Reviving the Technical Currency of Engineering Technology Faculty

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Abstract

Engineering Technology faculty development is a continuous challenge. Enrichment of faculty through real-life industrial experience provides the opportunity for continuous improvement of technology faculty technical currency. In the summer of 2000, one of the mechanical engineering technology faculty worked with local industry to revive technical skills, learn new skills, observe project management skills, and bring new learned skills into the classroom. He participated as a team member of the company in the startup process of a truck assembly production line. This summer opportunity provided first-hand experience for the faculty member to work in teams with project managers, engineers, technologists, and technicians of different companies. The authors will share their observations and mutual benefits of this partnership and how it has impacted faculty, the college, and industry in several ways. The paper concludes with some suggestions from authors to tie the internship with curriculum development.

What is Technical Currency and why the need for Revival?

Technical currency similar to professional development covers a wide range of options for updating and developing the skills of faculty. Lack of technical currency is a major impediment to the engineering technology profession's efforts to produce a skilled work force. Technical currency of engineering technology faculty is important and must be assured by providing opportunities for professional development. Effective procedures must be established and assessed to support and maintain empowered faculty in terms of their knowledge base, skills base, and teaching for transfer. Formal and informal efforts are in place in many educational institutions since their inception. Professional development includes developing skills of faculty beyond the classroom, including conferences, workshops, continuing education, on-job training, industrial internships, and consulting.

Faculty value the opportunities to maintain their knowledge and technical skills at their highest and most up-to-date level. Technical currency loss may occur when faculty discontinue participation in industrial internships or consulting for a period of years in their profession. In today's ever

changing marketplace, it is difficult for those working with products on a daily basis to keep up on the changes in technology with in a specific field. It is evident in today's world that taking several years off from industrial experience will reduce the faculty's ability to understand and connect with real world technology. Even engineering faculty realize the importance of industrial experience. It is of no use teaching just applied mathematics while the end product is involved with practical training. It is a recognized fact that internships and consulting have been difficult to obtain for faculty in technical fields. A 1986 study by Ms. Boyer and Mr. Lewis says that industrial experience enhanced and encouraged faculty to be more active in developing best teaching practices. Ms. Boyer and Mr. Lewis go on to note, however, that faculty members who consult teach as many courses, devote as much of their professional work time to teaching and research, and are as active in departmental and institutional governance as their peers who do not consult. This paper presents the author's motivation, strategies and benefits of industrial experience in reviving technical currency.

Motivation to Revive the Technical Currency- A Personal Experience

I joined the faculty in Mechanical Engineering Technology at Kansas State University-Salina in 1997. I received my undergraduate degree in mechanical engineering with a specialization in thermal and nuclear power engineering from Slovak Technical University, Bratislava, Slovakia. After my graduation I worked for four years as a senior engineer in the Tajuora Nuclear Research Center, Libya, North Africa. Responsibilities included planning, scheduling, and supervising of preventive, corrective, and overhaul maintenance of plant equipment, engineering systems, and radio-active waste management. Duties included systems engineering design, modification, testing, plant operation, and employee training. I completed my Ph. D. in mechanical engineering at North Dakota State University, Fargo, North Dakota. I did consulting for an aircraft company for six months and then began teaching in a manufacturing engineering program. With my background education and experience I am qualified to teach in engineering technology (ET) programs. Then I asked myself, how current is my technical knowledge and industrial experience? For the Accreditation Board for Engineering and Technology (ABET), I fulfill the requirement to be a full-time faculty member in ET programs. However, I felt as though I was not truly current in the latest industrial technology to be competent in the classroom. Educational institutions are slow in adapting to fast-growing technology changes. Even though the university administration is convinced of the advantages of faculty internships, it is difficult to help every faculty member find an industrial internship. I read the book "Who Moved my Cheese" by Spencer Johnson, and learned a valuable lesson: Keep moving and changing. The question is: Do I have to rely on the university to promote and provide an internship opportunity or do I take the lead myself? To be competitive and marketable I believe that I have to do it myself. The constant changes and challenges of new and emerging technologies forces anyone who wants to stay current to do so under his/her own motivation.

Strategies to Revive Technical Currency

Development of professional contacts with peers, alumni, Industrial Advisory Committees (IAC), local

professional organizations, and industry is vital. Faculty should build both personal and professional relationships with industry. The university administration also should take a lead in helping new incoming faculty develop professional relations with industry. Dr. Hau Lee, a professor of industrial engineering at Stanford University, offers this advice to new incoming faculty regarding consulting:

- Abide by university regulations and make sure the work does not interfere with teaching and research
- Choose subjects within their areas of expertise and interests
- Set up guidelines for pricing (e.g., travel time, teaching, initial meetings), but be prepared to be flexible if needed
- Always look for teaching and other scholarship opportunities through such engagements
- Spell out clearly the terms of confidentiality and publication rights
- Work with people who have strong interests in the success of the project.

New incoming faculty should be careful in doing consulting during the academic year. Based on advice from peers and personal contacts, I approached a local industry, Kasa Industrial Controls Inc. (Kasa), Salina, Kansas for summer employment. Doug Oliphant is Vice President of Engineering at Kasa and an alumnus who serves on the IAC of Electronics Engineering Technology program at KSU-Salina. Kasa went beyond curriculum and course review, in providing student internships, part-time employment and full time summer employment for students. In addition, KASA hired two KSU-Salina faculty members during the summer of 2000. The philosophy in providing student and faculty internships is based on the belief that the students and faculty:

- Have an opportunity to improve their knowledge base and communication skills
- Have an exposure to state-of-the- art technology
- Learn, apply, and transfer practical experience into academia
- Acquaint ET programs with industry to better serve student, faculty, and industry needs

Gradually, I developed a professional relationship with Doug Oliphant and emphasized the need to teach and implement current technology into courses and to transfer these new skills to students. First, I applied for a grant to acquire an industrial controls user interface software package. I was able to convince the company that the gift was mutually beneficial for industry and our students. Second, I stressed the importance of faculty internships to update my technical currency in terms of knowledge base, skills base, and teaching for transfer. The knowledge base includes information about real world hands-on experience on state-of-the-art equipment, accurate information about projects, communication skills and social skills, ways to sequence the presentation of concepts to students and bring the best practices from industry to the classroom. Skills base involves effective teaching and specific strategies such as role playing, hands-on learning, (which is part of the ET curriculum) and information about social skills with an “outside-the-box” attitude. Social skills are important both within and outside the classroom to develop professionalism. Teaching for transfer relates in ways to structure the instruction so that students can adapt the learning to real-world industrial applications.

Internship Activities

Kasa Industrial Controls Inc, hired five students and two faculty during the summer of 2000. KASA is

a well established, high-quality supplier of custom industrial control panels, engineering and systems integration. Kasa has two main project divisions. One is Material Handling, which covers control systems for automotive assembly lines including: inverted and overhead power and free conveyors; floor skid, skuk, and chain on edge systems; truck unloading and part delivery systems; lift, loaders, and transfers; and flat top conveyors. The other division is Special Projects, which covers batching and blending systems, food processing, grain handling, plastics and pneumatic conveying, water/waste water treatment, and machine tool automation. The latest industrial control practices require today's control engineer to develop not only the traditional electrical scematic and programmable logic controller (PLC) program, but they must be versed in network topology, database management, and data handling. Many of today's systems have not only the traditional PLC lader logic program, but also various PC based graphical interfaces that are capable of manipulating large amounts of data. Kasa engineers provide their customers with innovative solutions to complex control system needs from concept, through design and development, to implementation and startup at the customers facility.

Students and faculty were employed in the engineering services department. The faculty and students work under the supervision of Kasa project managers on developing industrial control systems for multiple types of automotive truck assembly line conveyors. The company immersed everyone in two to three week training program to teach new employees PLC and graphic display programming, parts identification and panel design overview, along with safety training. After training, students and faculty are assigned to project teams. In the first phase, they assist the project engineers in designing and documenting the control systems. In the second phase, project teams traveled to plant site to implement the project.

It is an exciting experience to participate in the startup process of an automotive truck assembly plant. KASA teams, being one of the subcontractors, has to work with other sub and main contractors and their teams. This is a unique project experience where one has the opportunity to interact with construction, mechanical, and electrical project personnel on the plant floor. This project necessitated interaction with people with different technical skills, geographic locations and personalities. The environment provided an opportunity to experience a "touchy feely" real world. It also taught the participants to be respectful and responsible in stressful situations as well as to feel the pains of long hours of work. Overall, the internship provided several benefits to all three parties involved: Industry, faculty and students.

Industry Benefits:

- Helps faculty transfer the experience of the internship into classroom to prepare better skilled graduates
- Awareness of ET programs, needs of students and faculty
- Encourages active participation in IAC activities
- Fills its seasonal employment needs
- Helped grow future employees
- Encourages its own employees to further their education

Faculty Benefits

- Enhances success in maintaining technical currency

Learns new skills
Leverages the experience towards applied research and teaching
Learns from mistakes and brings best practices into the classroom
Transfers the positive experience to colleagues and students
Offers financial security, which brings happiness
Motivates to continue to learn and change

Student Benefits

Secures future employment
Receives relevant real world experience in industry and classroom
Enhances social and communication skills
Learns respect and responsibility
Learns to think beyond the classroom

Conclusion

The need and importance of reviving technical currency is evident. It is important for novice and experienced faculty to develop working relationships with industry. After all, ET is an applied engineering field focusing on hands-on experience. Current industrial experience is an enrichment that yields tremendous benefits.

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