"Curriculum Innovation and Renewal Process - A Perspective of the Civil Engineering Faculty"

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Abstract

The content of this paper includes literature review on the curriculum innovation and renewal process. There is a lack of a universal methodology on what institutes a good curriculum. The problem is the budget, facilities, identification of customer needs and time variances that create great constraints that result in different approaches from campus to campus. A case study is presented which reflects the views of the civil engineering faculty at the University of Florida and the view of industry in a curriculum innovation and renewal workshop conducted by Mike Leonard, from Clemson under the Southeastern Universities Cooperation, on engineering education funded by the NSF. The main theme of this workshop is to let faculty and industry express their opinion about a process for continuing the curriculum renewal. The faculty are divided into two groups and are asked to rank issues related to the curriculum renewal process. The groups identified many items and finally narrowed them down to these final five items: 1) increased recognition; 2) modern labs; 3) reward good teaching; 4) faculty stress and 5) professional degree. The paper will discuss in detail the subject of the curriculum renewal process and provide conclusive remarks reflecting faculty views and overall assessment of the curriculum renewal process.

Introduction

In June of 1996, the Civil Engineering Department faculty at the University of Florida gathered in a workshop setup environment supported by the National Science Foundation Curriculum Innovation and Renewal under SUCCEED (Southeastern University and College Coalition for Engineering Education) protocol. The purpose of the seminar was to tackle issues relevant to strategic planning for the department in relation to Curriculum Innovation and Renewal.

The NSF engineering education coalitions have established a common set of goals[1] :

- To design and implement reform model for undergraduate engineering education
- To provide tested alternative curricula to improve undergraduate engineering education quality
- To create exchange and resource linkage among institutions
- To increase diversity and the number of women and under represented minorities and people with disabilities
- The coalition's home page must be specifically indexed for each aspect of undergraduate curricula relevant to areas specific needs

- Solving the logistic of curricula and need of each state or region and offering of service through Internet and home page. A sound mechanism to share results of new curricula among institutions.

In the content of new curricula to goal it is already set b the Accreditation Board for Engineering and Technology (ABET). It is under ABET criterion that the engineering programs must demonstrate that their graduates have[2]:

a) An ability to apply knowledge of mathematics science and engineering
b) An ability to design and conduct experiments as well as to analyze and interpret data
c) An ability to design a system, component or process to meet desired needs
d) An ability to function on multidisciplinary teams
e) An ability to identify, formulate and solve engineering problems
f) An understanding of professionalism and ethical responsibility
g) An ability to communicate effectively
h) The board education necessary to understand the impact of engineering solutions in a global/social context
i) A recognition of the need for and an ability to engage in lifelong learning
j) A knowledge of contemporary issues and
k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practices.

The success of any new curricula depends on the ability of competent faculty institutional support and financial resources. Furthermore, the input from government and industry is essential in the successful implementation of curriculum renewal. If university-industry become partners in the process of education, then joint benefits must be discussed. For instance, industry can benefit by gaining access to university laboratories, faculty, and student resources; and by receiving the products, processes, software, and services that university students and faculty create[3]. Joint venture can provide school with addition revenue and access to high tech equipment they could afford to purchase themselves[3]. Faculty can benefit by being exposed to the latest industry needs and technology[3].

Globally speaking, the world educational arena must take these suggestions and combine the vast resources of students, faculty and industry for the mutual benefits of all parties concerned. The new curriculum must focus attention to societal needs. There are many countries around the world that cannot provide job opportunities for their college graduates. This is a serious issue which requires industry-university partnerships. Students can co-op semesters to work in the industry to gain knowledge, faculty must spend their sabbaticals with industry and industry workers should participate in short courses to gain state-of-the-art knowledge. Sharing resources may reduce the economic burdens and may enhance job opportunities for graduating students. The dilemma of joblessness must be resolved globally in conjunction with new curricula partnerships between industry-university. These vast resources must work together for the benefit of society. New models are needed to enhance educational skills toward the betterment of healthy society.

The Workshop Content

The round-table style workshop at the university of Florida focused on[4]:

Department strengths, weaknesses, curriculum, competition in terms of what other programs are doing? Choices or changes in future (1-3 years). We have discussed that the civil engineering enrollment, in the U.S., has increased by 26%. The fact that universities around the country are reducing the total credit hours required for the BSCE degree. For instance the Department of Civil Engineering at the University of Florida reduced the total credit requirement from 145 to 131. The trend to change curriculum continuous process. The ABET and the American Society of Civil Engineers emphasizes in their new criterion for program assessment; more emphasizes in sciences and mathematics and the ability of students to design and conduct experimental work and education that is geared toward engineering practice. The faculty recognized the general education requirement of the civil engineering program. Emphasize were placed on:

- Communication and speaking skills
- Computer skills
- Mathematical sciences
- Physical and Biological Sciences
- Humanities
- Social Sciences

To enhance student quality, the learning preparation process requires early start. For instance the high school/university/industry combination efforts will assist in the implementation of new curricula. For instance, at the U.S. Coast Guard Academy, Senior mechanical engineering students team up with their local power company, Northeast Utilities System, and with Connecticut high schoolers. The college seniors serve as project leaders and mentors of high schoolers where they gain exposure to industry and learn from practicing industry engineers. This process likens the experience to industry work, with "the college students serving as managers, and the high school students as the worker bee"[5].

Another example is that the author witnessed during 1993-94, when he was teaching civil engineering courses in the college of engineering, Qatar university, under a senior Fulbright Scholarship. To increase student's awareness of the engineering profession, senior students are required to spend two months in practical training with national or international engineering establishments after the completion of three academic years. Students in their last year, and in order to fulfill the graduation requirements, all students must successfully complete the B.SC. Graduation project in which they work on a relevant engineering problem using the skills and tools they have acquired as students of engineering.

Workshop Results

We were divided into six groups, five in each group. There was only one individual from government and the remaining were professors from civil engineering and another faculty partici-

pant who is the chairman of the Industrial and Systems Engineering Department, at the University of Florida. The group identified the following issues and later we were asked to rank them:

- Required good teaching
- Technology
- Better teaching
- Laboratories
- Better with less
- Research
- Florida Engineering Society active involvement
- Break up classes
- 12 hours teaching load per semester
- Faculty stress
- Support to faculty

We were divided to two groups to rank the above issues:

First group ranking results:

1) reward good teaching, count good teaching equally to research activities and publication during promotion and tenures
2) Provide good laboratories equipped with
   a) Teaching support
   b) Quantity and quality of space
   c) Scheduled equipment and facility maintenance
3) Faculty stress included
   a) Too much work
   b) Not enough time
   c) Too much paper work
4) Dollar-wise faculty support
   More money, reward faculty salary saving with leverage to spend the money saved at his or her discretion supporting students, computer purchase, office update, book purchase, etc.

Second group ranking results:

1) Increase recognition
   Identify measures of success
2) Managing the core engineering curricula
   Increase the civil engineering faculty involvement
3) Professional degree
   a) Review mission statement
   b) Review student admission retention policy
4) Study nature of the future engineers
5) Review internal role of the faculty

Final ranking of both groups:

1) Increased recognition
   a) Blow your horn more often
   b) Identify units of measurement
   c) Promotion/tenure recognition
   d) Define excellence
   e) Identify who we want to be recognized and in what area
   f) More industry relations
   g) Establish objectives for recognition
   h) Define excellence
2) Laboratories
   a) Find sources of money
   b) Identify need
      i) Equipment
      ii) Subjects
      iii) Space quality, quantity
   c) Identify what is to be accomplished in the lab
   d) Donor recognition
   e) Technician support
   f) Maintenance
3) Reward good teaching
   a) Equally accounting teaching and research at the time of promotion
   b) Internal recognition
   c) More support for your teaching
   d) Determine objectives (i.e., role of teaching)
4) Faculty stress
   a) Faculty interaction
   b) More control over “management of process”
   c) More freedom in presenting case in promotion and tenure
   d) Gathering facts concerning faculty load at peer institutions
   e) Graduate students to help in the research
   f) Faculty advising
   g) More cooperation among the colleagues
5) Professional degree
   Generate strong professional support from industry

Overall, the short one-day workshop was very useful and productive in bringing out fault views and interesting discussion points relevant to curricula renewal. It was interesting to notice how faculty links their degree of satisfaction to future curriculum changes. They have ranked faculty recognition as number one item in the ranking agenda. They want clear-cut definition of excellence and identify units to measure it. They believed if faculty create more industry relation, then they need more time devoted to such need. Laboratory need was an important aspect of new curriculum in the context of monitory support for space, equipment, quantity and maintenance. The third high rank item was to reward good teaching. They ask for more support for teaching in the provision of student assistants, internal recognition and support for good teachers needed. Faculty stress was ranked fourth which clearly demonstrates that the top

administration recognized this fact and provide remedies toward reducing faculty stress. It seems that the SUCCEED group of the NSF and other organization concerned with the new curricula focus on these issues in conjunction with future curriculum renewal. It seems that these issues are linked in the successful implementation of future curricula.

References

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Biographical Information

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Dr. Najafi has earned his BSAE, MS and PhD in Civil Engineering from Virginia Polytechnic Institute and State University, Virginia. He also has a BSCE from the American College of Engineering, Kabul, Afghanistan.

For more than twenty years Dr. Najafi has worked in government, industry and education. This includes work as: a) an engineer and general director in the Ministry of Public Works, Kabul, Afghanistan; b) a county engineer, Giles County, Virginia, c) a consultant engineer, Halifax County, Virginia, d) a structural engineer, Planning Department, Virginia Polytechnic Institute, e) a construction manager, New England Railroad Construction Company, Bridgeport, Connecticut, f) a mechanical engineer, Bechtel Construction, Inc., Pottstown, Pennsylvania, g) a highway engineer, Federal Highway Administration, Washington, D.C.; h) an assistant professor, Civil Engineering Department, Villanova University, Pennsylvania, i) a visiting professor, Department of Electrical Engineering, George Mason University, Virginia, j) previously, an assistant professor and, currently, j) an associate professor in the Department of Civil Engineering at the University of Florida.

Dr. Najafi is a member of several professional societies including ASCE, TRB, APWA and Tau Beta Pi.

He has a number of refereed and nonrefereed publications and has presented numerous technical papers to professional national and international organizations. His areas of specialization include construction engineering and management, legal aspects, public works and transportation engineering and planning.