Abstract

Graduating Engineers need to increase their job market potential. It is an additional credential to students’ career development to have industrial experience. The responsibility of an engineering educational program should be to expose the graduating engineers to industrial experience. Students should be prepared to deal with responsibilities involving planning, design, construction and maintenance of their built up environment. Furthermore, engineering practitioners are involved daily in marketing, economic activities, materials and product life cycle. To succeed in engineering profession, job market requires both strong theoretical base and practical hands-on experience. Industry and government involvement in engineering education has tremendous potential to facilitate current trends in engineering education, assist in modifying the new curriculum, enhance teaching quality, meet the needs of graduating engineers and their future employers. Educators should be in contact with private firms and governmental organizations “Building Partnership” to develop practically oriented educational courses.

In this paper we will present cases illustrating the importance of engineering education and partnership between Industry and educational institution enhancing the quality of graduating students future career. Partnership between universities and industries/governments will satisfy both engineering faculty members and students in their future career needs.

The partnership also enhances the quality of institutional research, enables high-quality faculty and their students to interact more often with industry/government. The partnership further assists the design of new curricula and academic programs to respond to the needs of industry and government. The educational institutions and the industries/governments working in partnership can create an enduring foundation for student's development and life long learning.

The participation of industries/governments brings together a special set of forces on the engineering program to form a leading edge in engineering program. This paper will tackle the “partnership issues in light of current trends in engineering education with full objective to enhance teaching quality and students career needs”.

Introduction

The key point in strength of the economy of the United States is the emerging need for universities, government and industries to work together to increase the rate of technological progress. Government research policy has emphasized, through National Science Foundation (NSF), for instance, the importance of finding alternate ways to bridge the gap between industry and universities and the necessity of developing institutions that can foster joint research(1). Under the partnership between National Aeronautics and Space Administration (NASA) and Florida International University (FIU), the students of FIU can have 4-week

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Role of Government in Engineering Education

Case Study 1

A cooperative effort has been developed between NASA and Florida International University (F.I.U) to establish the Applied Research in Industrial and Systems Engineering (A.R.I.S.E) Center. The aim of partnership is to attract and retain women, Hispanics, African Americans, and other minority's individuals to engineering. Students participating in the program are exposed and trained on NASA's mission, given seminars on the realities of the workplace, diversity, and gender issues. Students attend their regular classes during the academic year, while working on projects for NASA. This model is being tested at various levels to transfer it to industries at large. Their preliminary results indicate that such partnership provides a winning formula for the student, industry and faculty(2).

The students participate in applied research project undertakings. Students are instructed on the benefits of pursuing postgraduate studies, in the hopes of enhancing their potential to succeed in the workplace as well as increasing their stature as role models for future generations. Students can have a 4-week on-site internship so that they become acquainted with the various Kennedy Space Center (K.S.C) processes needed to complete the projects and receive a stipend during the academic year and the summer terms(2). This type of joint venture is definitely a good sign of progress involving government/university in preparing the students for the new millennium.

Case Study 2

The U.S. Semiconductor industry, the Federal government and 14 of the nation's most prestigious universities have created a new national research network to conduct cutting-edge projects that are critical to the growth of U.S. Universities and U.S. Technology industries. The network formally known as the Focus Center Research Program, will lead to the creation of six national Focus Centers that, when fully funded, sustain 60 million dollars per year in new research activities(3).

The first two Focus Centers are headed by the University of California, Berkeley and the Georgia Institute of Technology. Both of the initial Focus Centers, which are funded through 2001, will investigate technological challenges identified. This program provides a tremendous opportunity for U.S. chip companies and the federal government to leverage their resources. And the students and faculty of the universities involved are widely benefited through the projects. The new university-industry/government partnership represented by the Focus Center Research Program will be of immense value in keeping the United States at the forefront of the vital semiconductor industry (3).

Role of Industry in Engineering Education

Case Study 1

In 1993, Milwaukee School of Engineering (MSOE)developed at the request of Rockwell Automation (An Engineering Corporation), a 4-week program for engineering students of Czech Technical University (CTU,
Prague, Czech Republic) to study in the United States. The targeted students were electrical engineering students with a specialization in automatic control, or computer automated manufacturing(4).

In 1998, the 5 week program involved students from 9 countries (including China and Russia) representing 12 universities. Key components of the program specifically the integration of technology with economics, humanities, and management science have recently been described in a Czech technical publication as being representative of the university of technology of the next century. The program has proven to be of benefit to all three partners (Milwaukee School of Engineering (MSOE), Czech Technical University (CTU) and Rockwell Automation). Rockwell has made a major positive influence upon selected engineering students in key markets of Central/Eastern Europe and recently Asia. The MSOE-CTU collaboration now includes an annual faculty exchange program, and selected MSOE students participate in the summer program, then study at CTU for one semester. Further expansion of the student exchange program is being planned. This case study shows an expansion of knowledge beyond the countries borders. Such technology transfer creates a better world for understanding the importance of diversity in the engineering education (4).

**Case Study 2**

At Kent State University, the academicians developed a non-traditional cooperative education program called Manufacturing Assistance for Cooperative Education (MACE). It aims at providing suitable work experiences to integrate and apply knowledge gathered during the student’s educational program. MACE can combine several academic programs, such as engineering technologies, business, marketing and computer science. One of the goals of MACE is to bring students from different disciplines together in a laboratory environment to solve real-world problems. The sharing of experiences created by combination of disciplines will develop a variety of skills from leadership to problem-solving and provide opportunity for the application of technical knowledge(5).

MACE is different, in the sense that, it has good control over its processes. Conventional co-op programs are controlled by industry. In contrast, MACE is a joint industry and university effort, conducted at the university’s manufacturing assistance facility. Hence, a definite bondage is maintained with the school, and the company’s project becomes the manufacturing support. The company’s professionals and the university’s faculty work in the field. The student obviously benefits from working with both sides of the theoretical and real-world issues. To be most effective, project work must be seen by the students to be relevant to the employer (5).

**Case Study 3**

For organized collaboration among industries, universities and government, it is required that the functions of each sector be integrated. To achieve this, the Research and Business Park (R&B Park), a “place” to promote cooperation among industries, universities and government, will be necessary. The R&B Park is located in Sapporo, Japan(6).

Construction of the Joint Research Center for Advanced Scientific Technologies (Advanced Research Center), which will promote joint research within Hokkaido University, and the university and private companies will primarily work together on joint basic research on the campus of Hokkaido University. It will be important that it serves as a base for the establishment of the Fusion Center for Industries, Universities and Government, as a “place” to bring together the expertise of Hokkaido University, including the Advanced Research Center, the technologies of national and public testing and research institutes and industry. Functions of the Fusion Center for Industries, Universities and Government are as follows:

1. Finding subjects for projects through collaboration among industries, universities and government.
2. Joint research and product development by companies, universities and testing and research institutes in Hokkaido.
3. Technical consultation for companies and introduction to universities, testing and research institutes and other companies.
4. Support and other activities for implementation of projects.
5. Training for entrepreneurs
6. Technical transfer of research seeds and patents from universities and testing and research institutes to companies.
7. Management of Research & Development Strategy Meeting and meetings to discuss the establishment of industrial bases (6).

Conclusions

This paper brought out the status of the paramount relationship between the university and industry, each of which has needs that the other can meet. The partnership experiences from the case studies indicate that it is a very successful approach in enhancing engineering education at the Universities. The outcome of partnership through the current relationship between industry and the educational institution in shaping engineering education are enumerated. The need for innovative approaches to the integration of educational institution with industries will become paramount to insure the United States of having a competitive workforce and continuous supply of well-trained, well-informed technical talent. The skills learned through partnership with industry will enable engineering students to plan and design successfully in the field they are going to be employed. The joint venture Industry/Government/University partnership is essential to the growth of a nation's economy, technology and environment. It puts any nation in a better challenging perspective in today's ferocious competitive market.

References


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