



Engineers Can Interact in a Liberal Arts World

Dr. Pete Hylton, Indiana University Purdue University, Indianapolis

Pete Hylton is an Assistant Professor at Indiana University Purdue University Indianapolis (IUPUI). He earned his B.S. degree in Mechanical Engineering from Rose-Hulman Institute of Technology, M.S degrees from Purdue University (Mechanical Engineering) and IUPUI (Applied mathematics) and Ed.D. from Grand Canyon University (Organizational Leadership). Dr. Hylton is currently the Director of Motorsports Engineering at IUPUI and his interests include motorsports safety, automotive performance, technical risk management, high speed dynamics, program management and organizational leadership.

Ms. Wendy Otoupal-Hylton, IUPUI

Engineers Can Interact in a Liberal Arts World

Abstract

Sometimes it seems, on the university campus, that the distance between the engineering realm and the liberal arts realm is light-years, not the two blocks between their separate buildings. This feeling is fostered by the completely different ways that faculty from the two arenas look at things, the different types of problems they face, and the different ways that they communicate. Engineers often view their liberal arts counterparts as too “touchy-feely.” This likely derives from the way engineers quantify everything in facts, figures, and formulas, rather than describing the world in terms of feelings and flocculent descriptions. On the other hand, the non-engineers often see their more scientific colleagues as overly rigid and regulated, missing out on the romance and reverence found by getting in touch with the universe through one’s subjective senses. These barriers are best broken down, either by examining ways to find a common ground to share, or by stepping outside one’s traditional comfort zone, and entering the other camp’s territory to communicate with them on their terms.

This paper will examine how one engineering education program has used both approaches to build new relationships, and demonstrate the ability of engineers and non-engineers to relate to each other. The creation of parallel programs, one in the School of Engineering and Technology (E&T) and one in the School of Liberal Arts (LA), both supporting a common industry, showed how faculty from the two programs could work together for the advancement of both. The second approach involved engineering faculty stepping outside their normal zone of activity, and becoming a part of the Spirit & Place Festival, normally the purview of departments more strongly aligned with social, cultural, and religious affairs. The success of this foray into topics not normally broached by engineers, offered horizon broadening opportunities for parties from both sides to better understand the other, increasing the likelihood of more future collaborations.

Introduction

Over fifty years ago, C.P. Snow, a trained scientist, turned literary author, made a case for the existence of two distinct and diverging cultures.¹ He saw those who study science and engineering, and those who study the arts, as growing progressively further apart in their viewpoints. He stated that he felt he “was moving among two groups – comparable in intelligence, identical in race, not grossly different in social origin, earning about the same incomes, who had almost ceased to communicate at all, who in intellectual, moral and psychological climate had little in common.”²

Snow and his colleagues interviewed over 30,000 engineers and scientists, nearly 25% of the total members of those careers in the United Kingdom at that time. He referred to be “shaken” by how little non-technical reading the technical experts did. He was concerned that they viewed popular and easily readable authors such as Dickens as “esoteric, tangled, and dubiously rewarding.” On the other hand, he found his literary compatriots unable or unwilling to relate to such simple scientific concepts as mass, acceleration or entropy, which he considered equivalent to an engineer refusing to try to read Shakespeare.² His “two culture” examinations led him to conclude that this cultural divide between the technical realm and the liberal arts realm, existed all over the western world.

Fifty years later, Whelan concluded that the situation was unimproved, with the tendency of liberal intellectuals to behave as modern version of the 19th century Luddites in their disdain for technology.³ Meanwhile, Wadhwa quotes no less an advocate of technology as Microsoft founder Bill Gates in urging a reduction in investment in the Liberal Arts because LA degrees “do not correlate well with job creation.”⁴

There continues to be a tendency for engineering students to look down their noses at those from the social sciences and the liberal arts as being too “touchy-feely” rather than objective and concrete. As Patnaik stated, “it is not uncommon to overhear engineering students comment that liberal arts students are majoring in unemployment. On the other hand, my friends in the College of Liberal Arts never fail to point out that engineering students are full of themselves.”⁵ The tendency of engineers to approach problem solving in a methodical and sequential fashion, using numeric data and proven facts as their primary, if not only, input simply supports this perspective of non-engineers.

Patnaik made the case that America’s progress has occurred primarily through collaborations between liberal arts and science and engineering. Research by Duke and Harvard universities of the heads of 502 technology companies supported this.⁴ Of those surveyed, 92% had bachelor’s degrees and 47% had graduate degrees. But only 37% had degrees in engineering or technology. Thus, those leading the majority of companies which are advancing our technology have liberal, non-technical degrees. It is therefore surprising that many collegiate engineering programs have reduced the number of liberal arts courses required in their plan of study in favor of more technical courses.⁴

Fortunately, some still recognize the importance of a diverse foundation to build a well-rounded graduate. Yale and Johns Hopkins universities have begun offering Bachelors of Arts degrees in engineering for students seeking greater technical understanding within a broader liberal arts context.⁶ Such schools are integrating the two disciplines in an effort to help graduates perform more effectively in an increasingly complex world.⁷ Apple founder Steve Jobs supported this trend, saying “It is in Apple’s DNA that technology alone is not enough – it is technology

married with liberal arts, married with the humanities, that yields us the result that makes our heart sing.”⁴

Smith College has decided to educate engineers in traditional liberal arts. They have created “a structure of requirements for engineering majors that assured substantial course work across traditional liberal arts disciplines. Students are required to take courses in literature, the arts, historical studies, the social sciences, and foreign languages.”⁸ Union College is experimenting with pairing courses, one taught by an engineering faculty member and another taught by one from the humanities or social sciences.⁹ Pairings such as music and acoustical engineering have proven to complement each other while generating both interest and benefit to both schools.

O’Neill-Carrillo, et al.¹⁰ have utilized engineering projects at the university level to respond to fundamental needs of society and address social, environmental, and socio-economic issues of the local community through creation of academic structures that enable direct interaction among students, faculty and community members. Catalano¹¹ described a new interdisciplinary course for both engineering and non-engineering students working on projects aimed at promoting concepts of peace and justice. The Compassion and Peace Practicum serves as an introduction to the technical arena for the non-technical students while broadening the understanding that engineers have of their role and impact on the world. Concepts and courses such as these can be an outgrowth of opening the channels of communication between E&T and LA. This paper will now examine projects within the School of E&T at Indiana University Purdue University Indianapolis (IUPUI) which have endeavored to forge new connections with programs in the School of LA.

Collaboration Between Schools

In the IUPUI School of E&T, a typical plan of study requires students to take one elective from a list of social sciences classes, one from a list of arts and humanities classes, and one from a list of cultural understanding classes, in addition to one course each in English composition, speech, and ethics, all taught by faculty from outside of E&T. In many cases, however, there still exists a lack of interaction between engineering faculty and faculty from the School of LA. This has not stopped one particular program from endeavoring to build new bridges and open doors that have traditionally been closed.

For example, both E&T and LA have faculty members who are heavily involved in the Motorsports Industry. When E&T’s relatively new Motorsports Engineering Bachelor of Science degree program was being developed, one of the tenured senior faculty members from LA was appointed as an adjunct faculty member in engineering and invited to serve as an advisor and also to serve on the search committee for new faculty in the motorsports program. In return, when a proposal was presented to the LA faculty to create a Motorsports Studies program, the

Director of Motorsports Engineering participated in the discussions, offering support as well as insight into what was helping the engineering program's success.

The Motorsports Studies plan requires LA students to take the Introduction to Motorsports course from the engineering program while a unique Business of Motorsports class is required in the engineering degree. The LA website even credits E&T in their description of the program: "The Certificate is interdisciplinary and draws on the expertise of the School of Engineering and Technology and their BS in Motorsports Engineering, and, depending upon a student's interests, may include courses taught in the Schools of Business, Journalism, and Physical Education and Tourism Management."¹²

Additionally, faculty members from motorsports engineering and the history department combined to write a grant proposal for a unique research project which would have assessed one of America's early roadways, the Pennsylvania Turnpike, and its impact on the development of high speed travel. By looking for common ground and shared areas of interest, it is possible for diverse faculty to develop close cooperation and collaboration.

Stepping Outside the Box

Engineering faculty can also seek opportunities to become involved in projects and activities that are more often seen as the purview of the liberal arts world. For example, for 18 years Indianapolis, Indiana has hosted a Spirit & Place Festival (S&P). The S&P describes itself as a civic collaboration of the arts, humanities and religion. The festival committee explains its goal by saying that it "mobilizes ideas, brings disparate people and organizations together to partner and converse, and sparks action for the common good. Through growth of the human spirit Central Indiana becomes a better place."¹³ Not surprisingly, S&P is typically seen as belonging to the liberal arts world, and draws little attention in the engineering and science community.

Not long ago, the theme for the festival was "Exploring Imagination" (see Figure 1). Typical seminars for that year's festival included "Exploring the Spiritual Mandate for Creative Care" and "Imagining a Global City." However, imagination and creativity are closely intertwined, and engineers are both imaginative and creative. Ainley has stated "the engineering design process contains many features that speak directly to the concept of creativity. Scholars from many fields of study can learn from their engineering colleagues how to better distinguish among various aspects of the creative process."⁹ Taking this to heart, the IUPUI Motorsports Engineering Director proposed a panel discussion, which was accepted by the organizers, entitled "Imagine It, Design It, Build It: Engineering Our World" (see Figure 2).



Figure 1: The theme for a recent S&P festival was “Exploring Imagination.” (used by permission of S&P festival)

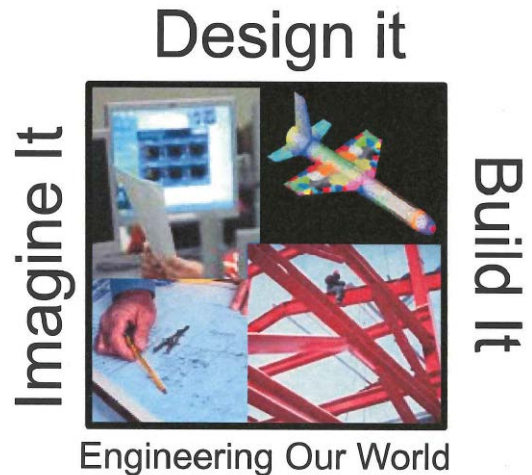


Figure 2: The E&T entry into S&P festival was entitled “Imagine It, Design It, Build It: Engineering Our World.” (IUPUI graphic)

The proposal for the session said: “We are constantly surrounded by devices that have come into being through the imagination and effort of engineers. The engineering profession builds the bridge between the discoveries and theories of scientists and the average person who needs a better, faster, safer, or more effective way to perform a task. There is an art to engineering, just as there is art involved any time an individual allows the ideas and environment around them to inspire a flight of imagination that leads to the creation of a new idea, a new song, a poem, or a painting.”

When an engineer envisions something, and applies their special skill, it provides the ability to not only imagine it, but to design it, and build it, thus bringing it into being in a way that others can use it and benefit from it. For those whose imagination runs more towards the artistic, humanitarian, or spiritual aspects of our world, these engineering imaginations may seem mundane. However, the tools that these engineers create are used all the time by their artistic neighbors. It seemed fitting, therefore, in connection with the theme of *Exploring Imagination*, to examine how the imagination of engineers interacts with, and makes possible, the achievements of these other societal leaders.

Participants assembled by the author for the panel discussion were J. Gregory Keller, a member of the School of Liberal Art’s Philosophy Department with specialties in ethics and twentieth-century philosophy; Rev. John Koppich, pastor of Fairview Presbyterian Church in Indianapolis; David Russick, chief designer for the Indianapolis Museum of Art; Robert White, dean of the School of LA with a specialty in sociology; Larry Hickman, Director of the Center for Dewey Studies; Doug Acheson, a technology professor with expertise in manufacturing and design graphics; and Pete Hylton, an engineering professor with expertise in the fields of aerospace and motorsports. This unique topic and diverse panel proved to be extremely popular as part of the

festival, with both students from the university and the public at-large attending in good numbers. The festival’s selection committee ranked the proposal as shown in Table 1. After every session, the S&P supplies a survey for feedback from attendees. The audience rated the discussion as shown in Table 2. Both sets of feedback reflect positively on the session.

One of the results of this panel discussion was to point out that while the cultural perception of the different fields are often quite diverse in practice there are similarities to build upon. The participants discussed related concepts such as determining the need for new projects to benefit humanity versus developing the design of such projects. While clearly related, the differences between the knowledge, skill sets, and problem solving approaches of the two sides pointed out that serious communication issues can develop. It is possible that while working toward the same goal, the different paradigms of the two sides could lead them to thoroughly misunderstanding the intent of, and the methodologies applied by, the other side.

However, once the open discussion exposed this potential problem, it was easier for all parties to step back, re-evaluate the gaps in communication and perception, and re-establish a stronger understanding of needs versus intents so as to avoid the potential problems. As witnessed by all present, an open discussion such as the ones seen in this session can help overcome differences in perspective and avoid issues which could derail a project. This could be useful in virtually any setting where those from the technology world and those from the liberal arts world have a common stake.

Table 1
 Spirit & Place Festival Committee Ranking of E&T Proposal
 Note: size and make-up of the selection committee is not made public.

<u>Category</u>	<u>Score out of possible 5.00</u>
Originality/Creativity	4.46
Opportunity for Civic Engagement	3.38
Strength of Collaboration	4.10
Connection to Theme	4.31
Opportunity for Audience Interaction	3.62

Table 2
 Spirit & Place Festival Attendee Ranking of E&T Panel Discussion
 Note: Over 100 people attended, of which 28 completed the post-session survey

<u>Statement</u>	<u>Strongly Agree</u>	<u>Agree</u>	<u>Neutral</u>	<u>Disagree</u>	<u>Strongly Disagree</u>
Event quality was high overall.	14.3%	67.9%	17.9%	0%	0%
I came away with a deeper understanding of the topic.	22.2%	63.0%	11.1%	0%	0%
I am interested in learning more about this topic.	23.1%	53.8%	23.1%	0%	0%
I was encouraged to take part in discussions related to this topic.	14.8%	40.7%	40.7%	3.7%	0%
This event was related to the festival theme.	11.1%	63.0%	22.2%	3.7%	0%
The event was grounded in artistic, religious or humanities traditions.	14.8%	44.4%	37.0%	3.7%	0%
I was able to participate in the event.	19.2%	61.5%	15.4%	3.7%	0%
The speakers were excellent.	29.6%	59.3%	11.1%	0%	0%
The program was well organized.	18.5%	74.1%	7.4%	0%	0%

Competing in a Liberal Arts World

The most recent S&P festival presented the theme of “Risk” (see Figure 3). One of the new and unique pieces of this year’s festival was a “Competition on Race” (see Figure 4). As the festival organizers explained, it welcomed individuals and organizations from any sector and discipline, including artists and cultural leaders, faith leaders and congregations, educational organizations and scholars, civic organizations and social entrepreneurs. All were invited to submit original projects. Spirit & Place provided a platform on which, participants could dare to imagine a better life.¹⁴



Figure 3: The 2013 S&P festival theme was “Risk.” (used by permission of S&P festival)



Figure 4: The 2013 S&P festival included an innovative “Competition About Race.” (used by permission of the S&P festival)

Again, the IUPUI Motorsports Engineering program saw a unique opportunity to embrace the challenge of a “Competition about Race.” An entry, entitled “A Competition *About Race.....Using Racing*,” was submitted. The proposal explained that with a Bachelor of Science degree in Motorsports Engineering through the School of Engineering & Technology and a unique program in Motorsports Studies through the School of Liberal Arts, the campus was well positioned to enter the competition. The goal of the project was to create opportunities for young people and their families to engage in multi-racial teams, working together to explore various concepts from the motorsports industry to concurrently broaden their understanding of career opportunities in fields they would not normally be exposed to, and of their ability to work in unison with others on a team which crosses racial and gender boundaries.

Of 43 submissions, this single engineering related proposal made the final four along with a Latino Youth Collective project to develop a documentary touching on topics intended to spark and ignite deep and thoughtful conversation on the topic of race; an Indianapolis Neighborhood Resource Center proposal for interactive stations around the city inviting the public to think and talk about race and how it affects them; and a Girls Gift Inc. project to create a cross-racial mentoring program for young minority women. In the end, the engineering proposal did not win, however, by making it to the final round the program received positive television, radio, print media and public forum exposure, and once again, the program director and the program were recognized for reaching outside the E&T stereotype. Engineering participation in the festival has been widely recognized as expanding the broad perspectives that the organizers strive for, and the director has already been asked to consider submitting a proposal for a session for the 2014 festival.

Conclusions

Many experts feel that study of the liberal arts is an important part of any education, including engineering. Many collegiate engineering programs are incorporating classes from outside of engineering, and in some cases are trying new ways to integrate these into their plans of study. This paper has additionally examined ways to encourage collaboration between schools of Engineering & Technology and Liberal Arts. Not every campus will have access to something as intriguing as the Spirit and Place Festival. However, collaborative outreach opportunities can be found in virtually any setting.

LA schools tend to develop stronger relationships with community and cultural organizations than do engineering schools. E&T faculty can utilize this fact and connect with the needs of the community through their fellow faculty members in LA., resulting in unexpected opportunities to apply engineering knowledge and problem solving skills in new arenas. Seeking out areas of common interest among faculty members from different schools, engineering faculty can

increase outreach and develop shared research projects, classes and programs which enhance all the parties at any university.

By examining venues not normally viewed as open to engineering, and finding themes of commonality, E&T faculty can open lines of communication to possible partners in new venues. Sometimes this may require a bold step outside of the traditional box. However, the benefits to be gained in terms of widening exposure for engineering programs, acceptance of engineers as participants in a wider community, and new perspectives through sharing of ideas, make it well worth the risk. Therefore, E&T faculty should be encouraged to boldly seek common ground in areas they are unfamiliar with.

E&T faculty willing to take this step are likely to find themselves welcomed with open arms by the liberal arts community. One might question this assertion, as LA faculty are under the same kinds of pressures for tenure and class preparation. However, the authors have discovered, while developing a new collaboration with the School of Art in support of a unique engineering design project, that the resource constrained arts departments seek collaboration with engineering as a way to attract attention and potential funding. They simply do not know how to connect, and therefore welcome an approach by engineering faculty.

Collaboration between the engineering and liberal arts communities is not likely to result in new engineering courses examining the collected works of Shakespeare, writing poetry, or teaching verse in iambic-parameter. On the other hand, anything is possible.

We engineers need not be seen as bland.
Nor must we fear to reach out to our peers,
Who teach of things we do not understand.
Let us reach out and overcome our fears.
Then shall we strive to find a common ground,
And train a grad whose skills are found well round.

References

- [1] Snow, C. (1956). "The Two Cultures." *New Statesman*, 6 October 1956.
- [2] Snow, C. (1959). "The Rede Lecture." Cambridge, UK: Cambridge University Press.
- [3] Whelan, R. (2009). "Fifty Years On: C.P. Snow's 'Two Cultures' are United in Desperation." Raleigh, NC: The Civitas Institute.
- [4] Wadhwa, V. (2011). "Engineering vs. Liberal Arts: Who's Right – Bill or Steve?" TechCrunch, available at www.techcrunch.com/2011/03/21/engineering-vs-liberal-arts-whos-right.
- [5] Patnaik, R. (2012). "Liberal Education Complements Engineering." *Peer Review*, 14(2).
- [6] Clark, R. (2008). "Engaging Non-Engineers in Engineering." *Chronicle of Higher Education*, 55(2).

- [7] “Engineering and the Liberal Arts, Strangers No Longer.” *Chronicle of Higher Education*, 55(2).
- [8] Crist, C.. (2008). “Engineering’s Influence on the Curriculum.” *Chronicle of Higher Education*, 55(2).
- [9] Ainlay, S. (2008). “Engineering and New Ways of Thinking.” *Chronicle of Higher Education*, 55(2).
- [10] O’Neill-Carrillo, E., Seijo, L., Maldonado, F., Hirleman, E., Marti, E., Rivera, A. (2007). “Mentoring Interdisciplinary Service Learning Projects.” *Proceedings of the Frontiers in Education Conference*, Milwaukee, WI.
- [11] Catalano, G. (2007). “Making Gentle the Life of the World.” *Proceedings of the Frontiers in Education Conference*, Milwaukee, WI.
- [12] “Welcome to Motorsports Studies.” *IU School of Liberal Arts* website. Retrieved from <http://liberalarts.iupui.edu/motorsports>.
- [13] *Risk: Nov 1-10* (2013). Indianapolis, IN: Spirit & Place Festival.
- [14] *Opening Night: \$20K: A Competition About Race* (2013). Indianapolis, IN: Spirit & Place Festival.