Special Session – Prepare Locally to Engineer Globally: Embedding a Global Citizenship Foundation into Engineering Curricula

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Abstract - Design projects that require engineering students to travel to other countries and semesters abroad have the potential to be very powerful learning experiences for those students. Unfortunately, cost and other constraints keep many students from taking advantage of such experiences and not all of those students who do travel reap the hoped-for gains. The goal of this special session is to discuss the importance of domestic preparation for global citizenry and consider options that are available to engineering departments to not only satisfy the ABET global and societal impact requirement but truly prepare students to be global citizens. This issue is particularly vital for those students who will not have a travel abroad opportunity as part of their curriculum. Aimed at faculty, department chairs, and student support personnel, this special session will address pedagogical options that can be embedded into the curriculum for human dignity, expanding mental models, and achieving complex thinking.

Index Terms – complex thinking, global citizen, human dignity, mental models.

INTRODUCTION

Colleges of all varieties, realizing the importance of preparing students to participate in a global economy, are strongly encouraging study abroad programs [1]. Semesters or years spend in study abroad and design projects that require engineering students to travel to other countries have the potential to be very powerful learning experiences for those students. Unfortunately, cost and other constraints keep many students from taking advantage of such experiences. Those students who are able to travel abroad within their studies or work with an international team are not always sufficiently prepared to grasp the full cultural and language lessons in which they are immersed, to process what they experience, and/or to re-acclimate upon return [2].

This special session draws on the three-sided framework used by one engineering department to prepare students to be global citizens whether they have the opportunity to study/work abroad during their college experience or not. The next section gives a brief overview of the framework. The sections following the framework provide a beginning list of starting places that can be threaded into engineering curricula and the goals for this interactive special session.

FOUNDATIONS FOR GLOBAL CITIZENSHIP

The Industrial Engineering department at the South Dakota School of Mines and Technology (SDSMT) has created an emergent framework for positive global citizenship. This framework is made up of three elements considered to be the foundation of a student’s lifelong journey to living and working in the global environment: human dignity, expanding one’s mental models, and achieving complex thinking. These three elements are threaded throughout the Industrial Engineering curriculum at SDSMT. Using Haws’ framework for teaching ethics in engineering (dogma, heuristics, case studies, meta-ethics), [3] individual courses and projects explore the three elements at different levels, but the goal of the curriculum as a whole is to explore all three elements at the meta-ethics level, or within the social and organizational context.

I. Human Dignity

The prerequisite for demonstrating true citizenship, national or global, is developing a basic respect for human dignity [4]. This respect affects not only choices made in engineering design, but teamwork, leadership, and communication.

II. Expanding Mental Models

An individual’s mental model is the framework through which that individual interprets and reacts to the world [5]. Helping our students to expand their mental models in regards to global citizenry means helping the students build an awareness of differences and similarities across cultures. This includes language, verbal and non-verbal communication, approaches to hierarchy, and social norms. In addition, students need to internalize the difference between the goals of collaboration and cooptation [6].

III. Complex Thinking

Underlying the expansion of mental models is a need for increased ability to perform complex thinking. According to King and Kitchner [7], the average college student graduates in the intellectual development stage that the Steps for Better Thinking model calls the “Biased Jumper” [8]. If the curriculum is not providing opportunities for students to move themselves out of this stage to higher levels of
complex thinking, true cross-cultural understanding will be severely damaged [9].

**FINDING YOUR OWN STARTING PLACE**

The opportunities to thread the three foundational elements introduced above are only limited by the imagination of the faculty and the time the faculty have available to implement their pedagogical choices. Additionally, many of the pedagogical choices that support the foundations of global citizenship leverage with or outright support other important topics in engineering education, such as life-long learning [10] and ethics.

One option to consider is to seek out off-campus opportunities that are local or otherwise have a lower cost to the student and college, such as working with Native American tribes and reservations, local services for people with disabilities and adult workshops, and the many geriatric and pediatric groups. Through intentional relationship development with these and similar organizations, opportunities are available to introduce students to a group likely to be different than their own up-bringing while aiding another organization to meet its goals.

Another option is make the pedagogical choice first and draw in the foundation elements in whatever pedagogical method best fits the course in questions. Some of the many choices that can easily support the foundations of global citizenry include service learning, case studies, in-class simulations, guest speakers, and cooperative projects with both on and off campus entities.

Regardless of whether an instructor or a degree program choose to develop an overall foundational focus, such as a particular group or organization, or use many opportunities in different contexts, it is important that students have appropriate opportunities for reflection and debriefing so that the students test and adjust their mental models.

**SESSION GOALS**

The main goal of this special session is to discuss the importance of domestic preparation for global citizenry and consider options that are available to engineering departments to not only satisfy the ABET global and societal impact requirement but truly prepare students to be global citizens. This issue is particularly vital for those students who will not have a travel abroad opportunity as part of their curriculum.

This session is designed to be interactive and as a result of the combined efforts of the background brought by the session presenters and the experiences of the other participants, the participants in this session will:

- be better able to articulate the curricular elements and pedagogical choices that support their students’ development as global citizens; and
- take home additional ideas that they may chose to apply in their own courses and degree programs.

**REFERENCES**


