Preparing the Engineering Technology Graduate for the Global Marketplace.

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Abstract

The Engineering Technology (ET) graduate must be able to have marketable skills to compete in today's job market. A college degree in engineering technology does not necessary mean that the ET graduate will be automatically employed. Recent trends in offshore outsourcing of high technology jobs are introducing uncertainty about the long term future of the U.S. engineering employment. Graduates will need to compete in environments not normally taught in the engineering technology curriculum. The faculty and student need to be aware of globalization in industry and prepare the graduate with the skills necessary for them to meet this challenge. Programs that do nothing to address the challenges of globalization will soon be irrelevant.

To be effective leaders in today's global manufacturing environment, the ET graduate will have to concentrate on soft skills (written and oral communication) as well as have good team skills working on projects and take more business and management courses.

This paper will focus on strategies how Engineering Technology programs can prepare the ET graduate for the job market in the midst of globalization. One strategy is to revise the ET curriculum to address globalization issues. Second, look at giving more "unstructured " or real world design problems for students to solve throughout the curriculum. Third, have more business/management courses in the ET curriculum as technical electives. Fourth, introduce a foreign language requirement in the curriculum, Fifth, have industry to sponsor senior design capstone projects. These strategies will help prepare the ET graduate for industry and give them the skills necessary for competing in a global manufacturing environment.

Introduction

Globalization has a significant effect that is faced by graduates of all institutions and degree programs. The nature of this issue must be better understood to pursue an effective strategy for the curricula development needed to prepare engineering graduates for a rapidly changing world. United States engineering students have historically enjoyed relatively high employment rates upon graduation. Recent trends in the offshore outsourcing of high technology jobs are introducing uncertainty about long term future of U.S. engineering employment [1].

Globalization presents challenges and opportunities in the form of unstructured problems. This is very different from problems with " open ended" solutions which focus is on the end result

and how it is achieved. In the case of unstructured problems, the solution again can be open-ended, but fundamentally the problem itself is not defined in terms of specifics [1].
The global markets and the concept of outsourcing parts of development to subject matter experts have created a change in the way students must prepare for a career in engineering. The students must understand the breakdown of various functional disciplines so they can decide where they best fit in. The students should strive to be as well rounded as possible. Students must continue to master the basic theory and fundamentals of engineering. Additional focus must be dedicated to engineering from a business perspective. In many developments, the toughest challenges are not at the implementation or design level, but more at the business level. Many American companies have integrated product teams. Industry is interested in people who can do teamwork. The important thing is to know who the key players are. New employees must understand how to work with teams that are not of the same culture. This is due to companies merging. Engineering today requires more than knowing subject matter. It is critical to know how to work with people and learn from people [2].

Rationale

The rationale of this paper is to help prepare future graduates with greater global awareness and provide them with an essential skill set needed to address globalization and to make them more marketable in the workplace.

There are basic skills that engineering technology programs need to provide it's graduates. These include the usual skills in writing and oral communication, science, math, and technology. The most important thing we can teach our graduates is how to learn. Are our graduates prepared with skills that are transferable from one industry to another? In addition to technical skills, experiences in entrepreneurship, project management, and professional issues (ethics) would be invaluable [3].

The skills that ET graduates need to compete in the changing global environment are not commonly a part of what is taught in the engineering technology curriculum. Emphasis on language skills, international experiences, and other global/cultural content would make ET programs stronger [3].

Modifying the current curriculum, such as offering new courses in micro/nano-technology, and teaching methodology in response to the current outsourcing trend is an important component of new manufacturing programs. In addition to the specific knowledge obtained directly from textbooks, students need to acquire other soft-skills such as entrepreneurship and cross-cultural communication skills to fit the global scenario [4].

Skill Set and Competency Needs from new College Graduates to Address Globalization

Technical and non-technical skills highly requested by hiring managers [5].

Technical

- Technical expertise in the field
- Analytical capabilities

- Continuing knowledge growth
- Internship and practical work experience
- Design experience
- Multidisciplinary experience

Non- Technical

- Teamwork skills
- Written and oral communication skills
- Presentation and selling skills
- Understanding of economics
- Business and travel etiquette
- Managing without authority
- Leadership with a global view

Strategies for Engineering Technology Schools to Address Globalization

- Introduce project-based curriculum rather than topic based.
- Department must have an Industry Advisory Board
- Industry sponsorship of senior capstone design projects
- Teams to work on senior design interdisciplinary projects
- Have students take more business and management courses as technical electives.
- Teach students a new way to learn through technology in the classroom
- Offer courses to teach more soft skills (oral and written) so students can be better communicators.
- Teach students about diversity and working together in teams.
- Introduce volunteer programs such as "Engineers without Borders" to provide a global perspective.

It must be emphasized that it is academia's responsibility to prepare our young graduates for the job market and to meet globalization challenges by: 1) Curriculum reform, develop courses of study in as many engineering fields as possible to increase students' understanding of global issues and cultural differences, 2) Include foreign language courses in the curriculum. Have student take at least one or two semester course in a foreign language to have a global or cultural exposure. 3) Provide opportunities for students to study abroad in their field of study. This will expand their view on how students form other countries design and work solutions to real world problems. 4) Have a student exchange program and invite other students from Third world countries to pursue a degree in Engineering or Engineering Technology. In turn, students are given another approach or view of how to solve an engineering problems especially in the senior design capstone course and 5) Give workshops and seminars to explore global issues.

Southern University Globalization Strategy

The Electronics Engineering Technology (EET) department within the college of Engineering at Southern University is trying to address the globalization concerns with their engineering technology students. One of the ways to keep EET graduates competitive globally is to

introduce more business and management courses as technical electives in the EET curriculum. As such, three management courses were included in the EET curriculum as technical electives. In addition, a new course was developed in the curriculum, EENT 400, which is a senior seminar to discuss leading edge technology and topics of interest to Engineering Technology majors including globalization issues. Members of industry were invited to become industry-University partners by having them serve on the Industry Advisory Committee of the EET department.

At present, the Electronics Engineering Technology department has teamed with five industries on the Industry Advisory Committee. These are: Entergy Corp., Exxon-Mobil, Lockheed-Martin, Raytheon, and Delphi Thermal Systems. Industry partners have direct input in the planning and strategy of the department mission and vision. The industry partner can also participate in curriculum reform in the department and thus, have direct input on what courses the EET student must take for him to be marketable and globally competitive in industry. As a result, one new course was developed with industry recommendation, the programmable logic controller (PLC) course. PLCs are used extensively in the manufacturing environment where companies have automated equipment [6].

An example of the Industry-University partnership is when students take the senior level project design course, have industry sponsor that senior design capstone project, one that is relevant to that industry. During 2006 and 2007 respectively, Lockheed –Martin an Aerospace company provided mentors to help students on their senior design capstone projects. Raytheon provided a grant in the amount of $1500 to fund equipment and supplies needed for senior design projects. Entergy Inc., a local power company located in St. Francisville, Louisiana will be sponsoring a project in the senior capstone design class, Fall 2008. This will give engineering technology students real world projects and provide them with an application for a real engineering problem. Therefore, the students will gain knowledge for working on a real industry problem [6].

An additional strategy for preparing the ET graduate for the global market is for the student to take a co-op or summer internship assignment. These assignments allow students to work in companies across the United States or abroad. Students can work on projects in teams composed of people from different countries or culture. This is a win-win situation where the student and company benefit from the diversity of the team members. Students from the EET department at Southern University often take a summer internship or co-op assignment. The student returns to class in the Fall or Spring semester better prepared as is successful in his courses because of the connection the student made between the theory and application obtained from the co-op or intern experience. In addition, because they worked and networked with students from different schools and cultures, they will expand their global experience. Some of these students will become friends for life which will give them an invaluable experience [7].

Southern University has a work abroad program during the Summer months (May 15-Aug 15) in Mexico, China, and Africa sponsored by the Foreign Language department. However, in the past, the Engineering College has not had a relationship with the Foreign Language Department on this global work opportunity as of yet. However, they are now pursuing talks on developing a relationship with the Foreign Language department to send some of the Engineering Students to work abroad during the summer months in these areas.

Summary and Conclusion

In conclusion, the key to addressing all strategies pertaining to globalization rest with academia in providing the skill set needed by graduates in the marketplace. In specific, by curriculum reform, Engineering Technology schools will need to streamline technical courses in the curriculum and provide more business and management courses so that students will have the business skills to be able to compete effectively in the global markets. Engineering and Engineering Technology schools will need to offer a foreign language requirement of one or more semesters to expose students to different languages. In addition, more "unstructured" type projects in their senior capstone design classes need to be given and integrated throughout the curriculum especially in the capstone courses. Industry should sponsor senior design projects. These projects would be more closely related to global or real manufacturing problems needing solutions. Engineering Technology students would be able to benefit more from these type projects because they are more application oriented and "hands on". Students obtain the skill set and knowledge to compete globally in a manufacturing environment. Engineering Technology schools and industry need to form partnerships to address globalization via their industry advisory board. These Industry-academic partnerships will help provide the graduate with the necessary skills to prepare them for challenges of the job market and globalization.

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Biography

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