

## ICMERE2015-Keynote-III

### GLOBAL COMPETENCY FOR ENGINEERS

Abu S. M. Masud

Boeing Global Engineering Professor  
Wichita State University, Wichita, Kansas, USA

abu.masud@wichita.edu

***Abstract-** In the age of global connectedness, engineers, like most other professionals, must design, produce and service products and processes from a global perspective. So, our academics need to ask: are we preparing our graduates to work and be successful in this global environment? This talk will discuss: why (we should internationalize our student's academic experience), what (is meant by global competence), and how (we can assure that our graduate will have the skills and knowledge necessary for work and to be successful).*

**Keywords:** global education, global skills, engineering curriculum

#### 1. INTRODUCTION

A February 24, 2015, article in BizJournals.com suggests that "All business is global." Since engineered products and services are a major segment in business, engineers who design, produce, and service these products and processes must also have global perspective. This is true even for companies that only serve local needs because much of its supply chain, customers, and collaborators are global. Whether you are a senior executive of a company or a student trying to obtain the skills that will be required tomorrow, you can't escape the impact of what's occurring on the world stage.

#### 2. WHY INTERNATIONALIZE STUDENT ACADEMIC EXPERIENCE?

Employers of our graduates, particularly those of engineering and business disciplines, and our corporate partners have often stated the need for engineers (read, employees) who can work in global teams, where teams are made up of members from different cultures, speaking different languages, following different religions, and living in different countries. These teams develop, design, produce, deploy and maintain products and services for all consumers and customers.

A 2004 taskforce report for NASALULGC [1] has suggested that internationalization, meaning "integrating international perspectives and experiences into learning, discovery and engagement" should be pursued because internationalization -

- helps students to "develop the global critical thinking essential to contributing as citizens of the world and competing in the international marketplace;"
- helps communities to link "to the world,

expanding opportunities for university service and engagement while also enhancing their global competitiveness;"

- "enlivens faculty scholarship and teaching, expands research opportunities, and provides a pathway to national and international distinction."

A 2006 report prepared for the American Society for Engineering Education [2] concludes that "Today, engineering colleges ... must educate their students to work as part of teams, communicate well, and understand the economic, social, environmental and international context of their professional activities."

A 2007 paper in Online Journal for Global Engineering Education [3] further outlines the need for global competence of engineering graduates - "Global competency is essential for engineers from any country who now compete in an international market for engineering know-how. No longer is cultural sensitivity needed only for product design destined for diverse markets. Increasingly, successful entry into the engineering profession requires significant intercultural skills in order to join efficient and productive collaborations with diverse engineering colleagues. Those colleagues may be encountered "virtually" at a distance, in person at an international site, or next door in the office of a multinational corporation. Outsourcing is increasing, not only for products but also for processes, including highly technical engineering work. Projects are distributed across sites and effective collaboration requires professionals who can work productively with colleagues who are very different from themselves."

### 3. WHAT IS GLOBAL COMPETENCE?

A 2010 NEA (National Education Association, Washington, DC) Policy Brief [4], suggests that “Global competence refers to the acquisition of in-depth knowledge and understanding of international issues, an appreciation of and ability to learn and work with people from diverse linguistic and cultural backgrounds, proficiency in a foreign language, and skills to function productively in an interdependent world community.”

International education, global education, and global competency are terms that are used often to state interrelated ideas for educating graduates to become productive members of the world today and in the future. Here are some potential definitions of these terms as they relate to engineering education (from the 2004 NASAULGC report):

- **Internationalization:** the process of integrating international and multicultural perspectives and experiences into the learning, discovery and engagement mission of higher education.
- **Global Competence:** the ability of faculty, staff and students not only to contribute to knowledge, but also to comprehend, analyze, and evaluate its meaning in the context of an increasingly globalized world.
- **Global education:** It is an education perspective which arises from the fact that contemporary people live and interact in an increasingly globalized world. This makes it crucial for education to give learners the opportunity and competences to reflect and share their own point of view and role within a global, interconnected society, as well as to understand and discuss complex relationships of common social, ecological, political and economic issues, so as to derive new ways of thinking and acting.

The 2010 NEA policy brief identifies four characteristics of global competence:

- **International awareness.** This constitutes the knowledge and understanding of world history, socioeconomic and political systems, and other global events.
- **Appreciation of cultural diversity.** This entails the ability to know, understand, and appreciate people from other cultures along with the capacity to acknowledge other points of view about pressing world issues.
- **Proficiency in foreign languages.** The ability to understand, read, write, and speak in more than one language enhances cross-cultural communication skills.
- **Competitive skills.** The ability to compete globally entails the acquisition of extensive knowledge of international issues. To be able to compete, students need high-level thinking skills that enhance creativity and innovation.

The 2004 NASAULGC document referred to earlier articulates five characteristics of globally competent graduates:

- Have diverse and knowledgeable worldview,
- Able to comprehend the international

dimensions of the major field of study,

- Able to communicate effectively in another language and/or cross-culturally,
  - Exhibit cross-cultural sensitivity and adaptability, and
  - Continue global learning throughout life.

In the paper “Toward Globally Competent Pedagogy” by Charlotte West [5] suggests that global competence requires:

- Knowledge of other world regions, cultures, and international issues
- Skills in communicating in languages other than English while working in global or cross-cultural environments
- Ability to use information from different sources around the world
- Modeling the values and perspectives of respect and concern for other cultures, peoples, and global realities.

**To summarize for our purpose,** for a graduate to have global competence, **we must assure that our program graduates will:**

- Have diverse and knowledgeable worldview (that is, knowledge of other world regions, cultures and international issues),
- Be able to communicate effectively in another language and/or cross-culturally (that is, communicate in other languages while working in global and cross-cultural environments), and
- Exhibit cross-cultural sensitivity and adaptability (that is, be able to adapt to the values and perspectives of respect and concern for other cultures, peoples, and global realities).

### 4. HOW TO INCORPORATE GLOBAL COMPETENCE AS AN OUTCOME IN ENGINEERING EDUCATION?

To discuss how to assure global competence for our program graduates, let us start from an understanding of where we are now.

I took a quick look at the web pages of the ME programs of CUET and BUET. It revealed that the current BSc in ME curricula at CUET and BUET have the following characteristics:

- Curriculum at both universities are very similar in requirement; total 160 credit hours in CUET and 161.50 credit hours in BUET
- Requires very little outside of mathematics, sciences and engineering courses – 11 credit hours of Humanities (English, Economics, Industrial Law & Accountancy, and Sociology & Industrial Psychology) in CUET; 9 credit hours of Humanities (selected from English, Economics, Sociology, Government, Accounting, and Industrial Sociology) in BUET.

Unless I am mistaken, after the eighth grade in school, these students have only had one course besides English and Bengali, on Social Studies (a combination of history, geography and civics) in grades 9 and 10. They have not had any other social sciences or humanities courses. Yet, these courses are often a foundation for

developing soft and global skills. That is, the ME graduates from either of these two programs will not receive much instruction in “soft skills” that most of the employers currently look for in addition to technical skills. What are those “soft skills” that employers are looking for? –

- be able to communicate well (orally and in writing),
- be able to work in (global) teams,
- have an understanding of human behaviors, society and culture, and
- be knowledgeable and have an understanding of ethics and technical professional codes of conduct.

In addition, for the 21<sup>st</sup> century engineers, the graduates must also have global competency. I might mention here that ABET, the accrediting agency for engineering and technology programs in the US (and globally), requires achievement of the following minimum learning outcomes that relate to global competence for graduates [6]:

- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

These five out of eleven required learning outcomes have to do with “soft and global skills.” For a graduate to have global competence, we must assure that our program graduates will:

- Have diverse and knowledgeable worldview (that is, knowledge of other world regions, cultures and international issues),
- Be able to communicate effectively in another language and/or cross-culturally (that is, communicate in other languages while working in global and cross-cultural environments), and
- Exhibit cross-cultural sensitivity and adaptability (that is, be able to adapt to the values and perspectives of respect and concern for other cultures, peoples, and global realities).

Where in our curriculum, students have an opportunity to gain knowledge in:

- Language
- Communication (verbal, written)
- Team work
- Humanities and social sciences

How many credit-hours do your programs require in these areas?

So, how can you add in these areas without expanding your curriculum?

Communication and Team Work in the curriculum:

- In-class team assignments with oral and written presentations
- Use Sessional or Lab classes to include team

assignment with oral and written reports beyond the typical lab reports

Experiential learning opportunities in real-world settings:

- case studies with real-world data/settings
- industry trips as learning opportunities
- industry/corporate partners to help develop course projects
- tap contemporary events to introduce global connection
- internships with jobs that reinforce course acquired skills/ knowledge

Re-engineering current curriculum:

- can you introduce new or redesign current courses to teach soft and global concepts by revising the technical courses?
- sometimes “less” can be “more”!
- rethink your curriculum goals or objectives in light of the new global realities (this is a longer process)
- can the same technical content be repackaged to create space for new courses?
- do you have industrial/alumni partners to assist you in identifying the required skills/knowledge?

What are we doing in my department in WSU?

- an engaged Industrial Advisory Council
- industrial connections tapped to provide Senior Design and class projects – experiential education
- many courses include team work, written/oral reporting

What else? (do more!)

- create an optional minor and certificate in “global competence”
- investigate how we can stress “global knowledge” by pre-selecting specific “general education” course sets
- add more international co-op/internship opportunities

What can CUET/BUET do? It does not necessarily have to mean a large number of new required courses in languages, humanities or social sciences. Engineering faculty may have to be flexible in repackaging course topical material to create space for any new course! This is not an easy task.

I would suggest that you consider a combination of the following steps:

- Involve your institutional stakeholders (faculty, administrators, employers/corporate supporters, alumni, students, etc.) to articulate a need for assuring learning outcomes for your graduates in the areas of soft skills and global competence.
- Benchmark with a selected set of aspirational programs regionally and globally to identify how your curriculum can incorporate soft skills and global competence teaching.
- Considering your institutional constraints, develop an “ideal” curriculum based on contents (topics), not on courses.
- Convert the topics based “ideal” curriculum of

courses.

- Increase opportunities outside of classrooms for your students to acquire and practice engineering skills and knowledge that involve non-technical areas (e.g., solving more real world problems in courses)

In conclusion, we need to offer our students the educational opportunities to gain skills and knowledge in the “soft” areas and, more importantly, in global competence. This is needed for them to be successful professionals. I have pointed out what global competence is and some of the ways we may be able to incorporate them in the educational opportunities for our students. As you might have guessed, for this to be a success, it would need high level support and faculty time and resources and involvement. Is it doable? YES!

## 7. REFERENCES

- [1] “A Call to Leadership: The Presidential Role in Internationalizing the University,” Report of the NASULGC Task Force on International Education, October 2004.
- [2] E. Dowell, E. Baum, and J. McTague, “Green Report: Engineering Education for a Changing World,” American Society for Engineering Education, 2006.
- [3] Beate I. Allert, Dianne L. Atkinson, Eckhard A. Groll, and E. Dan Hirleman, "Making the Case for Global Engineering: Building Foreign Language Collaborations for Designing, Implementing, and Assessing Programs," *Online Journal for Global Engineering Education*, Vol. 2, No. 2, 2007.
- [4] “Global Competence Is a 21<sup>st</sup> Century Imperative,” National Education Association (NEA) Policy Brief, No. PB28A, 2010.
- [5] Charlotte West, “Toward Globally Competent Pedagogy,” <http://www.nafsa.org/wcm/Product?prodid=379>, 2012.
- [6] “Criteria for Accrediting Engineering Programs (Effective for Reviews During the 2015-2016 Accreditation Cycle),” <http://www.abet.org/wp-content/uploads/2015/05/E001-15-16-EAC-Criteria-03-10-15.pdf>.

### Other Resources

- [7] J. Knight, “Internationalisation: Elements and Checkpoints,” Canadian Bureau for International Education, Ottawa, 1994.