of team work in the classroom. Other speakers included Greg Feierfeil of Lawrence Tech who spoke to the campus-wide transformation that is underway at LTU because of KEEN and Scott Schneider of their campus who spoke to the transformation that has occurred because of KEEN in problem-based learning approaches to teaching physics in exciting new ways. In addition to the talks, Kristen Mekemson and Tim hosted a reception for KEEN faculty, students and advisors who were attending the NCIIA meeting. Kristen, Tim and our KEEN advisors remained for a half day to hold an advisors' meeting to discuss next steps for the Network.

“...focused on KEEN and how it compares and contrasts to entrepreneurship education.”

Based on the evaluation responses, those in the audience seemed to have enjoyed and benefited from the presentations. All speakers received high marks. The single largest complaint was that there was insufficient time for discussion.

Upcoming Regional Meetings

June 3- 4 Calvin College (Grand Rapids, MI). Assessment Summit. Contact: David Pistrui dpistrui@acumendynamics.com. Objective: platform to present results to date on the development and testing of new assessment instruments and for faculty feedback.

July 19-20 Ohio Northern University (Ada, OH). Faculty Development Workshop: Engage the Entrepreneurial Mindset. Contact: Rob Kleine, r_kleine@onu.edu. Objective: to help interested faculty members learn how to instill the entrepreneurial mindset into existing courses.

September 15-17 Mercer University (Macon, GA). Innovation and Entrepreneurship. Contact: R. (Radha) Radharamanan, radharaman_r@mercer.edu. Objective: to take our regional conference to the next level: technical papers presentation; student projects/papers presentation; faculty and students participation from KEEN schools; interaction between KEEN Fellows and engineering faculty at Mercer University for possible future collaboration on projects, proposals, and exchange of students.

Spotlight on Santa Clara University

Ten years ago, Christopher Kitts was working at NASA-Ames while waiting for his final Stanford Ph.D. experiment to be launched into space. A friend from Santa Clara University (SCU) called and asked him if he would serve as a volunteer advisor on a senior design project. He agreed and worked with SCU students on building a satellite. People were surprised at the undergraduates' high quality of work on such a challenging task. He was invited to advise students on another spacecraft project the following year and to also help students develop SCU's first underwater robot. The engineering administrators found value in his work, but they had no open full-time positions to offer him. Kitts discovered that he really enjoyed working with students and to find talented students, he needed to be in the classroom. So he applied for several grants from NSF and the Air Force and funded his own position at the University as a research professor. A few years later, he received his Ph.D. and an appointment as an associate professor.

In 2008, when SCU was invited to apply for a KEEN grant, Kitts saw immediate connections to the contract work he and his students were doing as part of the Robotic Systems Laboratory. This laboratory focuses its robotics program on having students develop mature robotic systems and technologies that can be deployed in the field to conduct real-world missions for scientific discovery and technology validation. These projects can occur over the course of several successive student teams (<http://rsl.engr.scu.edu/>), typically as part of their senior undergraduate capstone design project. Kitts and Ruth Davis, the Associate Dean of Undergraduate Studies, Engineering, proposed revising curricula to instill the entrepreneurial mindset. They found the senior capstone design course, particularly the projects involving industry contracts, an ideal place to start. They had the infrastructure and the expertise in place, now they could bring in core concepts of business acumen and customer awareness to round out the students' learning.

The sponsored projects, focusing primarily on robotics, involve research and data collection. The sponsors are not concerned with how the data is collected, but rather the data itself. Since the yearlong senior design sequence culminates in a functional prototype, the robot created to collect the data is a means to an end. This gives Kitts the flexibility to have capstone students design an innovative robotic platform or subsystem and to also infuse new technologies developed by his graduate students. The team has a real customer, the industry or government sponsor, not a faculty member or a student, so they must work within those constraints without changing the project design. Students must also define the customer's need since they're not specific in what they want from the robot. In addition to these explicit customers, students also have other stakeholders—Professor Kitts and other students – since the robots stay in the lab after their mission and are used by other students for future projects.

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Dr. Chris Kitts

Spotlight on Santa Clara University (cont.)

Senior students also run the projects, which gives them exposure to elements of running a business. They must complete a mission at the end of the year on a time schedule, put together and follow a budget, coordinate the deliverable (e.g., a launch) and demonstrate the project. For one of this year's missions, fifty students are involved in a large-scale geological mission in Lake Tahoe: eight senior design students on two separate projects will operate their robots, six graduate students will experimentally verify their thesis and project research, and several dozen freshmen and sophomores will help to crew the boats and operate the robots as part of an introductory marine operations class. For this mission, the students are working with world-class scientists from the U.S. Geological Survey, and the robots will be used to create high-resolution maps of the underwater terrain, to take video of fault lines and specific rock formations, and to work with student SCUBA divers to collect samples. In running the mission, seniors also learn a lot about marine operations including how to create crew schedules and how to manage risk, particularly considering the safety issues involved in working with high voltage robots and water.

These projects expose students to many components of the entrepreneurial mindset; allow them to experience work in the fields of land, sea, air and space; and give them an opportunity to show off their work to industry professionals that judge their final projects and presentations. Many of these professionals hire SCU students on the spot. By leveraging his department's strengths, Kitts can advance student learning, robotics research, and the KEEN mission.

As part of SCU's initial proposal, Davis and Kitts also committed to creating a new course called Smart Product Design for junior engineering students. In their first week of the course, students must disassemble a product to discover how it works. By the end of the course, they must construct a computer-based electro-mechanical product. Alex Fischer, a junior mechanical engineer at SCU, was glad he had the opportunity to take this course. It stood out from his typical mechanical engineering classes; it allowed him to work on the planning and prototyping of a product involving mechatronics, the integrations of mechanical and electrical systems. In his words, this class helped him "learn about the challenge of responding to customer needs and the many ways to satisfy them." He enjoyed being able to problem solve and find creative solutions.

Inspired by KEEN network members Illinois Institute of Technology and Milwaukee School of Engineering, Kitts hosted two time-constrained innovation challenges at SCU. These are extra-curricular competitions that challenge students to design, prototype, and pitch a product concept. The first was held in 2009 in conjunction with BMW. Fischer recalls participating in the initial competition and recounts, "it was very exciting because it gave us a chance to explore the design and planning process in a way we hadn't before. We had to

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Spotlight on Santa Clara University (cont.)

come up with an idea to market to smart phone users. I'd done a lot of calculations in engineering classes, especially in physics and statics, but this was the first time I made a product." He adds, "We had to think about what the consumer wanted and how we could make the application ideal to them." Students also had to present their ideas in front of industry professionals, something students don't typically do prior to their senior project. Based on students' interest in this event, Kitts held the 2010 aerospace innovation challenge, a three-week competition held in cooperation with NASA Ames Research Center.

The impact SCU's KEEN initiative is having on students like Alex is evident. He considers his participation in the two innovation challenges and the Smart Product Design course the three defining aspects of his engineering education. He recognizes that in addition to knowing their technical areas, engineers are active in designing, creating, and presenting; they are at the heart of businesses. "I hope the [activities] continue," he says, "I'm encouraging my friends to take advantage of them."

SCU is interested in learning about other universities' strengths that network members can leverage. This model has worked well at SCU, and though it may not be for everyone, there is a lot of potential in creating collaborations based on KEEN schools' complementary skills. In April, Kitts hosted a regional meeting to explore such possibilities. He looks forward to seeing even one or two of these collaborations play out.

Living the Mission

Kern Family Foundation Mission:

The Kern Family Foundation seeks to enrich the lives of others by promoting strong pastoral leadership, educational excellence and high quality, innovative engineering talent.

Kern Entrepreneurship Education Network Mission:

To graduate engineers equipped with an entrepreneurial mindset who will contribute to business success and in so doing transform the U.S. workforce.

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Save the Date—2010 Fall Conference

Please “save the date” for the 2010 Fall KEEN Conference in Milwaukee on **Friday, October 8th – Saturday, October 9th**. We will be staying at the [InterContinental Hotel](#), the same location as last year. The Foundation will be hosting the Friday evening reception at the Harley-Davidson Museum. Registration will open in August 2nd. Mark your calendar! More information is located on the Foundation website: www.kffd.org.

Optional Session #1: The Kern Family Foundation’s K-12 STEM program will be hosting a meeting on **Thursday, October 7th from 1:00 to 5:00 p.m.** (Box lunches available at 12:00.) to explore the connection between KEEN and Project Lead the Way programs, particularly its Engineering Design and Development capstone course. For interested participants, the Foundation will cover associated travel and lodging costs.

Optional Session #2: Cindy Fry and Greg Leman of Baylor University will be leading a half-day workshop on the **Saturday, October 9th from 1:30-5:30 p.m.** The session, “Supercoach Entrepreneurial Training Workshop,” will give participants a brief history of the program, an overview of the training, and examples of its deployment at Baylor. The workshop is typically given to venture teams so they can gain insights into the tools that have proven efficient and effective for transforming technical and market “data” into a compelling story, and form the understanding needed to actually make the business work. This offering will be a briefer version than the typical 4-day format. Sign-up will take place through the online conference registration.