Bridging the Gap - between Engineers and Technicians

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Abstract

Workplace contention between those trained in the engineering profession and those with associate degrees (two or three years) in technology is commonly observed. The issues are generally created by pride and misunderstanding. Improved communication would be an obvious approach to mitigating the contention. Further questions are how much of this contention and concern may be fostered initially in the academic setting, and how much might be mitigated by efforts during the student's education program?

To explore these issues a one-and-a-half day symposium was held in April 1998 at Idaho State University (ISU), co-sponsored by Boise State University and Ricks College. Approximately 100 attendees from throughout the nation presented papers and engaged in discussion of example efforts to improve or develop successful symbiotic relationships between engineering professionals and technicians. Both academic and industrial leaders participated.

Introduction

The authors, all in administrative positions at Idaho State University (ISU), had observed contention between certain academic colleges (engineering and business in particular) and departments in the School of Applied Technology. These two groups were separated physically by half the distance across campus, by credit non-transferability, and by minimal appreciation and understanding of the role of the other in society. The contention is most obvious among faculty members, but it is presumed that faculty attitudes are transferred to students, whether directly or indirectly by innuendo reflecting those attitudes. Although we were attempting to solve these attitudes of contention within our university setting, we felt that this issue was not uncommon throughout the nation. Those of us with industrial experience were well aware of similar problems in the workplace. Consequently, we felt it would be worthwhile to hold a symposium in an attempt to determine how universal these contentious issues were, and what others had done to mitigate the problem. For this purpose the symposium of April 1998 was held at ISU at which over 60 papers were presented.

The introductory keynote speech was presented by Robert Furgason [1] who had recently completed his elected term as the President of the Accreditation Board for Engineering and Technology (ABET). At the time (1998), ABET was just starting to implement trial cases for its newly

adopted Criteria 2000 for accrediting engineering programs in the new millennium. These new criteria involved a major paradigm change for ABET, from a very prescriptive approach to an approach based on outcome assessment and continuous quality improvement. The new paradigm encourages innovation in academic programs. Furgason reflected on the time scale of technological development, implying that the both the educational preparation systems and the operational systems in industry may benefit from careful assessment to improve the systems that we now have. He suggested that:

- Engineers may not receive sufficient hands-on experience in their education
- Simulators are replacing real-time training experience on machines and equipment. Such simulators could be used effectively if available for educational programs.
- That a 4-year program for engineering education may be unrealistically short to accomplish the necessary goals. He discussed serious engineering failures of the last few decades, suggesting that education and training of both engineers and technicians needs to be re-examined in an attempt to determine how to avoid such catastrophic occurrences.

In some situations students are led to make career decisions in the freshman year, after which time switching between engineering and applied technology paths requires virtually a complete restart. Some academic institutions have made attempts to provide similarities in the two programs, at least in the general education requirements (Ricks College[2] and the California system[3]) and revisions are being made elsewhere to make portions of these two paths similar for articulation purposes.[4] Attempts at articulation have had difficulties, primarily in getting the articulation agreements approved by faculty and curriculum councils.

In cases where faculty had made special efforts to promote teamwork between engineering and technology students, such as at the senior design process level, difficulties occurred. Technology students often were reluctant to take a major decision-making role, and engineering students generally were unwilling to give much credence to the opinions of the technology students.[5]

Industry Perspective

When we approached local industry leaders about our concern regarding contention between engineers and technicians, many acknowledged that this is an issue of considerable concern. Consequently a number of local industrial leaders participated in the conference.

Successful Outcomes of Efforts at the Post-Secondary Level

Some of the most impressive programs to encourage cooperation between engineering and technology programs involve the senior design process. Brigham Young University (Carl Sorenson[6]) reported on a program in which senior design projects are fully sponsored by industry, and involve interdisciplinary "design" teams consisting of students from engineering, engineering technology, and business four year programs. The senior design teams spend a few days at a particular industrial organization to gain understanding of the problem and the project, and talk with the engineers and other company employees concerned with the project. The team then

returns to campus and spends the next 6 or 7 months on the project, producing a design, model, or analysis. Project results are presented to the company by the student team prior to their graduation. The success of this program is impressive, and it undoubtedly helps students appreciate the need for interdisciplinary teams and the importance of all the team members. However, it is not clear that these teaming efforts, which involve four-year academic programs, adequately address the disrespect and contention that develop between four year college graduates and those technicians with an associate (2-year degree) or no degree at all.

Operating senior design programs with industry sponsorship is becoming increasingly popular as a means of giving students a real-life experience, and exposing them to the importance of interdisciplinary efforts in the work place. But many faculty members are concerned about the time involved in making these arrangements with industry. Department chairs can provide reduced teaching loads for faculty members who engage in such industry-sponsored projects.

Weber State University [7] has a program for its applied technology students in which the students become involved with industry by participating in real design and/or analysis problems submitted to the Weber State Technology Assistance Center. With 170 potential companies in the local area of Weber State, the opportunity for these technology students to become involved with real problems, often receiving pay for their efforts, gives these students a better appreciation for the work of both engineers and technicians.

Successful Outcomes of Efforts in Industry

Several local industry leaders attended the symposium and presented their approaches to developing cooperative efforts between engineers and technicians. For instance, Argonne National Laboratory heavily promotes teamwork [8] between the two classes of employees. At the Idaho National Engineering and Environmental Laboratory, a Team Excellence Award program recognizes outstanding performance of entire teams, with engineers, planners, technicians, and secretaries all sharing equally in the success of the team.[9]

Student Perspectives

Several former students who had received degrees in both applied technology (two or three year programs) and later conventional engineering four-year programs were invited to participate in the conference. Since all of these students are presently employed as engineers, it was not unexpected that they generally expressed concerns that each had when they were “technicians.” They had definitely felt limited in their career potential.[10] One of the students[11] expressed a concern for the need to include more interdisciplinary team experiences in the engineering curriculum to better prepare graduates for the team environment of the industrial workplace. Based on experiences early in his career, he spoke of the need for engineers to fully appreciate the technician’s contributions and importance to work teams. Technicians can often save the project with their insight and experience.

Legislative Perspectives

The symposium benefited from the attendance of several state legislators. All indicated that they had little appreciation for an educational system that did not move aggressively to eliminate intolerance and misunderstanding between applied technology and engineering programs. This was certainly a consensus of the symposium. More important, however, is how to reduce the feelings and attitudes leading to this intolerance. Providing interdisciplinary experiences in the educational setting increases respect and understanding between the two groups and eventually can be expected to have the same positive effect in the industrial setting. Further ancillary benefits also develop as cooperation is enhanced in the university setting. For instance, ideas for special niche programs, that meet special needs of the nation as technology progresses and changes with time, can develop. [12]

Conclusions

As a result of the symposium, Idaho State University saw an immediate reduction in the hostile attitudes that had so often been obvious between applied technology instructors and the engineering and business faculty. Faculty from all three colleges attended the symposium, and administrators saw almost immediate improvement in relationships. ISU followed this with a special teaming day among the three colleges (Applied Technology, Engineering, and Business) some 10 months later. There were student contests in which interdisciplinary teams involving students from all three colleges competed. Again there was resulting improvement in attitudes concerning the other units, among both the faculty and the students.

University administrations probably need to take the lead in arranging for intramural activities (symposia, contests, etc.) that bring engineering, applied technology, and business students together on a reasonably regular basis, such as at least once a semester. Such activities should be planned and carried out with the cooperation of faculty, thus bringing the faculty of these units into closer and more frequent contact with each other. It appears that upper level administrative encouragement for such activities may be needed, in order to overcome the natural tendency of faculty and students to resist trying new concepts and initiatives. However, from our experience, once the parties are brought together, they find that there are mutual interests, and more cooperative activities develop. Such examples are students working together on national contests, and joint uses of laboratory facilities.

It is obvious that educational systems have an obligation to develop programs that increase experiences to promote mutual understanding and appreciation of the contributions of technicians, engineers and business majors. Such efforts require a paradigm shift, and a more tolerant and understanding attitude throughout higher education, from the administration, to curriculum councils, to faculty and students.

Bibliography

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11. Kunze, John, Boeing Airplane Company, Seattle, WA, experiences of a new engineer in the industrial workplace.
12. Hadad, Alan, Dean of Engineering and Applied Technology, University of Hartford, citing the niche programs that have developed using strengths of both applied technology and engineering.

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