SOME TECHNICAL WRITING SKILLS INDUSTRY NEEDS

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I must begin--despite all the standard advice to the contrary--with a couple of disclaimers. In the first place, what I have to say will not be new to oldtimers like Jim Souther and Tom Pearsall, who spoke on the companion panel; their feelings are the same as mine, I'm sure. In the second place, when I was asked to talk about "technical writing skills industry needs," I protested that I do not have a view of all of industry's needs, and I still insist that what I have to say is limited by my individual experience with engineers' writing. That means essentially their writing of proposals and of technical articles. I've missed a lot: I have no experience with the writing of manuals, specifications, procedures, reports, and so on; however, I do have some experience in conducting in-plant seminars for a large architectual engineering firm, and I will refer to that in making a couple of points later on.

Within these limits, therefore, I would suggest that engineers and other technical students should be taught three classes of things: (1) big-picture things; (2) writing procedures; and (3) some particular writing details.

BIG-PICTURE THINGS

Let me begin with a few of what I have referred to as big-picture things. The first of these is the importance of clear writing. In the seminars that I have taught I usually begin the first session with a request that each member of the group tell me and the rest of the group what his or her experinece has been with instruction in writing. The most common response is a memory of a class that interrupted the vital technical curriculum, a class that stressed rules, a class that was heartily disliked, a class that was forgotten as soon as possible. That kind of memory must be erased. The students must be convinced of the importance of clear writing.

For example, you teachers might refer to the research done by Richard Davis on the attitudes of prominent and successful engineers concerning the importance of writing. ("Technical Writing in Industry and Government," J. Tech. Writing and Communication, 7 [3] 1977; also reported with additional

detail in The Tech. Writing Teacher, Spring 1977, and J. T. W. C., 8 [3] 1978.) As you probably know, Davis surveyed 348 men listed in Engineers of Distinction and found that the respondents spend some 24% of their time in writing, and that another 31% of their time is spent in working with material that others have written. The respondents said that the writing they do is very important--often critical--to their positions, and they added that the ability to write effectively had contributed to their advancement. This kind of information may help to change the attitudes of your students.

In addition, you might point out that everything an engineer wants must be justified in writing, whether it be new equipment, or a new project, or a trip, or increased budget, or more time, or additional manpower, or added space--everything must be justified in writing. Further, once he leaves the drawing board, almost everything he does must be reported in writing. If the engineering student is convinced of the prominence that writing will have in his career, he may become interested in learning how to do it properly.

Finally, I might point out the attitudes of a couple of the engineering executives in my own company as evidence of the importance of writing. The Corporate Vice President of Engineering and Research, who is my boss, is so concerned with clear communication and is so exasperated by reading memos and reports that are full of jargon, acronyms, and initialisms that he has prohibited me from using initialisms and acronyms in the corporate-wide bulletin of engineering information that I publish. I can't even refer to the McDonnell Douglas Corporation as MDC, for example, for an audience of MDC employees. Similarly, our Corporate Director of Research is so concerned with the clear reporting of the research done in his laboratories that he personally reviews and edits every report prepared by his 80-odd PhD scientists. The attitudes of these executives are not unusual, I might add. They are characteristic of people in similar positions throughout industry.

The second of the big-picture things that I would suggest your students should be taught is the wide scope of the writing tasks that will face them in industry. They will have to write requisitions, standards, procedures, letters, memoranda, and on and on. Further, each of these tasks will embody certain company-peculiar requirements or Government-imposed requirements or customer-imposed requirements. Thus, there is no magic formula the student can learn. There is no standard format he can master. In turn, that suggests that he should be taught to concentrate on learning the basics of writing: the standard rhetorical modes and the standard manner of expression.

In turn, that leads to my third big-picture recommendation, that is, that you should in your teaching concentrate on theory, on such things as the principles of organization rather than how a trip report is organized; such things as how to analyze an audience instead of how to arrange a title page;

and such things as how to classify and partition and interpret rather than how to write an investigative report. I'm sure these pieces of advice contain nothing new, but I think they bear repeating.

WRITING PROCEDURES

The second of the classes of things I think engineers should be taught is writing procedures. Of the many, let me mention only two. The first of these is how to get words on paper efficiently. Again let me refer to my experience with the seminars. When I ask the engineers to tell me what they see as their greatest need, their answers almost invariably can be boiled down to a request that they be taught how to get more done in less time, how to avoid writing and rewriting everything, how to avoid having their supervisors return their written work for revision or complete rewriting. Specifically, I think they should be taught how to define a writing task, how to isolate the purpose, how to identify the audience, how to recognize the time and budget restraints, how to establish the context for the task, and so on. Further, they should be taught how to organize known material--that is, material that they are capable of writing without doing any further research--because that is their most frequent problem in industry. They are asked to write about subjects that they are expert in, subjects that they are familiar with. Library research is extremely rare. And finally, as part of this process, they should be taught one or more practical techniques for getting started. My engineering students tell me that one of their most serious problems is how to get the initial words to flow. I'm sure you know a number of useful, proven techniques that will help them solve the problem.

The second of the procedures I would like to see your student engineers taught is how to team-write. Most of the writing done in large companies like mine is done by groups of people. Even though letters, memos, and similar short documents may be drafted by an individual, they are normally reviewed by one or more other people who have the power to change or order changes. Proposals, research reports, and that kind of document are almost invariably prepared by several people, sometimes hundreds of them. The process of making assignments clearly and following writing assignments rigorously and the process of editing other people's writing and conversely learning how to respond properly to the editing of one's own writing are skills that if taught in school will save the young engineer considerable pain and discomfort when he or she gets into industry.

WRITING DETAILS

Let me go to the third of the classes of things engineers should be taught, that is, details about writing. Of the multitudes here, I would like to specify only two which are based on work I have recently done in editing the

bulletin I mentioned and in editing a professional journal I put out. The first of these is how to achieve precision in the use of language. In most technical writing there is entirely too much handwaving, too much "writing like you talk," too little recognition that writing is a dialect, too little recognition of the reader's limitations. For example, look at the sample of writing below.

HOW TO CITE REFERENCES PROPERLY IN TEXT

①Literature references serve a rather obvious purpose in any kind of technical paper: they show what others have previously done and published. ②One of the important purposes of literature references is to show the extent of those previous developments, which gives you the opportunity to define your own innovations or improvements against that background information. ③Still more important, references to existing articles and books should indicate the various approaches to related technical problems in the past, in contrast to your own methods and results.

④The proper use of references, then, is a true shortcut to the quality of your manuscript because they help to define the novelty of your technical developments or engineering designs. ⑤To know what has already been published in your field is, of cource, a great advantage. ⑥But findings and using the references is by no means a routine matter--indeed it has many pitfalls. ⑦Frequently an author does not know how to devote enough time to finding the pertinent literature nor how to cite it to his own advantage after he has found it. ⑧His methods of referring to other work may be inaccurate and downright confusing; his list of references may be very incomplete or inappropriate; or, in adapting from an existing bibliography, he may have missed the stimulus to thinking that comes from searching the literature himself.

This is the first two paragraphs of an article submitted for publication in my journal. It was written by an engineer with over thirty years' experience, an engineer who has published more than fifty professional papers, so it is not the work of an incompetent. Nevertheless, ask yourself what is the connection between sentences one and two. What is the connection between sentences two and three? What does sentence number four actually say? What does sentence number seven say? After reviewing these paragraphs you must ask, as I do, how can we teach a writer to see what his words actually say instead of what he meant to say? I hope you have an answer to that question.

The second of the details of writing that I would discuss is the matter of style. And again of the many possible aspects of style we could consider,

let me limit the discussion to only four of the most frequent kinds of fault I see in the writing that crosses my desk. The first of these is what has been called throat clearing. Look, if you will, at the sample paragraph below.

PERSPECTIVE ON MCDONNELL DOUGLAS CORPORATION
ENERGY SYSTEMS PROGRAMS

Strategic Plan

Capital investment for U.S. energy supply in 1980 approached $100 billion. This included investment of over $50 billion by the petroleum industry and $40 billion for electric power. The Energy Systems industry consists of the companies which provide equipment and services to the petroleum industry, electric utilities and other energy suppliers.

MDC's Strategic Diversification Plan, initially formulated in 1976, . . .

This was submitted by a PhD engineer for publication in our internal engineering bulletin. Although the side heading suggests that he intended to write about the company's strategic plan, the first paragraph says absolutely nothing about that subject. In editing it I simply eliminated the first paragraph. This kind of preliminary discourse seems to be one of the techniques that engineers (and probably others) use in an effort to get started on the writing process. They should be taught to go back and examine their writing with a view to eliminating the irrelevant early material.

The second of the problems in style that I'll mention is what has been called freight trains, long strings of attributive adjectives piled up in front of a noun. For example, look at the title of the sample we examined a moment ago. Another example is shown in the construction preceding "missiles" in the paragraph below.

TESTING LARGE NOSETIP MODELS IN AN ARC HEATED
STREAM USING SHROUDED FLOW

PROBLEM

The development of heat protection materials and/or systems for advanced strategic and interceptor ballistic and/or maneuvering missiles requires accurate and cost-effective simulation of the reentry heating environments using ground test facilities such as the heaters.

These freight trains are the natural response of the engineers to the constant advice they hear to "write briefly and concisely." They think that by eliminating prepositions, for example, they can be concise. They need to be instructed that the readers will simply have to go back and insert the prepositions themselves, and the writer's job is to save the reader that unnecessary effort.

The third problem in style is the typical wordy, overloaded sentence of the technical writer. For example, look at the paragraph below--again, submitted for publication in our internal engineering bulletin.

TIRE PRESSURE INDICATING SYSTEM

PROBLEM

Reviewing the incidents that have occurred on several major commercial transports in the last few years, many of them typically involve loss of pressure in one tire early during the taxi roll due to a tire or wheel failure or foreign object damage such as running over a light standard when turning onto the runway. This early failure is undetected by the flight crew and the takeoff is continued until the overload mated tire fails and the takeoff is aborted at high speed with significant damage to the aircraft and risk to the passengers.

Finally, the problem of transitions in technical writing is one that needs more attention. In the example below a series of disconnected sentences fails to tell a coherent story because the relationships between the sentences are not clear. The addition of a few transitions improves this paragraph considerably. The student should be taught how to make that improvement.

DIGITAL LOGIC FAULT SIMULATOR

PROBLEM

Creating effective test programs for digital logic circuits is increasingly difficult for the test engineer. A test program should detect 95% or more of the potential logic fault modes. The program should also diagnose the faulty modes by identifying all defective IC components. With today's integrated circuit complexity, it is not unusual for a digital module to have 2000 or more fault modes. It is very tedious and time consuming for the test engineer to manually derive stimuli test patterns and calculate the no-fault and faulty output

response data. The manually prepared test program is often incomplete and error prone. Any inadvertent test program errors will greatly increase the time and cost for validation of the test program on the ATE (Automatic Test Equipment). For all of these reasons it is desirable to provide simulation tools for the test engineer which aid in reducing cost and at the same improve test program quality.

CONCLUSION

In conclusion, let me repeat that I think engineering students must be convinced while they are in school that writing is a necessary skill. They must be encouraged to learn the techniques necessary to enable them to practice that skill when they get into industry. The most important thing for traditionally trained English teachers to know is that technical writing is functional. It is good if it accomplishes its function efficiently in the reader's terms. That is, there must be no guessing, no backtracking, no unnecessary effort by the reader. Grace and charm must take a back seat to economy and clarity. But that statement, of course, does not make the teacher's job any easier. You have your work cut out for you, and I wish you the best of luck in doing it.