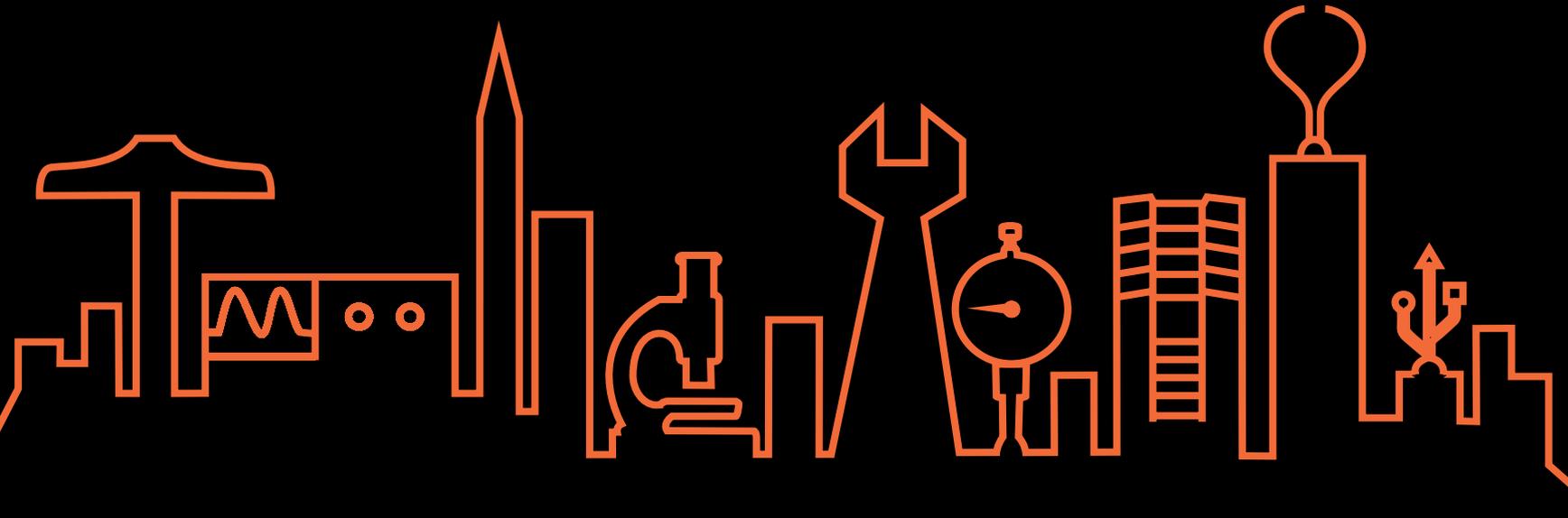


ABET

**Technical Education:
Building a Better World**
2016 ABET Symposium

April 14–15, 2016
Hollywood, Florida



OVERVIEW

Over two days in April, 750 technical educators, industry representatives and ABET Experts had the opportunity to learn from leaders in accreditation and assessment, engage in passionate discussions surrounding technical education and hear from five plenary speakers at the forefront of some of the most pressing topics in our disciplines.

From an opening lecture about trends in global higher education to a dynamic panel discussion about the importance of ethics in technical education and an inspiring talk about the engineering mindset and skillset, our goal was to bring engaging and thought-provoking content to each one of our sessions.

At a time when some are questioning the value of a college degree, we at ABET are confident that technical education can provide many of the answers—and above all the confidence we need—to tackle structural and societal issues of today and tomorrow. We believe that by partnering with and inspiring faculty and industry leaders, we can see **Technical Education Building a Better World**.

HIGHLIGHTS FROM THE 2016 ABET SYMPOSIUM

Francisco Marmolejo, the World Bank's Tertiary Education Coordinator, kicked off the Symposium with a provocative look at the immense role that education will play in the future of the global workforce.

Doug Melton asked the audience to think about how we can balance mindset and skillset to produce the most capable graduates. The Director of The Kern Family Foundation's Entrepreneurial Engineering Program shared his insight into the critical need to instill an entrepreneurial mindset.

We introduced a new concept to the Symposium this year: the Discussion Dens. These more intimate and organic sessions produced six incredibly engaging conversations. Topics included using engineering to build better communities and foster trust, how to prepare students to meet the needs of our constituents, and how effective assessment can engineer better education.



To cap off our premier event, NPR's Joe Palca sat down with Marc Edwards, from Virginia Tech, Arvind Thiruvengadam, from West Virginia University, and Steve Cramer, from the University of Wisconsin-Madison, to moderate a lively discussion that spanned ethics, accountability and the role that academics play in solving society's most pressing problems.

2016 PLENARY SESSIONS

**Global Issues and Trends
in Higher Education:
Are We Ready?**

**Entrepreneurial Mindset
is Transforming
Engineering Education**

**Great Minds,
Greater Impact**



Global Issues and Trends in Higher Education: Are We Ready?

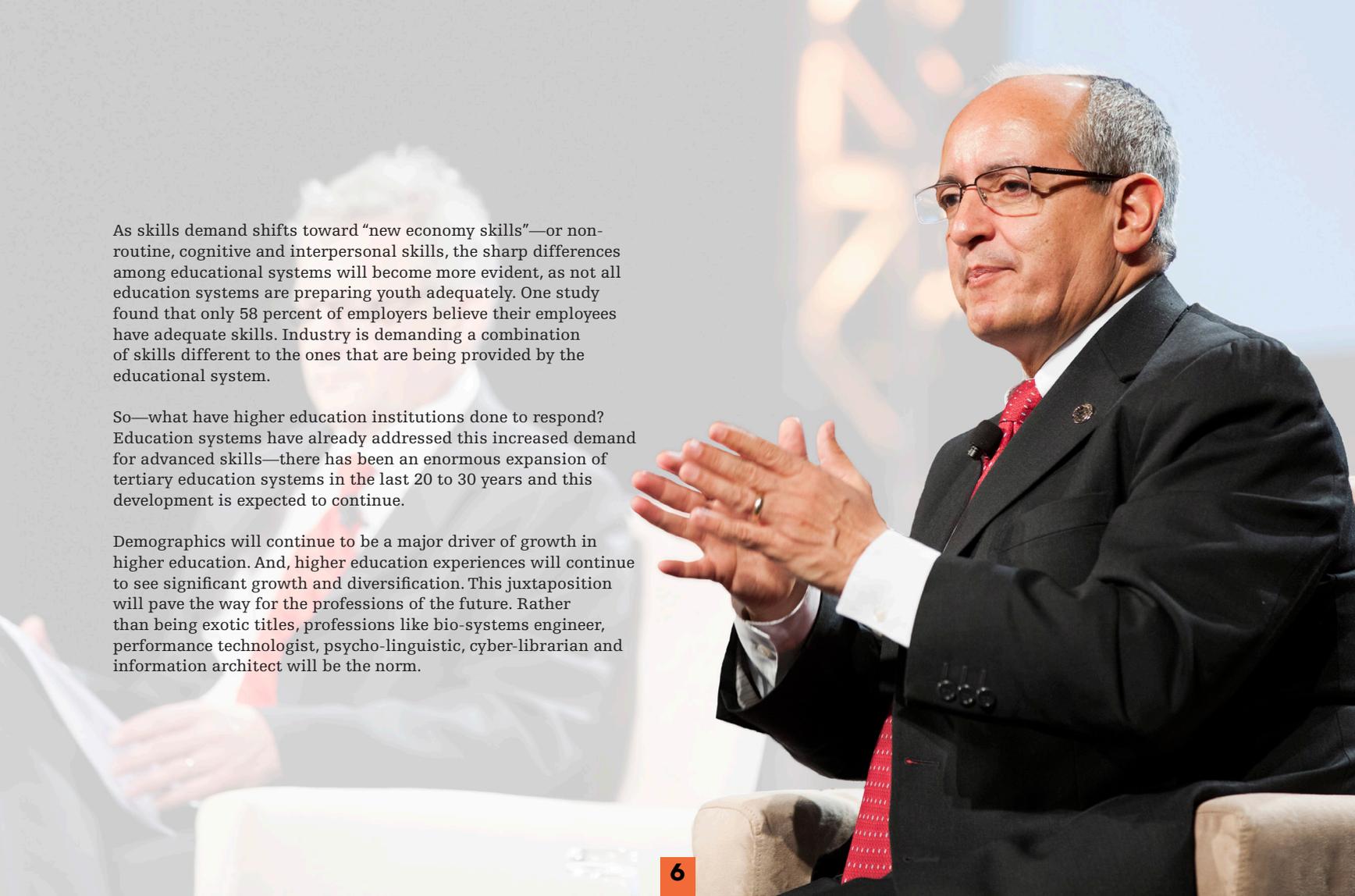
Francisco Marmolejo, Tertiary Education Coordinator, World Bank

By 2050, 75 percent of the world population will be living in cities (compared to 50 percent in 2007). This increase will include a dramatic demographic shift of the world's population—from 2015 to 2050, the total population in most of Europe will decrease by 5 percent, while most of Africa will grow by more than 40 percent. And, by 2030, 42 percent of the youth globally will live in Africa. As these population shifts happen, what is the impact on higher education?

“Today 20 households with average broadband usage generate as much traffic as the entire Internet carried in 1995”

(Katie McAuliffe, Digital Liberty)





As skills demand shifts toward “new economy skills”—or non-routine, cognitive and interpersonal skills, the sharp differences among educational systems will become more evident, as not all education systems are preparing youth adequately. One study found that only 58 percent of employers believe their employees have adequate skills. Industry is demanding a combination of skills different to the ones that are being provided by the educational system.

So—what have higher education institutions done to respond? Education systems have already addressed this increased demand for advanced skills—there has been an enormous expansion of tertiary education systems in the last 20 to 30 years and this development is expected to continue.

Demographics will continue to be a major driver of growth in higher education. And, higher education experiences will continue to see significant growth and diversification. This juxtaposition will pave the way for the professions of the future. Rather than being exotic titles, professions like bio-systems engineer, performance technologist, psycho-linguistic, cyber-librarian and information architect will be the norm.

Entrepreneurial Mindset is Transforming Engineering Education

Doug Melton, director for the Entrepreneurial Engineering Program at the Kern Family Foundation

“How can we balance mindset and skillset to produce the most capable graduates?” Doug Melton asked the audience, explaining that the Kern Family Foundation took this questions upon itself as it works to address the critical need to prepare students for the careers of tomorrow. The Foundation believes that to find jobs in a rapidly changing world, individuals require technical knowledge. However, the Foundation also understands these individuals cannot rely solely on a skillset to enjoy fulfilling careers.

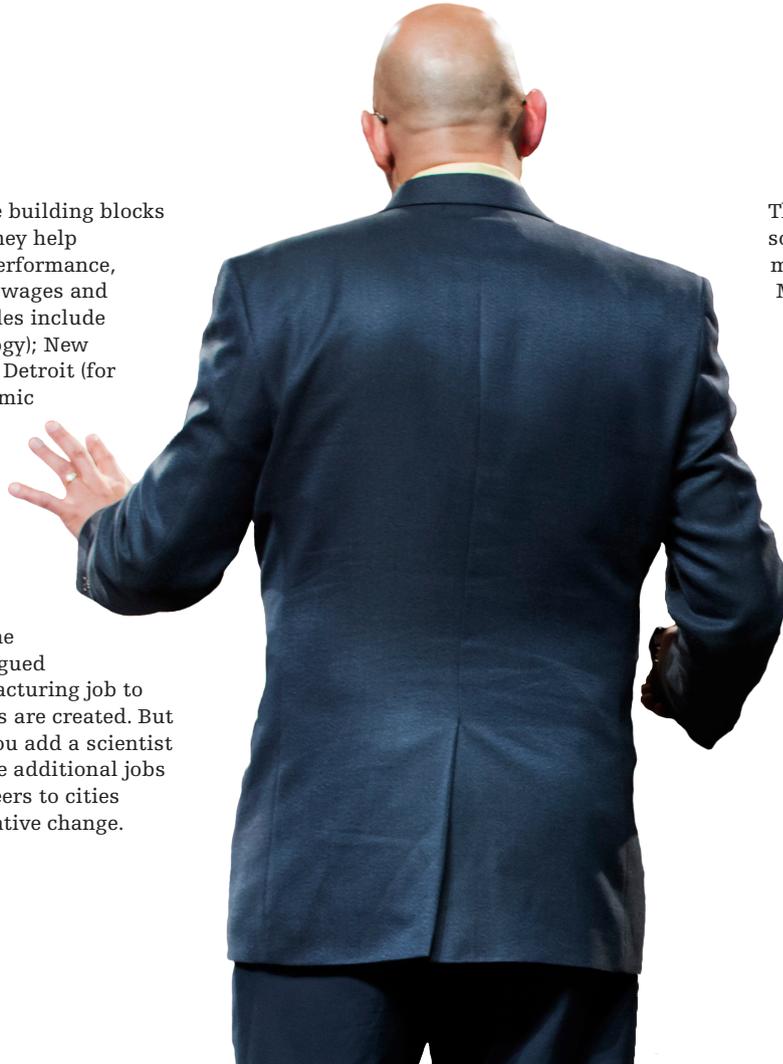
To have this positive and profound impact, there must be more entrepreneurship in engineering. Melton walked the audience through the three multipliers that allow for—and encourage—engineering entrepreneurship.

“We have the ability to transform education to have a positive and profound impact globally, in our nation and in our communities.”



Economic clusters are the building blocks of modern economies as they help drive regional economic performance, from job growth to higher wages and innovation. Perfect examples include Silicon Valley (for technology); New York City (for finance) and Detroit (for automobiles). These economic clusters are especially successful when adjacent to amplifiers—places like universities—which are key to driving their impact.

According to Melton, the second key multiplier is the **effect of engineers**. He argued that by adding one manufacturing job to an area, 1.6 additional jobs are created. But more importantly, when you add a scientist or engineer to an area, five additional jobs are created. Adding engineers to cities begins to drive transformative change.



The **entrepreneurial mindset**—someone's dispositions, attitudes and motivations—is the third multiplier in Melton's equation. This mindset allows engineers to inquire and explore, connect information and identify opportunities. The entrepreneurial mindset powers industries, transforms companies from within and creates value for employees and customers alike.

In a dynamic and interconnected world, it is essential that the engineers of tomorrow are being taught both a technical skillset and an entrepreneurial mindset—fostering curiosity, connections and the creation of value. This entrepreneurial mindset will allow engineers entering the workforce to create personal, economic and societal value through a lifetime of meaningful work.

Great Minds, Greater Impact

The Symposium ended with a lively discussion that spanned ethics, accountability and the role that academics can play—and have played—in solving the problems facing society.

Panelists from the Great Minds, Greater Impact session included:

Marc Edwards was part of a team that helped bring Flint, Michigan's problems with lead, leaks and legionella in the water supply to the world's attention after sampling in Flint homes starting April 2015. He came to the Symposium to talk about his experiences and perspectives. Edwards is the Charles P. Lunsford Professor of Environmental and Water Resources Engineering at Virginia Tech, where he routinely teaches a course on engineering ethics and heroism that was co-developed with Dr. Yanna Lambrinidou.

“I encourage scientists and engineers to better communicate the important work they're doing. There's huge value in getting people to think about your work in social context.” Joe Palca

Arvind Thiruvengadam began his professional career as a research assistant at the Center for Alternative Fuels, Engines and Emissions (CAFEE) at West Virginia University in 2012. In 2013, he was appointed to Research Assistant Professor in the Mechanical and Aerospace Engineering Department, where he continues to work, now as an Assistant Professor. In 2012, Thiruvengadam's lab at West Virginia University was excited to be testing emission levels on a few diesel cars. Three years later, their work uncovered the Volkswagen fuel emission scandal, a revelation affecting 11 million vehicles worldwide and rocking the largest automobile manufacturer on the planet.

Steve Cramer is a firm believer that giving academics the latitude to take risks on ideas and pursue the unknown is a dimension of *continued on next page*



higher education that we can't lose. As the Vice Provost for Teaching and Learning at the University of Wisconsin-Madison, he works with academics across campus to advance the learning mission of the university. He has focused on pursuing new approaches to teaching and learning in addition to continuing to teach and research. Cramer's scholarship is in structural and materials engineering.

The conversation was moderated by **Joe Palca**, one of the world's top voices in science and technology journalism. Since joining NPR as a science correspondent in 1992, Palca has covered a range of topics—everything from robotics and quantum computing to public water supplies, fuel emissions, and air quality. He is the eponymous host of the radio show *Joe's Big Idea*.

Top Takeaways



Marc Edwards: Rule number one: don't ask for permission. If in your profession you see something that is wrong, you have a responsibility to act. You have to become an activist. Get up every day and feel that sense of purpose—that you're doing what you were supposed to do.

"If you see something that is wrong, you have to act. If we didn't intervene, those kids in Flint would still be drinking that water."



Arvind Thiruvengadam: When we started testing, we didn't know what we were going to find. We know clean diesel is possible—we've seen the technology. So when we saw the results, our first reaction was to check to see if we made any mistakes. We wrote our report and released it, hoping a few people would read it and it would affect change.

"Our first report didn't name the manufacturer, we just wanted the data to do the right thing."



Steve Cramer: These are complex problems. When students are learning the basics of engineering, their textbooks show examples that are cut and dry, black and white. But ethics in engineering is much more difficult for students to get their arms around. You're seeing more ethics-based courses to show there are choices and societal impacts based on choices. We're definitely making progress.

"Higher education is about producing knowledgeable citizens who can make complex decisions for the betterment of society."

SESSION HIGHLIGHTS

The 2016 ABET Symposium had more than 90 concurrent sessions in four education tracks.

GLOBAL ACCREDITATION—how programs worldwide are pursuing ABET accreditation and how they are leveraging their accreditation status to distinguish themselves in the increasingly competitive global landscape.

BEST PRACTICES IN PROGRAM ASSESSMENT—best practices in program assessment and how to use this information to document, explain and improve innovative efforts implemented to prepare students for the global workforce.

DISRUPTION AND INNOVATION IN TECHNICAL EDUCATION—how technical programs are helping universities respond to growing demands to contribute to local and regional economic development.

ACCREDITATION POLICIES, PROCEDURES, AND PERSONNEL—insights into the accreditation process, with a focus on specific tasks and duties performed by program evaluators.

Within these tracks, there was a focus on four key themes that were consistent throughout Symposium sessions: **Accountability, Accreditation, Alliance and Access.**

ACCOUNTABILITY

“A lot of people see design as just a way to make your graphics look pretty. That’s certainly part of it, but design is also about making your graphics readable, understandable and usable. You can help people understand your data better” (Nathan Yau, Visualize This)

Flint, Ethiopia and Mexico: Working to Build Better Communities and Foster Trust

Kettering University’s Engineers Without Borders came to be after engineering graduates were coming to Laura Sullivan, professor of Mechanical Engineering, to ask for letters of recommendation for the Peace Corps. While acknowledging the graduates’ decision as noble, Sullivan thought there must be a better way to help engineering graduates combine their desires to make positive change in the world with the degree they earned. So she worked out a plan to form an Engineers Without Borders chapter at Kettering University aiming to collaborate with community partners to design and build sustainable engineering projects. These students use technical skills and engineering backgrounds to help build better, safer communities across the globe.

After spending so much time in places across the globe and in the United States, the group has vowed to do more listening when developing engineering solutions for the people they were helping. In Mexico, they built and installed biosand filters in a few locations within the village, along with solar disinfection units that help with access to clean, drinkable water. In Haiti, they worked to bring a fresh supply of drinking water into a community. And, in Africa, students and mentors traveled to

meet with village leaders, health professionals and municipality representatives to discuss the needs in the community. As a result, the team mapped the location of water sources and conducted tests to measure the quality of water sources.

Due to her active community engagement and technical background, in 2014 Sullivan became involved with the Flint water crisis. The Kettering professor and Flint resident was recently appointed to the Flint Water Inter-Agency Coordinating Committee by Michigan Governor Rick Snyder and is playing a leading role in helping Flint solve its water issues. During her session, she shared with the audience the heartbreaking story of the crisis in her community and the obstacles she’s constantly working to overcome.

Using Best Practices in Data Visualization to Improve Assessment Practice

Scott Dolan, from Excelsior College, introduced his audience to the growing field of data visualization. In response to Criterion 4—where a program must regularly use appropriate documented processes for assessing and evaluating the extent to which the student outcomes are being attained—he provided participants with the tools and resources they need to improve assessments.

ACCREDITATION

We Are Interested in Seeking ABET Accreditation...Are We Ready?

Winston Erevelles, Dean of the School of Science, Engineering and Technology at St. Mary's University and ABET adjunct accreditation director, spoke to a filled room about ABET accreditation. Key topics included eligibility, key policies and procedures, the evaluation process and our criteria. Erevelles shared with the interested audience that before pursuing ABET accreditation, the institution of higher education must have verifiable governmental, national or regional recognition to confer degrees. In addition, the program must be an integrated, organized experience that culminates in the awarding of a degree. In addition to program criteria, each program must meet additional criterion in the following eight categories: students, program educational objectives, student outcomes, continuous improvement, curriculum, faculty, facilities and institutional support.

The key questions to ask before seeking ABET accreditation include,

- > Are we ready?
- > Is our institution and our program qualified?
- > Does our program satisfy all applicable accreditation criteria?
- > Do our faculty members have enough time to prepare a self-study?
- > Is there enough time to prepare for the onsite visit?

Repacking Student Outcomes for Modern Global Engineering Practice

Current student outcomes have remained unchanged since the shift to outcomes-based education in the late 1990s, yet new demands on engineering practice continue to emerge. Attendees learned about updates to computing accreditation criteria; Criterion 4: what to expect, and bridging the gap; natural science accreditation; and whether it's time for a change to Criterion 3.

As ABET looks to update criteria and outcomes, considered proposed revisions are seen as aspirational. These changes can help build diverse multicultural workplaces; develop a knowledge in topics relevant to their discipline: usability, constructability, sustainability; and ensure programs are cognizant of the global dimensions, risks, uncertainties and other implications of the programs' engineering solutions.

ALLIANCE

(Re)Building and Managing Effective Industry Advisory Councils

A panel discussion and Q&A session with the audience delved into how to best use industry councils and the range of activities in which they can be engaged. Panelists emphasized that engagement needs to happen on a continuous basis. Although terms and rules of engagement may vary a bit from council to council, the successful ones have clearly defined purposes, clear expectations for members and active leadership by the industry representatives. Typical foci may include finding applied research opportunities for faculty; experiential learning and job placement opportunities for students; feedback on school strategy and curriculum; advocacy, both within the institution and outside; input in establishing intended learning outcomes (important to ABET accreditation) and fundraising.

Industrial Involvement in Technical Programs: A Global Context

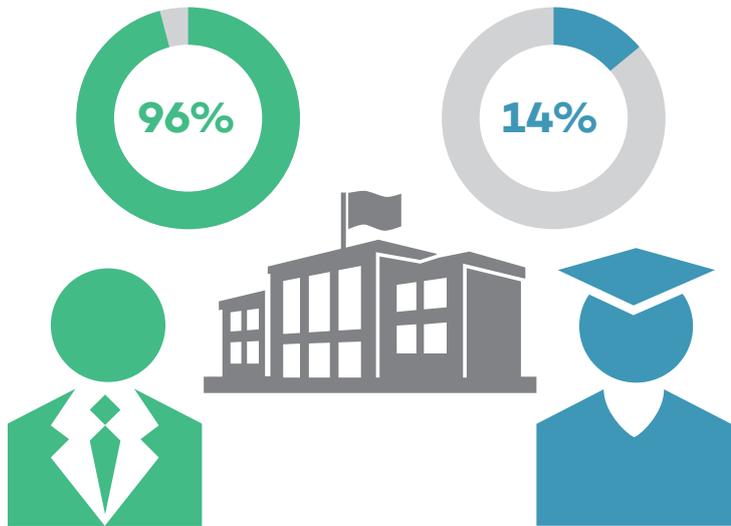
A panel presentation and discussion examined the importance of industrial involvement in engineering education and accreditation efforts. In many parts of the world, there is very little industrial involvement in education, which limits the amount of funding and in-kind donations an institution/program receives. Lack of industrial involvement in engineering education also creates a gap between students' academic experience and the needs of industry.

Today's challenges are multidisciplinary and will take multiple stakeholders to solve. That's why industry/university project case studies, formation and maintenance of industry advisory boards and fostering of a culture of industry investment in engineering education are so important. One panelist noted that partnerships with industry are necessary to promote knowledge and talent development, as well as the greater good. In addition, panelists agreed that to become incubators of entrepreneurship and innovation, universities must practice entrepreneurship. This "re-conceptualization" calls for new, non-traditional arrangements, they argued.

ABET Industry Advisory Council

Internships are a crucial part of the college experience, as they expose students to "corporate life" and prepare them to enter the profession. Defining appropriate outcomes of internship programs for students, finding the industry partner and implementing tactics to assure that the relationship benefits both engineering schools and employers are the key to creating internship programs that work.

Engineering education needs to innovate to better serve society.



96 percent of the college provosts surveyed believed their schools were successfully preparing students for the workplace. However, when recent college grads in the work force were asked whether they felt prepared, only 14 percent said yes.

(source: Tom Friedman <http://luenymorell.com/2014/09/10/provosts-vs-graduates-opinion-on-skills-gap-tom-friedman/>)

ACCESS

Resilience: Women and Engineering

ABET 2014-15 President Jamie Rogers shared insight into her long and rewarding engineering journey. In a light-hearted way, she spoke about the challenges women in engineering may face and why she switched from a music major to industrial engineering. (Hint, at the time, her husband and his friends were doing it and it looked easier than her music major).

It's not easy to acquire a major in the STEM field, and Jamie found it even harder as a woman. Women who have a passion and desire to learn, engage and contribute in engineering fields need resilience and persistence, she insisted.

Rogers also said she believes in finding a mentor and a company to provide support along the way. In her experience as a faculty member, Rogers thinks mentors serving students—not only for four years in a class, but also for a lifetime—are critically important to ensure more women succeed in these fields. This small act inspires confidence in women who graduate ready to enter the workforce. Rogers also believes that everyone should build a network of likeminded individuals who come from different technical areas.



“Our job is to inspire confidence. We partner with students not for four years, but for a lifetime.”

During her presentation she also shared with the audience the best piece of advice she has received and that she has been passing along to other women in engineering: *Just go for it. There's going to be obstacles in everything we do. So why not go for it and get to where you want to go?*

Practical Integration of Diversity and Inclusion Competencies into Engineering Education

Iowa University's Kristen Constant and NACME CEO Irving McPhail started the session by defining diversity and inclusion.

- > Diversity—our individual differences (race, ethnicity, gender, sexual orientation)
- > Inclusion—our behaviors and mindset (promoting respect, belonging, leveraging the value and harnessing the power of diversity to the benefit of the organization)

We can increase diversity, but without inclusion, it's not sustainable.

Industry says it wants and needs diverse engineers who can work effectively in diverse, multicultural, global environments, but while we can increase diversity, it is not sustainable without inclusion.

During their discussion, Constant and McPhail presented much data and research that supports the argument for diverse teams. They both argued that when teams have one or more members who represent the gender, ethnicity, culture, generation or sexual orientation of the team's end user, the entire team is far more likely to understand the target, increasing its likelihood for success. Employees who believe their company is supportive of diversity report better performance (83%), better responsiveness to changing customer needs (31% increase) and greater team collaboration (42% increase). In short, people work harder in diverse environments, both cognitively and socially. This hard work leads to better outcomes and performance.

Speaking to mostly academics in the audience, panelists emphasized that in order to change how industry thinks about diversity and inclusion, the university experience needs to develop inclusive classrooms and learning environments, which will set the precedent for an inclusive, diverse, functional workplace.

2016 ABET SYMPOSIUM PROGRAM COMMITTEE

The 2016 program committee worked to bring together the best content for our flagship event. The committee developed new and engaging discussions which allowed for more dynamic conversations among assembled attendees with shared interests, concerns and problems. The 2016 committee included:



Jenny Amos, program assessment track
Chief academic advisor and director of undergraduate programs for the department of bioengineering at the University of Illinois at Urbana-Champaign



Danielle Duran Baron, communications and marketing chair
Senior director, global communications and marketing, ABET



Zenaida Gephardt, global accreditation track
Associate professor of chemical engineering, department of chemical engineering, Rowan University



Charles Hickman, program chair
Managing director, constituent relations, ABET



Daniela Iacona, global accreditation track
Senior manager, international relations and board operations, ABET



Mike Leonard, program evaluator development track
Adjunct director, training, ABET; senior associate dean and professor, school of engineering, Mercer University



Joe Sussman, executive sponsor
Chief accreditation officer and chief information officer, ABET



Rochelle Williams, symposium chair
Director, programs and events, ABET

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ABOUT ABET

ABET is a forward-thinking, purpose-driven organization recognized by the Council for Higher Education Accreditation. All over the world, ABET accredits college and university technical programs committed to the quality of the education they provide their students.

Based in Baltimore, we are a global company, with more than 3,500 programs in 29 countries in the areas of applied science, computing, engineering and engineering technology at the associate, bachelor and master degree levels.





Join us in Baltimore, Maryland on April 20 and 21
for the 2017 ABET Symposium.

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