



I Should Not be Expected to Teach English!...But

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Abstract

This paper addresses a widely ignored fact, “Engineering professors ARE English teachers!” They do not teach literature or the structure of the novel. They do not provide grammar quizzes every Friday. And they certainly don’t give popular movie reviews of all the shows they watched on a given weekend. On the other hand, they spend a great deal of their professional lives writing journal articles and conference papers, reviewing articles written by other faculty, and being the mentors for untold numbers of theses and dissertations. Life as an engineering faculty member requires the writing and review of two major documents in their own lives: the thesis and the dissertation. Even the youngest assistant professor has been closely connected to writing a spectacular document and what it means to do so. It would be an interesting study to see how many faculty members never made a comment on the theses and dissertations of their own students.

Faculty members should think beyond the technical assignments that are given to students to issues that are raised in their own writing and speaking. These activities are important to students so that they can see the necessity of communicating well for their future success. Students will more readily accept the premise that communication is a vital part of an engineer's life if they are given that information along with their technical material and in the context that college professors have to spend a great amount of time writing, too.

This paper will look at the kinds of information that can be imparted to undergraduates through surveys of faculty on the variety of items that require change in those graduate theses and dissertations. Surveys will also be provided to address the students’ attitudes toward being given communication suggestions from engineering faculty.

Introduction

There is a growing need for members of all engineering departments to address a problem that is steadily increasing because of the large number of international students entering the undergraduate ranks. While the number of graduate students has always been high in most US institutions, there have never been the current numbers of international students in the university populations at the undergraduate level. This affects not only classroom size and the load on faculty; it presents a difficulty in many cases on both the understanding of English and the production of competent text by those students. This current climate does not show any lessening; therefore it is important for faculty to be given techniques that will help them in their classrooms. Instead of simply discussing how technical matters are conveyed, it becomes critical for engineering faculty to express to their colleagues the various ways in which they use written and oral communication techniques in their courses and how those methods have provided a better learning experience for their students both

domestic and international. There is also an equal responsibility for department chairpersons to further the dissemination of communication skill information to their department members. Individual faculty members should also think beyond the assignments that are given to students to issues that are raised in their own writing and speaking. These activities are important to students so that they can see the necessity of communicating well for their future success. Students will more readily accept the premise that communication is a vital part of an engineer's life if they are given that information along with their technical material and in the context that college professors have to spend a great amount of time writing, too.

The promise of articulate engineers able to construct concise papers directing their audiences to exact interpretations is the wish of all engineering departments. Engineers who are both well versed in their areas of expertise and able to convey this information have been a goal of colleges of engineering for decades. English departments on every campus in the country have performed the task of giving information on writing and sometimes presentation skills to engineering students on a one or two class basis. This one-time basis has constituted an engineer's indoctrination into communication skills (mostly attached to skills oriented to the arts and letters). Once this internship is over, the experience (whether good or bad) is placed behind (usually on a cold, back burner), and the engineers immerse themselves in their technical study, usually devoid of communication skill concern. The time has arrived for a simple fact to be made known. The most important role models in the area of communication skills are individuals who have always been in the engineering student's sight, the engineering professors. Professors in the engineering departments, as in most majors, are the focal point of their students, and their words far outdistance comments from individuals outside the major area. By uniting the faculty in a concerted effort to explore and improve communication skills, both engineering students and the world in general will profit. By analyzing what is done in each course in the engineer's major, by creating a continuum of communication skill instruction and evaluation in every department, and by utilizing in-place (through careful discussion) technical assignments to emphasize needed communication; the engineering student will be more willing to accept and investigate the need for communication skills.

A great deal of text has been devoted to the issue of creating good communicators out of engineers who are educated in traditional technical courses. Vast numbers of articles and books have suggested ways to ensure that at least the outward look of a writer's effort conforms to acceptable norms. Classes are required, papers are assigned, some comments are voiced; but in so many cases the retention of communication skill is not assured and does not become an integral part of the engineer's existence. Engineers need to understand the bond between their technical knowledge and their communication skills. This bond must be accomplished in the most efficient amount of time so that it creates a lasting awareness of technical communication and its importance in every engineer's career. This is especially important in an engineer's education where time is critical and the direct reflection of the importance of elements in the educational system must be clearly understood by the student.

The required courses of the typical engineer offer little room for flexibility. By the junior and senior years, students are fairly programmed into set schedules. Engineers, then, must be

provided with something that will give them the skills to produce the text needed to survive in the real world and do it in a manner that requires the least amount of superfluous effort. Supplying large numbers of writing courses will not improve the situation. Since there is no room in the schedule of the engineer, these courses will not be taken even if there is a definite awareness of need on the part of the student. Something must be done and the means is closer than one thinks.

Analysis

There exists in every college of engineering a vast untapped resource that up to this time seems to be ignored by the seekers of improved writing effort. The resource is the engineering faculty itself. No members of any department have reached their positions without producing large amounts of text and presenting information to a variety of audiences. Papers written in their undergraduate years, theses, dissertations, textbooks, and the endless number of articles prepared for proceedings, magazines, conferences, and collaborative efforts have forced these professors to be at the forefront of text producers. It is probable that few if any professors talk about the amount of writing that they do, or the difficulties that arise as they produce text. It is also currently unlikely that many faculty members will discuss with their students the number of revisions required to make their text ready to be considered publishable material. Here is the point at which a faculty member can step in and become a critical part of the communication skill acquisition simply by being a good role model for that communication. Role models exist everywhere in the real world so why not put engineering faculty in that same category. "A role model is a person who others look up to and admire. A role model provides inspiration and motivation to seek out accomplishments. Role models send messages about their beliefs by what they do and say."¹ If you ask engineering students, many will respond that that is what their instructors are. The effort should be then to convince faculty of their role (model) in the everyday action of teaching.

When you think about it, do any of these faculty ever mention the response that they receive when sending material into journals for review? With the amount of writing that is done, the amount of presenting that goes on, and the level of intellectual thinking that goes into the text produced; it would seem natural that this kind of information would be enlightening to students in every engineering course. This then fits in quite well with comments by individuals who believe in the intrinsic value of role models when people like engineering faculty, "Lead by example. Act the way you want other people to act. Think about what you are doing and how it will affect other people. Make good decision that can be passed on. Do you say things that someone might repeat? If yes, than make it something good."²

By the time students reach the junior and senior levels they have become engineers. They are listening to their instructors as mentors to the challenging careers that lie ahead. The captivating quality of the engineering curriculum lends itself to be the base upon which communication skills are presented to engineers. Professors would not have to spend great amounts of time discussing the communicating that they do. But knowing that professors experience the same kinds of problems that students do, it would open up the dialogue to a better awareness of communication skills. Students would learn from and with their professors about the ways that communication develops. By talking about the individual ways that each creates text, all could

benefit and learn. This is not a one-way street. Professors, too, could gain from the experience. Questions directed to them about particular communication problems might also enlighten the faculty into problems that they might be having. This in itself would promote the purposes of communication. Communication would become for students something that would allow them to learn more about what they know. Professors while teaching would also be involved in the learning process. All involved would benefit. As one writer put it, "I think mentors should be role models, BUT a role model who hasn't forgotten where s/he came from, how s/he got to where s/he is now and always looking back to see if s/he can help those that came from the very same place."³ Everyone has had to write, and engineering faculty continue to have to produce text throughout their careers. By taking their own travels through communication as a means to get engineering students to look at their own tasks, a bond can form that allows for the improvement of student text.

Procedure

How does one approach a situation where the faculty is to be asked to perhaps open up to students in an area that they may not be totally comfortable? How do you get faculty members to talk about an area in which they may have problems themselves? Here the need exists for concerned members of a department to begin the process. Much like creating a text, select faculty members must become the catalyst to encourage other members to talk about communication and how they approach it in their own writing and in their courses. Discussion among faculty members will help to bring the communication issue to the forefront. As discussion continues, the particular methods used to include communication tasks in one's course will become evident. These approaches may be minimal. They may include only formal reports with little communication skill comment or simply lab write ups. But each assignment discussed will provide a connection to other engineering courses. The dialogue will allow faculty members who may be uncomfortable with the communication process to listen to others who may provide concrete help in the area. As the discussions continue among the faculty members, the links between courses can be drawn.

Another process is to simply ask faculty and students alike what they see as concerns in their own writing and experience with the written text. At least there is a starting point to understand what the perceived problems are and address them. Instead of simply complaining about the lack of communication skill demonstrated by engineers, it is important that interested parties in engineering departments investigate the actual deficiencies and concerns of those affected. These parties are comprised of students, faculty, and employers. Faculty will provide the usual insights, "Engineers continue to be poor communicators! They can't write! They can't speak!" This may not be very helpful in trying to bring about change. Students are also fairly limited in their comments, "I can't write! I can't speak!" Certain employers will provide the same train of thought in their estimation of student output. These comments, though, do not provide much in the way of substantive help when it comes to correcting deficiencies. Therefore, access to actual concerns must be provided.

The initial investigation into communication issues began with a survey that was created to delve below the surface of "Can't write/Can't speak," and discover what the actual concerns of students and faculty were. In this survey, faculty and students in the College of Engineering were

asked to participate. Seventeen faculty members participated, distributing questionnaires to 28 classes. The two separate surveys produced a variety of interesting results, especially the similarity of concerns from both faculty and student alike. Since the surveys focused on the need for specifics and not the general attitude that “engineers can’t communicate,” it was important to gain insights about where the actual concerns lie.

The principal area of concern for both groups was the issue of grammar, punctuation, and spelling. This concern was followed closely by lack of organization skills, unclear expression of ideas, poor verbal skills, and difficulty with writing introductions and conclusions, and weak logic. The rankings for each group were as follows:

Faculty

- Grammar
- Verbal skills
- Organization
- Expression of ideas
- Poor introductions and conclusions
- Logic
- Support of ideas

Students

- Grammar
- Expression of ideas
- Organization
- Support of ideas
- Verbal skills
- Poor introductions and conclusions
- Logic

The two groups also had similar responses to the questions that dealt with how to improve the communication skills of engineers. They both felt that more written assignments with increased feedback would help immensely. This applied equally to the verbal skills where more presentations were suggested with a more concerted effort toward providing constructive feedback. Class analysis of technical papers, providing equal grading for both technical and the way the material is presented, more practice, and the teaching of presentation tools like PowerPoint were all listed as helps to improving the communication skills of engineers. Future work will more clearly indicate concerns and the ways to address these concerns in an engineering department. Samples of the surveys are included in the Appendix.

The current focus of engineering faculty and corporate leaders over the lack of communication skill expressed by engineering undergraduates has merit when we look at many of the documents produced by young engineers in their early engineering courses. These weak documents become the basis for much of the text production that is seen in the upper level engineering courses. Poor training in and attitudes toward the production of technical documents and a lack of concrete connections to the technical world in early writing classes have created a weakness in the communication system in many engineering departments. It is necessary, therefore, to address and correct this problem in any manner that will bring about improved communication skill.

Many avenues have been suggested to do just this: writing across the curriculum, writing intensive courses, tutors. The list is extensive. Another method may be to investigate the typical problems shown in the text produced by the average engineer and devise methods to address these particular problems within the engineering classroom. The goal of any engineering course should be to produce technically competent engineers who can produce written text that is free of mistakes in both the technical content and the presentation of that material. If communication skills are to be scrutinized in the engineering classroom by the engineering faculty member, it is necessary to provide information on specific areas of concern along with ways to address these concerns. By focusing on problems that are generally encountered in engineering text, the faculty member does not have to assume the role of English teacher. There will only be a necessity of directing the attention of the students to a very specialized list and requiring that the student address the concerns.

Avenues for Improvement

After investigating almost ten years of text produced by junior and senior mechanical engineering students, five common areas of concern were found to be most prevalent: the problems involved in simply beginning the production of a text, specific grammatical mistakes, difficulty in creating text that flows, awkward wording, and a lack of direction in editing. If every engineering professor makes an effort to direct students to focus on these concerns, the text production in engineering courses can improve.

Engineering students need to be told to let text flow from the knowledge that they possess. They need to sit down and brainstorm the information that may or may not be included in their writing. Telling students to make an effort to generate as much text without a concern for order or grammatical correctness produces a wealth of material that a student can then organize into a coherent document. By producing copy with as much information as the student can generate, a clear indication of gaps in necessary material will also be evident. Suggesting that outlines should be produced from this early writing will allow the student to see the direction in which the text will move, a movement that will result in a much more competent production.

A common concern among faculty readers is the level of poor grammatical skills expressed by student writers. But where does one start in a fluid mechanics or in a vibrations course to address these concerns. The unfocused feeling expressed by faculty is probably the same as the students who have no idea where to begin their reports when they have only the blank computer screen in front of them. There needs to be a basic list upon which to focus. After looking at a wide range of technical reports, a common set of errors came to light. These errors were in the use of tense: especially present and past. A simple request to look at the tense usage in text may be enough to correct some of these mistakes. Another area that seems to appear in many pieces of student text is incorrect documenting of sources both in the text and in the way bibliographies and reference lists are created. A great deal of complaint is raised, but if examples are given in the early days of a class, the problem might simply disappear. The last broad grammatical problem area concerns simple punctuation mistakes: punctuation with equations, both before and internally; where to place commas; the use of the semi-colon; punctuation with lists; and where does the punctuation go in figures and tables. A few grammar rules presented in the context of technical documentation to an engineering course at the beginning of each semester or quarter will, in most cases, eliminate many of these mistakes.

A third concern among readers of student text is the flat dull quality that comes from much of the text that is produced by students. This quality reflects a lack of flow in the wording, a condition similar to reading a list that indicates no apparent connection among the various parts of the list. This lack of connection makes a reader quickly begin to wander, sometimes becoming lost in personal thoughts far from the actual text. The three items that may help improve all student text are a focus on outlines, a review of simple paragraphing with topic sentences and supporting information, and an overview of the transitions that can be placed in a piece of writing to make the text flow. These relatively easy elements in writing can make a great difference in the quality of a student's text.

Another problem that is seldom mentioned to an entire class of students (but appears at some time or another in the text that they write) is awkward wording. Students are never shown examples of text that absolutely makes no sense; sentences that are so long that the reader loses contact with the core meaning; and word choices that are inappropriate, ambiguous, or redundant. Faculty who during the course of a semester or quarter give an overview of the kinds of text that do not convey concise meaning provide students with a clear indication of what their own text should avoid.

Lastly, many papers look as though the writer made no effort to read the paper after it was completed. Students sometimes feel that the final click on the computer to print the document is sufficient for a quality piece of text. But does anyone really spend time in giving students an indication of how they should approach their text to proofread and edit the copy. A simple process is to instill in students a need to first look at the content and make sure that they have supplied all the information required. They can then approach the issue of clarity. Is the wording clear and concise? In the third step they review the text for grammatical correctness. The last two steps require students to evaluate their own writing for its ability to present the text in the least number of words and to investigate their own particular style. These efforts will lead to a much better production and fewer concerns over the finished text.

A continuum of communication skills awareness can be plotted over an engineer's entire course structure. Certain types of less complicated text, like the memo, can be emphasized at the beginning levels of engineering expertise, so as to allow the engineer to create the texts without being overwhelmed by them. As the student engineers progress, the degree and amount of text production can increase along with their knowledge. Professors can talk about the similar kinds of writing that they do and the ways in which they handle the writing tasks. Students should also be required to begin the process of oral presentation early in their academic careers. Professors should give their students every chance available to speak of the technical knowledge that they are learning. As interest grows, planned seminars and workshops can be provided that will emphasize the importance of the engineering faculty as the catalyst for improvement.

The structure of unified technical knowledge and communication skill can be accomplished through a concerned engineering faculty speaking about communication, not preaching about it. By involving students in the work that they themselves do, the faculty of every engineering department can stimulate a massive movement in the production of improved engineering text. Along with the discussion on the need for a greater awareness of how text is presented the

assignments that are given by each instructor can allow the students to speak their minds through short one- minute write ups at the end of class, quick 1 or 2 sentences comments about previous lectures or assignments, or memos. These short assignments combined with longer formal reports can provide the student engineer with ample ground upon which to want to improve their communication skills. Small steps in creating text and placing that text in the forefront of engineering courses can be a simple way to make of engineering students a force in the world around them. The structure of the courses within a department could expand to all required courses as in the following. The communication elements in each course are shown below.

EGR 100 – Intro to Engineering Design (Freshman)

Resumes, email, short engineering focused reports, engineering writing demands, problem solving, speaking, ethics, and orientation to the university/college/majors

ME 201 – Thermodynamics (Sophomore)

Student communication survey, refresher for past grammatical expertise

ME 332 – Fluid Mechanics (Junior)

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

ME 391 – Mechanical Engineering Analysis

Reading, thinking, and teamwork

ME 412 – Heat Transfer

Design Project Documentation: Formal Report (1 @ 10 pp. + App., Individual)
Memo Reports (X @ 2 - 5 pages
App. Individual

ME 451 – Controls (Senior)

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

ME – 471 Machine Design II

Design Project Documentation:
Formal Design Reports

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

Faculty/Student Buy In

One of the major concerns with any discussion of asking faculty to spend time addressing communication issues in their technical world is the assumed negative response. Critics will say that faculty will want nothing to do with “English” issues. I think if one looks closely, one will discover that engineering faculty are sometimes more critical of what is presented to them than their colleagues in English. As we look at thesis after thesis and dissertation after dissertation we see a mass of red marks, most of which pinpoint writing deficiencies not technical deficiencies. Yes, these are one-on-one encounters with a graduate student and a faculty member and do not reflect the numbers of students in an undergraduate course, but they do reflect on particular communication issues that can be mentioned to undergraduates about their own writing. Students listen to their technical faculty and when one says that writing is important, it means a great deal more than when an English teacher makes the same comment.

This leads to the student response to an engineering faculty’s comments about a subject seemingly outside the engineering focus. The student must be educated into understanding that there is no engineering without communication. The minute that they are asked to present their technical knowledge without the use of any form of communication, it sinks in that they cannot function in the technical world without being able in some way, shape, or form pass their technical knowledge to others.

Conclusions

Industry is voicing its concern to all colleges and universities that students must learn to communicate more effectively. The pressure is growing from the outside to improve the performance of graduates. With that discussion can come the ways to at least inform students of the importance of communication skills in their lives. The gulf between the sciences and the humanities must be bridged and the need for communication skill expertise must be an integral part of every engineer's existence. Every faculty member must approach the following points with an open mind.

1. The importance of communication skill expertise must come from the faculty in order to create a lasting impression upon engineering students.
2. An equality between what is known and how it is presented must be created in order to make communication skills valuable.
3. The faculty must see itself as a vital link in the communication process.
4. Students must be instructed in the reality that in order to exist as a technical being they will need to function as a communicator.

As the faculty takes its place as the leader in communication skill direction, the engineering student will become more and more compatible with the needs of the world. The comments about student writing in the above text are quite simplistic, but therein lies the message. It does not require a great deal of effort to make students aware of the problems that commonly exist in their writing. Common mistakes seem to appear in most student text production. By looking at text that is produced in their own engineering courses, faculty can pinpoint the most common

errors and address those concerns. Students will receive the message that errors in communication are important to their lives as engineers and improvements will begin. It does not require a great deal of effort to survey the attitudes of faculty and students alike to gain insight into where problems are perceived. Organizing the department into groups that can address elements of concern will do much in both changing attitudes and creating better technical communicators.

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Appendix

Communication Surveys for Faculty

To: All professors in the College of Engineering

From:

Re: Student technical communication skills

There is concern about the engineering student's ability to effectively communicate via either the spoken or written word. As a result, the following survey is being distributed to determine, from the professor's perspective, what needs to be improved upon and how this might be accomplished. Your participation is greatly appreciated and will go a long way to solving this critical problem.

Once finished with the survey, either e-mail back via the reply to sender command to XXX or place a hard copy of the survey in my mailbox in the Mechanical Engineering office.

In addition, there is a survey for the students to complete on this same subject. As I realize, it is close to the end of the semester; it might be preferable to distribute them at the same time as the SIRS forms or the last class period or during the final exam period. Please note below how many surveys are needed for your classes.

I need _____ surveys to distribute to my class(es),

For each of the classes you are teaching this semester please respond to the following questions.

	# 1	# 2	# 3
Course Number	_____	_____	_____
Types of students in your class, please specify only those groups that account for a significant portion of the class population.			
Grad Student	_____	_____	_____
Senior	_____	_____	_____
Junior	_____	_____	_____
Sophomore	_____	_____	_____
Freshmen	_____	_____	_____

Types of communication performed by the students in your course

Formal presentations	_____	_____	_____
Short oral presentations	_____	_____	_____
Demonstrations	_____	_____	_____
Essays	_____	_____	_____
Projects	_____	_____	_____
Formal Reports	_____	_____	_____

Lab Reports _____

Other (memos, progress reports, feasibility studies, correspondence) _____

please specify _____

Communication problem areas for students (please use 1 for major problem area and 2 for minor problem area.)

Grammatical, spelling, and punctuation _____

Organization of paper or presentation _____

Expression of ideas _____

Logic _____

Support of ideas _____

Lack of technical comprehension _____

Introduction or conclusion _____

Transitions _____

Proper use of visual aids _____

Not focused on who the audience is _____

Use of ummm in oral communication _____

Verbal skills _____

Stilted or rambling style of presentation _____

Other, please specify _____

Please list below any suggestions as to what you think should be included in a technical communications course to improve these skills in our student population.

Please list below any ideas on how to educate the students on the various, areas of concern.

Other comments or concerns

Thank you for your time and cooperation

Communication Surveys for Students

An area that is of great importance to an engineer but in which there is little formal training or attention paid is technical communication. To help correct this problem, more emphasis is being placed on determining deficiencies for both the student and the system. This survey hopes to identify those areas of concern and possible solutions to this situation. Your participation is greatly appreciated.

You are:

Grad Student Senior Junior Sophomore Freshman

You have worked at (please mark all that apply):

an internship a co-op a job within the engineering field

Please list any classes that have dealt specifically with the subject of developing communication skills through any means that you feel have been valuable.

What types of communication have been discussed or examined in your courses (please mark all that apply),

Formal presentations

- ___ Short oral presentations
- ___ Demonstrations
- ___ Essays
- ___ Projects
- ___ Formal Reports
- ___ Lab Reports
- ___ Other (memos, progress reports, feasibility studies, correspondence)

Please specify _____

Please list below communication problem areas for yourself and possibly other students as well (please use 1 for major problem area and 2 for minor problem area).

- ___ Grammatical, spelling, and punctuation
 - ___ Organization of paper or presentation
 - ___ Expression of ideas
 - ___ Logic
 - ___ Support of ideas
 - ___ Lack of technical comprehension
 - ___ Introduction or conclusion
 - ___ Transitions
 - ___ Proper use of visual aids
 - ___ Not focused on who the audience is
 - ___ Use of ummm, you know in oral communication
 - ___ Verbal skills
 - ___ Stilted or rambling style of presentation
 - ___ Other, please specify _____
-

Please list below any suggestions as to what you think should be included in a technical communications course to improve these skills.

Please list below any issues that never seem to be raised in this kind of course that should be raised.

If you have worked at a co-op, internship or within the engineering field, please indicate, what if anything, the industry has taught you about the needs of communication that would be valuable in a communications course.

Please list below any ideas on how to educate students on the various areas of concern.

Other comments or concerns

Thank you for your time and cooperation