FIFTH SYMPOSIUM ON ENGINEERING AND LIBERAL EDUCATION

1-3 JUNE 2012
UNION COLLEGE
SCHENECTADY, NEW YORK
CAMPUS MAP
Trolley Schedule
The trolley runs about every 10 minutes during the designated times.

**Friday 1 June**
5:00 to 6:30 pm       Holiday Inn to Old Chapel Circle  
9:30 to 10:30 pm      Old Chapel Circle to Holiday Inn

**Saturday 2 June**
7:30 to 8:30 am       Holiday Inn to Old Chapel Circle  
12:30 to 1:30 pm      Reamer Circle to Holiday Inn  
5:00 to 6:45 pm       Reamer Circle to Holiday Inn  
9:00 to 10:00 pm      Old Chapel Circle to Holiday Inn

**Sunday 3 June**
7:30 to 8:30 am       Holiday Inn to Old Chapel Circle  
11:30 am to noon      from Reamer Circle to Holiday Inn

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**On the cover:**  At left, Smeaton's Tower, the third lighthouse on the Eddystone Rocks, 22 km out in the English Channel south of Plymouth (photo courtesy of Lynne Hatwell, [www.dovegreyreader.co.uk](http://www.dovegreyreader.co.uk)).  At right, engineering and liberal arts students making measurements of an oak tree trunk in a biomimetics course taught by Prof. Andrew Rapoff (photo courtesy of Prof. Rapoff).  John Smeaton (1724-1792) is considered the father of civil engineering.  He is said to have designed his lighthouse based on the trunk taper of the "spreading oak tree".  Students in this biomimetics course tested this hypothesis using field measurements and engineering analysis.
Welcome to the Fifth Symposium on Engineering and Liberal Education, hosted by Union College in Schenectady, New York.

We are incredibly grateful to have Dr. Charles M. Vest, President of the National Academy of Engineers and President Emeritus of the Massachusetts Institute of Technology, with us to present the keynote address.

Along with an outstanding array of papers from several leaders in engineering integration into liberal education, we have an exciting opening session on Saturday with members of the Kern Entrepreneurship Education Network (KEEN) presenting and discussing on the entrepreneurial mind in engineering.

On behalf of the Program Committee, we welcome you to our beautiful campus and hope that you have an inspiring symposium.

Andrew Rapoff, Symposium Chair

Program Committee

Chair
Andrew J. Rapoff, Ph.D.
Director of Engineering
Associate Professor of Mechanical Engineering
Union College

Members
Atsushi Akera, Ph.D.
Associate Professor of Science and Technology Studies
Director of First Year Studies Program
Rensselaer Polytechnic Institute

Bradford A. Bruno, Ph.D.
Chair and Thomas J. Watson Sr. and Emma Watson Day
Associate Professor of Mechanical Engineering
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Helen M. Hanson, Ph.D.
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Chair and William D. Williams Professor of Classics
Union College

Mark W. Walker, Ph.D.
Chair and John Bigelow Professor of History
Union College

Lilian S. Wu, Ph.D.
Program Executive, Global University Programs, IBM Corporate

**Symposium Staff**
Karen Crosby, Administrative Assistant for Academic Affairs

**ACKNOWLEDGEMENT OF SUPPORT**

We gratefully acknowledge the support of the David Falk '39 and Elynor Rudnick-Falk Endowed Fund, which greatly makes this Symposium possible. We also acknowledge the support of the Laurence W. Levine '52 and Barry Traub '53 Endowed Lecture Fund on the Liberal Arts and Engineering. This fund has helped us bring to campus Dr. Vest, a leading engineer who is also a leading proponent of the liberal arts. We further acknowledge the support of the Union College Office of Academic Affairs.

Special thanks to the Union College Facilities, Media and Dining Services staff, without whom this event would not be possible.
# SYMPOSIUM PROGRAM

**Friday 1 June**  
*All events in Hale House*

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<td>Registration &amp; Reception</td>
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<td>6:45</td>
<td>Welcome</td>
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<td>Dr. Stephen C. Ainlay, President, Union College</td>
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<td>7:00</td>
<td>Dinner</td>
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|        | *Engineering and the Liberal Arts in the 21st Century University*  
|        | Dr. Charles M. Vest, President of the National Academy of Engineering and President Emeritus of the Massachusetts Institute of Technology  
|        | Introduction by Dr. John E. Kelly III, Senior Vice President and Director of IBM Research, Union College Trustee  
|        | **Social Reception** to follow Keynote Address  |

**Saturday 2 June**

<table>
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<tr>
<td>8:00 am</td>
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<td>Old Chapel</td>
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| 9:00   | Session 1: A Whole New Engineering Mind  
|        | Olin 115                           |
|        | *A Whole New Engineering Mind*  
|        | Timothy J. Kriewall                |
| 10:30  | Break                              |
|        | Olin Rotunda                       |
| 11:00  | Lunch                              |
|        | Wold Atrium                        |
noon  
Olin Rotunda

Session 2: Posters

Technical-Social Integration in Engineering Education: Comparing Accreditation Requirements in Australia, China, Sweden, and the United States
Xiaofeng Tang, Dean Nieusma, Jens Kabo, John Currie, Wenlong Hu, Caroline Baillie

Sophomore Research Seminar: Identity and Security in a Technological World
Anastasia Pease, Shane Cotter

Integrating Engineering and Liberal Education in a Required Research Seminar
J. Douglass Klein, Cherrice Traver

Integrating Engineering and Liberal Education through a Whole New Endeavor
Peter Golding, Joseph A Ramos, Elsa Y Villa, Richard T. Schoephoerster

1:00 pm  
Olin 115

Session 3: Integrating Engineering into Liberal Education

Analyzing Context by Design: Strategies for Integrating Social and Technical Analysis
Dean Nieusma

Integrating Humanities into Engineering Education using Design as the Focus: An Interdisciplinary Teaching Experience
Sundar Balasubramaniam, Geetha Bakilapadavu, Sai Jagan Mohan

Probing Students' Understanding of the Social Context of Engineering Knowledge
Xiaofeng Tang

2:00  
Olin 115

Session 4: Integrating Liberal Education into Engineering

Perceptions of Non-Engineering Students and Employers of the Value of an Engineering Minor
John Krupeczak, Scott VanderStoep, Mani Mina, Robert Gustafson, James Young

Smarter Planet – Smarter Collaboration: Successful Industry and University Teamwork
Lilian Wu, David Hans
How To Present A Highly Technical Subject to A Non-Technical Audience
Ashraf Ghaly

3:00
Olin Rotunda

Break

3:30
Olin 115

Session 5: Challenges of Sustaining Engineering & Liberal Education Integration Efforts
Panelists: Atsushi Akera, Bradford Bruno, Ashraf Ghaly, David Gillette, Lee Odell

Session 5 Part 1: Lessons Learned
Rethinking Liberal Education at a Technological University
Lee Odell

A Model for Cross-Disciplinary Collaboration at a Public Masters University
David Gillette, Michael Huangs

4:15
Olin 115

Session 5 Part 2: Breakouts

5:00
Olin 115

Session 5 Part 3: Reports from Breakouts

5:30
Break and optional tour to follow Session IV

7:00
Hale House

Dinner
Social Reception to follow Dinner

Sunday 3 June

8:00 am
Old Chapel

Breakfast Buffet

9:00
Olin 115

Optional Closing Session 6: Plans for the Next Symposium
Facilitators: Andrew Rapoff, Mark Wunderlich

11:30
Olin Rotunda

Box Lunch - Stay or Go
KEYNOTE ADDRESS

Engineering and the Liberal Arts in the 21st Century University

Dr. Charles M. Vest
President of the National Academy of Engineering and President Emeritus of the Massachusetts Institute of Technology.

Abstract: The role of liberal arts in the education of engineers will become even more important as the world and its opportunities and challenges become increasingly technologically based. Indeed, it could be conjectured that 21st century engineering is in part vocational and in part itself a new liberal art. The role of universities in American society is changing in very substantive ways as the social contract is increasingly centered on their role in economic development. This trend makes it all the more important that we not ignore our responsibility to prepare citizens for a democracy, which has long been a goal of the liberal arts. Finally, the long-predicted stunning transformation of education through interactive on-line learning actually is now upon us, and engineering and the liberal arts should lead it together.

Biosketch: Dr. Charles M. Vest is President of the National Academy of Engineering and President Emeritus of the Massachusetts Institute of Technology.

Dr. Vest earned a B.S. in mechanical engineering from West Virginia University in 1963, and M.S.E. and PhD degrees in mechanical engineering from the University of Michigan in 1964 and 1967 respectively.

He joined the faculty of the University of Michigan as an assistant professor in 1968 where he taught in the areas of heat transfer, thermodynamics, and fluid mechanic, and conducted research in heat transfer and engineering applications of laser optics and holography. He and his graduate students developed techniques for making quantitative measurements of various properties and motions from holographic interferograms, especially the measurement of three-dimensional temperature and density fields using computer tomography. He became an associate professor in 1972 and a full professor in 1977.

In 1981 Dr. Vest turned much of his attention to academic administration at the University of Michigan, serving as associate dean of engineering from 1981-86, dean of engineering from 1986-1989, when he became provost and vice president for academic affairs. In 1990 he became president of the Massachusetts Institute of Technology (MIT) and served in that position until December 2004. He then became professor and president emeritus.
As president of MIT, he was active in science, technology, and innovation policy; building partnerships among academia, government and industry; and championing the importance of open, global scientific communication, travel, and sharing of intellectual resources. During his tenure, MIT launched its OpenCourseWare (OCW) initiative; co-founded the Alliance for Global Sustainability; enhanced the racial, gender, and cultural diversity of its students and faculty; established major new institutes in neuroscience and genomic medicine; and redeveloped much of its campus.

He was a director of DuPont for 14 years and of IBM for 13 years; was vice chair of the U.S. Council on Competitiveness for eight years; and served on various federal committees and commissions, including the Presidents Committee of Advisors on Science and Technology (PCAST) during the Clinton and Bush administrations, the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction, the Secretary of Education’s Commission on the Future of Higher Education, the Secretary of State’s Advisory Committee on Transformational Diplomacy and the Rice-Chertoff Secure Borders and Open Doors Advisory Committee. He serves on the boards of several non-profit organizations and foundations devoted to education, science, and technology.

In July 2007 he was elected to serve as president of the U.S. National Academy of Engineering (NAE) for six years. He has authored a book on holographic interferometry, and two books on higher education. He has received honorary doctoral degrees from seventeen universities, and was awarded the 2006 National Medal of Technology by President Bush and received the 2011 Vannevar Bush Award.

Biosketch from nae.org
ABSTRACTS

A Whole New Engineering Mind

Timothy J. Kriewall
*Kern Family Foundation*

Engineers have traditionally been considered problem solvers. Metaphorically, they have been educated to bring a tool bag full of equations to troubleshoot, analyze and synthesize a solution to a problem given to them. This engineering attribute is highly dependent on a well-developed analytical left brain. If this is the total scope of an engineer’s work, the engineer would only be a commodity. Every engineering program in the world prepares engineers to perform this task. The equations are the same regardless of the engineering college that teaches them.

What will differentiate the 21st-century engineer is his or her ability to leverage technology to benefit people around the world. As such, they will need to be prepared to see the world around them in order to recognize opportunity to fulfill an unmet need when no one is asking for the need to be fulfilled. This is what we consider at the Kern Family Foundation to be an entrepreneurial mindset. It will require the development of the right hemisphere of engineers’ brains as well as their left hemispheres. This talk will briefly explain how 20 schools across the country, most of which are comprehensive liberal arts colleges, are working together to develop a whole new mind in undergraduate engineering students in order to make life better for people around the world in the years to come. It requires a strong liberal arts influence in an engineering student’s undergraduate education.

Technical-Social Integration in Engineering Education: Comparing Accreditation Requirements in Australia, China, Sweden, and the United States

Xiaofeng Tang¹, Dean Nieusma¹, Jens Kabo², John Currie³, Wenlong Hu⁴, Caroline Baillie⁵

¹Rensselaer Polytechnic Institute, ²University of Gothenburg, ³University of Sydney, ⁴Beijing University of Aeronautics and Astronautics, ⁵University of Western Australia

Engineers today work in an increasingly globalized environment. As a result, liberal educators for engineers might benefit from a better understanding of the regulation and practice of engineering education in diverse national contexts. In this poster, we present the results of a comparative study of the central accreditation requirements for engineering programs in four countries: Australia, China, Sweden, and the United States. To identify opportunities and challenges for integrating the technical and social components of engineering education, we inquired how engineering graduates' expected capabilities related to the technical and social
domains of knowledge and skills are understood and represented within each set of requirements, and then we compared the representation of technical and social capabilities across the four contexts. Comparison of the representation of engineering graduates’ “technical” and “social” capabilities are summarized in a series of tables. Special attention was paid to how and where the “technical” and “social” capabilities of engineering graduates are distinguished and how and where they are conceptually integrated in each country. Finally, we discuss the implications of this comparison to the integration of liberal and engineering education.

**Sophomore Research Seminar: Identity and Security in a Technological World**

Shane Cotter, Anastasia Pease
*Union College*

As part of Union College’s effort to integrate technology into the study of the liberal arts, we have designed a general education course titled "Identity and Security in a Technological World." The course will be team-taught by professors from the Electrical Engineering and English departments and address the implementation and socio-cultural impact of new identification and security systems. We believe that this blend of literature, culture and technology will be attractive to both non-engineering and engineering students.

The technical course content will focus on the acquisition and storage of biometric data (fingerprints, face images, etc.) used in personal identification and forensic investigations of crimes. Students will learn how biometric and forensic systems work, and explore their uses, merits, and limitations. Through a collaboration with IBM, a research staff member will assist with the technical course content and demonstrate the computational power required to implement real biometric systems.

While exploring the technical side of these systems, students will also be asked to ponder a future where all biometric and personal data, including genetic and healthcare records, as well as shopping patterns, etc. will be easily accessible in real time. The technologies that allow the tracking of individuals anywhere in the world bring forward questions of security, privacy, and identity. Reading Science Fiction stories, along with news and science articles, students will explore the ethics, the dangers, and the advantages of a Big Brother world.
Integrating Engineering and Liberal Education in a Required Research Seminar

J. Douglass Klein, Cherrice Traver
Union College

Union College requires all students to take a Sophomore Research Seminar, which introduces students to the basics of scholarly research. For this offering of the course, we chose the theme of energy efficiency, with application to Union’s campus. The topic was in part inspired by IBM’s "Smarter Planet" initiative, and benefitted from three IBM guest speakers.

In addition to college-wide research-skill learning outcomes, students were introduced to both technical and social aspects of energy efficiency, the use of data analysis as a research tool, and the importance of taking multiple perspectives in addressing complex issues. Students also gained experience in team-based research.

Course objectives were addressed through a combination of classroom and outside activities designed to step students through the research process while introducing topical concepts needed to understand the energy course theme. A mix of individual and team assignments was given, progressing to a major research project. Students practiced both data collection and library research as they prepared for the final project on improving energy efficiency at Union. That project required students to work in teams and to address both technical and non-technical aspects of their specific research question. Students presented their results in a final research paper and gave oral presentations to an audience consisting of IBM researchers and faculty from Union, RPI and Aalborg University.

The course was assessed based on student feedback, project results and feedback from external constituents. Results will be presented in the paper.

Integrating Engineering and Liberal Education through a Whole New Endeavor

Peter Golding, Joseph A Ramos, Elsa Y Villa
University of Texas at El Paso

Integration of engineering and liberal arts education is central to developing the engineer of the conceptual age. The art and science of engineering is key to providing engineers with 22nd-Century-looking capacity to lead in our complex modern society. The US is at a tipping point regarding global competitiveness in technological innovation, and to a very large extent, humanity is critically dependent on the duopoly of technological innovation and liberal thinking for improvement of quality of lifestyle. This has been recognized within landmark reports across
almost a century (Mann 1918), Wickenden 1929, Duderstadt 2008, Sheppard et al 2008, and the National Academies 2010; see “Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5”). The interplay between technology and society guides our future humanity. To contribute and support leadership in this interplay, we are creating a new degree program in Leadership Engineering. The University of Texas at El Paso (UTEP) initiatives respond earnestly to the call from students, alumni, businesses, and civic organizations, including the National Academies, to visualize and actuate a new paradigm for engineering education (Schoephoerster & Golding 2010). The drafted UTEP Leadership Engineering degree program status is an attempt to address this call. The degree program is consistent with providing leadership in a new age, characterized as the conceptual age by Alan Greenspan in 1997, and later made popular in Daniel Pink’s "A Whole New Mind". Pink (2005) sees (quote): "The future belongs to a very different kind of person with a very different kind of mind. The era of 'left brain' dominance, and the Information Age that it engendered, are giving way to a new world in which the “right brain qualities”—inventiveness, empathy, meaning - predominate". To address these needs, the new program features problem-based learning across disciplines and situated learning through professional practice experiences.

**Analyzing Context by Design: Strategies for Integrating Social and Technical Analysis**

Dean Nieusma  
*Rensselaer Polytechnic Institute*

This presentation describes Rensselaer’s Programs in Design and Innovation (PDI) as a programmatic effort to teach contextual analysis to engineering students. After a brief review of PDI’s curricular structure—interdisciplinary, sequenced design studios; supplementary social science electives; multiple dual---major combinations—the presentation will go on to review some of the specific approaches by which students learn to appreciate and analyze a range of different types of "contexts" that are implicated in engineering design problem solving. Not least of which, these include contexts of technology use, organizational contexts of design work, broader cultural contexts that give products meaning and appeal, political---economic contexts that make some products seem inevitable and others unlikely. After reviewing some of these approaches to teaching contextual analysis, the presentation will identify limitations of our model and its potential for scaling.
Integrating Humanities into Engineering Education using Design as the Focus: An Interdisciplinary Teaching Experience

Sundar Balasubramaniam, Geetha Bakilapadavu, Sai Jagan Mohan
*Birla Institute of Technology & Science*

Integrating Humanities into an engineering education has been discussed for a long time in academic community. But the practice has been far from perfect: the usual engineering curriculum is just a smattering of a few humanities courses to none at all particularly in the Indian milieu. Often these Humanities courses are taught in isolation with no cohesion among themselves nor with the science and engineering subjects. One primary issue in integration is finding an effective way to introduce an engineering student to Humanities as a domain given its broad nature and scope. We address this problem by creating and teaching a course titled Humanities and Design. The course is aimed at science and engineering students who wish to gain a humanities perspective as applied to problems in science, engineering, or other disciplines. We have used design as the focusing element and have enabled students to choose specialized topics within the broad outline of the course. We describe our experience in this paper by recounting the structure and pedagogy of the course as we planned and also the way it has panned out over the semester. Along the way we discuss our original objectives and motivation as well as our empirical assessment of how far these are getting fulfilled. We also briefly present several of the topics discussed in the course and some operational aspects of the course to highlight the scope and effectiveness of the learning process. We summarize our qualitative observations and very briefly ponder over scaling the model to a large audience.

Probing Students' Understanding of the Social Context of Engineering Knowledge

Xiaofeng Tang
*Rensselaer Polytechnic Institute*

Both the underlying motivation of liberal education and the attention to engineering students' need for lifelong learning suggest that, in contemporary engineering education, learning of particular knowledge matters less than developing a sophisticated understanding of the nature of knowledge and learning. Psychological studies of college students' epistemological development have categorized the perspectives through which students understand the nature of knowledge; these categories range from a dualistic view of knowledge as absolutely right-or-wrong to a constructivist view of knowledge as relative to its particular context. In this talk, I review four influential psychological studies of college students' epistemological development (Perry (1970), Belenky, Clinchy, Goldberger, & Tarule (1986), Baxter Magolda (1992) and King & Kitchener (1994)). These four studies all agree that students at higher stages of epistemological development demonstrate understanding of knowledge as contextual and reflect on their own
role in the construction of knowledge. This finding provides support for promoting students' understanding of the social context of engineering knowledge. However, these works all take the meaning of “context for knowledge” for granted; none of these works further inquires into students' understanding of the specific social or cultural context that gives meaning to a particular domain of knowledge. In other words, “context” is black-boxed in these studies. I suggest that study of college students' epistemological development can benefit from further probing students' reflection on the social context in which knowledge is generated and/or applied. I suggest ways of adapting the psychological interviews for students' epistemological development to investigate engineering students' understanding of the social context of engineering knowledge. A study like this would help engineering educators overcome the "social/technical binary" that often plagues the integration of liberal and engineering education.

Perceptions of Non-Engineering Students and Employers of the Value of an Engineering Minor

John Krupczak¹, Scott VanderStoep¹, Mani Mina², Robert Gustafson³, James Young⁴
¹Hope College, ²Iowa State University, ³Ohio State University, ⁴Rice University

Engineering minors or certificates offered by engineering departments is an approach to developing technological competence in non-engineers. Minors or certificates allow a subject to be pursued to some degree of depth and provide a credential deemed attractive by many students. To help discern the perceptions of non-engineering students, focus groups were conducted with a total of 64 non-engineering majors. It was found that the students embraced the concept of an engineering minor because of its focus on project-based learning, critical thinking, problem solving, and employability. However, students expressed concern in clarifying the identity of a minor. Issues emerged such as how much technical background would be required, how much technical information would be taught in the courses, and how general versus specific the coursework would be. Non-engineering students felt that there was potentially broad interest among non-engineers in technological topics. Data were also obtained from surveys of potential employers regarding their perception of the value of engineering-literacy certificates. A total of 24 engineers and hiring managers in technological industries were surveyed. The learning outcome for non-engineers ranked highest by employers and managers was the ability to function effectively on teams with varying technological expertise. Also highly valued were the abilities to communicate effectively on technological issues and an understanding of basic engineering concepts. Lowest ranked were an ability to identify technology that appropriately reflects the values and culture of society for which it is intended and explaining some of the ways that technology shapes human history and people shape technology.

This work was supported by the National Science Foundation under award: DUE-0920164. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.
Smarter Planet – Smarter Collaboration: Successful Industry and University Teamwork

Lilian Wu, David Hans

*IBM*

Developing T-shaped liberal arts students, who understand and appreciate the value of math, computation and analytics at the core of their broader education plan is the goal of a Smarter Planet community. Today, schools, communities and businesses recognize the value that can be gained from using data and technology to better understand our environment and improve our business, infrastructure, and societal needs.

Over the past year, in collaboration with IBM Smarter Planet research scientists, three distinct seminars were developed at Union College. The courses focused on smarter energy, the ethical use of data analytics and the assessment of energy issues associated with open infrastructure sites like roads, parks and green spaces. For many students in each seminar, it was the first step in a life long journey as the new advocates and leaders for a Smarter Planet.

Each SRS course had unique challenges in terms of content and course design, but each course was built around a strong working relationship with IBM to share and leverage Smarter Planet expertise. This paper will discuss how universities can collaborate with companies like IBM to identify, research and plan the components of a successful cross discipline program. Hear how teams must manage difficult research team schedules, and adjust to challenging new classroom and student requirements. Finally, this paper will show how IBM plans to use a highly competitive Shared University Research (SUR) program to support the continued sharing of course material and student feedback with other schools to broaden the impact of a Smarter Planet.

How to Present A Highly Technical Subject to A Non-Technical Audience

Ashraf Ghaly

*Union College*

One of the major struggles instructors face in attempting to integrate engineering and the liberal arts is the delivery of highly technical content to audience with limited technical background. Interdisciplinary courses, or those that cross a number of disciplines attract students from many majors. This could be due to the interesting nature of such courses or because it is one of the requirements that must be fulfilled by students. Union College has been in the forefront of offering courses that appeal to a wide range of students and has allowed team-teaching of such courses where one of the instructors is an engineer and the other is from a liberal arts department. This approach has been successful for many years as students greatly enjoyed these courses.
Union also offers what is known as Minerva courses where many faculty members from many different departments participate in teaching a course with each teaching only one or two classes. This becomes a challenge for each faculty member as the students taking these courses come from almost every department on campus. The challenge multiplies if the assigned lecture is on a highly technical subject with considerable difficulty. The recipe for success to deliver such content lies essentially in two words: simplification and visualization. Simplifying presented concepts and dissecting complicated principles are a major undertaking but if done correctly, students experience will be extremely rewarding. Simple video clips, animation, and computer demonstration are the second component in getting the viewer’s full attention towards global comprehension of the presented subject. Students also responded well to sketches, figures, photos, tables, charts, and graphs than to descriptive text and lengthy explanation. This presentation will demonstrate how these features were employed to present a highly technical and complicated topic to a non-technical audience in the framework of one of Union College’s Minerva courses.

Challenges of Sustaining Engineering & Liberal Education

Atsushi Akera1, Bradford Bruno2, Ashraf Ghaly2, David Gillette3, Lee Odell1
1Rensselaer Polytechnic Institute, 2Union College, 3California Polytechnic State University

For this special session, our plan is to focus our conversations around the broadest efforts to rethink the role of liberal education in the context of our respective institutions, and for ensuring their sustainability. This multi-part session will begin with a panel presentation and discussion by representatives from different institutions (public, private vs. large vs. small, specialized vs. integrated); a breakout session organized around a specific set of questions; and a general plenary during which each group will share their findings and speak to the challenges of creating a sustainable program that successfully integrates engineering and liberal education.

Rethinking Liberal Education at a Technological University

Lee Odell
Rensselaer Polytechnic Institute

At Rensselaer a small group of faculty in Humanities, Arts, and Social Sciences have been charged with rethinking the role of liberal arts at Rensselaer and proposing curricular changes that will enhance that role. It is premature to say exactly what that proposal will look like, but we see one way we hope our work will be distinctive. Other efforts tend to focus on one basic question: How can liberal arts faculty introduce students to topics, themes and methods of inquiry that are basic to liberal arts? But the task of liberal education is much too big for any one subset of faculty to accomplish. Consequently, our task force is asking a different kind of question: How can we define liberal education—not just in terms of knowledge but also habits of mind—in ways that will let us accomplish two goals: proposing curricular changes within HASS and also enabling all schools and programs at Rensselaer to contribute to students’ liberal education?
Of course, this sort of question can lead to numerous potential pitfalls. But we believe our statements about habits of mind avoid these pitfalls and meet three criteria.

- They have heuristic and diagnostic value for both students and faculty.
- They can support rather than distract from efforts to teach subject matter in a wide range of disciplines.
- They provide a set of givens that can guide our efforts to propose substantial changes in liberal education at Rensselaer.

Our understanding of these habits of mind will surely continue to evolve. Even so, our current work will help explain some of these characteristics, show how they meet the criteria above and suggest ways they can help us avoid a variety of pitfalls.

A Model for Cross-Disciplinary Collaboration at a Public Masters University

David Gillette, Michael Huangs
California Polytechnic State University

In 2011, at the Symposium on Engineering and Liberal Education, the presentation team from Cal Poly discussed the overall political and theoretical issues that arose when creating a new interdisciplinary program combining liberal arts with engineering—the LAES program. This year, as the LAES program becomes a permanent part of the Cal Poly curriculum, we focus on the practical lessons learned from putting our program into place, and examine the common organizational problems that programs like LAES can solve at similar institutions.

By codifying collaborative, project-development work and assessing it as part of ongoing class and program structure, programs like LAES help institutions more accurately account for cross disciplinary activities between students, faculty, programs and community partners that otherwise may be ignored. In our paper we explain how a number of collaborative, project development activities were integrated into the LAES program, and provide recommendations for how our program’s organizational techniques might be used elsewhere.

Additionally, the interdisciplinary outreach provided by programs like LAES can serve as a catalyst for the creation of broader forms of cross-disciplinary collaboration that have the potential to create new methods for organizing students, faculty and budgets, effectively working around divisions at universities that commonly prevent change. In our paper we will discuss an outgrowth from the LAES program at Cal Poly—the Expressive Technology Studios project—and discuss how similar projects could be developed at other institutions.
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On the back cover: The Union College Logo (top) and Seal of Minerva (bottom). The adoption of the Seal of Minerva at the College’s founding was a radical innovation in that it incorporated a French motto: “Sous le lois de Minerve nous devenons tous frères”—“We all become brothers under the laws of Minerva”.
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