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## Internationalizing Engineering Education: Looking Forward, Looking Back

Brent Jesiek

Purdue University, [bjesiek@purdue.edu](mailto:bjesiek@purdue.edu)

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## ***EDITORIAL***

### **Internationalizing Engineering Education: Looking Forward, Looking Back**

*Brent K. Jesiek, Purdue University*

What does the future hold for internationalizing engineering education? History provides some important clues, revealing how ascendant social, economic, and political dynamics have inspired a long series of earlier efforts to cultivate engineers who can span national and cultural boundaries (Jesiek & Beddoes, 2010). Concerns about diplomacy and then international development were initially paramount from the 1940s into the 1970s, with engineers imagined as important actors in ongoing contests for power and influence among the Eastern and Western blocs. In the post-cold war era to the present, such concerns have been supplemented and to some extent displaced by discourses about competitiveness, globalization, and professional mobility, reflecting new kinds of power struggles as companies and countries alike jockey for global economic and technological leadership on the world stage.

Against this backdrop, the late 1980s into the early 2000s was marked by a flurry of activity in the new field of “global engineering education.” Among many developments, the mid-eighties saw formation of the ASEE’s International Division, along with establishment of pioneering international engineering education programs at numerous schools. The Global Engineering Education Exchange (GE3) was in turn formed in 1995 to facilitate international student exchange among a larger consortium of universities. A joint RPI-Boeing workshop generated a “Manifesto for Global Engineering Education” in 1997, followed by the first Annual Colloquium on International Engineering Education organized by the University of Rhode Island in 1998. This momentum continued with the 2006 founding of the *Online Journal of Global Engineering Education (OJGEE)* as a new outlet for scholarly work in the field, followed by a 2008 workshop where the “Newport Declaration to Globalize U.S. Engineering Education” was signed (Hirleman & Grandin, 2009).

The Newport Declaration was a kind of exclamation point and rallying cry for a movement that had gained considerable momentum. As the accompanying workshop report noted, period estimates suggested that only about 3% of engineering students were going abroad

for educational experiences while pursuing undergraduate degrees (Hirleman & Grandin, 2009, p. 10). The report identified numerous obstacles and hurdles associated with efforts to further “globalize” engineering education. In response to these issues and challenges, the Newport Declaration called on educators, administrators, and policymakers to take “immediate steps to integrate global education into the engineering curriculum to impact all students, recognizing global competency as one of the highest priorities for their graduates” (Grandin & Hirleman, 2009, p. 23).

Where does the field stand now, with another decade in the rear view mirror? To be sure, many of the programs established in the 1980s and 1990s remain active and even growing, and the number of engineering students who study abroad continues to inch upward. For example, the proportion of engineering students among all students studying abroad increased from 2.9% in 2005-6 to 5.1% in 2015-16, or from about 6,500 to almost 17,000 students, respectively (IIE, 2017). The latter figure represents about 15% of the total number of bachelor’s degrees awarded in engineering in 2015-16 (Yoder, 2016, p. 14). While these are impressive figures, much of this growth has likely occurred in short-term programs, which arguably have different – and some would argue lesser – impacts on participating students (IIE, 2017). Further, initiatives to dramatically increase the number of students at some leading engineering schools, such as RPI and Georgia Tech, have waxed and waned in the midst of leadership changes, financial constraints, and other factors.

At the same time, contrasting forces on the national and world stage raise new questions about the benefits of internationalization. A long and intense period of social, economic, and cultural globalization is now potently juxtaposed with resurgent forces of nationalism, regionalism, protectionism, factionalism, and tribalism in many parts of the world. What roles can and should engineers play in addressing the world’s challenges, and how can we help prepare them to excel? International education is arguably more important than ever, providing pathways to enhance the global mobility of graduates in response to employer demands, cultivate a sense of global citizenship and responsibility among our future leaders, and more generally enhance the ability of engineers and other professionals to work more effectively with diverse others – including colleagues, stakeholders, and communities. Engineers are also urgently needed to help address rising global threats such as climate change, along with looming challenges associated with rapid and unpredictable technological advancements.

To be sure, some positive indicators are worth noting. Recently revised ABET accreditation criteria include the word “global” in two of seven outcomes (ABET, 2017, pp. 39-40), suggesting that the profession remains cognizant that engineers need to learn how to work effectively across countries and cultures. At the same time, many schools continue to explore and investigate innovative program formats. For example, high-

impact intercultural learning experiences are being offered at many schools in the context of both on-campus and travel programs. New approaches are also being taken to better scaffold and document learning in such programs, such as via formal mentoring programs and structured reflection activities. Many institutions involved in designing international programs have expanded their operational mission to systematically assess student learning outcomes. Funding agencies such as NSF have likewise accepted the benefits of international learning and technology transfer and have created funding channels to align with these priorities, including through the Partnerships for International Research and Education (PIRE), International Research Experiences for Students (IRES), and Research Traineeship (NRT) programs.

The *Journal of International Engineering Education* is another important piece of this puzzle. Building on the solid foundations of its predecessor journal (OJGEE), our editorial team is injecting new life and vitality into this peer-reviewed publication outlet. Our goal is to work closely with our contributing authors to nurture and disseminate high quality research and scholarship to academics and professionals who are engaged in all facets of internationalizing engineering education. Aligned with this mission, our revised call for papers invites contributions in three main categories: research, practice, and perspectives.

We are also excited about how this inaugural issue of JIEE reflects the breadth and depth of possibilities for innovative scholarship in the field. To provide some further historical context, we begin with a short perspective piece by John Grandin about the origins and early history of the Annual Colloquium on International Engineering Education. We then turn to three research papers reflecting an impressive diversity of topics and approaches, starting with a contribution by Streiner and Besterfield-Sacre that offers a wide-ranging perspective based on interview data collected from ten administrators involved with international education at nine engineering schools. These authors use a concept mapping approach to identify and thematically cluster strategies associated with global program development. Their findings have notable research to practice implications, hopefully spurring faculty, staff, and other stakeholders to think more strategically about creating and sustaining high impact global learning experiences.

The remaining two papers in the volume focus on specific programs. The paper by Davis and Knight centers on Virginia Tech's innovative Rising Sophomore Abroad Program (RSAP). Their systematic approach to data collection and analysis can be viewed as an exemplar for future studies of this type, and their findings include many intriguing insights about the kinds of on- and off-campus learning that may be happening in many global engineering programs. Finally, the contribution by Hite and Thompson shifts our attention to an emerging context of global engineering, namely the pre-college environment. Using activity theory as a guiding frame, the authors report on many rich

sources of data to reflect on learning outcomes from a collaborative design project implemented with multiple groups of 4<sup>th</sup> grade students in Thailand.

In closing, I am grateful to my outstanding co-editors Sigrid Berka and Damon Rarick for their hard work in relaunching the journal. Together, we wholeheartedly thank the authors represented in this issue for their dedication, trust, and patience, particularly given all the uncertainties we faced together along the way. We also acknowledge the numerous anonymous peer reviewers who helped evaluate and improve the papers presented herein. We hope you enjoy the new JIEE. We welcome your feedback and comments, and encourage you to submit your work to be considered for future issues.

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