AC 2009-1005: WHY ADVOCATE COMMUNICATION SKILLS IN EXPERIENTIAL LEARNING?

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Why Advocate Communication Skills in Experiential Learning Coupled with Engineering?

Abstract

Experiential learning has become one of the most important foci of engineers enrolled in engineering programs today. Students are regularly combining their courses with work in the real world. With this real world experience, students have discovered that they can no longer simply learn technical expertise without the added knowledge of global issues, cultural constraints, and the need for communication skill. It has, therefore, become vitally important for programs in engineering to provide the necessary tools for their students to excel in the world outside the university during their experiential learning experiences. This focus along with the increased emphasis on communication excellence in the classroom has provided another vital link between the academic and industrial worlds. When students begin their experiential learning assignments, there are many things that are flowing through their minds. They consider the money that they will be earning as part of the work force. They are also entering, in most cases, an environment that is unfamiliar to them. They have not previously been in positions that have required them to become the supervisors of, for example, older union workers. They have not experienced jobs that have placed ultimate responsibility upon their decision making skills. Additionally, they must communicate too many different audiences both inside and outside the working environment. Many of these elements can to be addressed during their time in the classroom, before they go into the working world and after they have returned from these experiences. The emphasis on communication skill and the methods used to focus awareness on these necessities are addressed in this paper.

As freshmen enter the college ranks, many have the impression that the elements that they learned in English courses K-12 have passed to some nether world never to be accessed again. Conducting short surveys of these incoming freshmen finds some startling revelations. Comments range from, “I will never have to write again,” to “I’m going to be an engineer and that means NO English!” We realize that with a little thought from these students on the reality of life in the world of engineering will ultimately change this perspective. But it is an incoming group that sees engineering in a different light from the faculty and academic staff. It is important, therefore, to make every effort to juxtaposition the teaching of the necessary technical material with those skills that will make an engineer both suited for the real world technically and fully capable of communicating his or her engineering expertise to a waiting public.

Obviously it is important to get students involved with engineering as early as possible in their college careers. This involvement will make them a part of not only the institution but the profession of engineering. Hopefully faculty and staff will provide them with adequate information to understand the reasons for taking the calculus and physics and the chemistry and deformable solids. With that there begins the need to provide these same students with an element of their learning that may not seem to exist but is simply atrophied, the vital realization that in order to pursue the profession of engineering they must communicate. This reality definitely does come as a shock to some, and those are quick to respond with the

quotes from above. From day one, faculty must speak about not only technical expertise but the quality of the communication that conveys the information. If that is done, students will move from course to course never forgetting that it is not just the learning of the technical material but the presentation of that same material that will seal their ultimate fates as engineers.

As students enter the college ranks, they are also reminded that obtaining the engineering degree is not the only aspect of the educational system of which they need to be aware. More and more colleges are alerting their students to the need for experiential learning. This sense of experiencing the real working world is becoming prevalent across campuses, but it is especially in the forefront in colleges of engineering, where the need for engineers to experience the reality of the working world has been with us for over 100 years. Students who move from classroom to shop floor find that those elements of their textbook learning do have a place in the companies who have hired them. They use the knowledge that they have gained to practice their profession and learn more from their hands-on experiences. If they have been suitably prepared, they also experience a vast array of communication tasks. They write memos, formal reports, and emails. They speak one-on-one to subordinates and superiors. They spend a great deal of time talking to themselves and other is casual conversation. They slip in and out of engineering issues, but they never stop communicating.

So how does an engineering department work hand-in-hand with the experiential learning experiences of its students? Half the battle is already won. Obviously departments are concerned with what is taught in the classroom and its impact and usefulness to the graduated engineers and the companies that employ them. There is little complaint that what is taught technically is not sufficient for success in the real world, but many forget that element of communication that is necessary to carry that knowledge to others. It is assumed that a student will communicate adequately to get the message of engineering across. And here is where the problems arise. If students have been given the impression that the presentation of their engineering knowledge is a secondary issue and never can reach the level of importance of the technical information itself, then that technical information will never reach the level it could if knowledge and communication were equal partners. This partnership begins when the freshmen first arrive on campus by putting communication on an equal footing with technical knowledge. The way one conveys information gets the same respect as the knowledge itself. Technical expertise and communication skill are presented together as a clear indication that one cannot function without the other. Students must have something to present and the content must have a way to be presented.

In a department's plan to help students in the working world, there is a need to couple the classroom technical knowledge with communication activities. The current organization used by the Department of Mechanical Engineering at MSU incorporates technical knowledge acquisition with its presentation in course throughout the curriculum. Students become immersed in both facets of the program without separation.

Table A1. Communication Activities in ME Curriculum

Frosh Year	**EGR 100 – Residential Program** Resumes, email, short engineering focused reports, engineering writing demands, problem solving, speaking, ethics, and orientation to the university/college/majors	
Soph. Year	**ME 201 – Thermodynamics** Student communication survey, refresher for past grammatical expertise Tools: MS Word, Email, WWW	ME 222 – Deformable Solids Short reports on lab activities
Junior Year	**ME 332 – Fluid Mechanics** Laboratory Reports: (Approx. 9 @ 4-6 pages each) Brief narrative of procedure, measured data, deduced and analyzed data, plotted results with discussion and conclusions.	**ME 371 – Machine Design I** Short Technical Reporting Design Analysis Reports (2 @ 4-6 pp. Individual); Technical Analysis, Economic Analysis, Recommendation for Action Tools: EES.Powerpoint
	ME 391 – Mechanical Engineering Analysis Reading, thinking, and teamwork Tools: Matlab	**ME 412 – Heat Transfer** Design Project Documentation: Formal Report (1 @ 10 pp. + App., Individual) Memo Reports (X @ 2 - 5 pages App., Individual) Tools: MS Word, Excel
Senior Year	**ME 451 – Controls** Laboratory and Project Reports: Laboratory Experiment Written Reports (2 Formal Reports, Individual); Abstract, Nomenclature, Introduction, Analysis, Results, Discussion, and Conclusions – Teamwork (3-5 students/team), 9 short form reports, individual formal reports Tools: MS Word	**ME 461 – Vibrations** Laboratory and Project Reports: Laboratory Experiment Written Reports (2 Formal Reports, Individual); Abstract, Nomenclature, Introduction, Analysis, Results, Discussion, and Conclusions – Teamwork (3-5 students/team), 9 short form reports, individual formal reports Tools: MS Word, Excel, Matlab

	ME – 471 Machine Design II Design Project Documentation: Formal Design Reports Tools: C Programming, Excel, Matlab, WWW	**ME 481 – Senior Capstone Design** Problem Definition, Progress report, Project Report (1 @ 35- 200 pages) Detailed description of design approach, results, and conclusions, with supporting documentation Teamwork 3-5 Students/Team Multiple industry interactions, small group presentations 1 Formal presentation to industry, faculty, and student audience Tools: MS Word, Excel, Matlab, WWW, Powerpoint

As students move through the above courses, many of them come and go from the university on co-op and intern assignments. They spend time in class learning the technical material. They present that material in a variety of formats, and then they enter the arena of work and practice what they have learned. Industry does not separate technical expertise and the ability to communicate. In the real world, students must be able to put their ideas out to a variety of audiences and be understood. If they have been given the tools to present their technical knowledge, they will succeed. If not, they still have the opportunity to return to the classroom and improve their abilities. Experiential learning and classroom education can work hand-in-hand to prepare students to graduate as competent engineers, not only in what they know but how they present it.

Conclusions

If the classrooms from which our engineering students come are continually focused on communication as that element with which engineering cannot function, students will enter their experiential learning opportunities with eyes wide open to the learning that will complement their classroom experiences and the communication techniques and practice that will provide them with the means to have fruitful and spectacular careers.