Global Competency for Engineers

A Senior Project

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By

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Introduction

According to Linda Katehi in her written remarks to the Engineer of 2020 Summit on Engineering Education in 2004, there is a broad agreement that, “US engineers will face totally different problems from the ones we face today... US engineers will be based abroad, will have to travel (physically or virtually) around the world to meet customers, and will have to converse proficiently in more than one language. US engineers will represent a minority culture and, thus, will have to be open to different religions, different ways of thinking, and different social values” (Katehi, 152). Not all U.S. engineers are prepared to go global.

Not being prepared to go global due to lack of global competency can lead to failure in expatriate assignments. According to Robert Kohls, former director of training for the U.S. Information Agency and the Meridian International Center in D.C., who's also written books such as “Survival Kit for Overseas Living,” as much as forty to sixty percent of expatriate assignments fail due to lack of global competency and result in the early removal of the project or an employee staying at the cost of their productivity levels dropping far below what it could have been in the U.S. An average failed assignment could cost “... $150,000 to $250,000 in direct costs for an American company to bring a mid-level employee home from a foreign assignment... Other estimates place the cost of overseas assignments anywhere from $250,000 to 1 million dollars, 'not to mention lost contracts, dissatisfied customers, and other collateral damage.’” Fortunately, according to Kohls, “with effective intercultural training, the failure rate can be reduced to 5 percent or less” (Del Vitto, 2).
Deliverables

My goal was to create a workshop that could be used in the engineering industry to better help people gain “effective intercultural training” and prevent these failed assignments (Del Vitto, 2). This included a six hour workshop in which I created a lesson plan outline that included what activity was going to be used, how much time each activity took, and the purpose of each activity. I also included “resource” papers in which the facilitator referred to for detailed instructions on each activity, as well as what tools need to be used, and a more detailed goal and objective. For the activities, I curated a variety of articles for the participants to read as well as interactive games for the participants to engage in. The facilitator is also provided with a PowerPoint presentation that I created for them to refer to while conducting the workshop with additional presentation notes attached to the bottom.

I wanted to be able to reach out to all different learners and target certain educational levels. For this reason, I included activities that would appeal to kinesthetic, visual, as well as auditory learners. To achieve this, I included a combination of interactive games, presentation slides, and many discussions. For my resources, I included a section of what learners were “targeted” during a certain lesson. I also added a brief reasoning on which certain part of the activity targeted a certain learner (i.e. “Auditory (discussion, dialog, listening)”). To reach out to the different levels of educational understanding, I incorporated Bloom’s Taxonomy Pyramid into my resources for the instructor to facilitate discussion based on the different questions I provided. I mentioned what level of Bloom’s Pyramid (refer to Figure 5) was trying to be achieved, and included questions that would fall under that category. For example, if I was trying to
achieve Bloom’s objective of Synthesis, I gave an example question of “What changes would you make…?” that was relevant to the reading.

**Literature and Existing Trainings**

As I began my search for existing global competency workshops and findings, I found that there were endless studies and relevant research. Universities such as Georgia Tech and Rhode Island have already begun integrating cultural competency courses as a requirement for their engineers. Many studies such as the ASEE paper (see below) have already been conducted along with cross-cultural workshops and readings that have been used in a variety of educational and professional settings to demonstrate the importance and relevancy of global competency. There has already even been enough evidence of the lack of global competency to formulate statistics on its effects in the real world as demonstrated above in my introduction.

When I was looking for cross-cultural workshops that were already out in the public, I had one main requirement. I wanted to stray away from workshops that encouraged “cultural sensitivity.” I realized this after coming across an article titled “Why Cultural Sensitivity Training Is Ineffective and Insensitive,” written by Susana Rinderle, the President of Susana Rinderle Consulting, LLC, which is a consulting company that specializes in helping people “communicate effectively across differences and translate their good intentions into positive impacts” (Rinderle, “Why Cultural Sensitivity Training is Ineffective and Insensitive”).

According to Rinderle, there are three reasons why cultural sensitivity training doesn't work. First of all, it “indirectly calls out a limiting belief that the solution is that 'we' need to be more 'sensitive' to 'them'... Typically it carries an unspoken, even
unconscious racial tone – a belief that white people need to be more sensitive to people of color, or to a particular racial or ethnic group. It reinforces a perceived or real power imbalance – a notion that the solution to a problem is that I be more sensitive to you. That implies that you are fragile and need to be handled gently so you don't break...” Second of all, “participants are given generalized, sometimes stereotypical information about cultural or racial groups, perhaps walked through ways to build awareness, then sent back to their job duties tasked with being more sensitive. This can create an environment of walking on eggshells that is a barrier to effective communication and authentic relationships... Third of all, cultural sensitivity training rarely has clear goals that get at the root of whatever problem needs to be solved... Implementing a training program that has no goals, measurable results or clear outcomes tied to organizational mission and values is a waste of time an resources and one reason they fail” (Rinderle, “Why Cultural Sensitivity Training Is Ineffective and Insensitive”).

Keeping this in mind, I set out to find existing workshops that focused on having goals of achieving global competency and not cultural sensitivity. This meant that the workshops I modeled mine after, had set training activities and information that provided participants with a set of tools and knowledge they could apply in the workplace. This included trainings that helped participants learn more about themselves as well as others, while interacting in games that helped them better understand the differences in culture and being able to experience them.

One such workshop I found that helped participants not only learned about themselves and how they interacted culturally, but also provided them with information on whatever destination they wanted to learn about was Aperian Global. This is a virtual
training session that is often used by Boeing for their employees that are going on expatriate assignments. They integrate intercultural training, customized consulting, and virtual learning programs that help users build global leadership, teams, business skills, and more, based on assessment tests and resources that the participants use.

As seen above, one of the resources that Aperian provides is a “GlobeSmart Profile” that allows users to compare their average profile to people from another country. Some of the characteristics listed are whether or not a user is independent or interdependent, if they like to take risks or need to be certain, and if they are direct or indirect communicators. I have included one such activity in my own workshop, however, it is a more basic version used so that participants can compare themselves with other participating peers in the workshop as seen in the example below.
Figure 2: Resource 14 Personality Quiz from “Global Competency for Engineers”

I believe Aperian Global is one of the best virtual tools that could be used in cross-cultural training due to the program’s detailed analysis of each individual. They also provide users with a detailed background of themselves based on assessments, and also compare the user’s personality and characteristics to the people of the country they wish to visit. This is a very useful tool in helping participants learn more about themselves as well as seeing how they would react in another country. However, because the tool is a virtual one, it gives less of a personal experience to the participants, which I believe is essential in having a greater impact in people and enabling them to remember these tools for life.

Another workshop I found to be quite helpful in creating my own was Robert Kohls’ “Developing Intercultural Awareness: A Cross-Cultural Training Handbook.” The goal of Kohls’ workshop was to, “… Increase your positive attitudes toward the people of
other countries… Increase your ability to communicate with people of other cultures…
Make you more aware of your own American values and unstated cultural assumptions
which may make you seem strange to other national groups… Reduce any
counterproductive stereotypes and prejudices which you might have toward people of
other cultures… [And] prepare you to be better adjusted and more productive in an
overseas living experience” (Kohls, 7).

The objectives in this workshop lined with my idea of what a workshop should
accomplish and served as a great resource for me to refer to and model my workshop
after. Kohls organized his workshop using a lesson plan that listed out the activity being
used, the time limit, and the purpose of the activity, which is the same approach I took for
my own. However, Kohls’ workshop was focused on a more broad audience, while I tried
to focus more on engineers, using specific readings that demonstrated real life situations
in an engineering environment.
Figure 3: Example of Kohls’ workshop outline

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Objective</th>
<th>Resource #</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10 min.</td>
<td>Welcome: - Facilitator introduces him/herself - Introduce objectives</td>
<td>Building rapport and trust Give participants an understanding of what will be taught in the workshop</td>
<td>1</td>
</tr>
<tr>
<td>10-15 min.</td>
<td>Icebreaker activity</td>
<td>Establish group participation and allows facilitator to get to know participants</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 4: Example of “Global Competency for Engineers” workshop outline

Figure 3 above is an example of Kohls’ workshop compared to my own.

Aside from taking inspiration from the two workshops listed, I also used simulation games that have been successful for many users. One such game is called Bafa
Bafa, in which the goal of the game is to have participants:

1. Understand the meaning and impact of culture
2. Demonstrate how one’s feelings of attachment to a given culture are learned through the processes of socialization, and that one’s tendency to judge other cultures is based on one’s own cultural perspective
3. To demonstrate the potential for misinterpretation that arises when one evaluates another culture solely from the perspective of one’s own values
4. To build awareness of the extent to which cultures can vary (cultural difference) and to help participants work through these differences
5. To help participants come to appreciate cultural diversity and to examine their attitudes and behaviors towards others who are “different” from themselves

(Asanet, “An Introduction To Sociology”)

This game is played by having participants assigned into two different groups of “Alphas” and “Betas” in which they both have their own set of cultural rules. Both cultures have different cultural values and participants must interact accordingly based on their new cultures. Participants interact with people from opposite cultures and experience what it is like to communicate with others from a different background and see the difficulties in cross-cultural communication. This game was a perfect way for me to demonstrate the difficulties of communication between people from different backgrounds, and had already been proven successful in past uses.

Another game I found to be highly productive in demonstrating the difficulties of a cross-cultural setting is Barnga. The purpose of Barnga is to “… explore factors related to communication problems in intercultural situations. The term culture is used broadly;
for example, the game could be used to explore communication problems among people in different departments. Specifically, BARNGA entraps participants into assuming that everyone abides by the same rules of acceptable behavior. BARNGA points out that obvious cultural differences create fewer problems than subtle differences” (Barnga, 7). While this may seem similar to Bafa Bafa’s goals, the difference between the two is that Barnga is a simulation that also uses a game within it, in which participants must all work together on the game in order to accomplish a common goal.

This, I believe, perfectly demonstrates the frustrations and problems that could occur in the workplace between employees from different backgrounds. It shows that there are certain lessons to be learned and differences to take notice of when working with others, especially in a professional environment. There are things we may have overlooked or not thought of as important before. It gives the participants a more personal experience into what could happen if there was cultural clash in the workplace and the steps the participants would need to take to achieve a common goal, much like in the real world.

I also used a modified version of a game called “Partner Talk” in which participants are given certain communication habits that they must portray when they partner up with someone to have a conversation. The partners must interact with each other and display these habits for about ten minutes. The goal of this simulation is to have a discussion on how the “habits” made participants feel in a certain situation. Participants must discuss certain points that could have made them feel uncomfortable, or certain habits that made them feel out of place. This simulation is helpful in having users understand the different ways communication can be translated in certain cultures.
For the engineering focus of the workshop, I drew examples and stories from articles and resources such as the ASEE paper by Dr. Jane Lehr and Dr. Dianne DeTurris, in which several employees from a multinational defense company gave personal anecdotes on their experiences overseas. I also drew from examples I found in an article titled “Cross-Cultural ‘Soft Skills’ and the Global Engineer: Corporate ‘Best Practices’ and Trainer Methodologies” by Carol Del Vitto, a professor at the University of Central Florida. The purpose of these articles was to give specific and relevant examples to the engineering field. It would help foster discussion and opinions from the participants on the importance of being a globally competent engineer.

Overall, many of the resources and readings I chose to include in my workshop have already existed and been used in the industry. These activities have proven to be successful in the past. I included a simulation called Barnga, which has been used in cross-cultural communication classes, as well as in companies trying to introduce cross-cultural communication in the workplace. The simulation’s goal is to have participants experience cultural clashes and learn how to work through them in a game to achieve a common goal. Another simulation, Bafa Bafa, in which participants interact with one another while taking on new cultural customs, and discuss how they feel in different environments as an outsider. The readings included were taken from various schools as well as professional publications to distinguish a relevancy to the industry. Some of the readings include anecdotes directly from the field of engineering or other professional industries, as well as findings on the importance of global competency in engineering universities.
Resource Review

The originality of my workshop comes from my role as the “curator” of all the activities and resources I have used. While there are hundreds of resources to use, I had to find the ones that I thought served the purpose of my workshop best. Since the goals of my workshop were to have participants understand what global competency meant, why global competency was important, and how to achieve global competency, I had to have a set of defined guidelines in choosing the “right” activities and resources to use out of the hundreds of resources I went through. The guidelines were based on interviews and resources such as the ASEE paper as well as the “Cross Cultural ‘Soft Skills’ and the Global Engineer: Corporate ‘Best Practices’ and Trainer Methodologies” in which real life engineers and professionals listed what the industry needed in terms of a globally competent engineer.

Paul A. Camuti, President and CEO of Corporate Research Siemens Corporation, “in an article appearing in 2006 in the Online Journal for Global Engineering (OJGEE), describes that in order ‘to succeed in this new environment, new skills will be needed, skills that go beyond the traditional technical capabilities… In an environment that emphasizes cross-border collaboration, one needs to augment, analytical left-brain abilities with creative right-brain skills…”’ Qualities and skills that an engineer of the 21st century will need to succeed are “‘Good communication skills… the ability to work in teams; cross-cultural knowledge; social awareness; capacity to handle complex systems’” (Del Vitto, 3).

Another interview with Thomas Tischhauser, Vice President of the Powertrain and Chassis division of Continental Automotive Systems quotes him saying that
engineers “… must be prepared to ‘champion cultural diversity; by understanding that cultures are diverse… and need not only a good understanding of cultural differences, but also be able to function smoothly in a complex social setting’” (Del Vitto, 3). I also drew from four out of the six lessons learned from the ASEE paper interviews on the multinational defense company’s employees:

1. Try Not to Behave like an ‘Ugly American’
2. Understand the Differences Between the US and the Other Country
3. Focus on Communication
4. Build Relationships, Build Trust

Combining the skills and lessons each of the examples provided, I sought to curate a variety of activities that could accomplish each goal and build the skill that was listed. One of my main focuses was to also choose activities that allowed participants to have a personal experience with each lesson and be able to create personal memories and feelings after each activity. I felt like creating a personal experience that participants could go through would resonate in their minds and help build the skills they needed to become globally competent because they had personal experience in cultural clashes through the use of the games and activities in my workshop.

For example, both the Bafa Bafa and Barnga activities tackle the skills to “handle complex systems,” the ability to “function smoothly in a complex social setting,” as well as “understand the difference between the U.S. and the other country” by simulating different cultures in which participants understand what it is like to be in a cross-cultural setting. Participants are attempting to accomplish a common goal while also trying to understand another culture and interact in such a way that they succeed in the game. The
additional readings and activities in my workshop provide more of a connection as to how these skills can be used in the engineering field, and provides real life examples of the successes and failures that come with global competency, or lack thereof.

Another original aspect of my workshop is that I tried to reach out to all learners. I aimed to include activities for kinesthetic, visual, and auditory learners by incorporating a variety of resources that not only had participants actively learning in simulations, but I also made sure to include articles and readings that would reach out to visual learners, as well as discussion sessions that would be helpful to auditory learners. The resources I have for each activity also list what learner is being targeted in a certain lesson, and what components of the activity contribute to it. Another way I made my workshop unique from other workshops is the fact that I attempted to incorporate Bloom’s Taxonomy Pyramid into my lessons.

![Bloom's Taxonomy Pyramid](image)

**Figure 5: Image of Bloom’s Taxonomy Pyramid**
I used Bloom’s Taxonomy Pyramid in order to target different levels of educational goals. Each of my resources included questions that targeted different levels of Bloom’s Pyramid. This was my way of stimulating different educational levels in the participants by facilitating discussions using questions relevant to different levels of the pyramid.

**Design**

I created a lesson plan outline with the activity being used, the amount of time it would take to complete, and the objectives (refer back to Figure 3). I also included a resource page that described the objectives in detail, as well as listed what learners were targeted in that certain activity, what facilitation questions could be asked using Bloom’s Taxonomy Pyramid, and detailed instructions for the facilitator to carry out. With these resource pages I also included the readings that coordinated with the activity number. I also created a PowerPoint presentation with additional presenter notes. My timeline to work on this project was short. Although I worked on the ASEE paper with Dr. Lehr and Dr. DeTurris last year, I decided to change my senior project from a web-based application to this global competency workshop in the last four weeks.

**Week 1:** Gather information and resources to create a workshop

**Week 2:** Begin curating resources to use in the workshop based off of research

**Week 3:** Create the workshop along with the extra resources and materials

**Week 4:** Usability testing and final edits to the workshop

**Analysis and Verification of Project Success**

After receiving approval for my research from the Institutional Review Board
(IRB), I gathered a total of twelve test subjects for my analysis and verification of success. Six were participants from my Senior Projects class, and six were randomly selected. I gave each subject a survey on global competency before I began the mini presentation, and a second survey on global competency after the mini presentation. I defined success as having ten out of ten people who took the first survey and scored a 3 (neutral) and under for the two questions “I understand what global competency is” and “I know ways to be a globally competent engineer” then went through my workshop and on the second survey scored a 4 (agree) or above for the following two questions “You understand what it means to be a globally competent engineer” and “I learned ways to become a globally competent engineer.”

I labeled the surveys so I knew each person who took the first survey took the coordinating number of the second survey, so I could compare their first survey to their own second survey to see if my workshop had an impact on them. The reason why I focused on those two questions was because the answers would give me the most feedback on whether or not my workshop had an impact on the participants’ global competency knowledge. One of the main goals of my workshop was to have participants be able to take away the skills and tools that they would need in order to become globally competent.

However, I didn’t account for those who may have not filled out the questions and answered it completely truthfully. I should have considered those who may have not known what global competency was, but assumed they did. I also should have accounted for those who undermined their global competency knowledge and scored lower than they should have. These are steps I would re-consider in my future work on this
workshop if I were testing more subjects. I also would like to expand my future test subjects to include students in a variety of engineering majors, as well as engineering professionals in the real world.

The following is a breakdown of the demographic of students I had as my test subjects:

Total subjects: 12 Cal Poly Students

- 6 LAES majors
- 3 Liberal Studies majors
- 1 Political Science major
- 1 Journalism major
- 1 Graphic Communication major

First Survey:

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

1. I understand what global competency is. ___
2. Define global competency.
3. It is important to be globally competent as an engineer. ___
4. I know ways to be a globally competent engineer. ___

Figure 6: First survey from “Global Competency for Engineers” workshop

Second Survey:

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

After the workshop...

1. You understand what it means to be a globally competent engineer. ___
2. Define global competency.
3. It is important to be globally competent as an engineer. ___
4. I understand what it takes to be globally competent. ___
5. I learned ways to become a globally competent engineer. ______
6. Please list a few ways you can make yourself more globally competent.

**Figure 7:** Second survey from “Global Competency for Engineers” workshop

The link to the mini-presentation I created for this study is:

[https://docs.google.com/presentation/d/12GVeosCaWg20r1jEQKy-k75EqoEkNEyE2MNQR4u1ypA/edit?usp=sharing](https://docs.google.com/presentation/d/12GVeosCaWg20r1jEQKy-k75EqoEkNEyE2MNQR4u1ypA/edit?usp=sharing)

**Results**

First survey:

“I understand what global competency is.”

2 out of 12 students marked 4 for “Agree”

10 out of 12 students averaged a 1.9 between “Disagree” and “Strongly Disagree”

Second survey:

“I understand what global competency is.”

2 out of 12 student(s) averaged 4.5 for “Agree” to “Strongly Agree”

10 out of 12 student(s) averaged 4.5 for “Agree” to “Strongly Agree”

First survey:

“I know ways to be a globally competent engineer.”

2 out of 12 student(s) marked 4 for “Agree”

10 out of 12 students averaged a 1.8 between “Disagree” and “Strongly Disagree”

Second Survey:
“I know ways to be a globally competent engineer.”

12 out of 12 student(s) averaged 4.75 for “Agree” to “Strongly Agree”

I was successful in both of my questions. Students seemed to “agree” to “strongly agree” on understanding global competency as well as knowing ways to become a globally competent engineer after taking my short workshop. None of the students scored below a 4 on the second survey for “I know ways to be a globally competent engineer.” I do wish, however, that I had the time to test more students in engineering majors, as well as ask more in depth questions and be able to analyze their responses in the survey to gauge whether or not their original scores on global competency knowledge were accurate.

Societal Impacts

There is a clear need for globally competent engineers in an industry that is continuing to expand internationally. According to the Global Relocation Trends Survey Report, the number of American companies that have locations outside of the U.S., as well as the number of foreign companies coming into the U.S. has increased from “8% to 46% between 1999 and 2005” (Del Vitto, 5). The need to learn global competency skills and to be able to apply them in a professional setting is imminent if we want to remain on top of the engineering industry as a country. My workshop has the potential to be integrated into required introductory engineering classes to build a foundation in students as they work their way towards becoming future engineers. I also would like to pass along these materials to the LAES club for the officers to use this workshop to reach out to engineers or other majors that are interested in joining the LAES program. Dr. Lehr, Dr. DeTurris, and I also have plans to possibly use these materials within the next few
months at the multinational defense company we worked with on the ASEE paper.

**Next Steps**

For the next steps, I would like to be able to further expand the lessons by including more activities as well as creating a longer, three-day workshop. Other options would also include adding a handbook with anecdotes and stories, self-reflection pages, and journal pages in which the participants can document how they are feeling, or their thoughts during or after an activity. It would serve as a future guide for the participants to refer back to when they are traveling overseas after the workshop is over. I would also like to expand on my success analysis and be able to interview more engineers in school, as well as professionals in the real world, to see what I could have improved on, and if my workshop was helpful or not. If I had more time, I definitely would have interviewed a wider variety of engineering students within Cal Poly to determine if this workshop would be a useful asset to the engineering program at this school.

**Conclusion**

As the engineering field continues to expand and we become more integrated with other cultures, we need to build a strong global competency foundation in our engineers. This workshop has the potential to be the tool that helps build that foundation in our students as well as in our professionals. With the combination of activities, discussions, readings, and reflections, I believe there is a lot that can be taken away from this workshop. My goal was to create an interactive and personal experience to help participants explore the what, why, and how of global competency. I believe with some more work in the future, I could accomplish that goal and make a difference in the engineering community.
References


