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Managing Cultural Differences for Engineers

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Abstract - Understanding cultural issues, developing cross-cultural communication skills and recognizing the need to effectively apply these skills in the global arena are becoming critical success factors for an increasing number of engineers. To address these needs, an Engineering Management class has been developed at the University of Missouri - Rolla that uses a team project approach as the major method to achieve the learning objectives. The student teams develop training manuals for dealing with engineers from specific international cultures, based on the material learned in class as well as personal interactions with individuals of the specific ethnic background. An application of this class design is described.

The Need

Globalization is creating a rapidly increasing demand for engineers in our society who have the ability to deal effectively with professionals from other cultures. A number of trends are converging and intensifying this need. For example, foreign direct investment by U.S. companies has expanded rapidly, growing at a rate of 10 percent per year between 1982 and 1995, reaching a value of \$712 billion in 1995, a \$91 billion increase over 1994 [1]. At the same time, exports as a share of GDP has doubled from 6% to 12% in the last 13 years [2]. Technology transfers often drive these activities between organizations that lie across cultural boundaries, and engineers are the key personnel charged with their implementation. These strategic alliances, investments and trade relationships generate a growing demand for a new type of engineer, one who breaks down cultural barriers and has the capability to effectively communicate and interface with professionals from other cultures. The engineer's role could include: functioning as an expatriate, participating in a multinational project team requiring occasional trips, hosting an international engineer, working with a foreign trained engineer in a domestic facility, or tele-communicating with international contacts. Some might think that because engineering is an analytical field, cultural factors are not important. However, misinterpretations of intentions, or erroneous decoding of the communication, can easily destroy an individual's credibility, trust and respect, even before the technical issues are addressed. Many major projects and relationships have been ruined or severely hampered because of insensitivity

and lack of cultural preparation [3]-[5]. To fulfill this need, modern engineering education should prepare the students to better manage cultural differences.

However, an effective cross-cultural class for engineers is difficult to develop. Students with limited international experience find it difficult to appreciate the complexities, challenges and rewards of inter-cultural relationships. In addition, there is a tendency to focus on the obvious language difficulties, and ignore other crucial cultural factors. It is particularly difficult for students to question the validity and subjectivity of their own perception based merely on information from textbooks and lectures.

At the same time, most texts on the subject do not fulfill the needs for an engineering class. They tend to focus on the management and economic perspectives of strategic and business level issues. Other books deal with cross-cultural training and often focus on one specific culture. These are appropriate for individuals who are interested in that specific country but would limit this course since it seeks to develop general cross-cultural interpersonal capabilities.

However, most major universities have a valuable and underutilized resource that can add tremendous value to this learning process: their own international students. These international students can provide the teams with informed perceptions of their culture and, more importantly, provide personal interactions with professional level individuals from the culture of interest.

Class Design

This elective three credit-hours class, "Engineering Management 317: Comparative and Multi-National Management," is offered by the University of Missouri - Rolla. The objectives of the class are to:

- recognize the importance of culture in our own perceptions, values and behaviors;
- better understand cultural issues, similarities and differences;
- develop cross-cultural communications and interpersonal skills; and
- recognize the value of applying these skills.

The class uses **Managing Cultural Differences** [6] to provide a theoretical framework and focus on cross-cultural issues. The topics covered include: global leadership, communications, trends, negotiations, interpreters,

dimensions of national culture, co-opetition, cultural change, cultural synergy, cross-cultural effectiveness, transitions and relocations, and diversity at work. The class discussions that ensue, as well as many collaborative learning activities, support active class interaction that is critical to develop the perspectives and skills sought from this class. Cases are assigned and presented by teams, and practice exams are discussed first within the teams and finally by the class to encourage class interactions. The following are two representative exam questions. "Can all the cultural norms for a specific group be explicitly stated? Explain your response and include examples." "What are some of the major roles of dress and appearance in a culture?" However, the foundation of this class design is the team project.

The team project overcomes many of the difficulties associated with an effective cross-cultural class for engineers and takes advantage of the available university resources. It also offers the opportunity to develop cross-cultural communications and interpersonal skills through hands-on experience. Each student team produces a manual for working with engineers from a specific culture, or country, from which international students are available for participation. This class project is introduced at the beginning of the semester, so that as material is covered, application to the project can be recognized. This makes the material more relevant to the students. The material is also useful for the teams to plan and implement the interactions with the international students, or mentors, as they are called.

International students are appropriate subjects as mentors for the projects since they have personalities and characteristics similar to engineers from their home culture [7]. However, one of the special challenges with this approach is the recruitment of these mentors, since two or three mentors per project team are required. Luckily, most universities have international students' support organizations that can be very helpful in the recruitment process. Undergraduate or graduate engineering and applied science students are good prospects as potential mentors. They are more likely to volunteer if, without investing a large amount of time, they can see how they will learn more about American culture and help local students learn more about their culture. It helps that they are often driven by national pride to share their cultures with others. However, significant instructor intervention is still required.

Each team is responsible to prepare a progress report, develop a mentor intervention plan, make a formal presentation to the class and produce their manual. The progress report is scheduled around mid-term, and is designed to avoid procrastination and to share research methods and sources, as well as approaches among the teams. To encourage information sharing, it is made clear that the project grade is a function of their own quality and is not prejudiced by the quality of the other teams' work.

The project teams are responsible to design their own intervention plan with the mentors. An adequate intervention plan has the following characteristics:

- treats the mentors with respect and with consideration for their time;
- involves a majority of the team;
- allows the mentors to contribute in a flexible manner;
- allows the mentors freedom of behavior so that cultural aspects can be observed;
- allows for recording or documenting for analysis and use during the final presentation; and
- allows sufficient time to modify the plan if it becomes necessary, as is often the case.

The formal presentations are scheduled for one hour each at the end of the semester. The objectives of these presentations are:

- to share their experiences and new knowledge with the other students;
- generate discussions regarding the specific culture and comparisons with the other cultures;
- force the team to prioritize and organize their information;
- supply a basis for team grades;
- and provide a public speaking opportunity for the team members.

The teams are also responsible to design their own training manuals. The objective is to generate a manual that would be useful for American engineers that have a need to deal with engineers from that specific culture. Typical contents of a manual include: country data, history, demographic information, customs, cultural characteristics, business culture, engineering specific information, mentor interaction plan, and sources of information.

It is important that the project be as unstructured as the maturity of the class will allow. If the project is too well structured, there is a possibility that the teams will achieve their requirements without directly experiencing some of the cultural issues with their mentors. Because of this requirement, this class design is more appropriate for upper level undergraduate and graduate students.

Application

This class was offered in the fall of 1996. There were five teams formed focusing on Germany, Kuwait, Nepal, South Korea and Tunisia, with an average of five students per team. These cultures were selected because mentors from these countries were available. The instructor recruited sufficient mentors for all the teams, but some of the teams were able to find their own mentors and gain more flexibility regarding the country to study. Some of these mentors were not students, but they worked out well.

The presentations were very well done and exhibited a very high level of energy and enthusiasm. Most of the teams could have utilized more than an hour to present their valuable material and allow for better discussions. In spite of the time constraint, the discussions following the presentations were very thoughtful and dynamic since all the students had experienced a high level of involvement in these studies. The final class discussion productively compared the various cultures and ways for engineers to effectively work with them based on all the presentations.

The manuals synthesized the teams' total learning experiences. They included material learned in the structured part of the class as well as more personal recommendations and observations based on their direct interactions. The development of the manual structure by the team became an excellent review and analysis of all the material covered during the class. The effort to keep the manual from becoming too large forced the teams to prioritize and gain a deeper understanding of the issues. The final document provided a visible achievement that generated satisfaction to the students as well as a very effective future review tool for the team members.

The manual development effort was quite unstructured even though a number of effective templates were found early during the semester. Consequently, the teams experienced significant inter-cultural communication challenges while working with their mentors. The teams found that even though many of the mentors had lived in the U.S. for extended periods, they still had different ways to communicate, perceive issues and address cultural issues. At the same time warm bonds were developed with many of the mentors. This generated the personal experiences that were so important for effective learning that included frustrations that highlighted communication challenges, as well as the special bond and rewards that often accompany successful cross-cultural interactions. Most of the teams modified their interaction plan as they progressed during the semester, usually because they found that most of the activities with the mentors took longer than expected.

Some of the most important learning experiences were often presented as anecdotes during their final presentations. For example, one of the teams was confused by conflicting messages from the literature and comments made by their mentor. Video tapes had been made of some of the interactions with the mentor, and after reviewing them, they found that the behavior of their mentor was consistent with the literature, even though it contradicted his own statements. In another study, even though the team had read how it was customary in that culture for personal conversation to precede any business discussion, they were still unprepared when it took over an hour of pleasant talk before the mentors felt sufficiently at ease to begin discussing the prepared areas of discussion. This lesson was driven home to the students much better than textbooks or lectures, since a videotape of the interaction was included within the final presentation.

The project helped the students visualize how this knowledge could be used, and this result was documented in the student opinion forms that highlighted the applicability of the course. During the final session discussion, the students expressed their surprise of how relevant and useful the class had been. One of the participants of the Korean team was a Korean-American, and he noted how little he had been aware of his own cultural heritage and how useful the class had been for him.

Summary

Globalization is developing a demand for engineers that can effectively work with engineers from other cultures. This article presents a class design that effectively helps students:

- recognize the importance of culture in their own perceptions, values and behaviors;
- better understand cultural issues, similarities and differences;
- develop cross-cultural communications skills; and
- recognize the value of applying these skills.

It utilizes team projects that interact directly with foreign students from a particular culture and develop a training manual to deal with engineers from that culture.

References and Notes

- [1] *National Economic Trends*, Federal Reserve Bank of St. Louis, Oct., 1996, p.1.
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- [4] Kohls, K., 1996, *Survival Kit for Overseas Living*, Third Edition, Intercultural Press, pp.13-16.
- [5] Smith, G., "A Mexican Morass for Bell Atlantic", *Business Week*, January 20, 1997, pp.42-43.
- [6] Harris, P. and Moran, R., 1996 *Managing Cultural Differences*, Fourth Edition, Gulf Publishing: Houston.
- [7] It is not expected that the mentors have personalities and characteristics that precisely represent engineers from their home culture. This is due to the small sample size, the self-selection of international students, and their international experience. However, cultures that are significantly different from the American culture are chosen for study to ensure that differences are still evident in spite of the limitations.